


FACULTEIT ECONOMIE EN BEDRIJFSKUNDE

UNIVERSITEIT GENT

FACULTEIT ECONOMIE EN BEDRIJFSKUNDE

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Go With The Flow! Or Not?

Stock Prices in Domestic and Cross-country Transmission of U.S. Monetary Policy Shocks and the Role of Countercyclical Monetary Policy

Masterproef voorgedragen tot het bekomen van de graad van

Master of Science in de Handelswetenschappen

Olivier Vermassen

onder leiding van

De Heer Garo Garabedian

PERMISSION

Ondergetekende verklaart dat de inhoud van deze masterproef mag geraadpleegd en/of gereproduceerd worden, mits bronvermelding.

Vermassen Olivier

Abstract

This research contributes to the understudied area of the nexus between excess liquidity and real stock prices by assessing on one hand, the domestic transmission of U.S. excess liquidity to the real economy via real stock prices, and on the other hand the international transmission of U.S. excess liquidity to Emerging Market Economies. This research is important because it sheds light on two policy debates and the little known notion of excess liquidity. The first debate is about 'Leaning Against the Wind' and the second one about the effect of U.S. monetary policy actions, such as Quantitative Easing, on Emerging Market Economies.

The transmission is examined with a Recursive Vector Autoregression, which has impulse responses and variance decompositions as econometric applications. The main findings for the U.S. point out that U.S. excess liquidity exerts positive pressure on U.S. real stock prices, contrary to the recent asymmetric effect the U.S. policy rate had on U.S. real stock prices. To be more precise, real stock prices increased after a contractionary policy rate shock. The Federal Reserve should thus not Lean Against The Wind with the policy rate because of the pressure U.S. excess liquidity (supply) shocks exerts on U.S. real stock prices and the weak policy rate instrument. The main findings for the international transmission are that U.S. excess liquidity affects Peruvian and Malaysian real stock prices strongly and positively. Yet, the effect on real output is less strong. Accordingly, U.S. excess liquidity has led to equity booms rather than the revival of real activity.

Keywords: Excess Liquidity, Emerging Market Economies, International Transmission, U.S. Monetary Policy Shocks, Stock Price Channel, VAR

I would like to extend my gratitude to Garo Garabedian, my project supervisor, for the excellent guidance given throughout the year. A special thanks is also extended to Nicolas Dierick for proofreading my master thesis. Responsibility for any remaining errors lies with the author alone.

(!) A research for five countries has led to a huge amount of tables, impulse responses and variance decompositions. We chose to include all the preceding in the appendix in a concise and structured manner to not disturb the main storyline. This document is therefore divided in two parts, namely the master thesis and the appendix.


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Abbreviations

3MTB = Three-month Treasury Bill
ADF = Augmented Dickey-Fuller
AE = Advanced Economy
BP = Basispoints
BRIC = Brazil, Russia, India and China
CANSIM = Canadian Socioeconomic Information Management System
CPI = consumer price index
EL = excess liquidity
EME = Emerging Market Economies
EMH = Efficient Market Hypothesis
GDP = Gross-Domestic Product
HICP = Harmonised Index of Consumer Prices
I(p) = integrated from the p^{th} order
IBGE = Instituto Brasileiro de Geografia e Estatistica
INDPR = industrial production
INEI = Instituto Nacional de Estadistica e Informática
IPPI = industrial product price index
KPSS = Kwiatkowski–Phillips–Schmidt–Shin
LATW = leaning against the wind
LSAP = Large-scale asset purchases
M.to.GDP = money to GDP ratio as a deviation from its equilibrium trend
M1 = monetary aggregate M1
MSCI = Morgan Stanley Capital International
PP = Phillips-Perron
QE = Quantitative Easing
REER = Real Effective Exchange Rate
$\mathbf{r_{x,y}}$ = correlation between X and Y.
S&P 500 = Standard and Poor's 500
S&P/TSX = Standard and Poor's / Toronto Stock Exchange
SA = seasonally adjusted
UIP = Uncovered Interest Rate Parity
VAR = Vector Autoregression
VECM = Vector Error-Correction Model
ZLB = Zero Lower Bound

1 Introduction

1.1 Monetary Policy And Stock Prices

"*Investors at the time didn't think that they were floating on a bubble, and they saw the probability of a stock market crash as unusually low. Yet a plunge soon occurred.*" (Shiller, 2013)

The Federal Reserve was ready to take necessary actions after the two latest episodes of U.S. stock market crashes. For instance, economic agents were willing to pay a (too high) price for a certain amount of risk in the early 2000s. At some point in time, it was revealed that companies such as Worldcom and Enron committed fraud, which led to a 'confidence break driven' stock market collapse. Similarly, a confidence break between bankers in the period 2007-2008 led to a breakout of systemic risk that depressed global equity markets. After both crashes, monetary policy has played an important role in rebuilding confidence from the demand side by exploiting their monetary policy instrument. In both cases, it has led to a revival of the American stock market.

As one might expect, this paper is an empirical study about the relationship between monetary policy and stock prices. But before exploring this specific path, the policy framework we will be working in will be discussed. This framework is the foundation of the research question.
Section 2 contains the literature review and is about 3 big parts. Section 2.1 provides an overview of the main theoretical linkages between monetary policy and the real economy and allows on one hand identifying the necessary economic variables and on the other hand avoiding spurious regressions. Firstly, monetary policy actions that transmit to the real economy via (real) stock prices are discussed. The next part focuses on a subpart of the transmission, namely the nexus between

stock prices and monetary policy actions. Finally, the transmission is placed in an international framework.

Section 2.2 focuses on the empirical literature that estimates either a model similar to this paper or has a comparable research question. A distinction between Non-VAR and VAR models is made. The existing empirical work is valuable for the data and methodological approach as well as to compare our own results with.

Section 2 ends with a brief overview of the stylized facts that are expected to be present in this papers' model. In addition, an overview of country characteristics is given to get a sense of the country heterogeneity. Knowledge gathered in section 2.1 and 2.2 allows focusing in section 2.3 on what country features are most important. Ultimately, country characteristics help interpreting the results.

Section 3.1 is about data and the methodological approach, which is a subpart of section 3, the empirical work. Thereafter, we proceed with the interpretation of the results in order to form policy recommendations that allow coming back full circle.

1.2 Policy Framework

We can imagine the reader wondering what the fancy title means. Well, it actually summarizes the debate that has been going on between (monetary) economists since the late nineties: "should a central bank act countercyclical ('leaning against the wind') and mitigate boom-bust cycles or not?" In other words, 'go with the flow' would mean let whatever happens happen and clean the mess up later.

When writing a master thesis in monetary economics, we find it quite important to know in advance whether the research could have some interesting policy recommendations / implications. It turns out it has, as the financial crisis has made an 'old' debate topical again (De Grauwe, 2008, p. 1; Ravn, 2014, p. 24). The recent financial crisis and the resulting central bank actions have even added a more international aspect to the debate, because monetary and financial instability[1] can be exported abroad (See for instance asset price booms in BRIC countries). In the next paragraphs, we briefly explain the two debates.

1.2.1 The Finished One

This debate is about domestic monetary policy spillovers to the real economy via asset prices and the role that monetary policy should play in this part. Looking back at the past years, researchers pointed out that consumer prices have been stable, whilst asset prices have been extremely volatile. Researchers indicated that (ample) liquidity could be driving these volatile movements. (Giese & Tuxen, 2008, p. 3; Wiedmann, 2011, pp. 1-2; Schnabl & Hoffman, 2007, p. 10)

[1] Monetary stability has to be interpreted as "low and stable inflation" (Borio & Lowe, 2002, p. 22). In this research, we consider inflation as increases in consumer prices, as well as in asset prices.

[2] Something non-fundamental can also be discussable if taking the EMH to an extreme. Around the

De Grauwe (2008, pg. 1) and Alessi & Detken (2009, p. 7) distinguish two groups in this policy framework. Although these groups have been debating about the appropriate monetary policy action to mitigate asset price volatility and its effect on the real economy, both groups acknowledge that asset busts can cause macroeconomic and financial instability.

The first group consists of for instance Bernanke & Gertler (2000), Greenspan (2007) and Posen (2006) and believes in the reactive role of monetary policy, which means that monetary authorities should only intervene in asset markets to clean up the mess after the bubble bursted. This is also called asymmetric monetary policy (See for instance Roubini, 2006). The first groups' opinion is based upon two statements. Firstly, they argue that bubbles, which are non-fundamental[2] surges in asset prices, cannot be identified 'ex ante' because policymakers are not certain whether a surge in asset prices is related to fundamentals or not. Moreover, due to this identification problem, proactive monetary policy would make everything worse because fundamentals will also be affected (Cukierman, 2013, p. 379). Secondly, the policy rate is not appropriate to target bubbles. Even so, simple inflation targeting is already a mild form of LATW because of the positive relationship between asset prices and output, such as "… the calming effect of macroeconomic stability on financial markets" (Bernanke & Gertler, 2000, p. 14).

On the contrary, the second group, which includes researchers such as Smets (1997), Lee & Son (2013) and Roubini (2006), state that central banks should engage in proactive actions and burst bubbles if and only if the bursting bubble is expected to cause macroeconomic disruptions in terms of expected inflation and real output. Therefore, central banks should not burst every stock bubble, but this phenomenon should be placed in a broader framework, where the coexistence of several rapidly increasing variables has to be considered, which is related to several authors' (Borio & Lowe, 2002, p. 11; Cukierman, 2013, p. 380; Adalid & Detken, p. 7; Bruggeman, 2007, p. 21)[3] findings that large economic disruptions only happen in certain environments. Ravn (2014, p. 24) has expressed a more extreme view and warns that asymmetrical monetary policy, as proposed by the first group,

[2] Something non-fundamental can also be discussable if taking the EMH to an extreme. Around the Dot-Com bubble for example, people thought these peaks where justifiable because it was the start of a new economy and can thus be seen as a high-expected growth story (Bask, 2012, p. 221).

[3] For instance: "The results suggest that the combination of high money and credit growth, low interest rates, strong real GDP growth and low inflation should be seen as signaling an increasing risk of an imminent aggregate asset price boom." (Bruggeman, 2007, pg. 21)

creates “moral hazard problems” because “gains are privatized, whilst losses are monetized or socialized” (Stiglitz, 2011).

Also, the second group easily rejects the arguments of the first group. At first, not targeting a boom can also cause economic disruptions (Borio & Lowe, 2002, p. 26). Next, Roubini (2006, pp. 91-92) argues that the identification problem is no excuse, as all policy decisions are subject to some “… degree of uncertainty”.

Given the recent stock market crashes and the increasing availability of early warning indicators for boom/bust cycles[4] (See for instance: Borio, 2012 and Bierut, 2013); central banks have no excuse to not target or burst these asset price bubbles (Alessi & Detken, 2009, p. 5). Therefore, the first group is losing credit. This may be stressed even further, up to this day; most economists will agree that LATW is the preferred monetary action (Nisticò, 2012, p. 126).

1.2.2 The Controversial One

Policymakers debate about the effects of monetary spillovers of Advanced Economies to other economies’ financial markets and real economy. Based on financial news, a lot of EMEs[5] complain about this ‘problem’, where especially the U.S.’s actions are felt abroad:

[4] For instance: Bierut (2013, p. 1) discovered that the “real private credit growth gap” performs best as a leading indicator for stock prices.

[5] For the purpose of this paper, an emerging market will be defined in line with De Rosa, (2009, p. 1): “... one that is poorer than those in the developed world but that has capital markets accessible to international investors ... and which has adopted the institutional, legal, and financial structures that put it on at least a potential path to becoming a more developed country over time.”

> *"While everybody wants the US economy to recover, it does no good at all to just throw dollars from a helicopter."* Guido Mantega, Finance Minister of Brazil, 2010 (in: Fratzscher, Lo Duca & Straub, 2012, p. 2)

> *"This crisis started in the developed world, … it will not be overcome through quantitative easing policies that have triggered … a monetary tsunami, have led to a currency war and have introduced new and perverse forms of protectionism in the world."* President Rousseff of Brazil, 2012 (in: Fratzscher, Lo Duca & Straub, 2013, p. 4)

Like the previous debate, there are two groups that can be identified. The first group, which mainly includes EMEs, argues that U.S. monetary actions had severe consequences such as, 'currency appreciation', 'overheating' and 'asset price bubbles' and ultimately economic disruptions due to reversals. All the preceding relates thus to hot money finding a way in and out of EMEs. (Fratzscher, 2013, pp. 4-5; Ponomarenko, 2013, p. 92; Bernanke, 2012) In this case, QE is seen as a push factor for capital flows towards EMEs (Chua, Endut, Khadri, & Sim, 2013, p. 3).

Nevertheless, this debate is still controversial (Fratzscher, 2012), and this is where the other group steps in. On the one hand, this group of AEs reports that spillover effects are unavoidable because of economic and financial integration, while on the other hand, the effects have mainly been positive for EMEs' real output because of increasing U.S. demand (Chen, Filardo, He, Zhu, 2011, pp. 238-239; Zhu, 2012, p. 12; Bernanke, 2012). This unavoidable spillover effect is exacerbated by the fact that small and open economies are more vulnerable to 'external shocks'. (Guesmi & Nguyen, 2011, p. 2517) Nevertheless, this positive effect can be easily counter argued because of 'sudden stops' and 'reversals', which result in enormous capital outflows eventually leading to financial and macroeconomic instability. (Volz, 2012, p. 3)

EMEs face difficulties in using the policy instrument to address this capital flow volatility. Firstly, this relates to the impossible trinity because most EMEs have chosen for independent monetary policy and capital mobility. Due to this capital mobility, U.S. shocks can be rapidly transmitted abroad. (Hoffman, Loeffler, 2014, p. 4; Murray, 2013, p. 10) Secondly, the difficulty is that EMEs cannot significantly change their policy rate. On one hand, lowering the policy rate is not an option because

it has reached such a high level to slow down the economy. On the other hand, increasing the policy rate would increase interest rate differentials and make EMEs an even more interesting investment opportunity.

This might be an example of "… the use of only one policy tool is insufficient to preserve both monetary and financial stability". (Tinbergen, 1952 in: Hoffman, Loeffler, 2014, p. 6) EMEs' current solution to address the capital flow volatility is imposing capital controls and working with reserve requirements.

1.3 Research Question

Whilst researchers and policymakers were debating whether central banks should burst bubbles, the work of other researchers reveals the role of monetary related variables in asset boom bust cycles and the nexus between monetary policy and asset prices. For instance, the work of Christiano, Ilut, Motto & Rostagna (2008, p. 6) discovers that "…asset price booms are correlated with strong credit growth".

Similarly, the aim of this paper is to investigate the link between U.S. monetary policy and domestic and foreign stock prices. This approach is somewhat the reverse of the first policy debate. The rationale is as follows, if monetary policy actions exert pressure on stock prices, then it would be counterintuitive and difficult to use their instruments to target boom-bust cycles, as it are these tools that are causing stock price volatility.

We come to the following research question: "What is the role of stock prices in domestic and cross-country transmission of U.S. monetary policy shocks and to what extent can countercyclical monetary policy mitigate these effects?" This research is especially interesting for both policymakers and investors, as it can improve their understanding about the transmission mechanisms, given that equity prices have an important role in the transmission. Furthermore, such an analysis is useful to examine if U.S. monetary policy is a risk factor in international financial markets. This research question can be split up in three parts.

In line with the first policy debate, the stock market channel will be examined as a transmission mechanism of monetary policy shocks to the domestic real economy. The main contribution to the literature is the broad definition of monetary policy shocks, as the transmission of the policy rate, money supply[6] and excess liquidity supply shocks is investigated[7]. There is still an abundance of

[6] We are aware that on one hand money supply shocks are usually described as macro shocks, (Rapach, 2001) and on the other hand, that neither money supply, nor excess liquidity is completely controllable by a central bank. Yet, we define both as monetary policy instruments for simplicity. Also, the identification as supply shocks makes it more reasonable that a central bank can control them.

research opportunities, which could be explained by what Gerdesmeier & Polleit (2005, p. 4) call "the economy-without-money", meaning that money was not important when analyzing the impact of monetary policy. The motivation to focus on excess liquidity is on one hand based upon Gouteron & Szpiro (2007, p. 4) their opinion that "… surplus money not spent on the market for goods and services would likely be spent on the asset market" and on the other hand, our interest to fill the academic void of excess liquidity transmission. The second contribution refers to the Lucas critique, as models are state-dependent and results can change over time. The final contribution is that the model can be estimated with a newer dataset. This is especially valid because a lot has changed over the couple of years! In the aftermath of the financial crisis, policy makers in advanced economies sought comfort in unconventional measures, as the traditional policy instrument faced the zero lower bound due to exploitation. One of the main goals was to let this ample liquidity "… stabilize financial markets and store up confidence" (Zhu, 2012, p. 12).

For the second part of the research question, namely cross-country transmission, we investigate how excess liquidity in the U.S. creates external stock price shifts in EMEs. Intuitively, liquidity in excess of an equilibrium value seems most likely to spill over. In addition, the effect on other domestic variables is also examined for comparative reasons. The spillover of excess liquidity will happen through the domestic variables of one country at a time (no aggregated variables). This allows shedding light on country heterogeneity and the asymmetrical effects of monetary policy, in contrast to researchers who examine global excess liquidity spillovers on global variables (See for instance Darius & Radde, 2010, p. 3).

This research is interesting for a number of reasons. Firstly, up to this day, the literature remains very scarce about excess liquidity spillovers[8] and the transmission channel remains a 'black box'. Similar existing research focuses solely on global (excess) liquidity, contrary to this papers' approach that separates the effects between the U.S. and other AEs. Secondly, this approach sheds light on the controversial policy debate. With the model, we can examine to what extent U.S. monetary policy has an effect on EMEs and to which variables it spilled over.

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[7] We also investigate how the domestic transmission of monetary policy works in EMEs to get to know the country, but we do not consider domestic excess liquidity as we assume that this is only created by AEs.

[8] Nevertheless, more and more researchers are shifting the focus from Advanced to Emerging Market Economies, which is an indication that research is not immune to fashions.

Third, based on the results of the domestic and cross-country transmission of U.S. monetary policy shocks to the real economy, it is investigated what monetary regime contributes to financial and monetary stability[9]. For this reason the focus lies on pro-cyclical or countercyclical monetary policy. In this research, countercyclical monetary policy should be interpreted as central banks adapting the interest rate after real effective exchange rate, real output or real stock price shocks. Eventually, this enables giving advice about appropriate policy measures to ward against equity price volatility and external excess liquidity shocks.

Concerning the countries, the main focus lies on the U.S. for AEs because it is a leading country. Moreover, the Federal Reserve is seen as THE central bank, given that everyone watches its actions. As Craine & Martin (2008, p. 194) stated, a "…U.S. monetary surprise is a world surprise". Consequently, it is especially U.S. monetary actions that can exert effects. These effects get exacerbated because some EMEs are highly dollarized and the U.S. is a funding and reserve currency. (Hoffman & Loeffler, 2014, pp. 2, 4)

Canada is added as a benchmark country for the domestic transmission, because of its different country structure and monetary regime. More precisely, Canada is a small and open economy and the financial crisis resolution was very different. For instance, the policy rate did not hit the ZLB.

Brazil, Peru and Malaysia are the EME countries that have been chosen, where each one has different characteristics. Firstly, there is some geographical diversity. Secondly, according to the FTSE list, Brazil and Malaysia are seen as advanced emerging markets, while Peru is seen as a secondary emerging market. (FTSE, 2014) Thirdly, Malaysia tried to fight spillover effects in the nineties, while Peru has no capital controls and Brazil started to impose these in 2009-2010. Lastly, data availability has strongly influenced the choice for these countries.

[9] This idea is based on Borio & Lowe's (2002, p. 22) question: "Of particular interest is the question of what type of monetary regime is most likely to deliver the "best" combination of monetary and financial stability".

2 Literature Review

Before continuing the literature review, a brief recap on the notion of 'fundamental stock price value'. Rapach (2001, pp. 11, 21) proposes the following discount model for real stock prices:

$$S_t = E_t \sum_{i=1}^{\infty} \frac{D_{t+i}}{\prod_{j=1}^{i}(1 + R_{t+j})}$$

"where S_t is the real price of stocks; E_t is the expectations operator conditional on information available at time t; R_t is the real rate at which cash flows are discounted (the sum of the risk-free bond rate and an equity-risk premium); D_t is the real dividend". (p. 21)

This model suggests that real stock prices are only dependent of a discount factor and future cashflows.

2.1 The Transmission Mechanisms[10]

2.1.1 From Monetary Policy To the Real Economy

Monetary policy cannot exert an immediate effect on the real economy and actions will be transmitted with a lag through various channels.[11] Firstly, Tobin's (1969) Q and the 'Wealth Channel'

[10] The focus lays on transmission mechanisms wherein stock prices play a role or where stock prices can be affected by. Consequently, every transmission mechanism will be explained from a stock price point of view and we neglect other asset prices.

are two similar channels that transmit monetary policy shocks through stock prices, despite the difference that they have a producer and consumer perspective respectively. (Mishkin, 2001, pp. 4-5)

The transmission happens as follows. Expansionary monetary policy, described as increases in money supply or a decrease in the interest rate, can affect the short-term real interest rate via the traditional interest rate channel due to the sluggish adjustment of prices. Also, linked to the end result of the transmission, expansionary monetary policy can create positive expectations about future economic growth, under the assumption that investors are forward-looking. (Maio, 2013, p. 2; Ioannidis & Kontonikas, 2008, p. 36)

Both decreasing real interest rate and higher expected economic growth increases stock prices[12] [13]. On the one hand, increasing stock prices positively influences 'Tobins Q' which basically comes down to the possibility of cheaper equity financing as producers can collect more whilst issuing the same (lower Cost of Capital). Eventually, this 'high Q' should result in increasing investments (Tobin, 1969). On the other hand, climbing equity prices increase wealth that in turn stimulates consumption. As a rule, both increasing investments and consumption lead to booming real output.

Mishkin (2001, pp. 3-4) has expressed a more extreme version of the 'Wealth Channel' and notes that increasing financial wealth has a "Household Liquidity Effect". More precisely, households are less probable to go in "financial distress" and this positively influences "consumer durable expenditure and residential housing".

The fourth direct channel via stock prices is the "Balance Sheet Channel", which states that climbing equity prices decrease 'moral hazard' and 'adverse selection' (Mishkin 2001, pp. 2-3). The previous concepts positively influence investments. Also, increasing stock prices leads to economic agents having more collateral to borrow and therefore decreasing leverage. This enables economic agents to access more credit to invest. (Bernanke & Gertler, 2000, p. 9)

Finally, the 'risk-taking channel' is about the effect of for instance increasing equity prices on the risk-behavior of banks in terms of granted credits, which eventually stimulates output through increased investments. (Benford, Berry, Nikolov, Young & Robson, 2009, p. 93)

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[11] Monetary economists argue that money cannot affect real activity, except in the short-run (De Rosa, 2009, p. 28)

[12] This relationship only holds if the short-term real interest rate is linked to the discount factor. (Ioannidis & Kontonikas, 2008, p. 36; Pirovano, 2012, p. 374)

[13] This could also be seen as stocks getting more attractive relative to bonds. (Mishkin, 2001, p. 2)

All the preceding affects the real economy in a positive way due to two rising determinants, namely investment and consumption.
(All the preceding of section 2.1.1 was also greatly inspired by the following authors that express similar views on all explained transmission mechanisms = Mishkin, 2001, pp. 1-5; Montes, 2013, pp. 671-673; Laopodis, 2013, pp. 381-382; Hussain, 2011, p. 752; Bernanke & Gertler, 2000, p. 8; Joyce, Lasaosa, Stevens & Tong, 2010, p. 6; Benford, Berry, Nikolov, Young & Robson, 2009, p. 93; Kazi, Wagan, & Akbar, 2013, p. 92; Maio, 2013, pp. 1-2; Ioannidis & Kontonikas, 2008, pp. 34-36)

Next to the transmission mechanisms that directly operate through stock prices, there are channels that can exacerbate an indirect effect on equity prices. Firstly, expansionary monetary policy positively influences the availability of credit and decreases the cost of credit, explained as the 'bank-lending channel'. Secondly, real interest rate decreases can positively influence net exports through the exchange rate, which in turn increases output. Accordingly, investors should take into account the effect of the exchange rate channel on expected output growth (Mishkin, 2001, p. 5; Ehrman & Fratzscher, 2004, p. 8; Chatziantoniou, Duffy, & Filis, 2013, p. 755)

Overall, this section provides a motivation to include a measure for aggregate output, prices, stock prices and the policy rate. Also, the exchange rate is a variable that may not be forgotten. Nevertheless, it is not possible to include every single exchange rate. Therefore, a variable that aggregates everything will be looked for.

2.1.2 From Monetary Policy To Stock Prices

2.1.2.1 Linking Money-Related Variables To Stock Prices

> "*Just as consumer-price inflation is often described as a situation of 'too much money chasing too few goods', asset-price inflation could similarly be characterized as 'too much money chasing too few assets'* ". (Issing, 2004)

Consumer price inflation rates have been low over the past couple of years, in contrast to the tremendously volatile movements of equity prices. Rogoff (2006, p. 266) and Wiedmann (2011, pp. 1-2) argue that ample liquidity might be an important driver. Rajan (2005, 2006 in: Adalid & Detken, 2007, p. 13) claims that ample liquidity drives investment managers into illiquid and riskier assets. Borio & Lowe (2002, p. 11, 22) complement this view by the reasoning that more demand shows itself more clearly in asset prices, rather than consumer prices when in a stable inflation environment.

Wiedmann (2011, pp. 1-2) puts forward an interesting price contradiction. More precisely, economic agents dislike consumer price inflation, but are eager to accept an increase in asset prices. Climbing asset prices can be explained as a feedback model, which is basically a story of increasing optimism and confidence, more people coming into the market and everybody feeling richer, … All the preceding could thus get reinforced by ample liquidity[14]. (Rogoff, 2006, p. 266; Wiedmann, 2011, pp. 1-2) There is for instance cheaper access to credit (Schnabl & Hoffman, 2007, p. 1; Wiedmann, 2011, pp. 26, 29) This is important as "this reasoning indicates a long-run relationship between liquidity/ 'excess liquidity' and stock market levels with a potential inclusion of economic activity or other macro variables." (Wiedmann, 2011, p. 2)

Why should money affect the stock market? There are three important theories linking increasing money supply (ceteris paribus) to increasing stock prices. Firstly, more "money holdings" could lead to economic agents rebalancing their portfolio to "desired levels" by buying more stocks. (Wiedmann, 2011, pp. 20-21; Gouteron & Szpiro, 2007, p. 5; Meltzer, 1995, p. 52) Secondly, increasing money supply can increase inflation expectations. Consequently, equity prices become more interesting as an inflation-hedging instrument (Bakshi & Chen, 1996, p. 243 in: Wiedmann, 2011, pp. 21-22). Lastly, money supply shocks can increase the attractiveness of stocks relative to bonds via the short-term real interest rate. (Mishkin, 2001, p. 2)

Although there exists a theoretical framework between (excess) liquidity and stock prices, Bruggeman (2007) and Gouteron & Szpiro (2007) argue that there is no simple relationship between them. The work of some researchers revealed a causal relationship, while the work of others did not.

[14] It is assumed that, for this reasoning, the supply of assets remains the same (Baks & Kramer, 1999, p. 5)

Intuitively, due to the high liquidity of money, it is possible that it finds a way into equity prices (Benford, Berry, Nikolov, Young & Robson, 2009, p. 92).

For instance, Adalid & Detken (2007, p. 35-36) found that high money growth coincides with asset price booms. Similarly, Schnabl & Hoffman (2007, p. 3) discovered that credit booms lead to stock market booms. Furthermore, the work of Congdon (2005, p. 13) reveals for the U.S., U.K. and Japan that "… causality runs from money to asset prices …". For the US, Fair (2002, p. 9) found that most "… events that led to large stock price changes … are directly or indirectly related to monetary policy".

In spite of this, Bruggeman (2007, p. 21) discovered that excess liquidity periods only coincide with asset booms in 33% of the cases. Gouteron & Szpiro (2007) even found no link at all between excess liquidity and equity prices.

This inconclusive evidence leads to the conclusion that we have to be careful for spurious regressions. (Gouteron & Szpiro, 2007, p. 6) Adalid & Detken (2007, p. 36) make clear that, "due to the well known problems of econometric identification, caution is nevertheless warranted wherever a causal interpretation is suggested".

To sum up, there is a theoretical framework that links (excess) money with other financial or macro-economic variables. In some cases however, the nexus might be artificial. As well money as excess liquidity will be included in our model, but caution is warranted. Furthermore, both measures have to be identified as supply shocks.

2.1.2.2 The QE-Channels

Next to the traditional channels, there are specific sub channels[15] that explain how monetary policy can affect equity prices, also known as the QE or LSAP channels[16]. Therefore, these are primordially applicable in the post-crisis period. There are three of them.

Firstly, the 'Portfolio Rebalance Channel' describes that, due to the decreasing profitability of long-term bonds which LSAP programs affect, investors their 'search for yield' drives them into other

[15] We only discuss the ones that have not already been explained in section 2.1.1.

[16] This means that these channels will be explained from an expansionary monetary policy point of view. Furthermore, we apply them to equity prices.

assets like equity. More precisely, the Federal Reserve buys more long-term bonds, which leads to decreasing yields. Thereafter, investors will bid up prices of other assets, such as equity, that are 'imperfect substitutes' in order to rebalance their portfolio. (Gagnon, Raskin, Remache & Sack, 2010, p. 5; Chen, Filardo, He & Zhu, 2011, pp. 236-237; Meaning & Zhu, 2011, p. 73-75; Chua, Endut, Khadri & Sim, 2013, p. 3)

Secondly, the 'Signaling Channel' is about the known and promised future 'low policy rate' path, which in turn boosts stock prices due to the nexus between interest rate uncertainty and the equity risk premium. Furthermore, this channel can, together with ample liquidity and future growth prospects, exacerbate the 'search for yield' effect and decrease the 'liquidity premium'. (Meaning & Zhu, 2011, p. 73-75; Chua, Endut, Khadri & Sim, 2013, p. 3; Chen, Filardo, He & Zhu, 2011, pp. 236-237)

Finally, the latest channel describes the forcing up of stock prices by means of the possibility to decrease real interest rates, whilst prices and wages sluggishly adjust. A remarkable finding is that all the effects of QE/LSAP work through the interest rate instead of a direct effect of money. (Meaning & Zhu, 2011, p. 73-75; Chua, Endut, Khadri & Sim, 2013, p. 3; Chen, Filardo, He & Zhu, 2011, pp. 236-237)

2.1.3 International Transmission

> "*Global investors have used part of the additional liquidity to invest abroad, leading to massive capital flows to emerging market economies, thus driving up exchange rates and inflating asset prices*." (Volz, 2012, p. 35)

The international transmission of U.S. monetary policy to other countries is a story of pull-and-push. Apart from this, financial & economic integration and capital mobility are stimulating factors. It is stimulating in a way that EMEs become more vulnerable to shocks from abroad (Wiedmann, 2011, p. 44). For instance, Fratzscher (2012, p. 342) argues that "... financial globalization and the exposure to common global factors have made countries more vulnerable to external and global shocks." (See also Guesmi & Nguyen, 2011, p. 2517) Therefore, the magnitude of an external shock will likely

depend on country openness and financial integration (Chua, Endut, Khadri & Sim, 2013, p. 5). The shock itself can be transmitted through four stock price related channels.

Firstly, similar to the QE channels of section 2.1.2.2, there exists a 'global portfolio-rebalancing channel'. (Chua, Endut, Khadri & Sim, 2013, p. 3; Chen, Filardo, He & Zhu, 2011, pp. 236-237) Under the assumption that UIP does not hold, stocks of emerging markets are 'imperfect substitutes' as they offer higher expected stock returns and have better future growth prospects. Therefore, domestic (U.S.) monetary expansion 'pulls' investors to EME stock markets and investors rebalance their portfolio by including more stocks from EMEs.

Secondly, linked to the 'search for yield' channel, volatile EME-stocks can fulfill economic agents their desire for return, whilst there is a shortage of interesting domestic (U.S.) assets as U.S. excess liquidity already pushed the domestic equity prices up (Agur & Demertzis, 2013, p. 180; BIS, 2011, p. 6). Not only were AEs less interesting due to for instance high unemployment and climbing debt levels, it was also about high interest rate differential 'pushing' U.S. excess liquidity to EMEs via short-term capital flows. (Zhu, 2012, pp. 14, 45-47; Griffith-Jones, Gallagher, 2012, p. 47; Broto, Cassou, Erce, 2011, p. 1942; Chua, Endut, Khadri & Sim, 2013, pp. 3, 6; Schnabl & Hoffman, 2007, p. 5; Volz, 2012, p. 1).

Third, other countries can absorb U.S. money shocks, especially because credit creation[17] in the U.S. has been fairly weak (Griffith-Jones, Gallagher, 2012, p. 47). Another related international transmission mechanism to the previous one is the U.S. excess liquidity 'spillover' on foreign (EMEs) money growth, which in turn increases domestic equity prices. Consequently, foreign investors would be 'pulled' to EMEs stock markets. (Baks & Kramer, 1999, p. 6; Wiedmann, 2011, p. 69)

Finally, there is an exchange rate channel, which is the most important buffer to catch external shocks if there exists a floating exchange rate regime. Nevertheless, the occurrence of leakages is likely. (BIS, 2011, p. 6; Zhu, 2012, p. 14; Fukuda, Kimura, Sudo, & Ugai, 2013, p. 2; Canova, 2005, p. 241) Chinn (2013, p. 2) argues that there are always leakages, but has drawn attention to the fact that it is the magnitude of the spillover that is important. As a matter of fact, investors can "… shift towards assets denominated in higher-yielding currencies" so that increasing equity prices and currency appreciation go hand in hand (Chen, Filardo, He & Zhu, 2011, pp. 237)

All the preceding channels can activate certain domestic channels that ultimately result in a change of real activity. For instance, the international channels can activate the domestic Tobin's (1969) Q

[17] See also Schularick & Taylor (2009) for the 'decoupling of money and credit' over the recent years.

channel because EMEs' stock prices have increased and therefore, domestic firms can better access capital.

In general, all preceding transmission of U.S. monetary policy can lead to 'overheating', 'inflationary pressures' and 'currency appreciation' in EMEs. (Aizenman, Pasricha, 2013, p. 31; Volz, 2012, p. 3) This means that, applied to our model, U.S. monetary policy can potentially spill over to output, the exchange rate, consumer prices, money, stock prices and the interest rate. This effect can be either direct or indirect. An example of a direct effect would be increasing portfolio flows to EMEs. The indirect effect on the other hand would probably happen via foreign spillovers on domestic money or interest rates, such as a Peruvian policy rate change due to a changing U.S. policy rate (Kim & Nguyen, 2009, p. 416).

In brief, this section motivates to include a measure that can lead to spillover effects towards EMEs. In our case, this will be excess liquidity. Yet, caution is warranted, as we cannot control for which part of U.S. EL has truly flown to EMEs.

2.2 Empirical Evidence[18]

The literature puts forward different techniques to estimate the linkages between monetary policy and stock prices. Some popular methods are VAR models (See for instance: Brana, Djigbenou & Prat, 2012; Kim, 2001), event studies (See for instance: Bernanke & Kuttner, 2005; Craine & Martin, 2008) and the heteroscedasticity based approach (See for instance: Rigobon & Sack, 2004; Corallo, 2006). As it is in our interest to model a shock that transmits to the real economy, the usage of a VAR model is most appropriate. Nevertheless, the results of the other approaches are still interesting. Therefor, this section is split up in a VAR and Non-VAR part.

2.2.1 Non-VAR Studies

Ehrman & Fratzscher (2004, p. 4) finds that stock returns decrease with 3% after a 50BP federal funds rate cut for the period 1994-2003. Similarly, Rigobon & Sack (2004, p. 1573) observe that the S&P500 declines with 1,7% after a 25BP increase in the three month treasury bill. The study of Bernanke & Kuttner (2003, pp. 1, 45) indicates that the equity risk premium is the changing factor in the discount model. Bernanke & Kuttner focus on the period 1989M06-2002M12 and stock prices directly increase with 1% after an unanticipated 25BP interest rate cut.
Opposite causality also holds for the U.S., as Rigobon & Sack (2003, p. 641) find that "… a 5 percent rise (fall) in the S&P 500 index increases the likelihood of a 25 basis point tightening (easing) by about a half". Similarly, the work of Ravn (2011, pp. 1, 19) discovers that when the S&P500 decreases with 5%, the probability that the Fed increases the interest rate with 25BP is 33% higher.

Studies with intraday data are popular because it allows identifying the response of stock prices to 'pure' monetary policy decisions. It is 'pure' in a way that it is unrelated to other news. (Hussain, 2011, p. 752) Hussain (2011, pp. 752-753) found that the U.S. stock market directly reacts to

[18] In this paper, the focus lies on the economic properties rather than the statistical ones.

monetary policy decisions. Similarly, the work of Ammer, Vega & Wonsgman (2010, p. 181) discovers for announcements between 1994-2006 that the S&P500 increases with 1,5% five minutes after the announcement.

In the model of Ammer, Vega & Wongswan (2010, p. 181), U.S. monetary policy announcements have more or less the same effect on foreign equity prices, which are represented by indices such as MSCI Europe and MSCI Asia. In the same way, Kishor & Marfatia (2013, pp. 1-4, 23) found that global equity markets respond positively to an unexpected FOMC announcement (sample from 1994-2008), but results can differ due to time-varying financial integration.

The work of Hausman & Wongswan (2011, p. 547-549) indicates with a high frequency analysis for 49 countries that U.S. monetary policy has more effect when the exchange rate regime is less flexible and when the financial link with the U.S. is stronger (For instance: "… % of each country's equity market capitalization owned by U.S. investors"). The model of Hausman & Wongswan indicates that Peruvian and Malaysian stock markets do not react to 'U.S. monetary policy surprises' and relates this to the their closed economy (p. 557). The work of Wongswan (2009, p. 364) had already revealed that such spillovers are mainly due to a financial link between countries. This research employs a high frequency analysis and the model points out that a 25BP decrease of the federal funds rate increases Malaysian equity prices with 0,5% and U.S. stock prices with 1,75% (pp. 345-346). Similarly, the work of Laeven & Tong (2012, p. 530-532) reveals that countries' stock prices react stronger to U.S. monetary policy shocks when there is a fixed-exchange rate regime and when "… domestic monetary policy is more aligned with that of the United States". For the 44 countries that Laeven & Tong (2012, pp. 536, 543) study, a 25% U.S. interest rate increase, reduces foreign stock prices with 1%.

More recent research focused on the response of stock prices to QE announcements. It seems that the early announcements like QE1 had a large effect on equity prices, in comparison to the later announcements like QE2 (Fratzscher, Lo Duca, & Roland, 2013, pp. 2-3; IMF, 2013, p. 1). There is though a lot of country heterogeneity concerning foreign QE spillovers (IMF, 2013, p. 20). The work of Chua, Endut, Khadri, & Sim (2013, p. 11-12) shows that QE1 & 2 had a low impact on the Malaysian equity and exchange rate market in contrast to the response of Brazilian markets. The reverse relationship was found for QE3.

2.2.2 VAR Studies

Roughly speaking, 3 types of VAR models can be identified. Firstly, researchers modeled monetary policy shocks with mainly domestic variables. Secondly, the focus shifted towards possible spillovers effects towards other industrialized countries or global variables, due to for instance global (excess) liquidity. Finally, due to the expansionary monetary policy and capital flow volatility in the period 2008-2013, researchers added excess liquidity measures or QE-related variables to their models and some shifted their focus to spillover effects on emerging markets. These last models are very topical and still in 'development'. Throughout the paper, these will respectively be called the first, second and third generation models.

In the VAR literature, there is no disagreement about the main macro-economic variables to include: real output, prices, interest rates, real stock prices, a commodity price index and real money. The nature of these variables can however differ from paper to paper. Darius & Radde (2010, p. 7) add narrow money, whilst Rüffer & Stracca (2006, p. 20) use broad money. Both included the GDP deflator, but consumer prices are also a common choice (See for instance: Li, Iscan & Xu, 2010, p. 895). Also, the definition of excess liquidity can differ from paper to paper. This will be further addressed throughout this section.

Li, Iscan & Xu (2010 pp. 876-877, 894) estimate how monetary policy shocks affect stock prices from 1988M01 till 2003M12 to answer the question whether country size and openness are determinants for the magnitude of the response to a monetary policy shock. The work of Li, Iscan & Xu discovers that open economies are more affected by shocks from abroad, and thus, the domestic interest rate will hardly influence the discount rate for stock prices. Li, Iscan & Xu's work employ a Structural VAR model to reveal that positive interest rate shocks lead to a strong, but short effect on Canadian real stock prices (0,8% decrease after four months), in response to an unanticipated 25BP increase. Although the effects in the U.S. are strong, the responses demand more time to dampen out (4% decrease after seventeen months). Li, Iscan & Xu explain this different effect through differences in country structure, where financial market openness plays the most important role.

Björnland & Leitemo (2011, p. 275) find with a Structural VAR for the period 1983M1-2002M12 that the S&P-500 decreases with 9% after a 100BP increase of the federal funds rate. Furthermore, there

is two-way causality between both variables as 1% real stock price shocks lead to a federal funds rate increase of 4BP.

Rapach (2001, pp. 9-10) focuses on the effect of U.S. real stock prices to U.S. money supply shocks. This is investigated with a Structural VAR model during the period 1959Q3-1999Q1. Real stock prices directly and positively react in response to money supply innovations. Similarly, the work of Lastrapes (1998, pp. 190-391) reveals that real equity prices of the United States and Canada react directly and positively to a money supply shock. On the other hand, the work of Siklos & Anusiewicz (1998, p. 62) discovers for Canada that domestic money supply shocks lead to decreasing stock prices. All the preceding was about researchers working with domestic variables, but what about the global perspective?

Dreger & Wolters (2009, pp. 1, 5, 7) work with a domestic and global VAR model for the euro-area and the United States and find that (global) liquidity shocks have no impact on real equity prices for the period 1985Q1-2007Q4. Similarly Belke, Orth & Setzer (2009, p. 1, 10) show that real stock prices do not react to global liquidity shocks. Belke, Orth & Setzer work with aggregated data for 11 OECD countries in a Recursive VAR framework for the period 1984Q1-2006Q4. The preceding researchers focus on liquidity, but what about excess liquidity?

Darius & Radde (2010, pp. 5, 7) investigated the impact of global excess liquidity on asset prices of the G7 with a recursive VAR and find it to be unimportant for global equity prices for the period 1971Q1-2009Q3. Similarly, the work of Giese & Tuxen (2007, p. 26) and Rüffer & Stracca (2006, p. 22) shows that the effect of global (excess) liquidity on global share prices is less clear. Giese & Tuxen (2007, p. 11) work with a Cointegrated VAR for the period 1982Q4-2006Q4 with aggregated data of France, Germany, Italy, Japan, United Kingdom and the United States. Rüffer & Stracca (2006, p. 14-15, 27) on the other hand, work with data of 15 countries (developed and developing) from 1980Q1 till 2004Q4. The data of the G5 are aggregated to identify the effect of global liquidity spillovers. Gouteron & Szpiro (2007, p. 20) focus on domestic excess liquidity and find that it has no effect on real equity prices for four industrialized countries during the period 1980-2004.

Although all of the researchers in the preceding paragraph use the money-to-GDP ratio as a proxy for excess liquidity, Brana, Djigbenou & Prat (2012, pp. 259, 265) define excess liquidity as the difference between money growth and GDP growth. The work of Brana, Djigbenou & Prat discovers with a Panel VAR (including Brazil, Malaysia and Peru) that consumer prices and real output of EMEs react to excess global liquidity shocks, contrary to equity prices whose response is insignificant. Their

excess liquidity derivation is based on Baks & Kramer (1999), whose work reveals that G7 excess liquidity positively influences G7 real stock returns (pp. 14-15). Bagliano & Morana (2012, pp. 1-2, 5, 12) on the other hand, estimate the impact of U.S. excess liquidity with a Factor VAR model for 50 countries during the period 1980-2009. U.S. liquidity is defined as M2/GDP. Bagliano & Morana's main finding for the U.S. was that stock prices increase directly and significantly with 0,9%. Concerning international spillovers of U.S. excess liquidity, foreign stock prices of OECD countries tend to react positively with 5% ('medium-term'), while non-OECD countries react negatively with 6% ('short-term'). Despite the negative or insignificant effects on EMEs' stock prices, the work of Canova (2005, pp. 231, 235) reveals that the financial channel (equity prices, exchange rates…) plays a major role regarding to spillover effects.

It is also possible that U.S. monetary policy shocks have spilled over to other EME variables. Mackowiak (2007, pp. 2512-2514) finds that such shocks "… affect the interest rate and exchange rate … quickly and strongly" between the period 1986 and 2000, while there is only a small effect on consumer prices and real output. Mackowiak finds this with a Structural VAR model for 8 EMEs with Malaysia being one of them. Similarly, the work of Kim & Yang (2012, p. 305) discovers with a Structural VAR model that especially the interest rate of EMEs reacts to U.S. monetary shocks. This complements Canova's (2005, pp. 231, 235) finding that Latin American countries', such as Brazil and Peru, monetary policy contracts after a U.S. contractionary shock. Also, the work of Edwards (2012, p. 1) shows that the Fed its actions influence the interest rates of EMEs.
Kim (2001, p. 339) states that the 'real world interest rate' is important for international transmission of shocks originated in the U.S. This was investigated with a VAR model for the G6. The intuition behind the 'world real interest rate' is that the interest rate of different countries know a long-term equilibrium. In Kim's model, the U.S. is a large country and can exert pressure on this interest rate. This would in turn stimulate world consumption and investment in all countries of the world (p. 354). (See also Volz, 2012, p. 38; Fukuda, Kimura, Sudo & Ugai, 2013, p. 2)

Chen, Filardo, He & Zhu (2011, pp. 230, 233, 252, 254) estimate the U.S. QE1 impact on EMEs with a global VECM and discovered that QE1 impacted Brazilian real GDP and nominal stock prices. Chinn (2013, p. 17) finds that QE1 has different effects than QE2. The work of Chua, Endut, Khadri, & Sim (2013, p. 3, 6) reveals that money has flown into EMEs' stocks and bonds because of QE1 stimulating capital flows. As a consequence of these volatile capital flows, Tillman (2013, p. 717) investigates the international transmission with a Panel VAR by introducing capital inflows shocks. The work of

Tillman discovers that such shocks strongly affect stock prices in Malaysia. The heterogenous response across countries is related to the reaction of EMEs' monetary policy to these shocks. Tillman his model indicates that the result on equity prices is much stronger for EMEs than for AEs. This relates to Mackowiak's (2007, p. 2512) expression: ''When the U.S. sneezes, emerging markets catch a cold.''

2.3 Stylized Facts and Country Heterogeneity

2.3.1 Stylized Facts

When researchers do not impose sign restrictions, some results can be counterintuitive. There are two that stand out, namely the liquidity and the price puzzle. The price puzzle means that consumer prices go up after a contractionary monetary policy shock, but can be solved by adding a commodity price index (Christiano, Eichenbaum, & Evans, 1998, p. 30). The liquidity puzzle on the other hand, is about increasing interest rates if money supply rises (Strongin, 1995, p. 464).

Intuitive stylized facts are the temporary decrease of stock prices and output after policy rate innovations (Li, Isçan and Xu, 2010; Peersman and Smets, 2001, p. 8; Walsh, 2010, p. 22). Furthermore, the magnitude of EMEs' response to external U.S. shocks is expected to be positively related to financial openness and the correlation between the domestic monetary policy rate with the Federal Funds Rate, in contrast to country size that should be negatively related. (Li, Isçan and Xu, 2010; Laeven & Tong, 2012; Wongswan, 2009)

2.3.2 Country Heterogeneity

2.3.2.1 Brazil

The Brazilian central bank is an inflation-targeting regime since 1999Q2 and the exchange rate is left to float independently (De Rosa, 2009, p. 33-34). They announce the inflation target (4,5%) to control expectations (De Mello & Moccero, 2011, p. 232; Dias, Teixeira & Dias, 2013, p. 159). Their policy instrument is the overnight nominal Selic interest rate and they are seen as a credible central bank (Minella & Souza-Sobrinho, 2013, p. 408; Sanchez-Fung, 2011, pp. 1730-1731). The 'Banco Central do

Brasil' mainly reacts to output and to some extent to the exchange rate according to Furlani, Portugal & Laurini's (2010, p. 294) DSGE model. The work of Moura & De Carvalho (2010, pp. 392, 402) reveals that Brazil aggressively fights inflation.

Other important country characteristics are the imposition of capital controls since 2009-2010 (Economist, 2013) and the low U.S. dependency, as they only export 3% to the U.S. (Goel & Asija, 2012, p. 169). Furthermore, Brazil is known for its banking system, which "… reports high levels of capitalization, liquidity and profitability". (Montes, Peixoto, 2014, p. 85) This is complemented with a supervisory and regulatory framework such as Basel II and III (Montes, Peixoto, 2014, p. 86). For this reason, Goel & Asija (2012, p. 176) point out that Brazil's crisis problems were due to interconnections with other countries, rather than domestic reasons.

2.3.2.2 Canada

Canada is an inflation-targeting regime since 1991 with the overnight interest rate as its main policy instrument. (Murray, 2013, p. 11) The work of Komlan (2013, p. 919) indicates that Canada is "inflation avoidant" as they "… react more to positive inflation deviations than to negative ones". According to Lange (2010, p. 782), the Bank of Canada leans against the wind by targeting the exchange rate and reacting to "… unexpected increases in long-term yields". Furthermore, this small and open country's interest rate moves closely with the U.S.'s (Murray, 2013, p. 10; Li, Iscan & Xu, 2010, p. 877)

2.3.2.3 Malaysia

The central bank policy of Malaysia is classified as 'other' in De Rosa's (2009, p. 33) overview, which means other than monetary aggregate targeting, inflation targeting or an exchange rate anchor. According to Chen (2012, p. 418), Malaysia targeted monetary aggregates untill the nineties followed by short-term interest rates. The exchange rate regime is currently a managed float, which means

that there is no specific determined path, but interventions can occur depending on the circumstances. (De Rosa, 2009, p. 33)

Their exchange rate regime has known some evolutions. Between 1998 and 2005, the Malaysian Ringitt was pegged to the U.S. dollar. Furthermore, Malaysia introduced capital controls after the Asian Crisis, but abandoned these after a couple of years. (De Rosa, 2009, p. 146) The work of Kim & Yang (2012, p. 316) reveals that after the Asian crisis, "Malaysia was partly successful in keeping domestic monetary policy independent from US monetary policy".

The institutional quality in Malaysia is seen as outstanding for an emerging market. This is due to the constant development of their financial system. (Ang & McKibben, 2007, pp. 216, 227; Ang, 2009, p. 1261) For instance, the Malaysian central bank came with a financial sector master plan in 2001 (Anwar & Sun, 2011, p. 335).

2.3.2.4 Peru

The Peruvian central bank targets inflation and has a managed float. This inflation targeting strategy is implemented since 2002:Q1 (De Rosa, 2009, pp. 33-34, 70). The regime shift of this open-economy is due to historical problems of hyperinflation. The consequence of this hyperinflation was extreme dollarization of the financial system, which means that economic agents prefer saving in U.S. dollar on one hand and loaning in U.S. dollars on the other hand. (Carranza, Cayo, Galdon-Sanchez, 2003, p. 475; Fuentes, Rios, 2014, p. 558) "Monetary stability helped reduce financial dollarization from levels near 80% at the end of the 1990s to 45% in 2010". (Castillo, Humala, 2012, p. 75) Although Peru had problems of hyperinflation, it is categorized as a mild inflation-targeting regime in the model of Moura & Carvalho (2010, pp. 392, 402)

2.3.2.5 United States

The Federal Reserve is a central bank that controls the Federal Funds Rate directly with respect to inflation and unemployment since 1988. After the financial crisis, a regime shift happened, whereas

the policy rate had hit the ZLB and the Fed sought comfort in unconventional monetary policy tools such as Quantitative Easing (Walsh, 2010, p. 553).

3 Empirical Research

3.1 Data and Methodology[19]

3.1.1 Variables

3.1.1.1 Necessary Economic Variables And Their Proxy

The addition of variables is based on the underlying economic theory and approaches by other researchers. As one might expect, the following variables will certainly be included: real output, prices, real money[20], a policy rate and real stock prices for each economy separately. Unlike the researchers who focus on global spillovers on global variables, national variables are used in this framework. The reasoning behind this is that spillovers on global variables neglect the heterogeneous country impact. (Wiedmann, 2011, p. 4)

Industrial production will proxy output as this allows working with monthly data, which in turn strongly contributes to the 'degrees of freedom' and will tighten the confidence intervals (See also section 3.1.6.2). Besides, industrial production is a good proxy for real GDP ($r_{INDPR,real\ GDP}$ = ±80% in growth rates on a quarterly basis for the U.S.).

[19] Everything will be estimated in Eviews.

[20] It could also be argued to include credit or an unconventional monetary policy tool like the central banks' balance sheet. These are however not included, as these three are usually strongly correlated with one another.

A consumer price index is used to proxy prices, knowing that this neglects other (important) prices in the economy such as asset prices.

Concerning the monetary aggregate, the empirical literature uses various types in their models, starting from the monetary base till M3. In this research, Wiedmann (2011, p. 40) his advice is followed, complemented with Baks & Kramer's (1999, p. 14) finding that narrow money is more related to asset prices than broad money. Wiedmann (2011, p. 40) points out that on one hand, the monetary aggregate should be broad enough to capture all the liquidity that could flow into equity prices, on the other hand, it should be narrow enough to remain, to some extent, controllable by central banks. Therefor, both M1 and M2 seem appropriate. M1 was implemented in the initial framework, while M2 will be used as a robustness test, similar to Rüffer & Stracca (2006, p. 26). Both applications are expected to yield the same result, as M1 and M2 are usually strongly correlated ($r_{M1,M2} = 92\%$) with one another. All money variables are expressed in real terms by deflating them with the consumer price index. (See for instance Alessi & Detken, 2009, p. 18)

A short-term interest rate is included as a monetary policy tool. The first choice naturally falls to the policy rate. If this is not available for a long enough period, a highly correlated proxy will be applied.

According to Bernanke & Gertler (2000, p. 5), "stock prices are endogenous variables which are often disconnected from the current state of the economy" and should thus be implemented in our framework. "Economic theory argues in favor of focusing on real instead of nominal rates because payouts (dividends or rents) supposedly grow with the inflation rate". (Shiller 2007, p. 5 in: Wiedmann, 2011, p. 25). Consequently, the stock price index[21] will be deflated through a consumer price index[22], which is the proxy for prices (See for instance Lastrapes, 1998; Li, Işçan & Xu, 2010; Wiedmann, 2011; Alessi & Detken, 2009, p. 18). Furthermore, this allows assessing the impact of real shocks on the real economy.

In general, there are two approaches, which can be followed. On the one hand, a model with everything denominated in one currency can be estimated (See for instance: Brana, Djigbenou & Prat, 2012, p. 263). On the other hand, the same model can be estimated with everything denominated in its own currency, but with the addition of a real effective exchange rate as an

[21] In line with Li, Iscan & Xu (2010, p. 884) the S&P500 and S&P/TSX are used as stock market proxies for the U.S. and Canada respectively.

[22] We are aware that this could be discussable as this assumes that consumer prices proxy all inflation in an economy. In addition, it would be ideal if a data series that contains inflation expectations were available.

endogenous variable (Peersman & Smets, 2001, p. 8). We haven chosen to follow the second strategy, as this fits our research question the most. To be more precise, when the variable is denominated in another currency, it is difficult to know whether the response of for instance Malaysian real stock prices to a U.S. excess liquidity shock is caused by the local currency denominated real stock price or by the exchange rate.

Lastly, it is also a common practice to include a commodity price index[23] in these VAR models (See for instance: Brana, Djigbenou & Prat, 2012; Sousa & Zaghini, 2004). Kim (2001, pp. 357-358) commented that adding a commodity price index allows "… controlling for inflationary pressure and supply shocks", in contrast to Peersman & Smets (2001, p. 8) who explain it as "controlling for changes in world demand and inflation". Nevertheless, it is added to capture external shocks. Similar to Brana, Djigbenou & Prat's (2012) research who is closest to this paper, the CRB index was chosen (also used by Darius & Radde, 2010, p. 7; Crowder, 2006, p. 523).

3.1.1.2 Measures Of Excess Liquidity

Ironically, the most important variable is most vulnerable to various definitions and is difficult, if not impossible, to 'perfectly' operationalize. Moreover, there is a discrepancy between the theoretical and empirical literature when it comes to excess liquidity measures. The theoretical literature puts forward several measures to define and calculate excess liquidity, while the empirical literature uses other methods.

Two important features of theoretically derived excess liquidity are (or should be) its dependence on an equilibrium value and its possibility to signal future inflation (Polleit & Gerdesmeier, 2005; Drescher, 2011). The first problem with the theoretical nature of an excess liquidity measure is its imperfection, because it assumes the stability of the money demand function. As can be seen in the formulas on the following pages, such an excess liquidity indicator only involves a measure for money supply. (Polleit & Gerdesmeier, 2005, p. 6) Secondly, only consumer prices are considered, whilst "… rebalancing of (real) money stock imbalances works through all prices of the economy" (Meltzer, 1995, p. 51 in: Drescher, 2011, p. 17). The third 'problematic' assumption is the 'long-term

[23] According to Peersman & Smets (2001, p. 8) and Christiano, Eichenbaum, & Evans (1998, p. 30), the addition of a commodity price index can resolve the "price-puzzle".

neutrality of money', which means that all excess money should go into prices (Adalid & Detken, 2007, pp. 19-20).

BIS (2011, p. 13) perceptively states that the problem in operationalizing excess liquidity measures is the "lack of equilibrium concepts". Against this backdrop, the empirical literature implements other 'easy to calculate' methods to operationalize excess liquidity (See for instance: Bruggeman, 2007; Brana, Djigbenou & Prat, 2012). This paper follows the empirical literature to keep estimation feasible. Nevertheless, there are still several measures available and findings can potentially differ depending on the excess liquidity measure.

Gerdesmeier & Polleit (2005) and Drescher (2011) have put forward several excess liquidity concepts, which are econometrically difficult to work with, as these involve equilibrium values of certain variables. Deviations from a HP-filtered trend are calculated in order to keep estimation feasible, which is done by Bruggeman (2007, p. 3) and Adalid & Detken (2007, p. 19). Similar to Bruggeman (2007, p. 3), excess liquidity is defined as follows:

$$'Money\ to\ GDP\ ratio' - 'equilibrium' = LN\left(\frac{M1}{INDPR}\right) - \left[LN\left(\frac{M1}{INDPR}\right)\right]^{*}\ ^{24\ 25}$$

The equilibrium will thus be calculated with a HP-filter (λ=14.400) and is statistically a trend value. It sounds intuitive to correct money for output, because this assumes that only liquidity in excess of output can have spillover effects (Sousa & Zaghini, 2004, p. 21). So if the money supply is to great for the real economy, it is assumed that it will be spent on for instance equity markets. (Gouteron & Szpiro, 2007, p. 4)

Other researchers define excess liquidity in only one way, without investigating the 'definition risk'. Because of this risk, excess liquidity will be defined in four other ways as a robustness check. Firstly, two theoretical excess liquidity measures will be operationalized with Bruggeman (2007, p. 3) and Adalid & Detken (2007, p. 19) their method by using a HP-filter (λ = 14400). On one hand, the real money gap is about money corrected for prices, as a deviation from its equilibrium value, while on

[24] 'ln' stands for natural logarithm and '*' means equilibrium value.

[25] If we refer to excess liquidity throughout the paper, it is about the money to GDP ratio as a deviation from its equilibrium value.

the other hand; monetary overhang is money as a deviation from 'equilibrium money' (Polleit & Gerdesmeier, 2005, pp. 9-11):

$$Real\ Money\ Gap = LN\left(\frac{M1}{CPI}\right) - \left[LN\left(\frac{M1}{CPI}\right)\right]^{*}$$

$$Monetary\ Overhang = LN(M1) - [LN(M1)]^{*}$$

The theoretical literature has though proposed other ways to estimate equilibrium values of excess liquidity measures. For instance, Monetary overhang should be estimated by using a VECM with GDP, an interest rate and prices as explanatory variables and one predefined cointegration equation (Drescher, 2011, pp. 6-7, 18-19). However, this exceeds the scope of this paper, and therefor, a HP-filter was preferred.

Secondly, two empirical approaches of excess liquidity estimation are reconstructed. In line with Brana, Djigbenou & Prat (2012, p. 259) who follow Baks & Kramers (1999) method, the following equation is calculated:

$$Money\ Growth - \ GDP\ Growth = LN\left(\frac{M1}{M1(-1)}\right) - LN\ \left(\frac{GDP}{GDP(-1)}\right)$$ [26]

Consequently, excess liquidity is redefined as a period where money grows faster than GDP[27]. From a theoretical point of view, this measure is inferior to the others because it does not depend on an equilibrium value (Polleit & Gerdesmeier, 2005; Drescher, 2011).

Similarly, there is another widely used non-theoretical excess liquidity measure, namely the money-to-GDP ratio (see section 2.2.2), which does not involve an equilibrium value (Rüffer & Stracca, 2006, p. 7):

$$'Marshallian\ K' = \ LN\left(\frac{M}{GDP}\right)$$

[26] '(-1)' stands for first lag.

[27] Industrial production proxies GDP in this calculation.

Overall, we argue that, from an equity price perspective, the real money gap and the 'Money to GDP ratio – equilibrium' seem the most appropriate in our analysis as it seems logical that money could find its way into equity prices, if it does not flow into consumer prices or real output. However, defining the most appropriate excess liquidity measure for an equity price framework lies outside the scope of this paper. As a result, different excess liquidity measures were chosen to perform the robustness analysis.

3.1.1.3 Global Excess Liquidity

One goal of this paper is to research the effect of U.S. excess liquidity on domestic and foreign equity prices. In spite of this, other researchers tend to focus on global excess liquidity (See for instance: Brana, Djigbenou & Prat, 2012; Darius & Radde, 2010). In order to correct for other countries' excess liquidity, a separation is made between a measure of U.S. excess liquidity and a global one (consists of Canada, Eurozone, Japan, U.K.[28]).

Such a global measure is usually constructed by summation of monetary aggregates[29] and gross-domestic products (Sousa & Zaghini, 2004, p. 5). However, industrial production proxies GDP in this papers' model and summing up industrial production would deliver a wrong image about the relative importance of each country in this measure. As a consequence, a monthly real GDP series is created to avoid aggregation issues:

$$\text{GDP series} = GDP_{1999Q4} \prod_{i=1}^{t}(1 + g_i) \text{ where for instance } g_1 = \ln\left(\frac{INDPR_{01/2000}}{INDPR_{12/1999}}\right)$$

[28] We are aware that this misses a substantial part of world GDP. Nevertheless, we included the countries for which their central bank plays an important role in the world. Furthermore, Sousa & Zaghini (2004, p. 8) include the same countries in their global variable.

[29] We are aware that this approach is not perfect, due to the fact that the definition of M1 can differ per country (Sousa & Zaghini, 2004, p. 30). Also, some researchers weigh the monetary aggregate. Sousa & Zaghini (2004) do this by using GDP weights. A graphical analysis shows that this makes a minor difference (p. 31).

Everything concerning the global measure is dollar-denominated (see for instance: Brana, Djigbenou & Prat, 2012, p. 263)

The second problem is the strong correlation (r=70%) between global and U.S. excess liquidity. Accordingly, the co-movement with the U.S.'s excess liquidity measure is filtered out of the global variable by using the error term '$\varepsilon_{GL.EL}$' of the following regression as a proxy for a pure global excess liquidity shock:

$$GL.EL = \alpha + \beta\, US.EL + \varepsilon_{GL.EL}$$

3.1.2 Data And Transformations

Now that the variables have been chosen, the data can be examined. The data is retrieved from Datastream, the Federal Reserve or the Bank of International Settlements. In table[30] 2.1, an overview is given of all used data with their characteristics and original source.
Concerning transformations, variables are expressed in logarithms (except for the interest rate), an approach implemented by all researchers because it eases the interpretation (See for instance: Peersman & Smets, 2001, p. 9). Also, CPI, money and industrial production data are seasonally adjusted. If series are not downloadable as seasonally adjusted data, the Census X-13 method is applied.

[30] Overviews, tables and figures can be found in the appendix, which is the second bundle of this document.

3.1.3 Descriptive Statistics

Tests for equality of means (Anova F-test & Welch F-test) point out that the excess liquidity measures (except for the money-to-GDP ratio because this variable is I(1)) are not significantly different from each other (p=0,87 & p=0,78 respectively). The variance on the other hand differs significantly from each other (p=0,00 with Bartlett, Levene and Brown-Forsythe test for equality of variance). As can be seen in figure 3.1.1, EL, defined as the money-to-GDP ratio minus its equilibrium, varies the most out of the four stationary excess liquidity measures. In addition, the excess liquidity measures have known an enormous surge after the Dot-Com bubble and in particular after the financial crisis.

In table 2.2, summary statistics are given about the correlation of excess liquidity indicators. It seems that excess liquidity, defined as the money-to-GDP ratio minus its equilibrium is strongly correlated with monetary overhang and the real money gap. For this reason, these three excess liquidity measures are expected to deliver the same results. In spite of this, the excess liquidity measures that do not involve equilibrium variables (MG-GDPG & M_TO_GDP) are weakly correlated with the theoretically derived measures, and are consequently expected to deliver other results.

3.1.4 Preliminary Graphical Analysis

It is difficult to analyze the behavior of the variables, as it is the dynamics between the variables that are of particular interest. Yet, several graphical analyses are performed.

Firstly, the consumer price index, industrial production, real money and real stock prices are plotted for the AEs (See figure 3.1.2). For the U.S., CPI, INDPR and M1 (See figure 3.1.2.1) seem to move in the same direction until 2007. Even so, money decouples from this trend in the aftermath of the financial crisis and the slope of the increasing trend seems to match the slope of the stock market retake. As Meltzer (1995, p. 51 in: Drescher, 2011, p. 17) pointed out, "… the rebalancing of (real) money stock imbalances works through all prices of the economy".

Despite the strong disconnection between stock prices and macroeconomic variables in the U.S., Canadian stock prices appear to be more connected to consumer prices and real output. On the

contrary, money seems to seriously deviate from this trend and has known an exponential growth over the past couple of years.

If this increasing availability of money is neither used for GDP, nor flown into consumer prices, it seems that it led to equity price inflation (Drescher, 2011, pg. 1). This complements Joyce, Lasaosa, Stevens & Tong (2010, p. 6) their view, which states that QE had the clearest impact in financial markets. Apart from this, the enormous stock price movements clearly indicate why policymakers wonder whether such equity volatility is justifiable relative to the fundamentals (Semmler & Zhang, 2007, p. 411-412).

The second graphical analysis focuses on the nexus between the U.S. QE-announcements/programs and real stock prices. Figure 3.1.3.1 reveals that Canadian and U.S. real stock prices closely moved together until the decoupling around the end of 2011. Furthermore, the plot shows that the QE programs have positively influenced stock prices of AEs. In addition, the first rumors of the tapering do not seem to have affected real equity prices.

Similar to the AEs, real stock prices of EMEs show co-movement until the beginning of 2010 (See figure 3.1.3.2). The graph indicates that QE1 went along with climbing real equity prices for Brazil, Peru and Malaysia, whilst QE2 and QE3 had a rather heterogeneous impact. For instance, while the Malaysian real stock prices remained stable during the QE2-program, the Peruvian and Brazilian real stock prices decreased.

Finally, the relationship between real stock prices and the main excess liquidity measure, namely the money-to-GDP ratio as a deviation from its equilibrium value, is graphically analyzed (See figure 3.1.4.1 and 3.1.4.2 for AEs and EMEs respectively). Concerning the AEs, it is noticeable that three excess liquidity periods, as well for Canadian excess liquidity as for the U.S.'s, precede stock market booms in the domestic economy. Firstly, the excess liquidity period of '99-'00 goes before the stock market boom of '00-'01. Secondly, excess liquidity between '01 and '06 precedes the climbing stock prices of the '03-'09 period. Finally, the large excess liquidity surge in the aftermath of the financial crisis foreshadows the stock market revival of '09.

Not only stock market booms of AEs, but also EMEs' seem to be preceded by U.S. excess liquidity periods. The distinguished periods are more or less the same as for the AEs. This can be explained by the strong correlation between stock markets. Nevertheless, Malaysia deviates from this pattern.

3.1.5 Methodological Issues

It goes without saying that in general, empirical studies go together with methodological issues. There are primarily three major issues present in this paper.

At first, it is especially the post-financial crisis liquidity surge that is of interest, which undoubtedly had a strong impact on excess liquidity. The 'straightforward' approach would be to estimate a 5-year post crisis VAR. Yet, the small sample would quickly absorb all 'degrees of freedom' and lead to over-parameterization, which would in turn contribute to model instability. Another approach would be to investigate a prolonged period with 15 to 20 years of data. Even so, this approach will surely increase the likelihood of structural break appearances in the data due to for instance the changing monetary regime of the Federal Reserve after the financial crisis. This leads to the conclusion that there is somewhat of a trade-off.

Next, as also seen in the literature section, there are a variety of models that can be used for this papers' analysis. Regarding domestic monetary policy shocks, researchers favor Structural VARs with short-run restrictions (See for example Li, Iscan & Xu, 2010; Christiano, Eichenbaum, Vigfusson, 2006). For international transmission on the other hand, Global VARs might be more appropriate (See for example Dreger & Wolters, 2009).

In addition, linked to our first methodological issue, Bayesian Time-Varying Parameter VARs would fit the job. More precisely, VAR data-intensity prevents the inclusion of all relevant variables, possibly leading to 'omitted variable biases'. Bayesian VARs on the contrary can cope with these problems due to 'shrinkage' by imposing parameter restrictions. Moreover, the time-varying aspect can be coped with by using time-varying parameters and can thus handle changing monetary regimes. Besides, it is especially the asymmetric response of stock prices to monetary policy actions that necessitates the usage of time-varying parameters, as the monetary policy response to equity price changes depends on whether the monetary policy decisions are taken in a boom or bust period. (See for instance: Farka, 2009, p. 48; Darius & Radde, 2010, p. 16).

Figure 3.1.5.1 and 3.1.5.2, that are about 5-year rolling correlations with the U.S. policy rate and U.S. stock market respectively, reveal that time-variation is present in the data. Higher correlation between equity returns indicates stronger bilateral financial integration. (Coeurdacier, Kollman & Martin, 2007; Aviat & Coeurdacier, 2007; Portes & Rey, 2005; Forbes & Chinn, 2004; Imbs, 2004 in:

Jinjarak, 2013, p. 2) The rolling correlations point out that the correlation between U.S. and EMEs' stock returns have been increasing over the past years, and thus financial integration might be time-varying.

On the other hand, the common exposure to global shocks can lead to monetary authorities reacting in the same way and thus an aligned interest rate with the U.S. (Laeven & Tong, 2012, p. 530-532; Bauer & Neely, 2014, p. 30; Fratzscher, 2012, p. 342; Guesmi & Nguyen, 2011, p. 2517) Linked to the country analysis of section 2.3.2, it seems that bilateral relationships between the U.S. and an EME explain the magnitude of the correlation. That is to say, Peru is/was highly dollarized (Castillo, Humala, 2012, p. 75) and Malaysia has had a tied exchange rate (De Rosa, 2009, p. 146) with the U.S. In spite of this, Brazil is rather closed and does not have a strong relationship with the U.S. (Goel & Asija, 2012, p. 169)

Lastly, there is the 'variables part'. On one hand, a choice concerning the nature of the variables has to be made. These can be included in stationary or non-stationary form, or cointegration vectors can be used.

On the other hand, there is the exhaustiveness of the relevant variables. Although most relevant variables were discussed in section 3.1.1.1, there is no consistency in the international variables researchers include. For instance, Sousa & Zaghini (2004, p. 21) follow Kim's (2001) 'marginal approach' that dictates to solely include the foreign variable of interest, contrary to Peersman & Smets (2001, p. 8) who include U.S. Output and the Federal Funds Rate to proxy global factors (See also Mackowiak, 2007, p. 2514).

3.1.6 Methodological Motivation And Specification

3.1.6.1 Motivation For The VAR-approach

As already indicated in section 3.1.4, a model that can cope with the dynamics between the variables is needed such as the VAR-technology. After all, VAR modeling is the most widely used method in monetary economics (Walsh, 2010, p. 18). The great advantage of a VAR is that it can directly cope with an endogenous environment[31]. To be more precise, everything is interlinked with one another in monetary economics. In addition, a VAR model allows simulating a basic macroeconomic environment wherein initiated shocks to a specific variable flow through our lag structure and interacts with other variables.

A second advantage is that the generation of Impulse response functions is an easy way to identify the response of certain variables to exogenous shocks in another variable. In particular, the exogeneity of the shock is of major importance. In reality, variables such as stock prices solely react to unanticipated news, at least according to the EMH.

3.1.6.2 Mitigating The Methodological Issues

There are three methodological issues that we need to mitigate before the construction and estimation of our models can be implemented. Trying to mitigate both problems of our first issue, we have on one hand chosen to estimate a VAR model with approximately 20 years of observations, which enables sharper inference and estimation, and on the other hand the inclusion of dummy variables to decrease the likelihood of having structural breaks.

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[31] For instance, real activity can change after a policy rate shock, but it is also possible that central banks change the policy rate in order to influence real output. Therefore, causality can run in both ways.

Contrary to researchers (For instance: Peersman & Smets, 2001; Sousa & Zaghini, 2004) that work with quarterly data, this papers' model will be estimated with monthly data by utilizing Industrial Production as a Real Output proxy (Similar approach as Lastrapes, 1998; Li, Isçan & Xu, 2010). For the U.S., quarterly Industrial Production and Real GDP are correlated for about 80% in growth rates. This approach increases 'degrees of freedom' and will tighten the confidence intervals. (See also section 3.1.1.1)

Despite the fact that the VAR-approach is preferred, there are different types of VAR-models and a choice has to be made. Due to 'knowledge restrictions', only a Recursive Constant-Parameter VAR can be estimated (also used by Thorbecke, 1997; Patelis, 1997; Siklos & Anusiewicz, 1998). Obviously, the Recursive VAR requires putting up with the probability that Omitted Variable Biases may arise because not all relevant variables can be added due to over-parameterization. Moreover, Constant-Parameters will not be able to capture the whole story.
With regard to Omitted Variable Biases, Kim's (2001, p. 342) "marginal approach" will be followed because the observation-to-parameter ratio is already tight (see table 2.6). As a result, it is not possible to consider every variable, which might seem relevant. Apart from this, there are two extra arguments in favor of not adding extra foreign variables such as U.S. GDP, CPI and IR. Firstly, these U.S. variables are strongly correlated (because of economic integration) with the domestic variables and may cause problems of multicollinearity. Secondly, U.S. GDP is implicitly present in our excess liquidity measure and may thus cause problems to separate these effects.
Nevertheless, this marginal modeling approach still follows the literature, as the problem of Omitted Variable Biases is either frequently ignored, or discarded and motivated by the impossibility to cope with it, due to VAR data intensity (see for instance: Sousa & Zaghini, 2004).

Concerning the nature of the variables, (most) literature is followed. The VAR will be estimated in levels when the endogenous variables are cointegrated (See for instance Darius & Radde, 2010, p. 8; Adalid & Detken, 2007, p. 21; Sousa & Zaghini, 2004, p. 15; Peersman & Straub, 2005, p. 12; Li, Iscan & Xu, 2010, p. 884). On the one hand, this eases interpretation, as shocks in levels are economically more meaningful than shocks in growth rates (Adalid & Detken, 2007, p. 21). On the other hand Sousa & Zaghini (2004, p. 15) and Peersman & Straub (2005, p. 17-18) explain that an analysis in levels allows for implicit cointegration, while estimation in differences would throw away this kind of information. Both papers refer back to Sims, Stock & Watson's (1990, p. 136) original research, where was concluded "…that the common practice of attempting to transform models to stationary

form by difference or cointegration operators whenever it appears likely that the data are integrated is in many cases unnecessary". This also complements Cochrane (1997, p. 132) his view who favors estimation in levels when the cointegration vector is not known 'ex ante'. Nevertheless, each series will be subjected to unit root tests (ADF, PP, KPSS) to verify whether the data are I(1) or I(0) and a cointegration test is performed with the Johansen test.

Due to the estimation in levels and the extended period, the likelihood of having structural breaks (For instance due to different monetary regimes, equity boom-bust cycles…) increases (See also first mitigation of methodological issue p. 41). Eviews does not provide automatic procedures to test for these and there is no straightforward way to cope with such structural breaks. Therefor, similar to Li, Iscan & Xu (2010, p. 884), a graphical analysis is performed and the boom-bust periods[32] within the data (especially for the equity index) will be covered by a dummy variable during that period. Thereafter, the significance is tested with the likelihood ratio via a sequential procedure. For example, the U.S. model will be given a dummy variable around the Dot-Com bubble and around the financial crisis. Next, each dummy is separately tested for significance. The contemporaneous implementation of these two dummy variables will be tested if both dummies are separately significant.

3.1.6.3 Model Specification[33] [34]

The following Vector Autoregression will be estimated:

$$Y_t = A(L)Y_{t-1} + B(L)X_{t-1} + \mu_t$$ [35]

where Y_t is a vector of endogenous variables, while X_t contains the exogenous ones. The VAR is symmetric and as there is no theory to guide us towards the optimal lag length, information criteria

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[32] Following Wiedmann his (2011) advice, we only incorporate this for those periods that coincide with economic relevant events.

[33] We are aware that, due to the various amount of models we estimate, things may be perceived complex. Therefor, we included an overview in the appendix (See Structure 1.1.1 and 1.1.2). We advise the reader to keep this overview at hand while reading this section.

[34] The focus of this section lies on economical aspects, rather than statistical ones.

[35] This notation is based on Peersman & Smets (2001, p. 8).

will be used. Given the methodological issue of over-parameterization, fewer lags are preferred in order to increase degrees of freedom. (Wiedmann, 2011, p. 80) Consequently, only a maximum lag length of 3 is allowed [36].

In the next paragraphs, a detailed description of AEs and EMEs their models are discussed. In order to specify our models, it is firstly assumed that AEs generate excess liquidity and these can either spill over domestically or towards EMEs (not to other AEs). The second assumption is that UIP does not hold. Otherwise, there would be no reason for economic agents to invest abroad.

The Advanced Economies are modeled per country and with domestic variables. Linked to the literature, this is a first generation model complemented with a third generation model feature, namely Excess Liquidity. Y_t' contains the following endogenous variables: $[(CRB)\quad EL\quad INDPR\quad CPI\quad M1\quad IR\quad REER\quad Stocks]$ and X_t' the following exogenous ones: $[c\quad time\quad (CRB)\quad Dummy]$. The constant and linear trend is also added by for instance Sousa & Zaghini (2004, p. 15). It is common to include the commodity price index exogenously, as will be done for Canada (See for example Peersman & Smets, 2001, p. 8). For the U.S. on the other hand, the commodity price index is usually added as an endogenous variable (See for instance: Peersman & Smets, 2001, p. 10; Christiano, Eichenbaum, & Evans, 1998, p. 18). Adding it exogenously would mean that the U.S. could not affect commodity prices, whilst empirical work shows that commodity prices fall after a positive Federal Funds Rate shocks (Neri & Nobili, 2010, pp. 55-56; Christiano, Eichenbaum, & Evans, 1998, p. 21).

Concerning the EMEs' models, an approach similar to Kim (2001, p. 342) is followed. These models will be split up in two parts, namely a domestic (1st generation) and foreign model (3th generation), where the foreign model is used to assess international spillover effects. Economically, this could be seen as a closed and an open economy respectively. Dreger & Wolters (2009, p. 2) for instance, also estimate a "country-specific model" and an international spillover model (with a Global VAR).
The domestic EME-models contain the following endogenous variables: $[INDPR\quad CPI\quad M1\quad IR\quad Stocks]$, whilst with the foreign model, the real effective exchange rate (REER), Excess Liquidity and the commodity price index (CRB) will be added. Both models are accompanied with a constant, a linear trend and dummies as in our AEs model. As mentioned in

[36] The exogenous variables receive the same amount of lags as the endogenous ones. Contemporaneous terms of the exogenous variables are not allowed.

section 3.1.1.3, excess liquidity will be split up in a U.S. and a global part. U.S. Excess Liquidity is added endogenously and Global Excess Liquidity (error term '$\varepsilon_{GL.EL}$') exogenously. From an economical point of view, U.S. Excess Liquidity should be exogenous as EMEs are not able to influence this (See for example Ilzetzki & Jin, 2013, p. 14). Nevertheless, this has to be added endogenously in order to generate impulse responses.

Impulse responses and variance decompositions are the main tool of analysis. The Cholesky Ordering transforms the Unrestricted VAR in a Recursive one by adding contemporaneous values of the variables ordered before 'X' to 'X's equation. Eventually, this produces orthogonalized error terms and allows introducing exogenous shocks in our endogenous environment. (Stock & Watson, 2001, p. 3; Hussain, 2011; Rigobon & Sack, 2003). The following standard Cholesky Ordering is applied (See for instance: Peersman & Smets, 2001 ; Sousa & Zaghini, 2004 ; Belke, Orth & Setzer, 2009) :

$$U.S. = [CRB \quad EL \quad INDPR \quad CPI \quad M1 \quad IR \quad REER \quad Stocks]$$
$$Canada = [EL \quad INDPR \quad CPI \quad M1 \quad IR \quad REER \quad Stocks]$$
$$\textit{EMEs Domestic} = [INDPR \quad CPI \quad M1 \quad IR \quad Stocks]$$
$$\textit{EMEs Foreign} = [EL \quad INDPR \quad CPI \quad M1 \quad IR \quad REER \quad Stocks]$$

To our knowledge, we are the first to work with domestic excess liquidity in a VAR-model. Consequently, there is no literature to guide us towards the right Cholesky place. Nevertheless, an economical reasoning has been made. Because the aim is to identify monetary policy supply shocks, excess liquidity is put before industrial production so that excess liquidity does not react contemporaneously to output. This should allow identifying the shocks as supply shocks[37]. We are aware that it is somewhat tricky, as industrial production is implicitly proponent in the excess liquidity measure. Nevertheless, this is a similar reasoning as Belke, Orth & Setzer (2009, p. 16) concerning money and interest rates. To be more precise, Belke, Orth & Setzer argue that placing money before the interest rate allows to interpret shocks as "money supply shocks".

[37] Suppose Excess Liquidity is placed after Industrial Production. This means that the excess liquidity equation contains a contemporaneous term for output. In the crisis-period, the economy contracted and this would directly lead to a change in excess liquidity, as there is more demand for liquidity. In this case, shocks would be seen as "demand shocks". (Belke, Orth & Setzer, 2009, p. 16; Stock & Watson, 2001, p. 3)

Darius & Radde (2010, p. 9) argue that "global factors lag behind domestic factors"[38] and since the U.S. is seen as a leading country and its domestic variables are used to proxy global ones (See for instance: Peersman & Smets, 2001, p. 8), the Excess Liquidity measure is placed first in the EME-models.

Real output and consumer prices are placed before the others because these are usually sluggish to adjust. The real effective exchange rate and stock prices on the other hand rapidly react to 'news' and therefore, contemporaneous terms of all previous variables are placed in their equation (Stock & Watson, 2001, p. 3; Peersman & Smets, 2001; Sousa & Zaghini, 2004; Belke, Orth & Setzer, 2009).

The models seek to shed light on the domestic and international stock price channel. Even so, the focus lies on the overall impact of monetary policy shocks on the real economy via stock prices, rather than through which specific sub-channels such as the Wealth Channel or Tobin's-Q. In order to assess this stock price transmission channel, positive one standard deviation innovations to the variables are introduced. But what shocks are introduced to which variables?

Firstly, the effect of stock prices to monetary policy shocks is assessed. On the one hand, monetary policy shocks consist of interest rate, money and excess liquidity shocks for AEs. For EMEs[39] [40] on the other hand, monetary policy shocks are domestic interest rate and money shocks in the domestic models and U.S. excess liquidity shocks in the foreign model. Especially for the preceding shocks, the exogeneity of the innovations is important, as stock markets solely tend to react to unanticipated events (Craine & Martin, 2008, p. 180).

Secondly, stock price shocks are initiated towards industrial production and consumer prices to observe the impact on real activity. Introducing stock price shocks assumes that stock prices are a leading indicator for future activity because it "… contains information about the future that is not yet incorporated in the current macroeconomic variables …" (Björnland & Leitemo, 2009, p. 281).

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[38] A similar reasoning applies for the CRB index that is placed first in the U.S. model.

[39] For the stylized facts and stock market channel of the EMEs: In a first analysis, everything except for the spillovers will be interpreted from the domestic model. Thereafter, a comparison is made to the foreign model in order to get a feeling of the 'financial openness effect'. (Only impulse responses and variance decompositions of the foreign model are included in the Appendix)

[40] While it is not directly linked to our research question, we chose to examine the domestic stock price channel of EMEs because this sheds light on how the transmission can differ per country. Eventually, this could help interpreting the results of the international transmission.

Next, excess liquidity can influence other EMEs variables and therefore, spillovers to other variables than stock prices are also assessed. Moreover, it is possible that excess liquidity shocks only exert an indirect effect on foreign stock prices, by first influencing other domestic variables such as the interest rate[41] and real output or even investor psychology. (See for instance Kurov, 2010; Laeven & Tong, 2012) Therefor, the model does not indicate whether Excess Liquidity really flows into foreign equity prices or not. To be more precise, is it about correlation or (in)direct causation?

Finally, the response of the policy rate to industrial production, real effective exchange rate and stock price shocks are examined in order to get a sense about the country's monetary regime. This is similar to Chatziantoniou, Duffy & Filis (2013, pp. 760-761) who introduce stock market and GDP innovations to the interest rate. We are aware that this approach is not perfect, because it is for example not possible to introduce bubbly (non-fundamental) stock price shocks.

3.1.7 Robustness Analysis[42]

The first robustness check will consist of model changes. More precisely, the lag structure, the estimation period and the Cholesky ordering will be changed to investigate the impulse response stability. In addition, changing the estimation period allows getting a sense of the time-variation. Hence, the model is re-estimated with two third of the full period (Miniane & Rogers, 2007, p. 1020). Changing the Cholesky ordering and the lag structure assess the vulnerability of the results to small changes. For the alternative Cholesky ordering, the approach of Brana, Djibenou & Prat (2012) is followed, who argue that money should be placed first: [M1 *IR* GDP CPI Stocks]. The final model change is the estimation of a VECM, which is in line with Peersman and Straub (2005, p. 14) who estimate a differenced VAR as a robustness check. In our case, a pure differenced VAR would lead to misspecification due to the finding of cointegration and therefor, a VECM was chosen (Cochrane, 1997). Estimating a VECM allows verifying whether the results are based on causation rather than correlation. To be more precise, the issue of having correlation rather than causation could follow from the non-stationary nature of most variables.

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[41] U.S. monetary shocks to the interest rate of an EME can also say something about (in)dependency relative to the U.S. (Kim & Yang, 2012, p. 306)

[42] See structure 1.2 in the Appendix.

Next, to further prove the correctness and robustness of our results, certain variables are interchanged. The necessity of this analysis is reinforced by theoretical shortcomings. The literature does not provide a clear view on which monetary aggregate and which excess liquidity measure is the most appropriate within the present framework. Therefore, alternative measures of Excess Liquidity have been created. (See section 3.1.1.2)

Although marginal VARs are widely employed, a Full-VAR is estimated as a final robustness check. It is estimated with U.S. Consumer Prices, Output and the Policy rate added as exogenous variables. Although the addition of such variables seems logical due to increasing financial integration, it has not found its way into these models with the exception of some (See for instance Peersman & Smets, 2001).

3.2 Empirical Results

3.2.1 General Findings

There are several findings that either apply to all models of all countries, or are relevant for all. Firstly, the unit root null was accepted for most series (I(1)), except for the excess liquidity measure and in some cases, the interest rate. The results per country can be found in the tables of section 2.3 in the appendix. Secondly, all the endogenous variables are cointegrated. The amount of cointegration relationships can be found in section 2.4 of the appendix. Thirdly, in the tables of section 2.5 in the appendix, the information concerning the amount of lags can be found. The data intensity, which is also linked to the lag length, can be found in section 2.6 of the appendix. As can be seen in section 2.6, there are at least 1,11 observations per parameter to estimate. Finally, section 2.7 is about the significance of the dummy variables per model. The periods wherein these dummies take the value 1 are usually based on the stock price data, as these are most volatile and deviate from their 'long-term trend'.

There are four findings of standard diagnostic tests that apply to all models. Firstly, the residuals follow a non-normal distribution. According to Rüffer & Stracca, 2006 (p. 24), non-normality of residuals could be due to non-linearities in the data, thus caution is warranted to not overinterpret the results. Secondly, the residuals are heteroscedastic. That the multivariate LM test shows signs of residual correlation is a third finding. There is however no clear pattern in the residual correlation over the different models. In one model, there is residual autocorrelation in the second lag, but also in the eight and so on. Note that estimating a VECM does not solve this problem and therefore, it does not seem to be due to the nonstationary nature of the variables. Finally, each model satifies the stability condition, which means that no inverse roots of the AR characteristics polynomial lie outside the unit circle.
Nevertheless, all these findings only decrease the significance of the results and Eviews does not put forward solutions to cope with these problems. Therefore, the research is continued.

Most countries do not show evidence of price or liquidity puzzles (See section 3.2.1 & 3.2.2 for AEs, and section 3.3.1 & 3.3.2 for EMEs). Consumer prices do not even react to domestic interest rate innovations or money shocks within a 36-month period. A liquidity puzzle is found in the U.S. for the first 14 months. This result is however neither robust to the lag structure, nor to the ordering of the variables. Peru on the contrary shows a strong policy rate increase after an M1-shock, but not to an M2 shock. The robustness test also shows that this result is especially present in the pre-crisis period. The liquidity and price puzzles were results found for industrialized countries and therefor, the result should not necessarily be puzzling for EMEs. To be more precise, monetary policy in emerging markets might be ineffective. (Chen, 2012, p. 413)

Real output does not strongly respond to policy rate shocks. For the U.S., Malaysia, and Peru, the effect is insignificant. Canada's real output on the other hand decreases with maximally 0,4% after the 19th month. A similar result is found for Brazil, yet the maximum result occurs after the 2nd month.

3.2.2 Advanced Economies[43]

When assessing the stock market channel, it is expected that financial markets are fast to incorporate news in stock prices, as shocks in our model are unanticipated innovations. (Ioannidis & Kontonikas, 2008, p. 33; Pirovano, 2012, p. 373) The finding that U.S. and Canadian real stock prices do not robustly react to interest rate shocks challenge the results of for instance Li, Iscan & Xu (2010).

In addition, U.S. real stock prices were expected to respond positively to real money supply innovations (Rapach, 2001; Lastrapes, 1998), contrary to the inconclusive evidence found for Canada (See Lastrapes, 1998 for postive response and Siklos & Anusiewicz, 1998 for a negative response). For the full sample, U.S. and Canadian real stock prices decrease after real money supply innovations.

[43] The impulse responses and variances decompositions for the AEs can be found in section 3.2 of the Appendix. The structure in the appendix is very similar to the structure of the text. An explanation is given in section 3.4 of the Appendix if the impulse response does not survive a robustness test. Nevertheless, a summarizing overview is given on the following page (page 51 of Master thesis).

However, subsample stability tests point out that U.S. real stock prices react negatively to real money shocks for the period 1994-2007 and respond positively for the period 2000-2013. Also, the decrease of Canadian real stock prices is not robust to most checks.

	Overview 1: Significance of response and maximum response if significant		
	Impulse Response	United States	Canada
Monetary policy shock to stock prices	Significant response Stocks to IR shock?	NO	NO
	Significant response Stocks to M1 shock?	YES: +0,4%	YES: -1%
	Significant response Stocks to EL shock?	YES: +2,1%	NO
Stock price shock to macroeconomy	Significant response of INDPR to Stocks shock?	YES: +0,28%	NO
	Significant response of CPI to Stocks shock?	NO	NO
Other EL spillover?	Significant response CPI to EL shock?	YES: -0,8%	YES: -0,9%
	Significant response INDPR to EL shock?	YES: -0,3% & 0,2%	YES: -0,7%
	Significant response REER to EL shock?	NO	NO
Countercyclical Monetary Policy	Significant response IR to INDPR shock?	NO	NO
	Significant response IR to Stocks shock?	YES: +5BP	NO
	Significant response IR to REER shock?	NO	YES: +21BP

Next, U.S. stock markets strongly react to excess liquidity shocks with about 2,1% after twelve months. Innovations in excess liquidity are able to explain up to 25% of the forecast error variance of stock prices in the 36th month. In spite of this, Canadian stock prices do not react to excess liquidity innovations.

The final part for the assession of the stock market channel is the introduction of real stock price innovations. The results for the U.S. point out that a real output peak increase of 0,4% occurs after

eight months. This result does mainly hold for the period 2000-2013. In addition, real equity price shocks explain up to 25% of the forecast error variance of real output at the 17th month. For Canada on the contrary, Neither real output, nor consumer prices react to real stock price innovations.

Unexpectedly, domestic excess liquidity innovations directly lead to a 0,4% decrease in U.S. real output. Even so, real output starts increasing with 0,3% after seventeen months. Excess liquidity is important for U.S. real output as its innovations are directly able to explain 38% of the forecast error in real output. Similarly, Canadian real output directly decreases with 0,7% after excess liquidity shocks. The variance decomposition points out that excess liquidity is even more important for Canadian real output than for the U.S. (68% after one month). In addition, Canadian consumer prices directly respond by decreasing by 0,1% after an excess liquidity innovation.

The results for the U.S. indicate that the Federal Reserve does not conduct countercyclical monetary policy, as the policy rate does not respond to real output shocks, nor does it to real stock prices or the real effective exchange rate. Subsample stability tests however indicate that the policy rate increases after real output and real stock price innovations for the period 1994-2007. This can be explained by the changed monetary regime of the Federal Reserve.

In contrast, the Canadian central bank does increase its policy rate after REER innovations, which depicts a peak increase of 0,2% after sixteen months. In fact, Canada is known to lean against the wind by targeting the exchange rate. (Lange, 2010, p. 782) The variance decomposition points out that REER shocks explain more than 50% of the forecast error variance in the policy rate at month 36.

In conclusion, the stock price channel is important for the transmission of monetary policy shocks in the United States. It seems that especially excess liquidity shocks exert pressure on stock prices. In contrast, the stock price channel seems less important for Canada, because real activity does not respond to stock price shocks. Furthermore, Canadian stock prices do not react to excess liquidity. The results do however not explain why excess liquidity is important for the U.S. and not for Canada. Canada targets in particular the exchange rate and therefore, the response of real stock prices to excess liquidity shocks does not seem to be linked to the policy regime that is in place in a particular country.

3.2.3 Emerging Market Economies[44]

	Overview 2: Significance of response and maximum response if significant			
	Impulse Response	Brazil	Malaysia	Peru
Monetary policy shock to stock prices	Significant response Stocks to IR shock?	YES: -3,5%	YES: -3,5%	NO
	Significant response Stocks to M1 shock?	NO	YES: 3,8%	NO
Stock price shock to macroeconomy	Significant response of INDPR to Stocks shock?	YES: +0,7%	YES: +1%	YES: +0,4%
	Significant response of CPI to Stocks shock?	YES: -0,39%	NO	NO
International transmission: U.S. EL spillover?	Significant response Stocks to U.S. EL shock?	NO	YES: +3,8%	YES: +3,8%
	Significant response IR to U.S. EL shock?	NO	NO	-30BP
	Significant response M1 to U.S. EL shock?	NO	YES: +1%	YES: +1%
	Significant response REER to U.S. EL shock?	YES: +2%	NO	NO
	Significant response INDPR to U.S. EL shock?	YES: -0,6%	YES: +1%	NO
	Significant response CPI to U.S. EL shock?	YES: -0,4%	YES: -0,2%	YES: -0,1%
Countercyclical Monetary Policy	Significant response IR to INDPR shock?	NO	NO	NO
	Significant response IR to Stocks shock?	YES: -110BP	YES: +80BP	YES: -35BP & +40BP
	Significant response IR to REER shock?	NO	NO	YES: -25BP

[44] The impulse responses and variances decompositions for the EMEs can be found in section 3.3 of the Appendix. The structure in the appendix is very similar to the structure of the text. An explanation is given in section 3.4 of the Appendix if the impulse response does not survive a robustness test.

The results for the three emerging markets seem to be very heterogeneous. Brazilian real stock prices decrease directly with 3,5% after policy rate innovations. In the same way, Malaysian real stock prices reach a maximum decrease of 3,5%, yet this happens 4 months after the policy rate shock was introduced. Apart from this, Malaysian real stock prices respond to real money innovations with +3,8% after 3 months. On the contrary, Peruvian real stock prices do not react to policy rate shocks, or to real money supply innovations.

However, subsample stability tests indicate that there is time-variation in the results. Brazilian real stock prices require five months more to react to a policy rate innovation between 2000 and 2013. A maximum peak of 2% is reached after five months. In contrast, Malaysian real stock prices do not react to policy rate shocks for the subsample 2000-2013. For the period 1994-2007, Peruvian real stock prices decrease with 2% directly after a policy rate shock. Still, Peru's policy rate was strongly intertwined with the U.S. policy rate during the period 2002-2007 (see figure 3.1.5.1 in the Appendix) and the response could thus be due to a change in the U.S. policy rate, rather than the Peruvian one.

The country analysis of section 2.3.2 can (partly) explain this country heterogeneity. Brazil is a closed economy, which can indicate that stock prices will mainly react to the domestic monetary policy (Li, Iscan & Xu, 2010). Furthermore, Brazil has a good financial system, as does Malaysia, which could contribute to the credibility of monetary policy. Real stock prices are more likely to react to monetary policy actions if the central bank in question is credible. The opposite seems to hold for Peru, as this country is/was highly dollarized.

Next, stock price shocks are initiated to consumer prices and real output. Despite the difference in magnitude, all 3 EMEs' real output reacts positively to stock price innovations. Brazilian real output increases with 0,7% at month 6 and Malaysian real output with 1% at month 8. Peruvian real output increases with 0,4% after 12 months, but this result is proven not to be robust. Consumer prices on the other hand remain unaffected by stock price shocks, with the exception of Brazil whose consumer prices decrease up to 0,4% after 15 months.

Mackowiak (2007, p. 2512) has drawn attention to the fact that "… when the U.S. sneezes, emerging markets catch a cold". The results confirm this saying, because U.S. excess liquidity is double as important for EMEs' than for the U.S. itself. In comparison, Tillman (2013, p. 728) discovered that capital inflow shocks are far more important for EMEs than for AEs. Even so, the results indicate that real stock prices increase after excess liquidity innovations, while Bagliano & Morana (2012, pp. 1-2, 5, 12) find that stock prices of non-OECD countries decrease in response to U.S. M2/GDP shocks. Apart from this Brana, Djigbenou & Prat (2012, pp. 259, 265) found that equity prices do not react to

global excess liquidity shocks. Could it be that the 'definition risk' of excess liquidity is driving these differing results?

Malaysian as well as Peruvian real stock prices increase up to ±3,8% ten to thirteen months after the excess liquidity shock and such shocks can explain up to 25% of the forecast error variance of Malaysian as well as Peruvian real stock prices. In addition, excess liquidity innovations explain up to 20% of the forecast error variance of Malaysian and Peruvian real stock prices. In contrast, Brazilian real stock prices do not react at all to excess liquidity innovations.

Subsample stability tests for Malaysia indicate that this result only holds for the period 2000-2013. Other robustness checks indicate that the effect of real stock prices to excess liquidity innovations becomes more significant (maximum of 7%), if estimating a VECM. It becomes less significant (maximum of 2%) if the lag structure or the monetary aggregate is changed. In general, it seems that the effect is present and significant for Malaysia. On the other hand, robustness checks for the Peruvian model point out that real equity prices do not react to excess liquidity shocks if the sample 1994-2007 or a VECM is considered.

Researchers that work with global variables have found excess liquidity to be unimportant for (real) share prices (see for instance Darius & Radde, 2010, pp. 5-7). This papers' result that U.S. excess liquidity positively affects Malaysia and Peru might be an indication that such models with global variables neglect country heterogeneity.

Nevertheless, it could be that U.S. excess liquidity has affected Malaysian and Peruvian real stock prices by first spilling over towards domestic monetary policy related variables. The Peruvian policy rate decreased until 0,25% 10 months after the excess liquidity shock. As indicated in the literature section, lots of researchers have found the interest rate channel to be important for international transmission (See for instance Mackowiak, 2007). Moreover, Peruvian real money increases up to 1% at the 22nd month. In the same way, Malaysian real money increases up to 1%, but this happens after 16 months. However, the response of real money to excess liquidity innovations is not robust. Nevertheless, because of the effect of excess liquidity on real money and the policy rate, it is possible that excess liquidity affects real stock prices indirectly. To be more precise, after excess liquidity has affected real money and/or the policy rate.

Neither the Peruvian nor the Malaysian real effective exchange rate is affected by excess liquidity shocks. On the contrary, the Brazilian REER increases up to 2% at month 12. Nevertheless, the significance of the effect disappears when estimating a VECM or when using M2 as a monetary aggregate.

At last, the effect of excess liquidity on the real economy is examined. Although an increase of real output in response to excess liquidity innovations was expected (Brana, Djigbenou & Prat, 2012, pp. 259, 265), Brazilian real output decreased by 0,6% after 2 months. Peruvian real output does not react to excess liquidity innovations and the effect for Malaysia is not robust. On the other hand, consumer prices decrease after excess liquidity innovations. This decrease is however not robust for Brazil and does not survive the subsample stability tests for any of the countries. Overall, U.S. excess liquidity has neither led to overheating, nor to inflationary pressures.

Can the results be explained by the monetary regime in place? The Brazilian and Peruvian central bank decreases its policy rate up to 1 and 0,3% respectively, five months after real stock price innovations. Duncan (2014, p. 144) has discovered a similar counterintuitive result, namely EMEs increase the interest rate during a recession. Next to a decrease, the Peruvian policy rate also knows a reversal effect. To be more precise, the Peruvian policy rate increases up to 0,4%, 20 months after the real stock prices shock was introduced. On the contrary, the Malaysian policy rate increases shortly after the real stock price innovation with a maximum of 80BP.

Contrary to Brazil, the Peruvian central bank reacts to the real effective exchange rate. In fact, the Peruvian policy rate decreases until it reaches 0,25%, 2 months after the REER innovations. Yet, subsample stability tests indicate that the significance of both results for Peru only hold in the period 1994-2007.

In spite of all the preceding, the Malaysian policy rate does not respond to real output, or REER shocks.

These results do not give an indication that the monetary regime in place can be used to ward against U.S. excess liquidity shocks. Brazil decreases its policy rate when real stock prices unexpectedly increase, which means that the central bank is even fueling the increasing real stock prices even more. Yet, excess liquidity innovations do not affect the Brazilian stock market. In the same way, the Peruvian central bank engages in such a fueling practice. Even so, real stock prices do respond to U.S. excess liquidity shocks. On the contrary, Malaysia countercyclically reacts to real stock price shocks, but is strongly affected by U.S. excess liquidity innovations. Overall, the monetary reaction to real stock price innovations does not seem to explain the effect of U.S. excess liquidity shocks on EMEs' real stock prices.

Two of the three countries react to U.S. excess liquidity innovations, namely Malaysia and Peru. At first, one similarity of these two countries is financial openness, contrary to Brazil that is rather large

and closed. Secondly, Peru and Malaysia have relationships with the U.S., while this is rather limited for Brazil. To be more precise, Peru is highly dollarized and the Malaysian Ringgit was coupled to the U.S. dollar at the beginning of 2000. Although a research of three countries is to few to generalize the results, it seems that financial openness and bilateral relationships with the U.S. explain the increasing real stock prices in response to U.S. excess liquidity innovations. (See also section 2.3.2)

To sum up, the stock price channel is important for both Brazil and Malaysia, because on one hand, real stock prices react to money and/or policy rate shocks and on the other hand, the macroeconomic variables (consumer prices and real output) react to real stock price innovations. In spite of this, the stock price channel is unimportant for Peru. Nevertheless, real stock prices play, for Peru as well as for Malaysia, an important role in the international transmission of U.S. excess liquidity shocks. For the most part, real stock prices are far more important as an international transmitter than money, REER, consumer prices, real output or the policy rate. So, this preliminary evidence indicates that U.S. excess liquidity has led to 'equity booms', rather than 'overheating', 'inflationary pressures' or 'currency appreciation'. The magnitude of the effect of U.S. excess liquidity on real stock prices cannot be explained by countercyclical or pro-cyclical monetary policy.

3.3 Robustness Of Results

To some extent, the robustness of the results has already been discussed in the previous section. Section 3.3 on the other hand, aspires to shed light on the reason of non-robustness. At first, the most common form of non-robustness is that various impulse responses do not survive the subsample stability test. It seems that the addition of a prolonged period has come at a cost, namely time-variation in the dataset. For instance, researchers have found (global) excess liquidity to be unimportant for equity prices. The dataset of these researches was most of the times limited to pre-crisis periods. (See for instance Darius & Radde, 2010, pp. 5, 7) Other researchers that have focused on QE-spillovers have found it to have significant effects on EMEs stock prices (See for instance Chen, Filardo, He & Zhu, 2011, pp. 230, 233, 252, 254).

Unexpectedly, in only 3 out of 24 cases, the results between the domestic and the foreign model change. On the contrary, the results are not robust when controlling for other U.S. variables. To be more precise, the significance of 13 out of 22 impulse responses that were initially significant

disappeared after estimating a Full-VAR. This seems to confirm the expected problems of the addition of other U.S. variables (see section 3.1.6.2).

Section 3.5 (see appendix) is about the response of real stock prices to other excess liquidity measures. Brazilian real stock prices react to monetary overhang innovations, while for Canada, the MON_CPI seems more important. For Malaysia, Peru and Brazil, excess liquidity defined as EL, MO and MON_CPI lead to, more or less, the same result. On the contrary, if excess liquidity is defined as money growth minus GDP growth, the effect is insignificant for all countries, except for the negative response of U.S. real equity prices. The insignificance of the result was a similar finding of Brana, Djigbenou & Prat (2012).

The most widely used proxy for excess liquidity is the money-to-GDP ratio. On one hand, the global share prices did not react to global excess liquidity (See for instance Darius & Radde, 2010, pp. 5, 7). Such insignificant results are found for Canada and Peru. On the other hand, Bagliano & Morana (2012, p. 1-2, 5, 12) have discovered that stock prices of non-OECD countries negatively respond to M2/GDP innovations. In comparison, Brazil and the U.S. negatively react to M1/INDPR innovations. Unexpectedly, Malaysian real stock prices increase after such innovations.

These puzzling results point out that our research has shed light on several new questions. Firstly, what is the appropriate excess liquidity measure in an equity price framework? Secondly, can the appropriateness of the excess liquidity definition depend on country characteristics? Nevertheless, we accept the finding of an 'excess liquidity puzzle' and leave the unanswered questions for future research.

3.4 Policy Recommendations

In order to form a full circle, policy recommendations may be formulated. What are the policy relevant results for the U.S. economy? Firstly, the results have provided preliminary evidence that U.S. excess liquidity supply shocks[45] affect the U.S. stock market rapidly, whilst real activity responded negatively. Secondly, the policy rate does not seem to work appropriately, as U.S. real stock prices increase after a contractionary policy rate shock for the period 2000-2013. This asymmetric response of real stock prices indicates that the policy rate might not be able to guide equity prices towards 'equilibrium'.

As a consequence, we are not inclined to advice that monetary policy should play an important role in equity price stabilization. The fact that monetary policy has only one tool at its disposal enhances this recommendation. More precisely, it is difficult, if not impossible, to accomplish multiple stabilization goals (macroeconomic and monetary stability, asset price stability, financial stability) with only one instrument (Borio & Lowe, 2002, p. 24). Accordingly, new tools or new authorities might need to be developed in order to LATW (Cukierman, 2013, p. 379).

In addition, Bernanke & Gertler (2000, p. 5) describe "... stock prices as an endogenous variable often disconnected from the current state of the economy". Therefore, the inclusion of stock prices in a monetary policy rule might not be the most productive choice. On one hand, this would increase uncertainty due to the volatile policy rate. On the other hand, the Federal Reserve's main role of macroeconomic stabilization might be endangered because of this disconnection.

Another part of the results has shed light on the question whether U.S. monetary policy has either stimulated equity booms in EMEs, or whether it has revived EMEs real activity. The results have pointed out that Brazilian real output responded negatively to U.S. excess liquidity innovations, contrary to Malaysia's positive response. Also, Peruvian real output did not respond at all. Yet, U.S. excess liquidity shocks had a strong effect on Malaysian and Peruvian real stock prices.

[45] Because it is a supply shock, it is assumed that especially monetary policy will play a role in its determination.

Because of the strong effect on real equity prices[46] and the weak response of real output to U.S. excess liquidity shocks, we are inclined to advise that the U.S. should better internalize the actions they take in order to limit the spillover effects (for instance QE that strongly contributed to excess liquidity), which is a similar recommendation as the IMF (2013, p. 26) and Murray (2013, p. 9) have given.[47]

Ethical entrepreneurship and corporate social responsibility are major topics in todays' society. Yet, to our knowledge, there is no such thing as ethical central banking. In fact, countries take actions that are obviously prosperous for their own economy, but neglect the damage it can cause to other countries.

[46] Still, this recommendation neglects whether the stock price movements are fundamental-based or not.

[47] Nevertheless, it is arguable that it is difficult to give an answer to this debate with our research. It is a post-crisis debate, while our research uses a dataset that contains as well pre- as post-crisis evolutions.

4 Conclusion

Knowledge about the domestic and international transmission of U.S. monetary policy shocks via real stock prices is on one hand important for examining the Federal Reserve as a risk factor in international financial markets, and on the other important for domestic and international policymaking. The other part of our research question is about whether countercyclical monetary policy can help policymakers to mitigate the ('unwanted') effects that the Federal Reserve generates. The Recursive VAR model, with impulse responses and variance decompositions as the main tool of analysis, allows examining to what extent U.S. monetary policy shocks leads to domestic and external stock price shifts. Monetary policy shocks are defined as shocks in the policy rate, real money and excess liquidity for the domestic transmission, while only excess liquidity is used for the international transmission. In addition, the effect of U.S. excess liquidity innovations on other variables of EMEs are investigated for comparative reasons. To finalize the domestic transmission mechanism via real stock prices, stock price shocks to consumer prices and real output are initiated. In response to the other part of the research question, industrial production, real effective exchange rate and real stock price shocks are introduced to the policy rate, in order to examine how the central bank in that particular country reacts to such kind of shocks. Eventually, if possible, the response of the policy rate is used to explain the results of the transmission.

The results of the domestic (U.S.) transmission indicate that especially U.S. excess liquidity supply shocks exert pressure on U.S. real stock prices. This is not the case for every country, as Canadian (= Benchmark country) real stock prices did not respond to domestic excess liquidity innovations. A second important finding for the U.S. was that a subsample stability test for period 2000-2013 pointed out that U.S. real stock prices tend to increase after a contractionary U.S. policy rate shock. It does not seem that countercyclical monetary policy can explain the differing results between Canada and the U.S.

The Federal reserve should thus not Lean Against The Wind with the policy rate because on one hand, U.S. monetary policy can exert serious pressure on U.S. real stock prices with U.S. excess liquidity supply shocks, and on the other hand, because of the asymmetric response of real stock

prices to a policy rate shock in 2000-2013. Policymakers need to focus on new tools and/or new authorities.

The results of the international transmission of U.S. excess liquidity shocks towards Emerging Markets Economies have pointed out that the stock price channel is the most important transmitter. In particular, Malaysian and Peruvian real stock prices strongly reacted to U.S. excess liquidity shocks. Despite the non-responding Brazilian real stock prices to U.S. excess liquidity innovations, the results cannot be explained by the monetary regime in place.
The strong effect on real equity prices and the weak response of real output to U.S. excess liquidity shocks indicate that U.S. actions have led to equity booms in EMEs, rather than the revival of real activity.

In brief, the stock price channel is important for the domestic transmission of U.S. excess liquidity, as well as its international transmission. The results did not indicate that countercyclical monetary policy actions could mitigate the magnitude of the effects.

Further research should at first shed light on the excess liquidity puzzle. To be more precise, what is the appropriate definition of excess liquidity in an equity price framework and is this definition appropriate for all countries? Secondly, the research question should be re-examined with a Time-Varying Parameter Bayesian VAR to cope with on one hand changing monetary regimes, and on the other hand, to allow for parameter restrictions.
Nevertheless, “Inflation is always and everywhere a monetary phenomenon” (Friedman, 1963 in: De Grauwe, Polan, 2005, p. 239) and this research has provided preliminary evidence that this time, it were equity prices that have absorbed this excess money.

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FACULTEIT ECONOMIE EN BEDRIJFSKUNDE

UNIVERSITEIT GENT

FACULTEIT ECONOMIE EN BEDRIJFSKUNDE

ACADEMIEJAAR 2013 – 2014

Appendix

Masterproef voorgedragen tot het bekomen van de graad van

Master of Science in de Handelswetenschappen

Olivier Vermassen

onder leiding van

De Heer Garo Garabedian

Appendices

Table of Contents

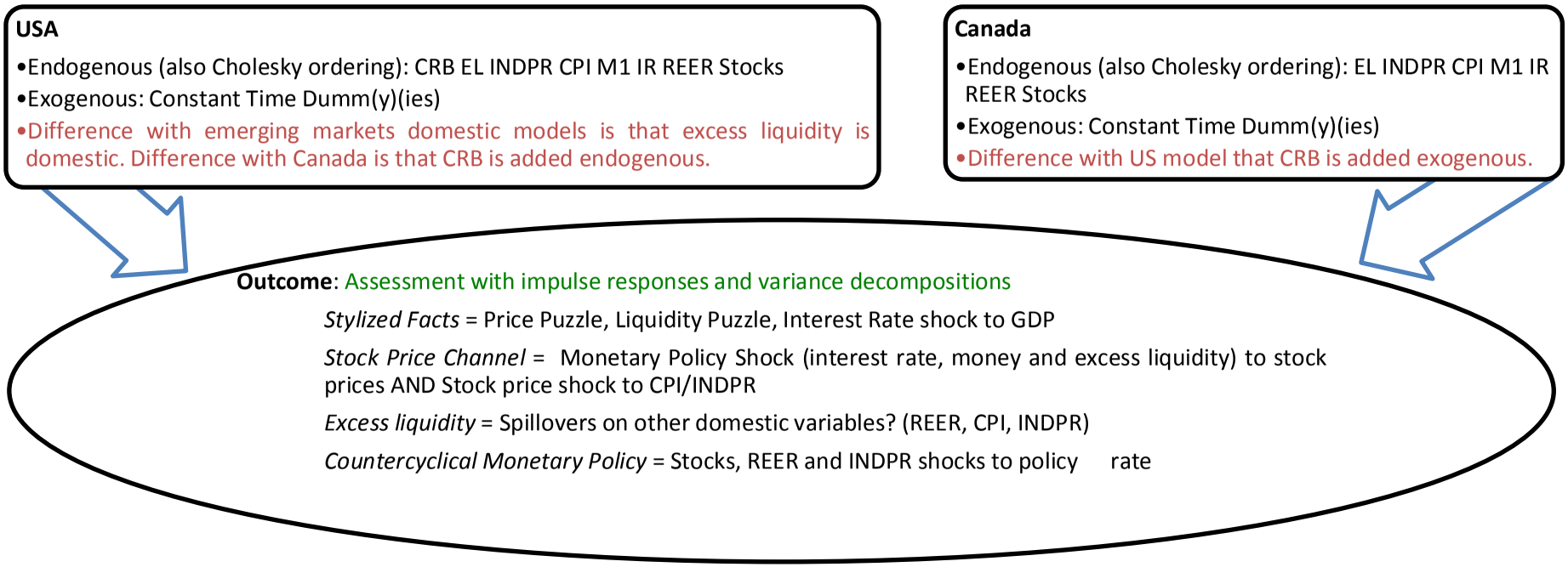
Abbreviations:

AE = Advanced Economy
CANSIM = Canadian Socioeconomic Information Management System
CDBCRP = Interest rate of Peru
CPI = Consumer Price Index
CRB = Commodity price index of Commodity Research Bureau
EL = Excess Liquidity
EL = Money to GDP ratio as a deviation from its equilibrium value.
EME = Emerging Market Economies
FTSE = Financial Times Stock Exchange
GDP = Gross Domestic Product
IBGE = Instituto Brasileiro de Geografia e Estatistica
INDPR = Industrial Production
IPPI = industrial product prices index
IR = policy rate
M.to.GDP = money-to-GDP ratio as deviation from its equilibrium value.
M1 = Monetary aggregate M1
MG – GDPG = excess liquidity defined as the difference between money growth and GDP-growth.
MO = Monetary overhang; money as a deviation from its equilibrium value.
MON_CPI = money-to-price ratio as a deviation from its equilibrium value.
QE = Quantitative Easing
REER = Real Effective Exchange Rate
S&P = Standard & Poor's
SA = Seasonally Adjusted
Stocks = stock price index
S&P/TSX = Standard & Poor's Toronto Stock Exchange
U.K. = United Kingdom
U.S. = United States

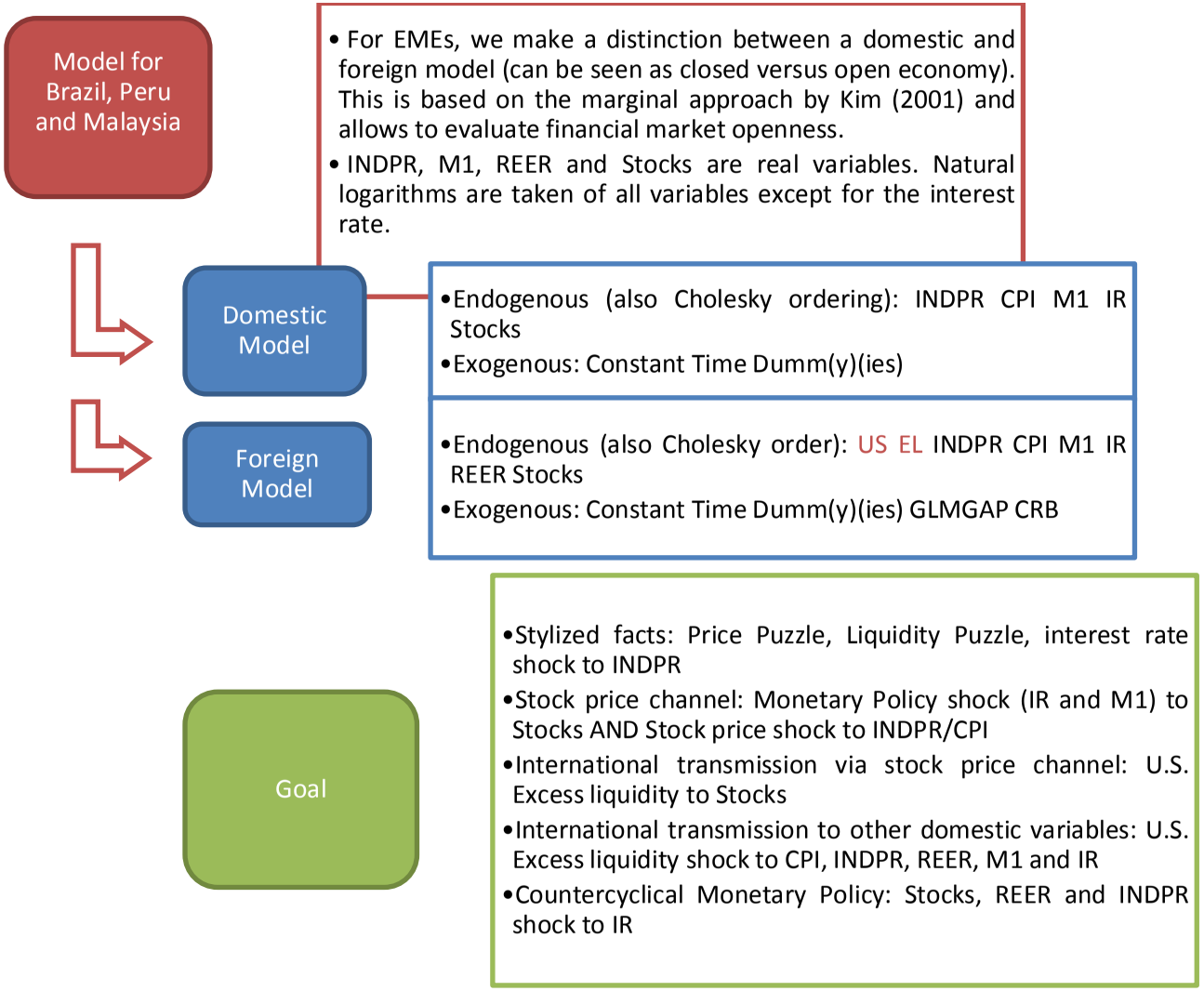
1 Structure

1.1 Overviews of Models to estimate

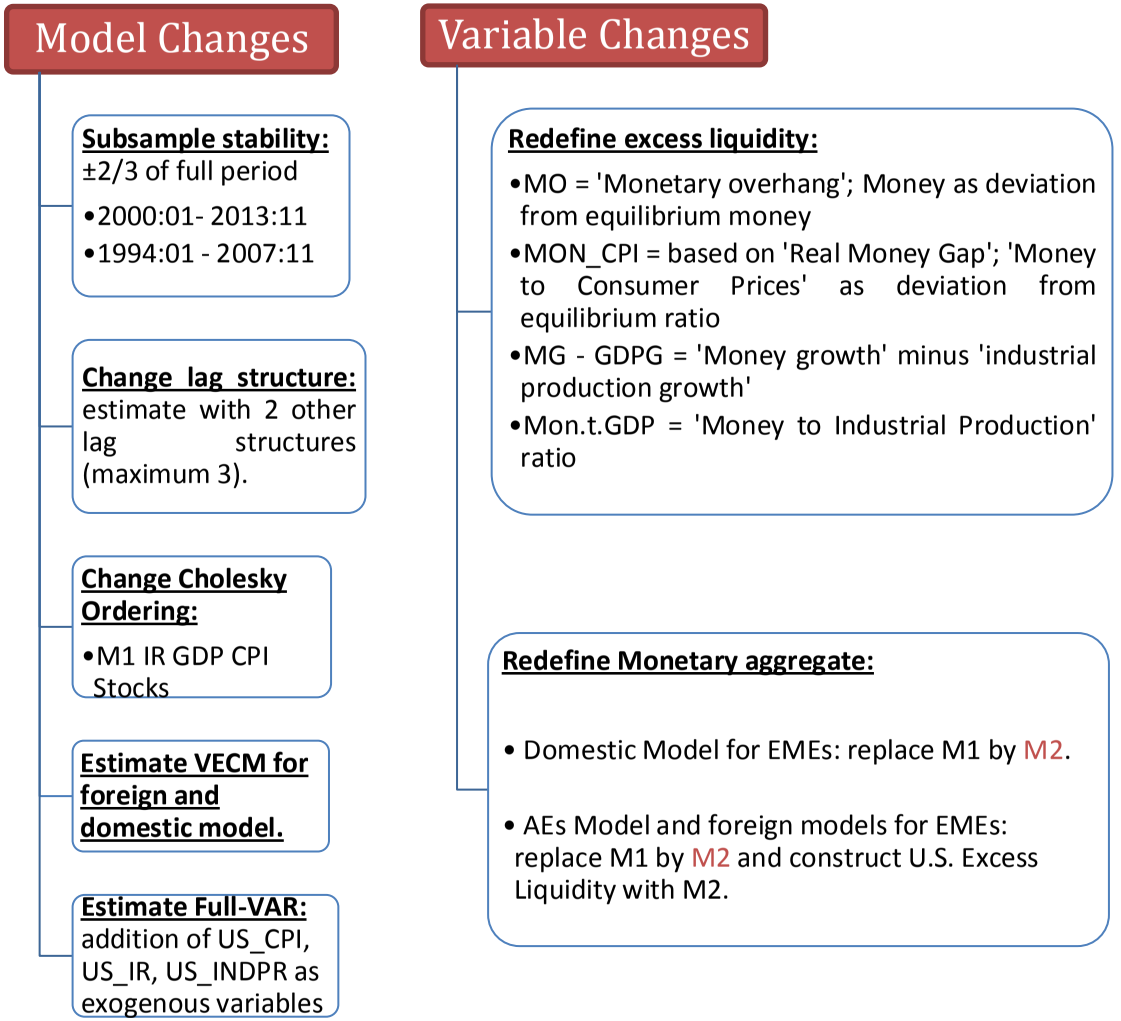
1.1.1 Model for Advanced Economies



1.1.2 *Models for Emerging Market Economies*



1.2 Robustness Analysis



2 Tables

2.1 Data Sources

Variable		Brazil	Canada	Malaysia
CPI	Original source:	IBGE	Statistics Canada (CANSIM)	Department of Statistics, Malaysia
	Conversion method:	Average	Average	Average
	Adjustment:	Price Index, not SA	Price Index, not SA	Price index, not SA
	Value:	Index, 1993M12=100	Index, 2002=100	Index, 2010=100
	Information:	Overall, Broad national index (IPCA)	Consumer prices, all items	Consumer prices
Equity Index	Original source:	Datastream	S&P/TSX	FTSE
	Conversion method:	Unknown	Unknown	Unknown
	Adjustment:	Index, not SA	Index, not SA	Index, not SA
	Value:	Brazilian Real	Canadian Dollar	Malaysian Ringitt
	Information:	Brazil-Datastream market (Price Ind.)	S&P/TSX Composite Index (Price Index)	FTSE Malaysia (Price Index)
INDPR	Original source:	IBGE	Statistics Canada (CANSIM)	Department of Statistics, Malaysia
	Conversion method:	Average	Average	Average
	Adjustment:	Volume index, SA	Price Index, not SA	Volume index, not SA
	Value:	Index, 2002=100	Index, 2010=100	Index, 2005=100
	Information:	Overall, general industry	Industrial product prices (IPPI)	Totally industry

IR	Original source: Conversion method: Adjustment: Information:	Banco Central do Brasil End of Period Interest rate (%) SELIC target rate	Statistics Canada (CANSIM) End of Period Interest rate (%) Overnight money market financing rate	Central Bank of Malaysia Average Interest rate (%) Treasury Bills, Bid, 3 Month
M1 (and M2 for some countries)	Original source: Conversion method: Adjustment: Value:	Banco Central do Brasil End of period Current prices, SA Millions Brazilian Real	Bank of Canada End of Period Current prices, SA Millions Canadian Dollar	Central Bank of Malaysia End of Period Current prices, not SA Millions Malaysian Ringitt

Variable		Peru	USA
CPI	Original source: Conversion method: Adjustment: Value: Information:	INEI Average Price index, not SA Index, 2009=100 Consumer prices, total, Lima	US Department of Labor: Bureau of Labor statistics Average Price index, SA Index, 1982-84=100 Consumer prices for all Urban consumers, all items
Equity Index	Original source: Conversion method: Adjustment: Value: Information:	FTSE Unknown Index, not SA Peruvian Nuevo Sol FTSE World Peru Price Index	Standard and Poors Index, not SA United States Dollar S&P 500 composite index (price index)
INDPR	Original source: Conversion method: Adjustment: Value: Information:	INEI Sum Constant prices, not SA Millions Peruvian Nuevo Sol, 1994 prices Monthly GDP, production approach	Board of Governors of the Federal Reserve System Average Volume Index, SA Index, 2007=100 Industrial production index

IR	Original source:	Central Reserve bank of Peru	Board of Governors of the Federal Reserve System
	Conversion method:	Unknown	Average
	Adjustment:	Interest rate (%)	Interest rate (%)
	Information:	CDBCRPs stock interest rate	Overnight Federal Funds rate
M1 (and M2)	Original source:	Central Reserve bank of Peru	Board of Governors of the Federal Reserve System
	Conversion method:	End of Period	End of Period
	Adjustment:	Current prices, not SA	Current prices, SA
	Value:	Millions Peruvian Nuevo Sol	Billions of dollars

Variable		Other
CRB	Original source:	Commodity Research Bureau
	Conversion method:	Unknown
	Adjustment:	Spot Index, not SA
	Value:	Index, 1967=100
REER	Original Source	Bank for International Settlements effective exchange rate (EER)
	Conversion method:	Most recent weights are based on trade in 2008-'10 and indices' base year is 2010 (weighting pattern = time-varying)
	Adjustment	Real EERs are the geometrical weighted averages of bilateral exchange rates adjusted by relative consumer prices.
	Value	Monthly averages ; 2010 = 100

Variable		Eurozone	Japan	United Kingdom
CPI	Original source:	Eurostat	Statcs. Bureau, Ministry of Internal Affairs & Comm., Japan	Office for National Statistics, U.K.
	Conversion method:	Average	Average	Average
	Adjustment:	Price Index, not SA	Price Index, SA	Price index, not SA
	Value:	Index, 2005=100	Index, 2010=100	Index, 2005=100
	Information:	Total HICP (EA17)	Consumer Prices, Nationwide, all items	Consumer prices, all items (CPI)
INDPR	Original source:	Eurostat	Ministry of Economy, Trade and Industry, Japan	Office for National Statistics, U.K.
	Conversion method:	Average	Average	Average
	Adjustment:	Volume index, not SA	Volume index, SA	Volume index, SA
	Value:	Index, 2010=100	Index, 2010=100	Index, 2010=100
	Information:	Industrial production: manufacturing (EA 18)	Industrial production: mining and manufacturing	Index of production: all production industries
M1 and M2	Original source:	European Central Bank	Bank of Japan	Bank of England
	Conversion method:	End of Period	Average	End of Period
	Adjustment:	Current prices, SA	Current prices, not SA	Current Prices, SA
	Value:	Millions Euro	Billions Japanese Yen	Millions UK Sterling Pound
ER	Original source:	WM/Reuters	Bank of Tokyo Mitsubishi-UFJ	WM/Reuters
	Conversion method:	10th of the month	10th of the month	10th of the month
	Adjustment:	Spot price, not SA	Spot price, not SA	Spot price, not SA
	Value:	United States Dollar to Euro	Japanese Yen to United States Dollar	United States Dollars to United Kingdom Sterling

2.2 Descriptive Statistics (Only for U.S.)

Correlation	M_TO_GDP	MG_GDPG	MO	MON_CPI	EL
M_TO_GDP	1.000000	0.150626	0.310784	0.240363	0.363273
MG_GDPG	0.150626	1.000000	0.152477	0.084544	0.185268
MO	0.310784	0.152477	1.000000	0.801088	0.894816
MON_CPI	0.240363	0.084544	0.801088	1.000000	0.788248
EL	0.363273	0.185268	0.894816	0.788248	1.000000

EL = Money to GDP ratio as a deviation from its equilibrium value.

MO = Monetary overhang ; money as a deviation from its equilibrium value.

MON_CPI = money-to-price ratio as a deviation from its equilibrium value.

MG – GDPG = excess liquidity defined as the difference between money growth and GDP-growth.

M.to.GDP = money-to-GDP ratio as deviation from its equilibrium value.

2.3 Unit Root Tests

All unit root tests are estimated with a constant and compared with a 5% critical value. A linear trend is added if significant. The lag length for the ADF test is based on an automatic procedure where the Schwarz Info Criterion decides. For the PP and KPSS test, the spectral estimation method is Bartlett Kernel and Newey-West Bandwidth chooses the bandwidth automatically. (All these options are default in Eviews)

2.3.1 Brazil

	ADF	PP	KPSS
CPI	**I(1)**	**I(1)**	**I(1)**
INDPR	**I(1)**	**I(1)**	**I(0)**
IR	**I(1)**	**I(0)**	**I(0)**
M1	**I(2)**	**I(1)**	**I(1)**
REER	**I(1)**	**I(1)**	**I(1)**
Stocks	**I(1)**	**I(1)**	**I(1)**

2.3.2 Canada

	ADF	PP	KPSS
CPI	**I(1)**	**I(1)**	**I(1)**
INDPR	**I(1)**	**I(1)**	**I(1)**
IR	**I(0)**	**I(0)**	**I(0)**
M1	**I(2)**	**I(1)**	**I(2)**
REER	**I(1)**	**I(1)**	**I(1)**
Stocks	**I(1)**	**I(1)**	**I(1)**
EL	**I(0)**	**I(0)**	**I(0)**

2.3.3 Malaysia

	ADF	PP	KPSS
CPI	**I(1)**	**I(1)**	**I(1)**
INDPR	**I1)**	**I(1)**	**I(1)**
IR	**I(1)**	**I(1)**	**I(1)**
M1	**I(2)**	**I(1)**	**I(2)**
REER	**I(1)**	**I(1)**	**I(1)**
Stocks	**I(1)**	**I(1)**	**I(1)**

2.3.4 Peru

	ADF	PP	KPSS
CPI	**I(1)**	**I(1)**	**I(1)**
INDPR	**I(1)**	**I(1)**	**I(1)**
IR	**I(1)**	**I(1)**	**I(1)**
M1	**I(1)**	**I(1)**	**I(1)**
REER	**I(1)**	**I(1)**	**I(1)**
Stocks	**I(1)**	**I(1)**	**I(1)**

2.3.5 U.S.

	ADF	PP	KPSS
CPI	**I(1)**	**I(1)**	**I(1)**
INDPR	**I(1)**	**I(1)**	**I(1)**
IR	**I(1)**	**I(1)**	**I(0)**
M1	**I(1)**	**I(1)**	**I(2)**
REER	**I(1)**	**I(1)**	**I(1)**
S&P500	**I(1)**	**I(1)**	**I(1)**
US EL[1]	**I(0)**	**I(0)**	**I(0)**

2.3.6 Global Factors

	ADF	PP	KPSS
CRB	**I(1)**	**I(1)**	**I(1)**
GL EL[1]	**I(0)**	**I(0)**	**I(0)**

2.4 Tests For Cointegration

Cointegration is tested for with the Johansen test (same amount of lags as with VAR model). We allowed for a linear trend in our data, and included only an intercept in the cointegration equation. It is tested with only the endogenous variables, as Eviews suggests that the addition of exogenous variables can bias the estimations. The endogenous variables involve series which are I(1) and I(0), in line with for instance Frömmel, Garabedian & Schobert (2011). It is also an approach recommended by Johansen & Juselius (1992) when it strengthens the cointegration test.

[1] All excess liquidity measures are I(0), except for the money-to-GDP ratio that is I(1).

The amount of cointegration equations according to the trace test is included in the following tables:

	Advanced Economies
Canada	**2**
U.S.	**4**

	Emerging Market Economies	
	Domestic Model	Foreign Model
Brazil	**3**	**1**
Malaysia	**1**	**3**
Peru	**2**	**3**

2.5 Lag Length And Information Criteria

The used amount of lags is included in the following table, followed by the information criteria that advise us to include that amount of lags. The tests were executed with a maximum of 3 lags (more is not affordable in terms of 'degrees of freedom').

	Advanced Economies	
	Amount of lags	Criteria
Canada	1	SC, HQ
U.S.	3	LR, FPE, AIC, SC, HQ

	Emerging Market Economies (domestic model)	
	Amount of lags	Criteria
Brazil	2	FPE, AIC, HQ
Malaysia	3	LR, FPE, AIC, HQ
Peru	3	LR, FPE, AIC

	Emerging Market Economies (foreign model)	
	Amount of lags	Criteria
Brazil	2	FPE, AIC, HQ
Malaysia	3	LR, FPE, AIC
Peru	2	FPE, AIC

2.6 Amount Of Observations In Relation To The Amount Of Parameters To Estimate

In the following table, we compare the amount of observations we have with the amount of parameters to estimate.

Countries	# Observations	Parameters to estimate	Ratio
Canada	**238**	**77**	**3,09:1**
U.S.	**237**	**213**	**1,11:1**

	# Observations		Parameters to estimate		Ratio	
Countries	Domestic	Foreign	Domestic	Foreign	Dom.	For.
Brazil	**204**	**204**	**65**	**140**	**3,14:1**	**1,46:1**
Malaysia	**236**	**236**	**90**	**210**	**2,62:1**	**1,12:1**
Peru	**236**	**237**	**85**	**140**	**2,77:1**	**1,69:1**

Estimation Periods:

- U.S.: 1994M01 – 2013M12;
- Canada, Peru, Malaysia: 1994M01 – 2013M11;
- Brazil: 1996M10 – 2013M11.

2.7 Dummy Variables

In the following table, we compare our Chi-Square parameter versus the 5% critical value. > means that the dummy is significant and has to stay in the model. (N.S.) means that the dummy is not significant.

(!) Significance is not reported for the contemporaneous inclusion of more than one dummy variable, as there was never more than one significant.

	Advanced Economies	
	Period when it takes 1	Significance
Canada	1998M01 – 2002M08	11,28 < 14,07 (N.S.)
	2002M09 – 2008M12	7,28 < 14,07 (N.S.)
	2009M01 – 2013M11	38,163 > 14,07
U.S.	1995M01 – 2003M01	672,93 > 15,507
	2003M02 – 2009M01	9,50 < 15,507 (N.S.)
	2009M02 – 2013M12	11,012 < 15,507 (N.S.)

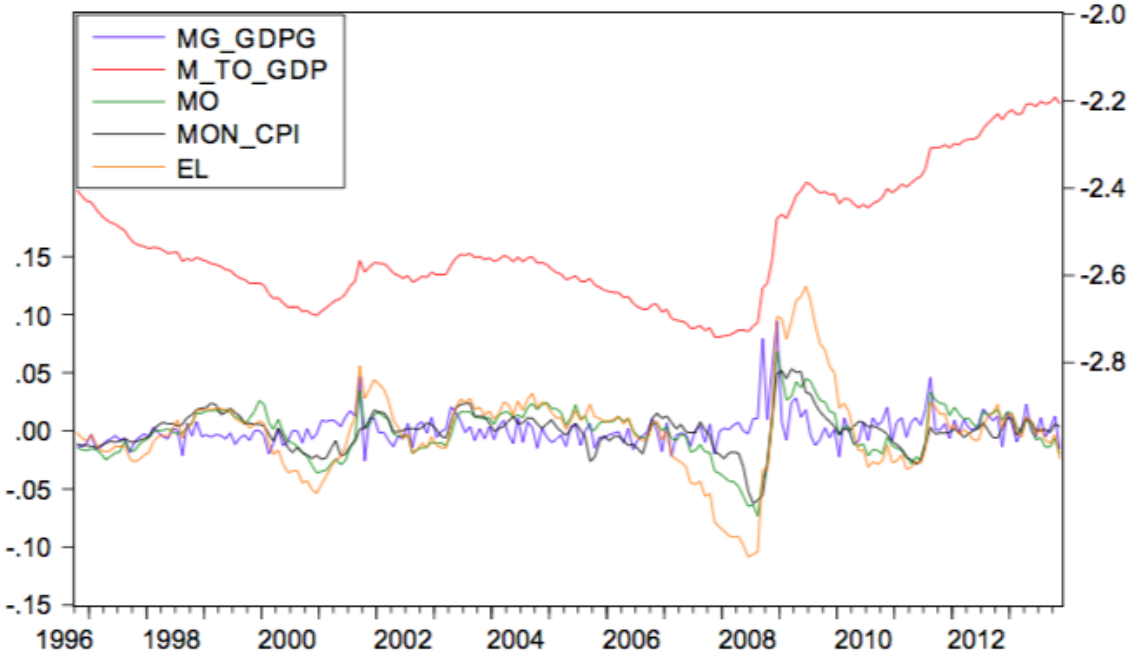
	Emerging Market Economies (domestic model)	
	Period when it takes 1	Significance
Brazil	2006M01 – 2008M12	8,06 < 11,07 (N.S.)
	2009M01 – 2011M06	324,37 > 11,07
Malaysia	1994M01 – 1998M05	15,21 > 11,07
	1998M06 – 2001M05	8,81 < 11,07 (N.S.)
	2006M05 – 2009M01	4,61 < 11,07 (N.S.)
Peru	2005M04 – 2008M08	4,19 < 11,07 (N.S.)
	2008M09 – 2013M08	4,34 < 11,07 (N.S.)

	Emerging Market Economies (foreign model)	
	Period when it takes 1	Significance
Brazil	2006M01 – 2008M12	5,33 < 14,07 (N.S.)
	2009M01 – 2011M06	2,9 < 14,07 (N.S.)
Malaysia	1994M01 – 1998M05	2,45 < 11,07 (N.S.)
	1998M06 – 2001M05	60,19 > 11,07
	2006M05 – 2009M01	2,45 < 11,07 (N.S.)
Peru	2005M04 – 2008M08	5,3425 < 14,07 (N.S.)
	2008M09 – 2013M08	8,52 < 14,07 (N.S.)

3 Figures

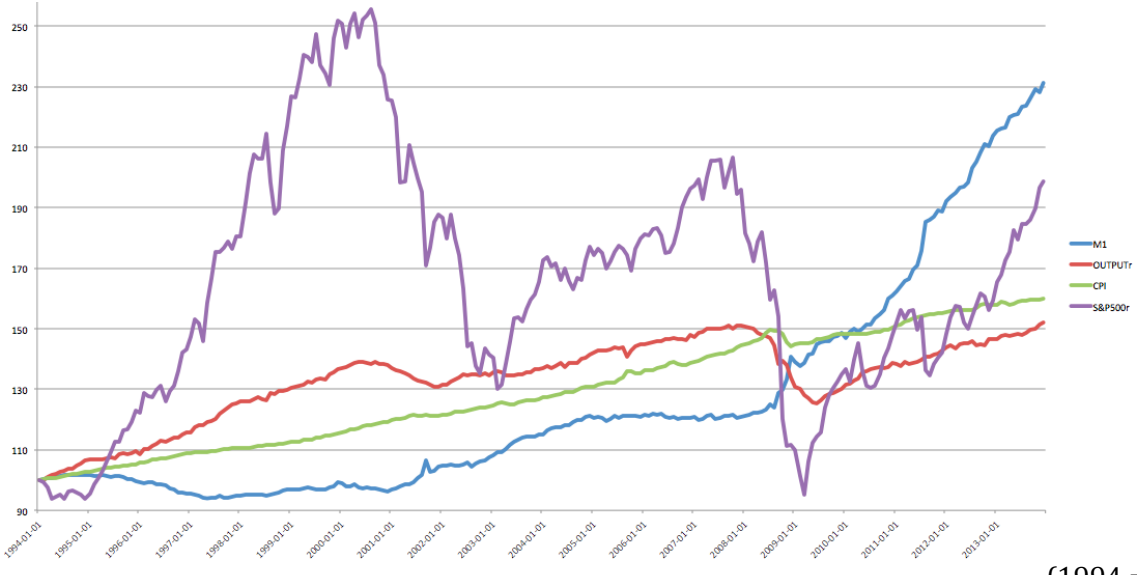
3.1 Data Analysis

3.1.1 Excess Liquidity Measures



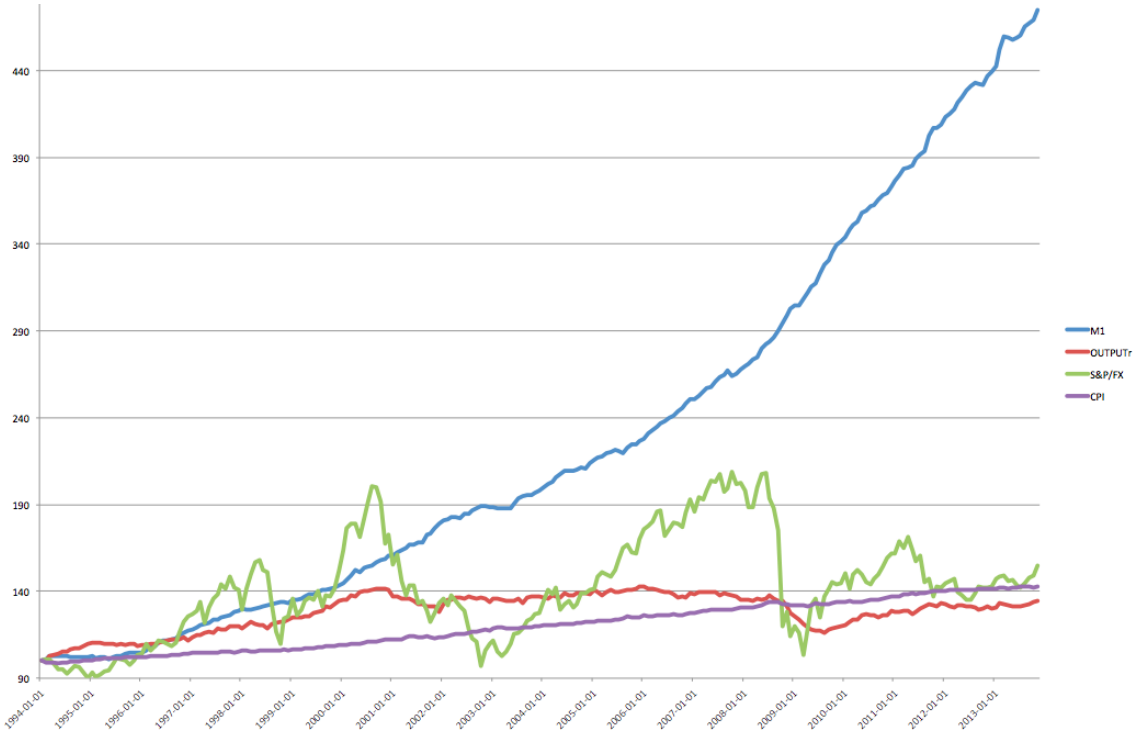
3.1.2 Co-movement Of Economic and Financial Variables

3.1.2.1 U.S.



(1994 = 100)

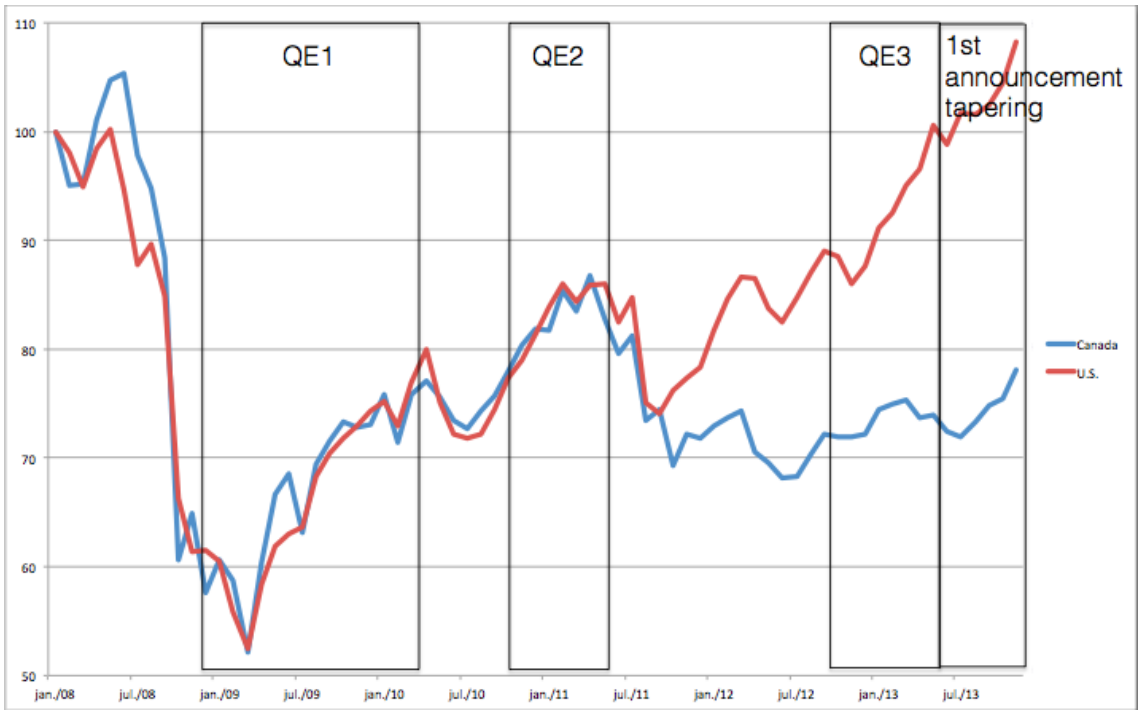
3.1.2.2 Canada



(1994 = 100)

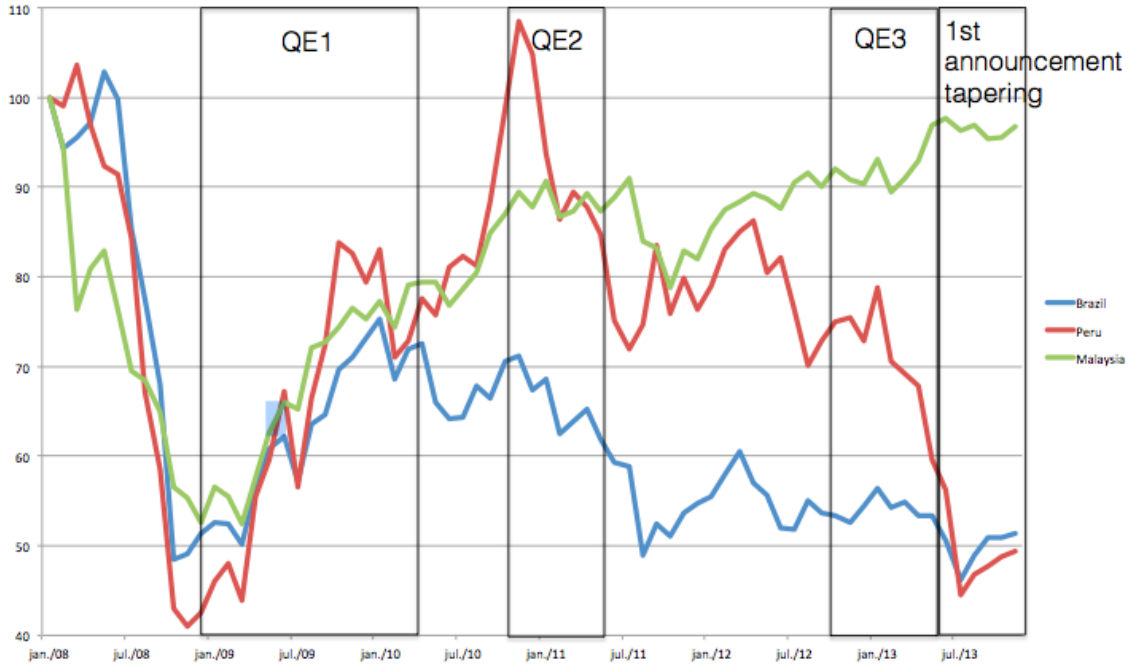
3.1.3 U.S. Quantitative Easing And Stock Prices

3.1.3.1 Advanced Economies



(2008 = 100)

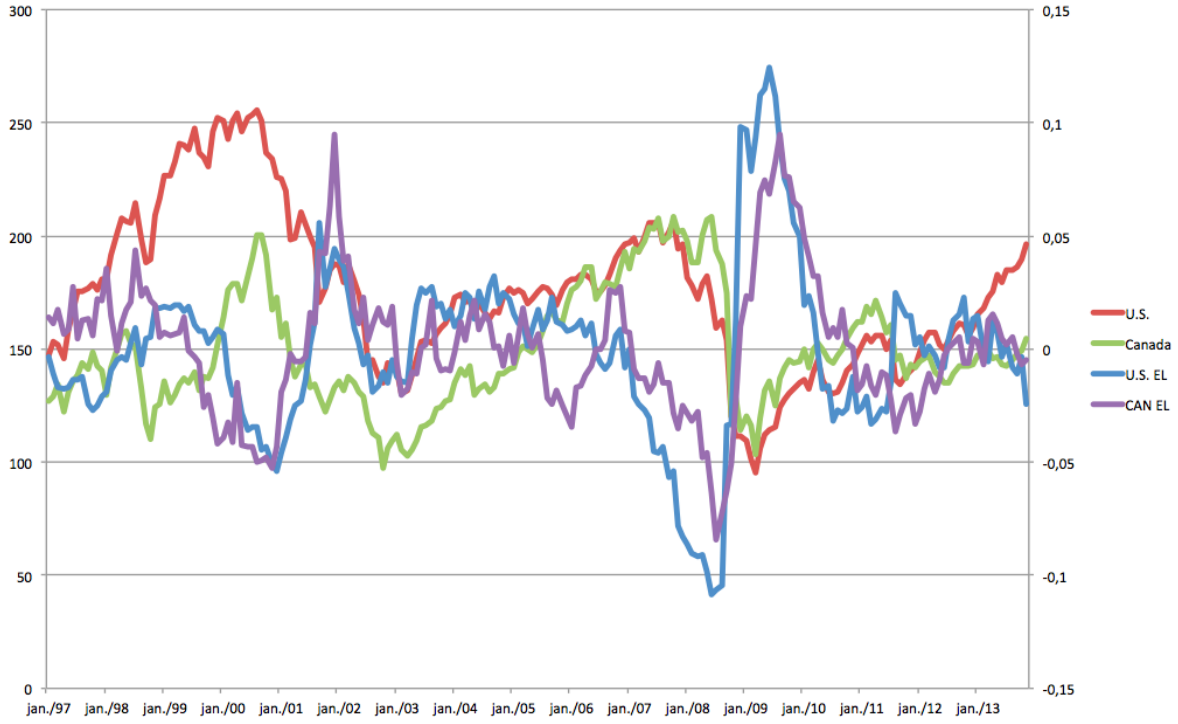
3.1.3.2 Emerging Market Economies



(2008 = 100)

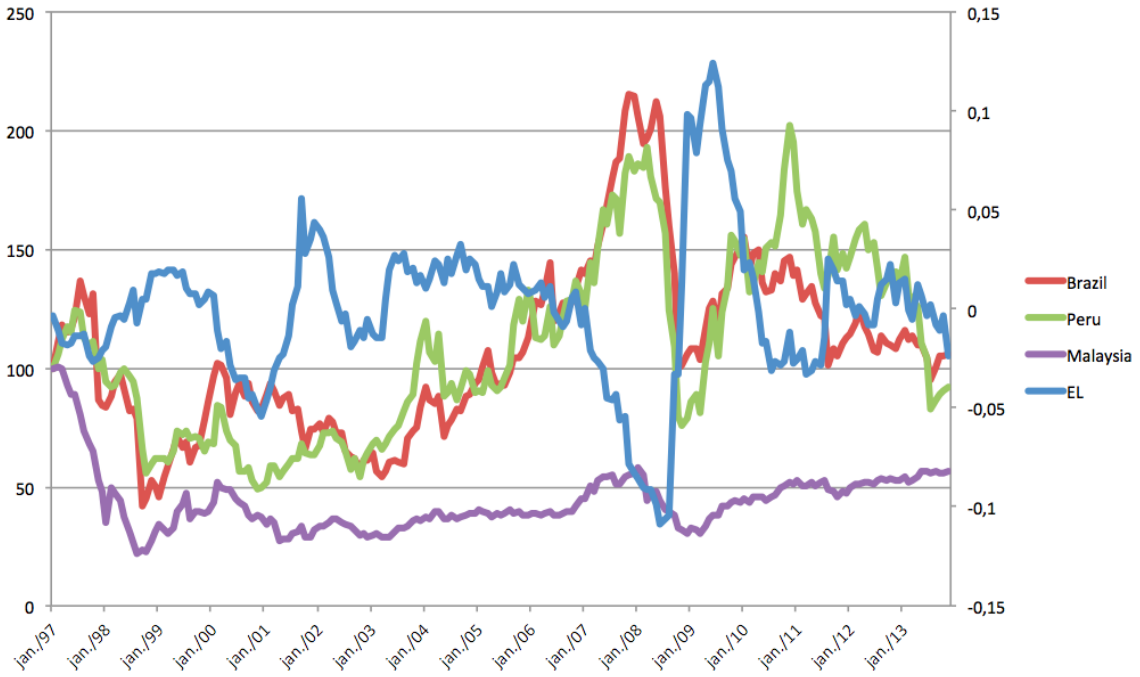
3.1.4 Excess Liquidity And Stock Prices

3.1.4.1 Advanced Economies



(1994 = 100 for Stock Price Index)

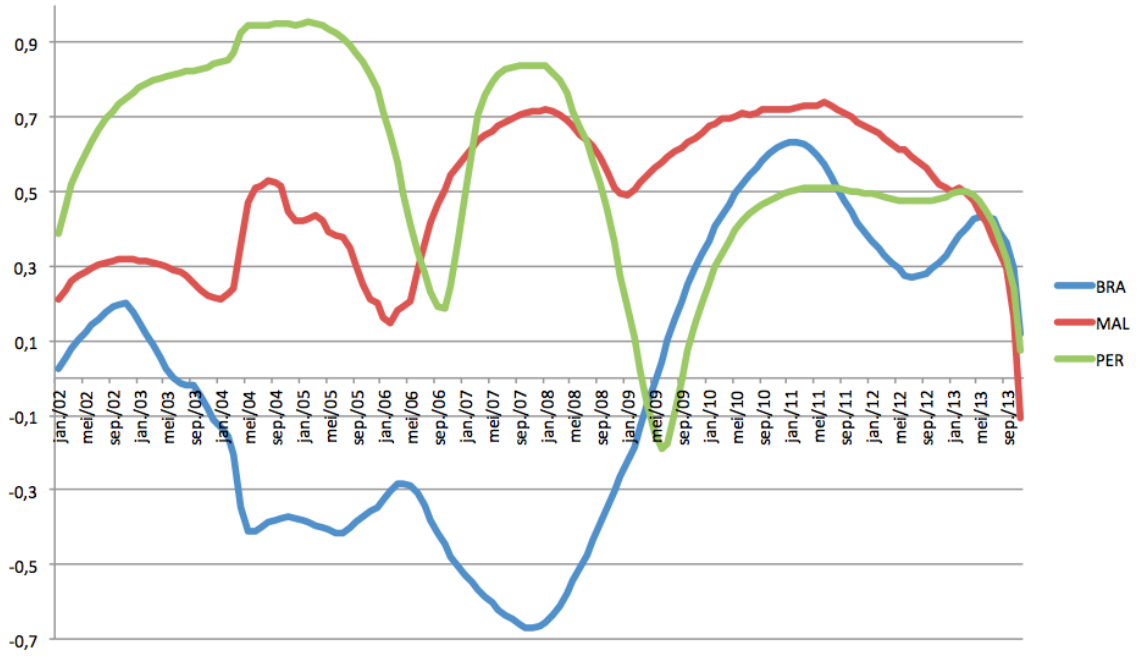
3.1.4.2 Emerging Market Economies



(1997 = 100 for Stock Price Index)

3.1.5 Time-varying Financial Integration

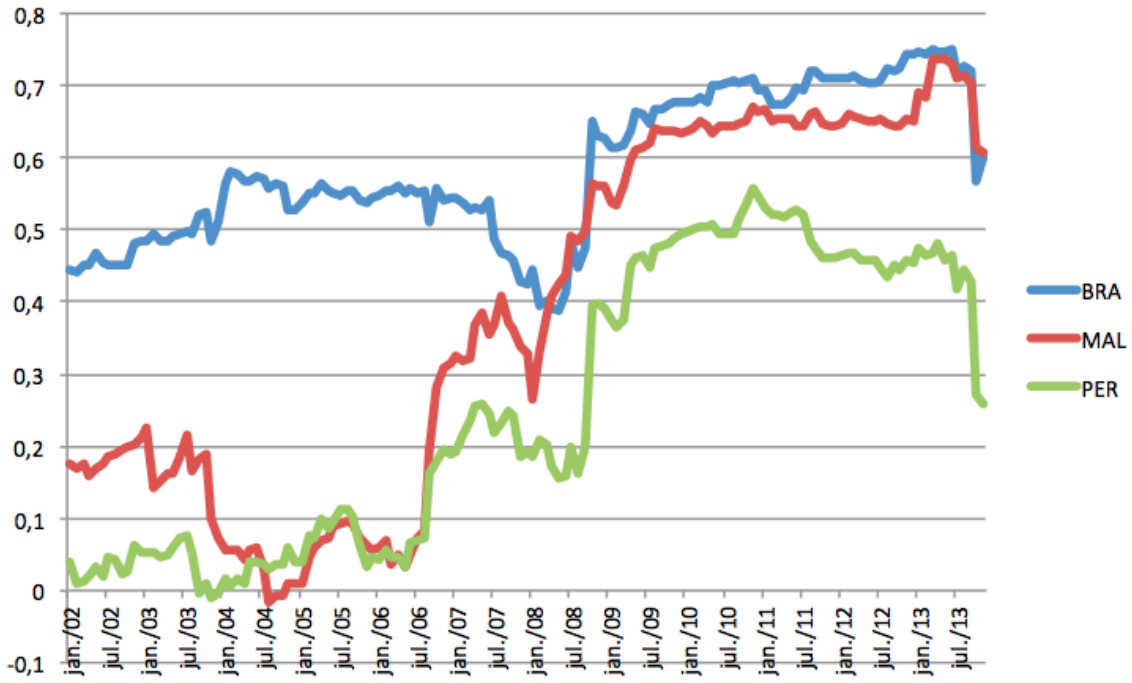
3.1.5.1 5-year Rolling Correlation With The U.S. Interest Rate



Correlation over full sample (1997-2013):

BRA	MAL	PER
0,52	0,51	0,74

3.1.5.2 5-year Rolling Correlation With The U.S. Stock Market



Correlation over full sample (1997-2013):

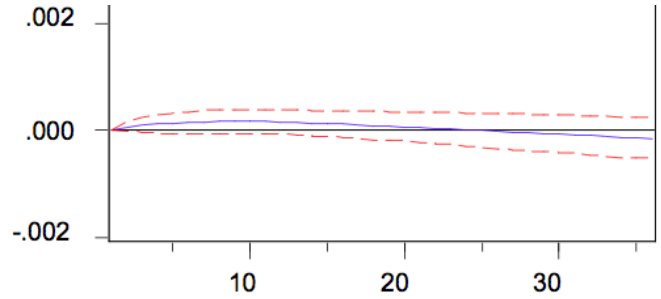
BRA	MAL	PER
0,52	0,30	0,24

3.2 Impulse Responses And Variance Decompositions Of Advanced Economies (Foreign Model)

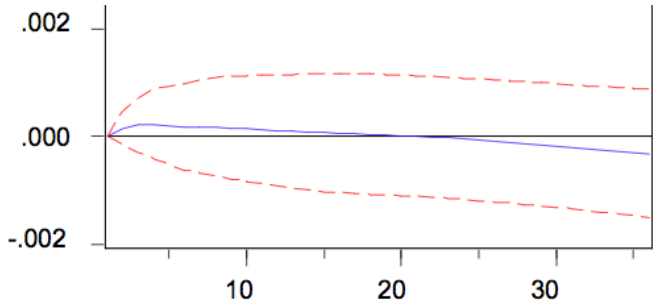
3.2.1 Price Puzzle

U.S.

Response of consumer prices (CPI) to Real Money (M1) Shock



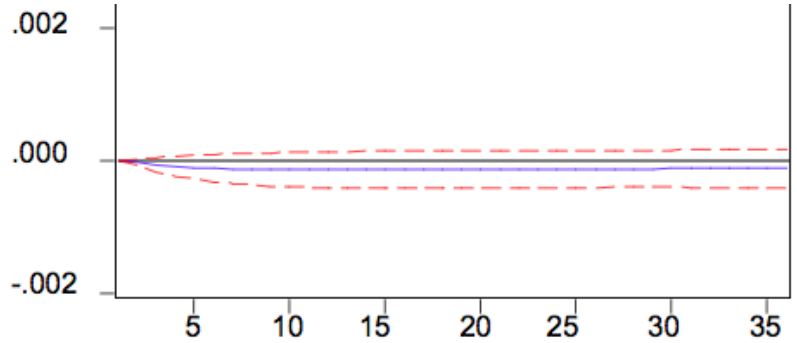
Response of consumer prices (CPI) to Policy rate (IR) shock

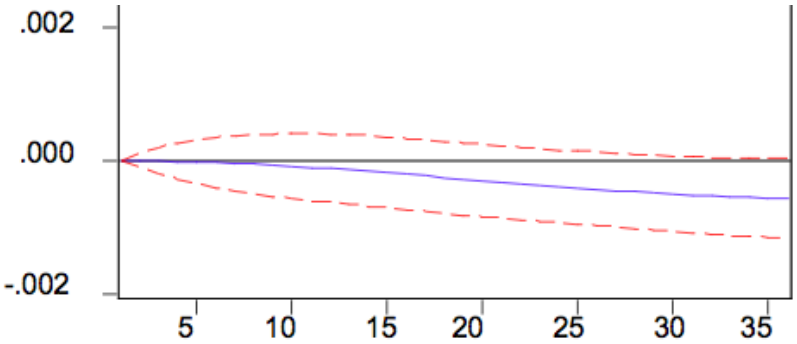


Robustness

Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES

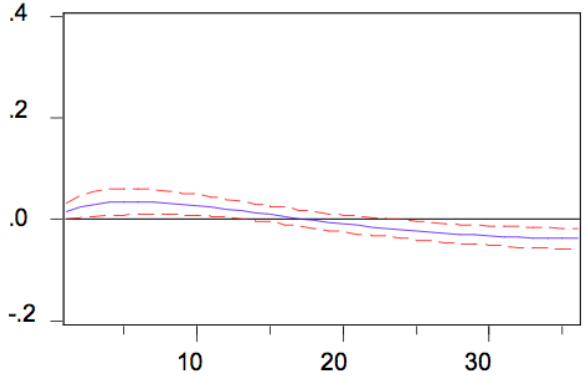
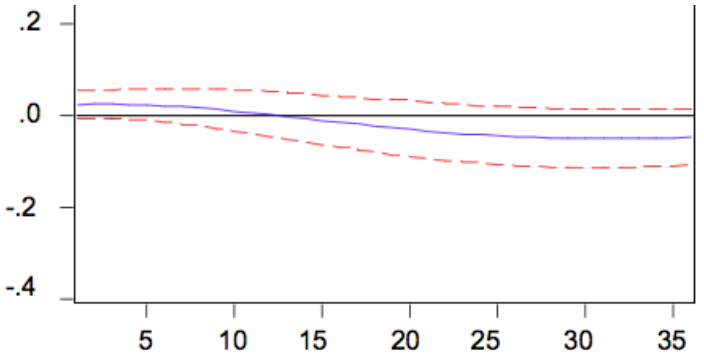
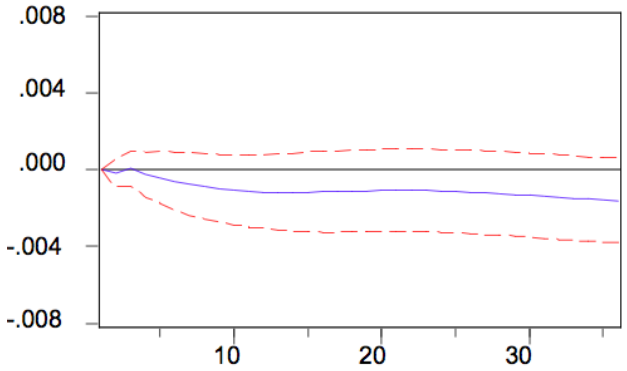
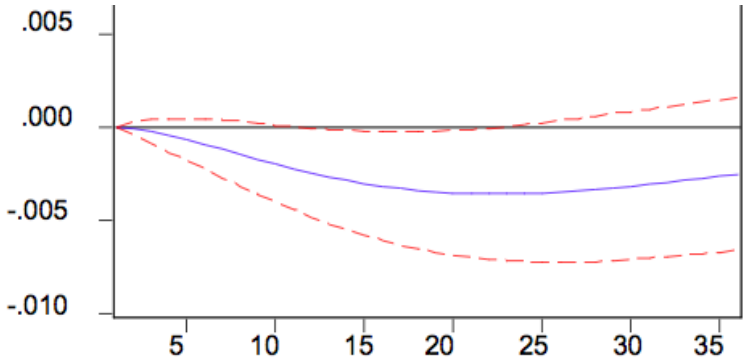
Canada



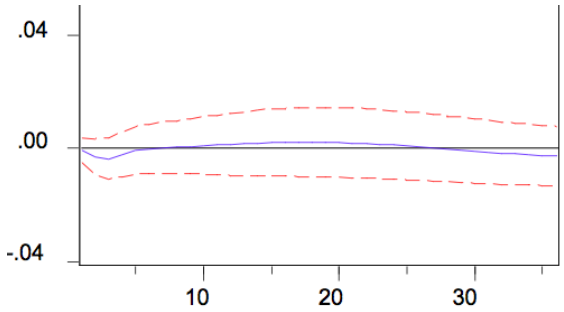
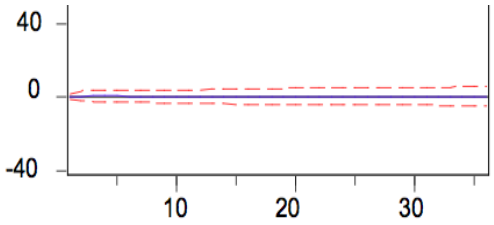
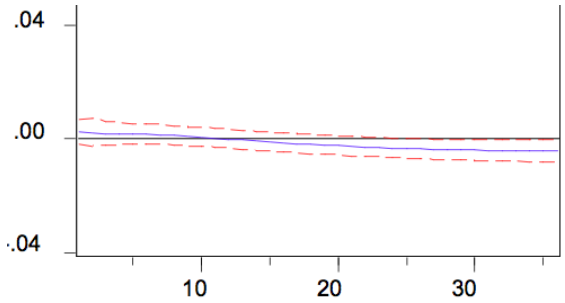
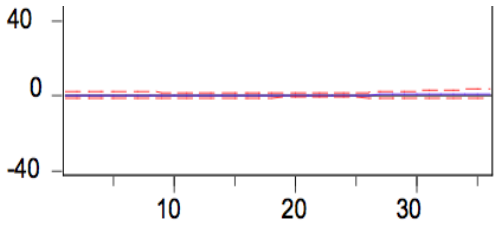
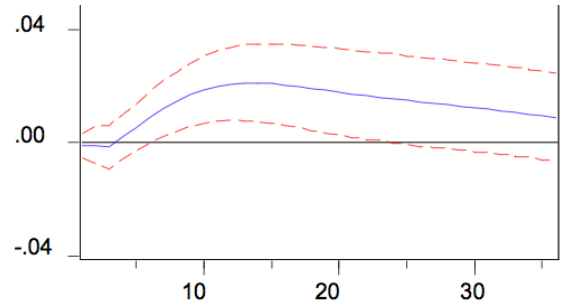
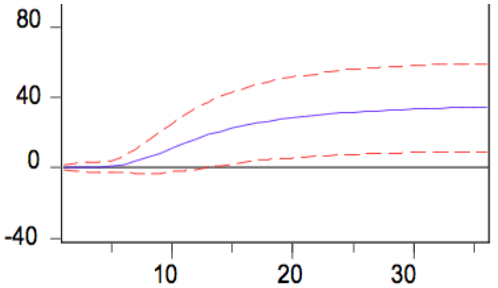


Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? NO
Robust to VECM? YES
Robust to other monetary aggregate? YES

3.2.2 *Liquidity Puzzle And Contractionary Monetary Policy Shock*

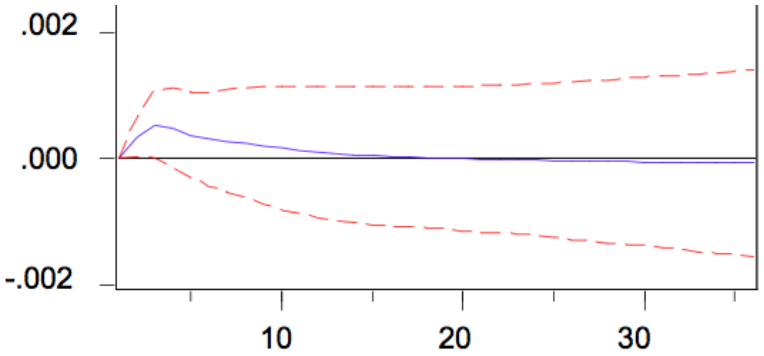
	U.S.	Canada
Response of the policy rate (IR) to Real Money (M1) Shock		
Response of real output (INDPR) to Policy rate (IR) shock		
Robustness	Robust to subsample? YES Robust to lag structure? NO Robust to ordering? NO Robust to VECM? YES Robust to other monetary aggregate? YES	Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES

3.2.3 Stock Price Channel For the U.S.

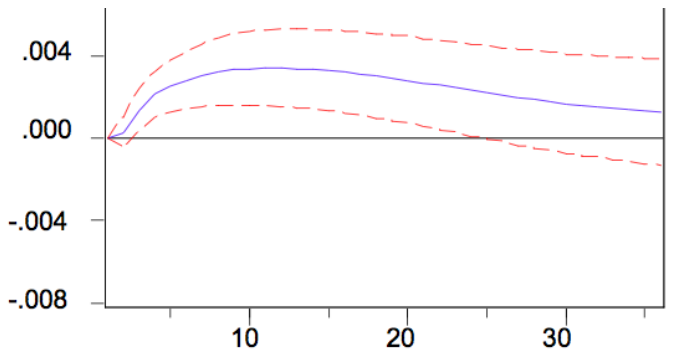
	Impulse Response	Variance Decomposition	Robustness
Response of Real Stock Prices (Stocks) to Policy Rate (IR) shock			Robust to subsample? NO Robust to lag structure? NO Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES
Response of Real Stock Prices (Stocks) to Real Money (M1) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES
Response of Real Stock Prices (Stocks) to Excess Liquidity (EL) shock			Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES

Impulse Response

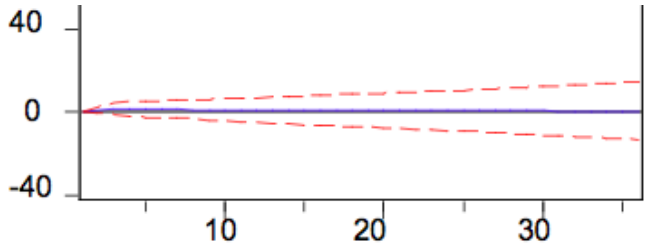
Response of Consumer Prices (CPI) to Real Stock Price (Stocks) shock

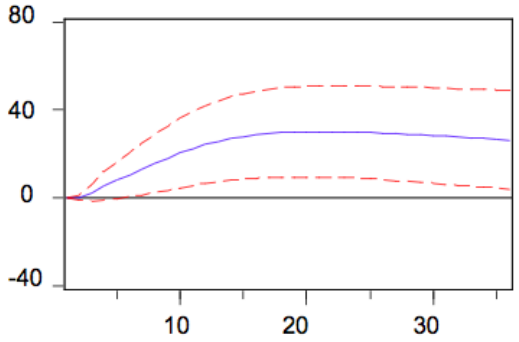


Response of Real Output (INDPR) to Real Stock Prices (Stocks) shock



Variance Decomposition



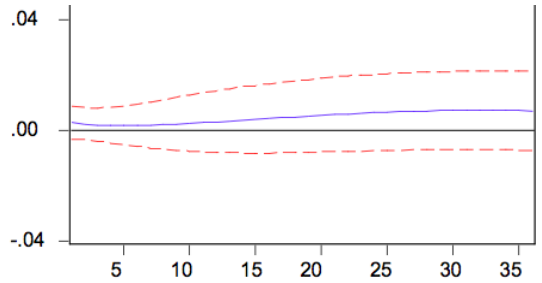
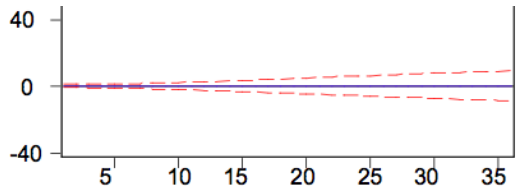
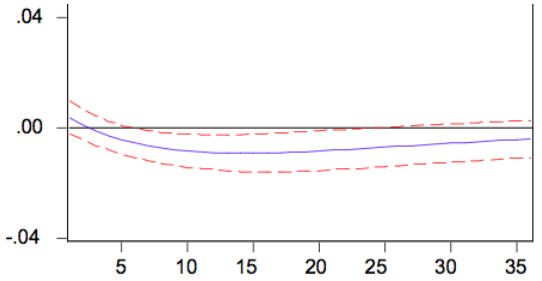
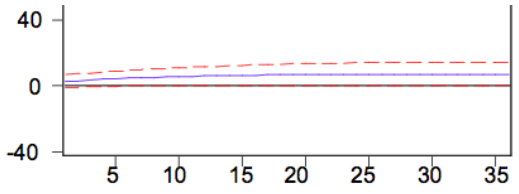
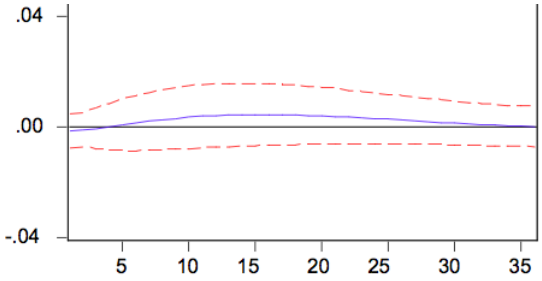
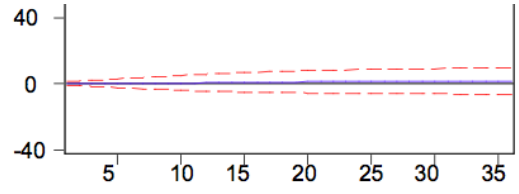


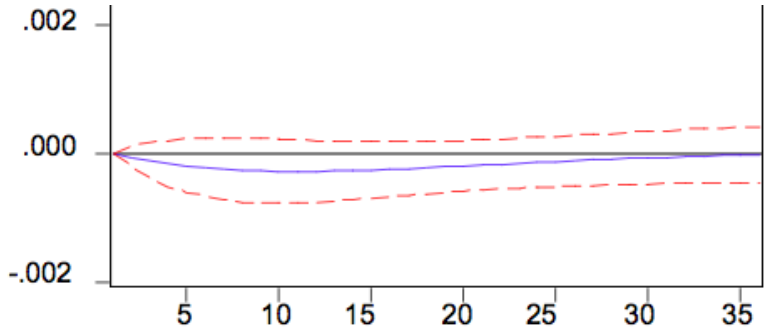
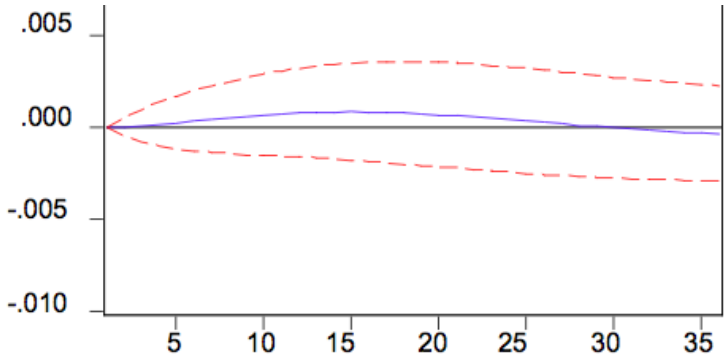
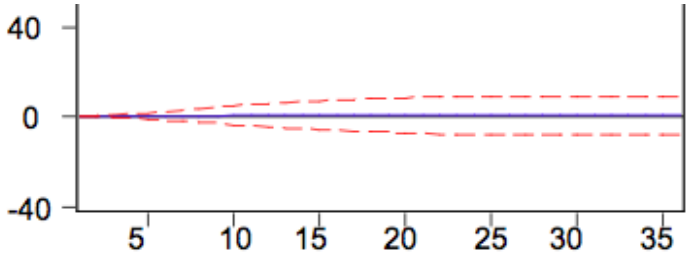
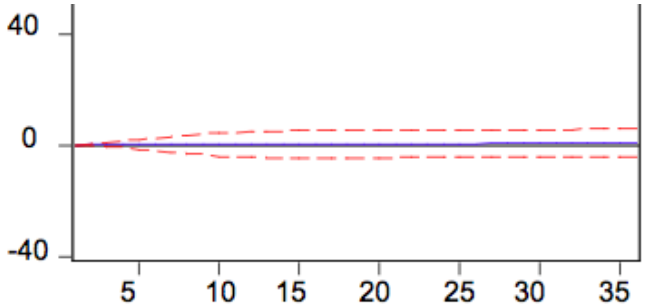
Robustness

Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES

Robust to subsample? NO
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES

3.2.4 Stock Price Channel For Canada

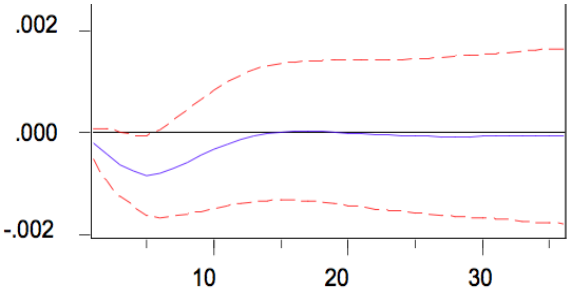
	Impulse Response	Variance Decomposition	Robustness
Response of Real Stock Prices (Stocks) to Policy Rate (IR) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES
Response of Real Stock Prices (Stocks) to Real Money (M1) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? NO Robust to VECM? NO Robust to other monetary aggregate? NO
Response of Real Stock Prices (Stocks) to Excess Liquidity (EL) shock			Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES

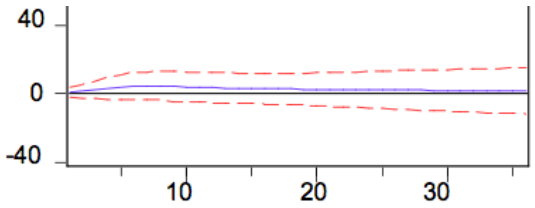
	Response of Consumer Prices (CPI) to Real Stock Price (Stocks) shock	**Response of Real Output (INDPR) to Real Stock Price (Stocks) shock**
Impulse Response		
Variance Decomposition		
Robustness	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES

3.2.5 Excess Liquidity Spillovers On Other Variables Than Stock Prices For The U.S.

Impulse Response | **Variance Decomposition** | **Robustness**

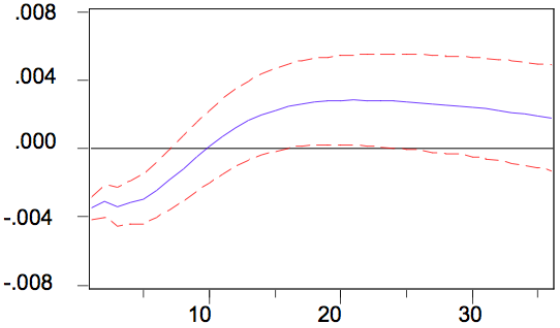
Response of Consumer Prices (CPI) to Excess Liquidity (EL) shock

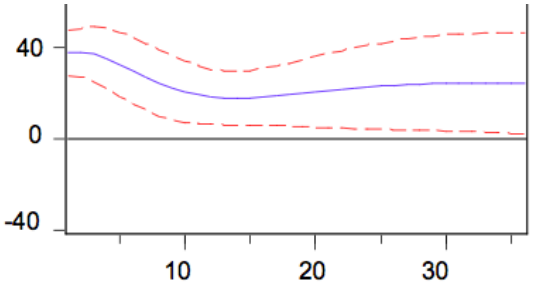




Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES

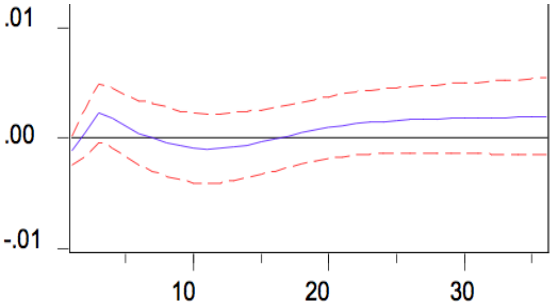
Response of Real Output (INDPR to Excess Liquidity (EL) shock

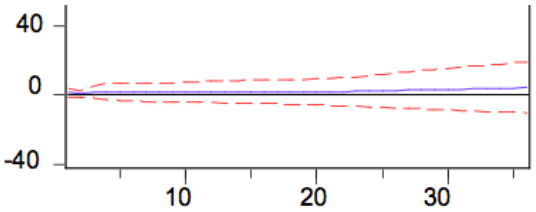




Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES

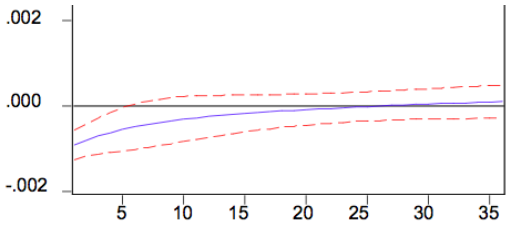
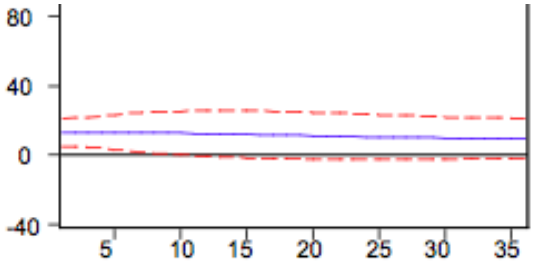
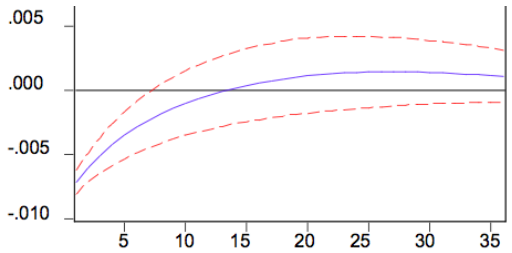
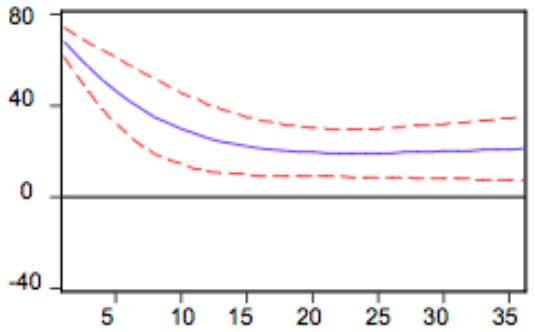
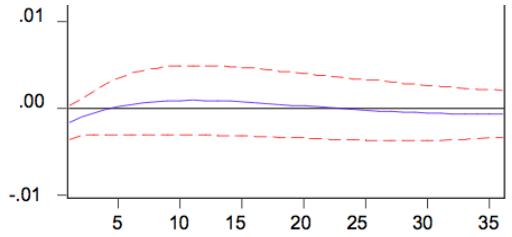
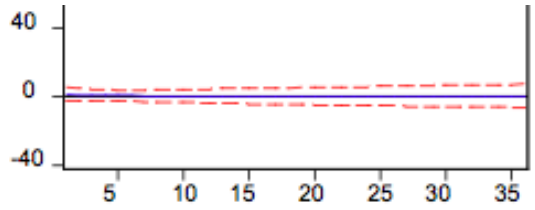
Response of Real Effective Exchange Rate (REER) to Excess Liquidity (EL) shock



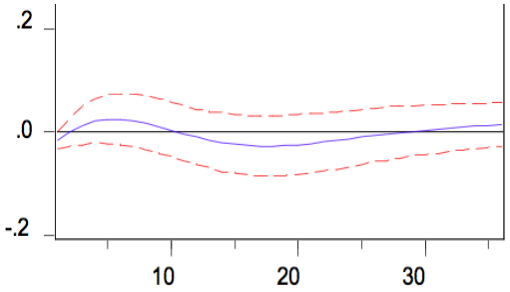
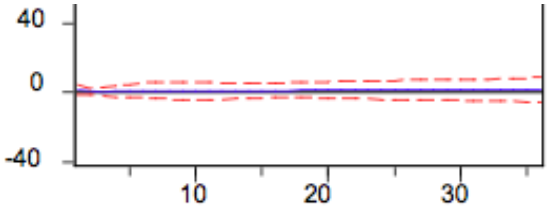
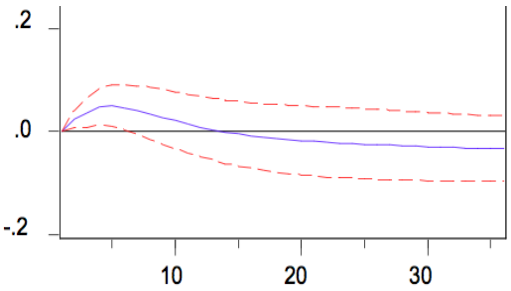
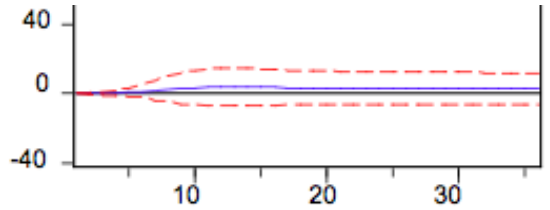
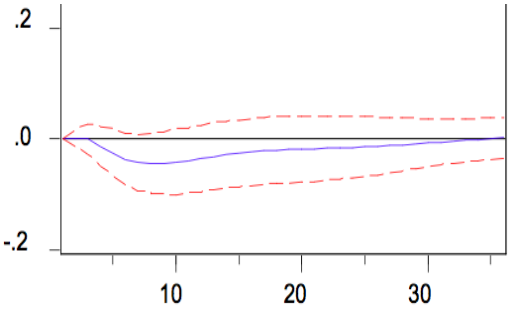
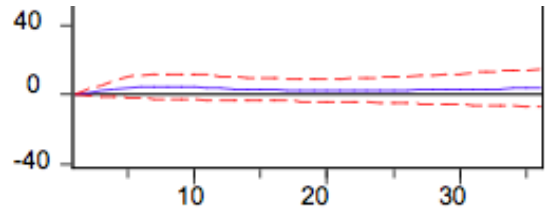


Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES

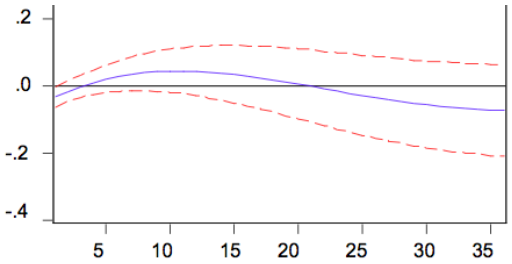
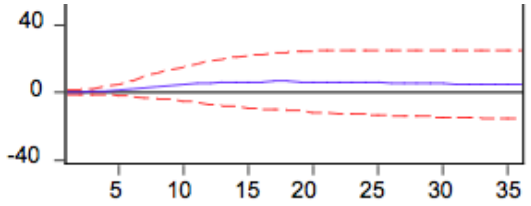
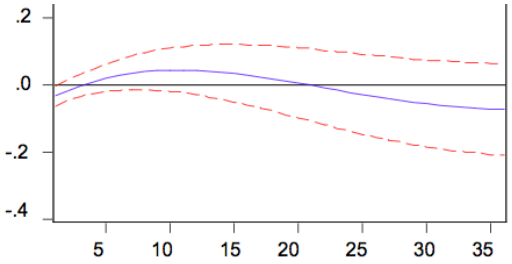
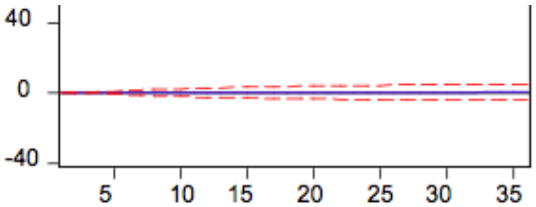
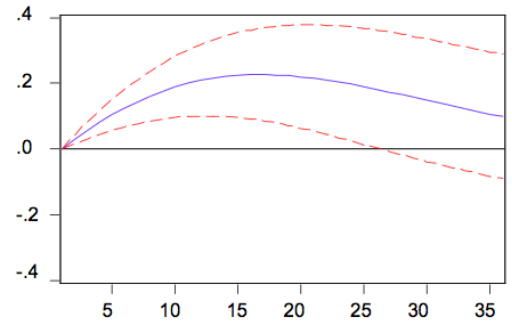
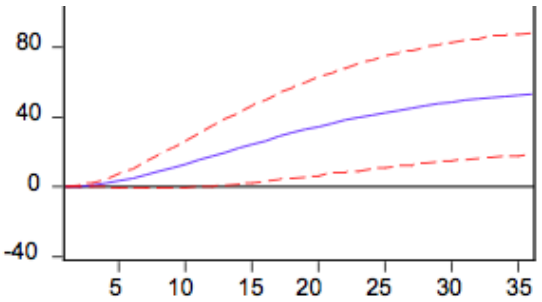
3.2.6 Excess Liquidity Spillovers On Other Variables Than Stock Prices For Canada

	Impulse Response	Variance Decomposition	Robustness
Response of Consumer Prices (CPI) to Excess Liquidity (EL) shock			Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES
Response of Real Output (INDPR) to Excess Liquidity (EL) shock			Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES
Response of Real Effective Exchange Rate (REER) to Excess Liquidity (EL) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES

3.2.7 Countercyclical Monetary Policy For The U.S.

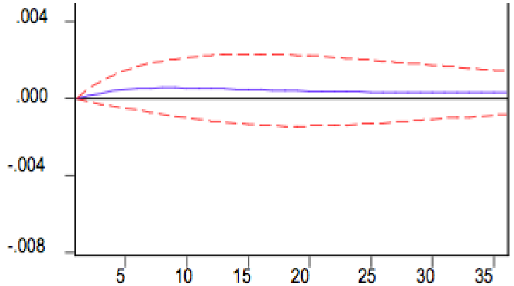
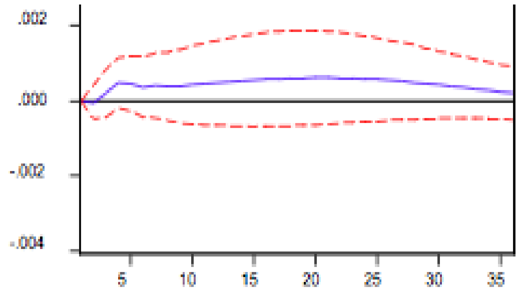
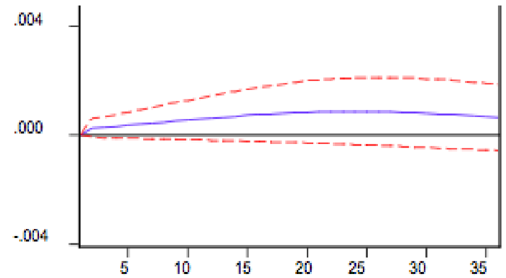
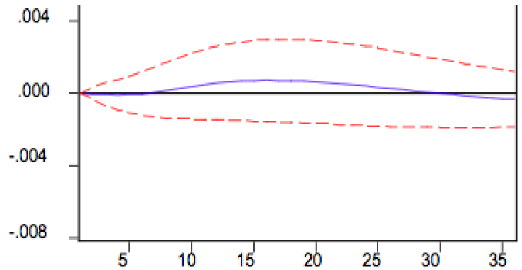
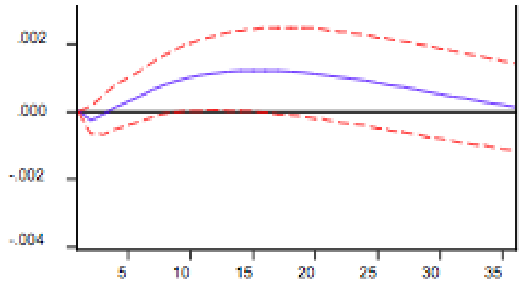
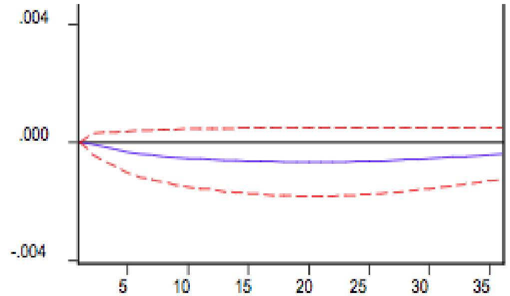
	Impulse Response	Variance Decomposition	Robustness
Response of the policy rate (IR) to Real Output (INDPR) shock			Robust to subsample? NO Robust to lag structure? NO Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES
Response of the policy rate (IR) to Real Stock Price (Stocks) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES
Response of the policy rate (IR) to Real Effective Exchange rate (REER) shock			Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES

3.2.8 Countercyclical Monetary Policy For Canada

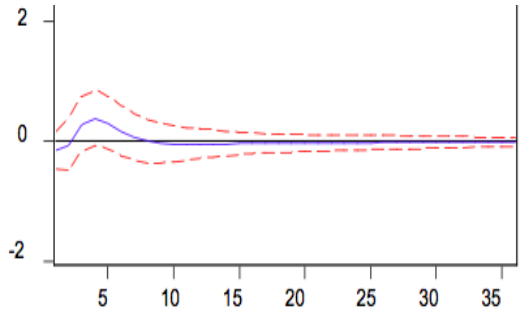
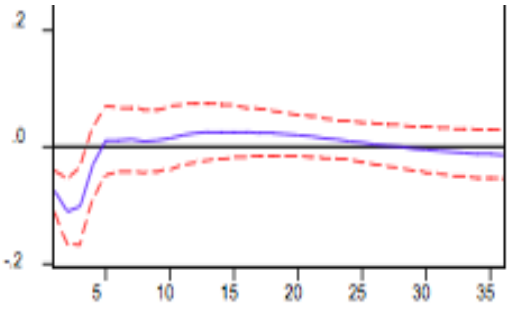
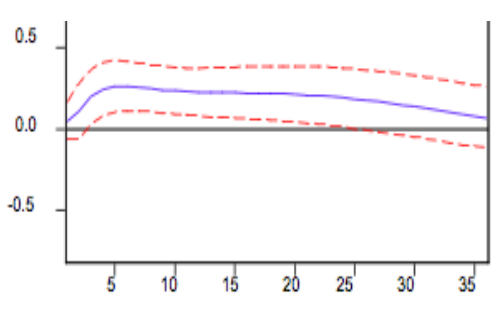
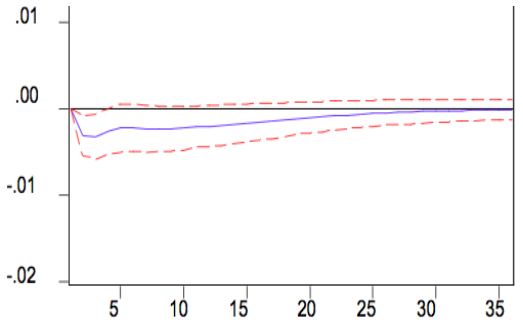
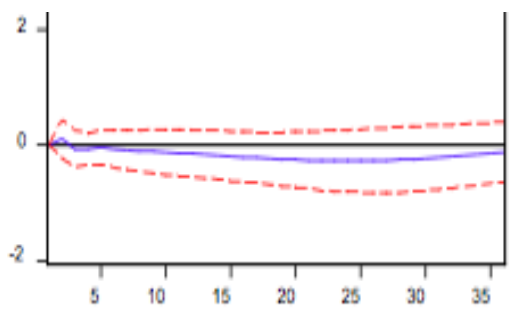
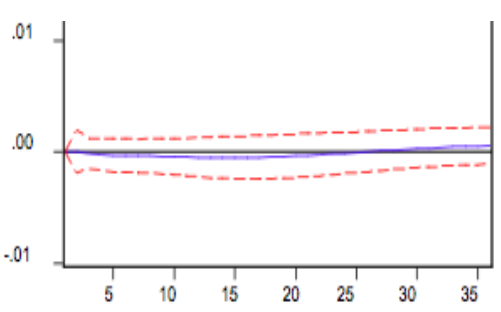
	Impulse Response	Variance Decomposition	Robustness
Response of the policy rate (IR) to Real Output (INDPR) shock			Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES
Response of the policy rate (IR) to Real Stock Price (Stocks) shock			Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES
Response of the policy rate (IR) to Real Effective Exchange rate (REER) shock			Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES

3.3 Impulse Responses and Variance Decompositions For EMEs (Foreign Model)

3.3.1 Price Puzzle

	Brazil	Malaysia	Peru
Response of consumer prices (CPI) to Real Money (M1) Shock			
Response of consumer prices (CPI) to Policy rate (IR) shock			
Robustness	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES Changing results due to financial openness? NO	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES Changing results due to financial openness? NO	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES Changing results due to financial openness? NO

3.3.2 Liquidity Puzzle and Contractionary Monetary Policy Shock

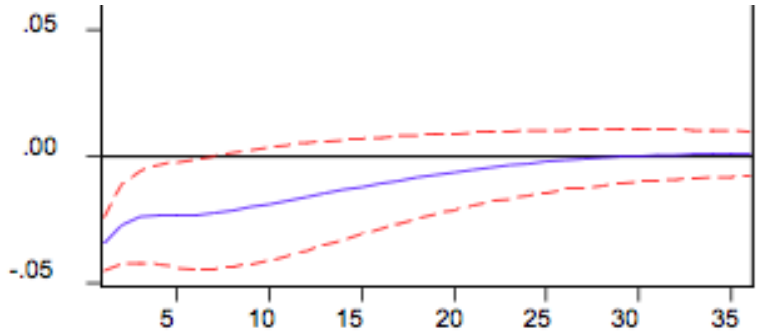
	Brazil	Malaysia	Peru
Response of the policy rate (IR) to Real Money (M1) Shock			
Response of real output (INDPR) to Policy rate (IR) shock			
Robustness	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES Changing results due to financial openness? YES	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES Changing results due to financial openness? NO	Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? NO Robust to FULL- VAR? NO Changing results due to financial openness? NO

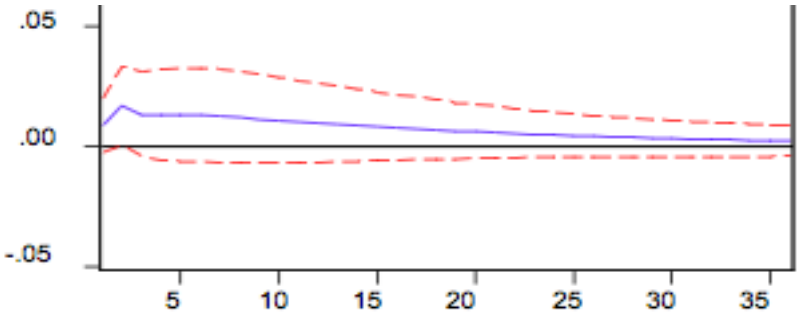
3.3.3 *Stock Price Channel for Brazil*

Response of Real Stock Prices (Stocks) to Policy Rate (IR) shock

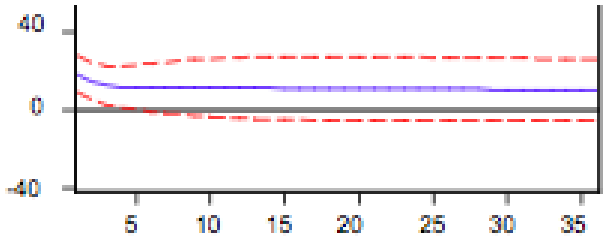
Response of Real Stock Prices (Stocks) to Real Money (M1) shock

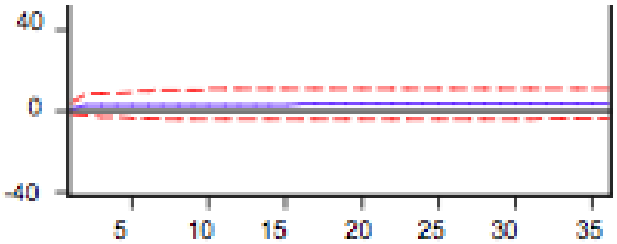
Impulse Response





Variance Decomposition





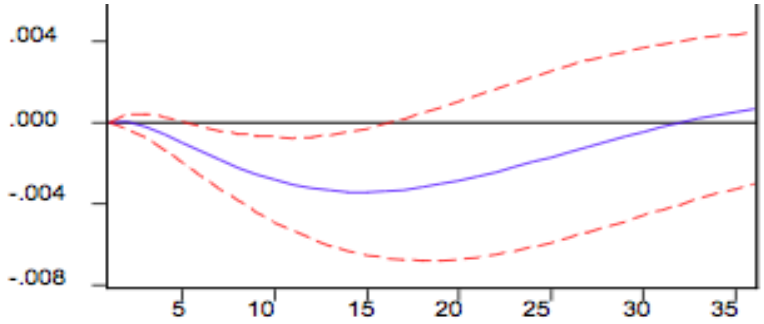
Robustness

Robust to subsample? NO
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES
Robust to FULL- VAR? YES
Changing results due to financial openness? NO

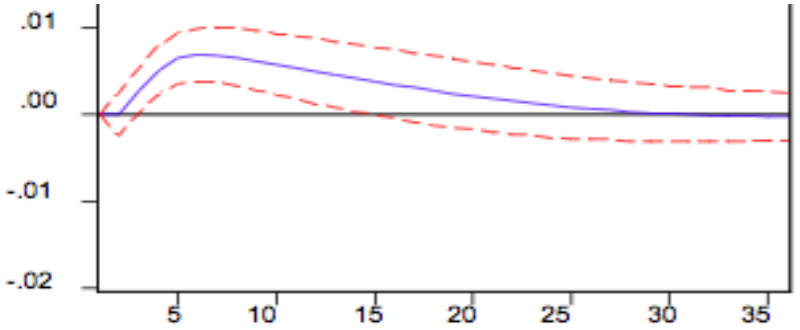
Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES
Robust to FULL- VAR? YES
Changing results due to financial openness? NO

Impulse Response

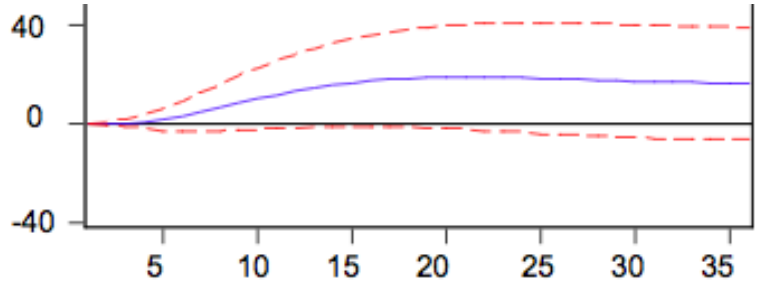
Response of Consumer Prices (CPI) to Real Stock Price (Stocks) shock

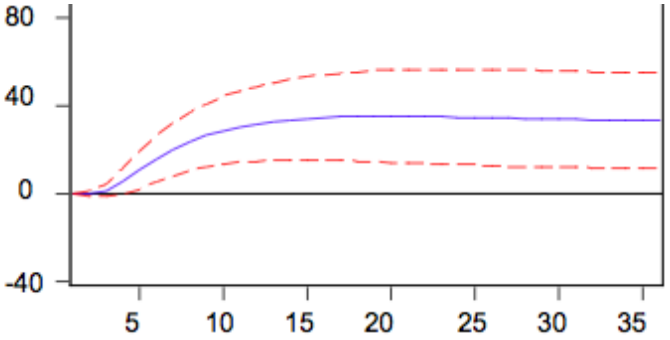


Response of Real Output (INDPR) to Real Stock Price (Stocks) shock



Variance Decomposition





Robustness

Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES
Robust to FULL- VAR? NO
Changing results due to financial openness? NO

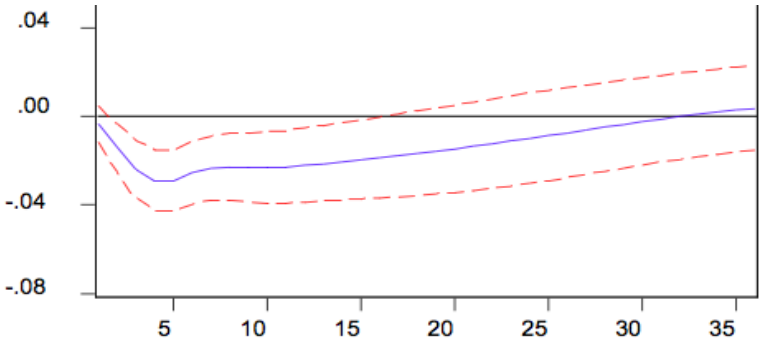
Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES
Robust to FULL- VAR? YES
Changing results due to financial openness? NO

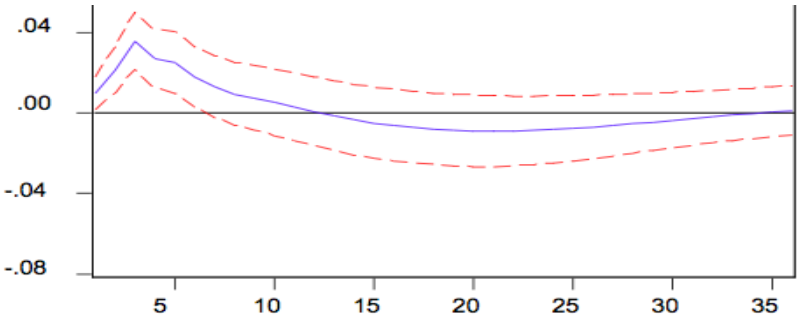
3.3.4 Stock Price Channel for Malaysia

Response of Real Stock Prices (Stocks) to Policy Rate (IR) shock

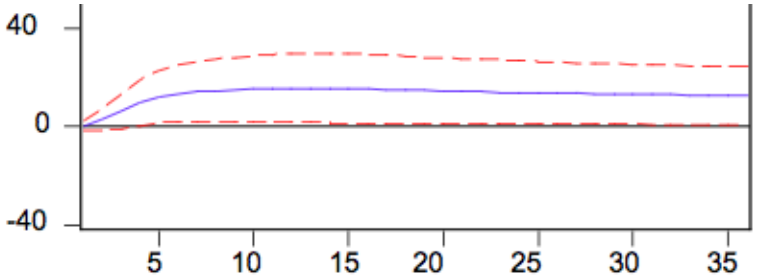
Response of Real Stock Prices (Stocks) to Real Money (M1) shock

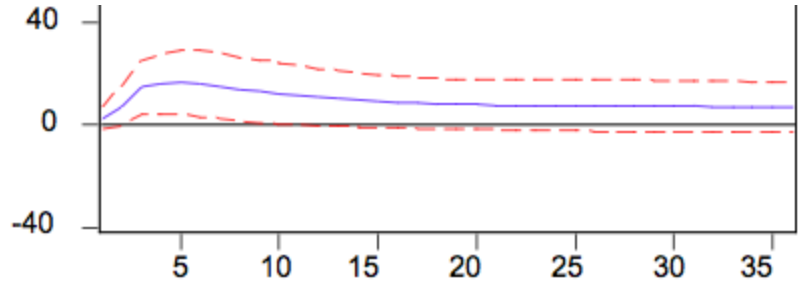
Impulse Response





Variance Decomposition





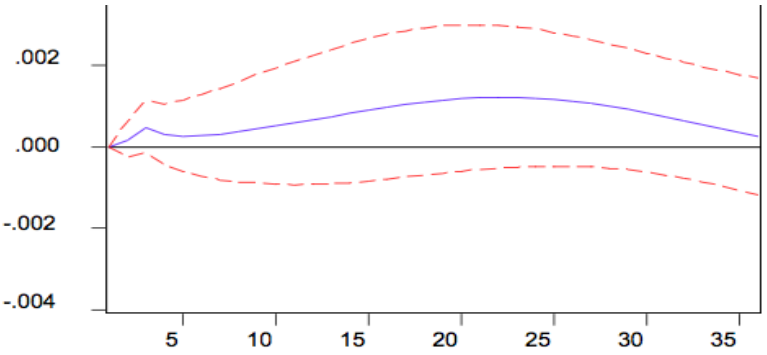
Robustness

Robust to subsample? NO
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES
Robust to FULL- VAR? YES
Changing results due to financial openness? YES

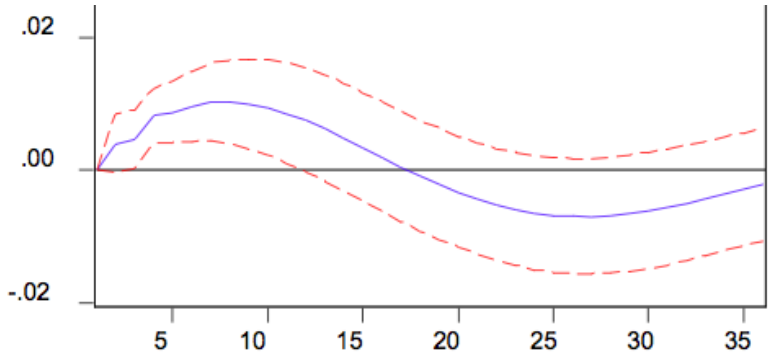
Robust to subsample? NO
Robust to lag structure? NO
Robust to ordering? YES
Robust to VECM? NO
Robust to other monetary aggregate? YES
Robust to FULL- VAR? YES
Changing results due to financial openness? NO

Impulse Response

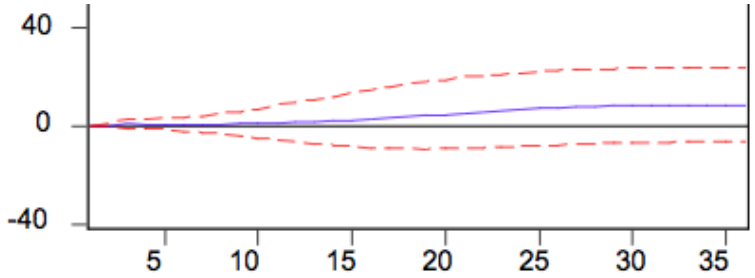
Response of Consumer Prices (CPI) Real Stock Price (Stocks) shock

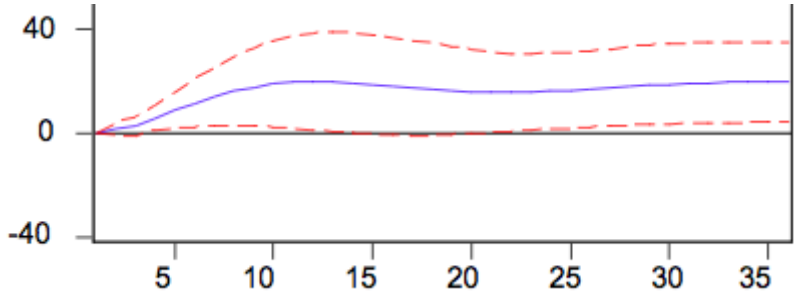


Response of Real Output (INDPR) to Real Stock Price (Stocks) shock



Variance Decomposition





Robustness

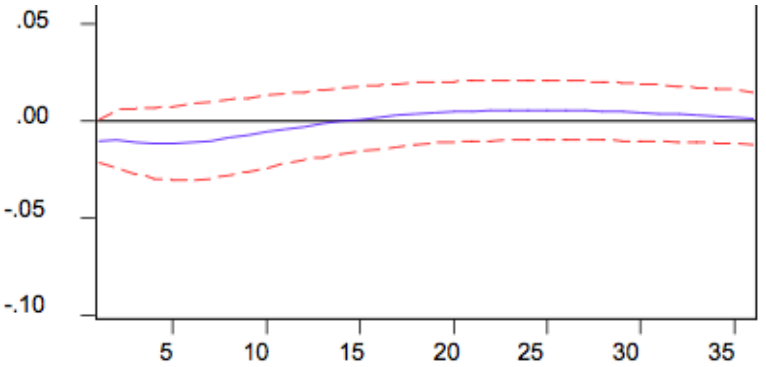
Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES
Robust to FULL- VAR? YES
Changing results due to financial openness? NO

Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES
Robust to FULL- VAR? NO
Changing results due to financial openness? NO

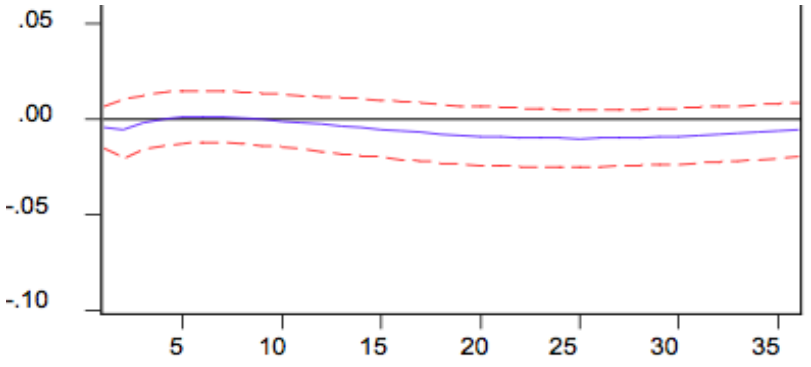
3.3.5 *Stock Price Channel for Peru*

Impulse Response

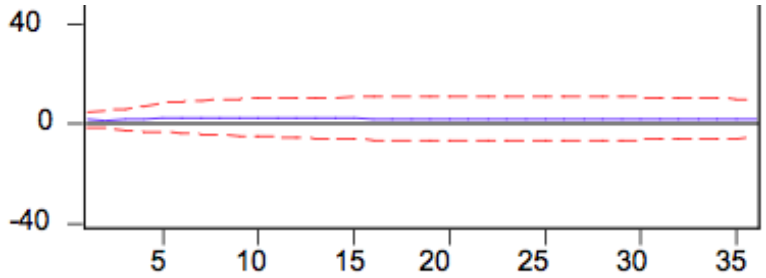
Response of Real Stock Prices (Stocks) to Policy Rate (IR) shock

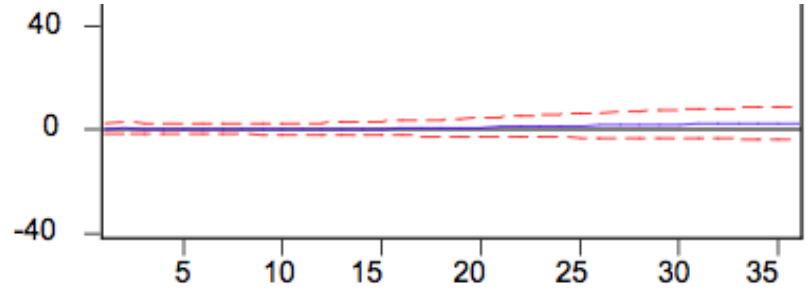


Response of Real Stock Prices (Stocks) to Real Money (M1) shock



Variance Decomposition





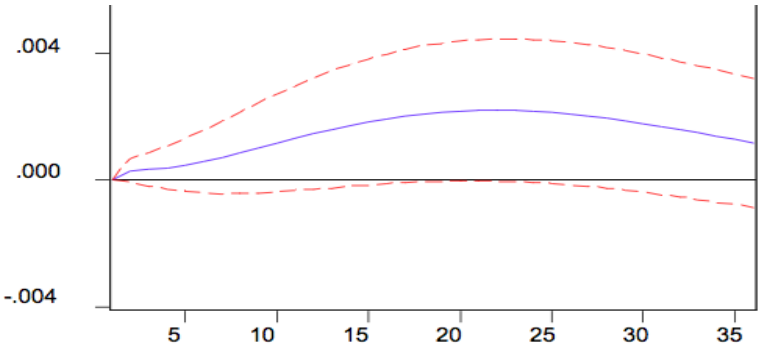
Robustness

Robust to subsample? NO
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES
Robust to FULL- VAR? YES
Changing results due to financial openness? NO

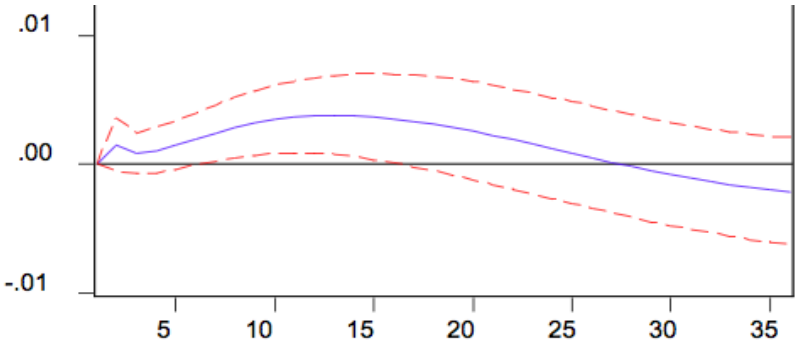
Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? YES
Robust to other monetary aggregate? YES
Robust to FULL- VAR? YES
Changing results due to financial openness? NO

Impulse Response

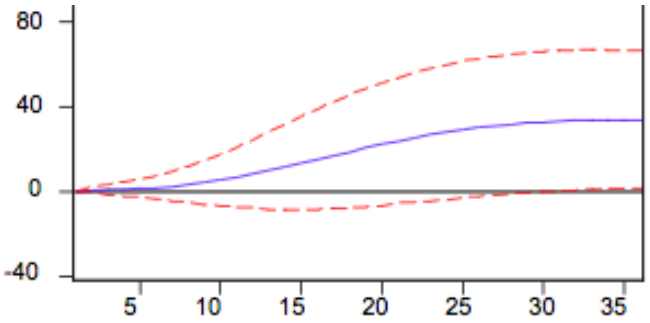
Response of Consumer Prices (CPI) Real Stock Price (Stocks) shock

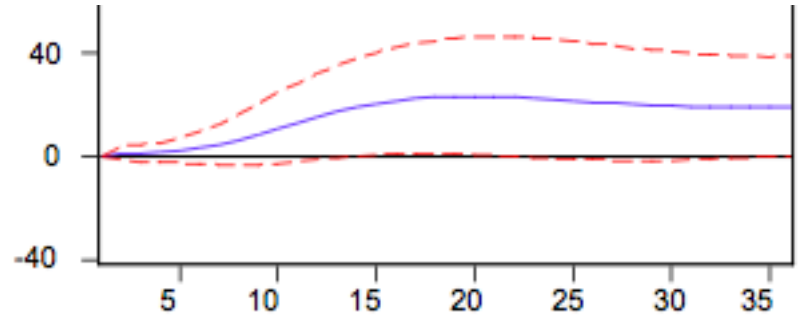


Response of Real Output (INDPR) to Real Stock Price (Stocks) shock



Variance Decomposition



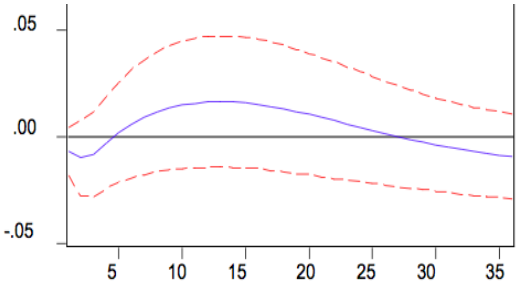
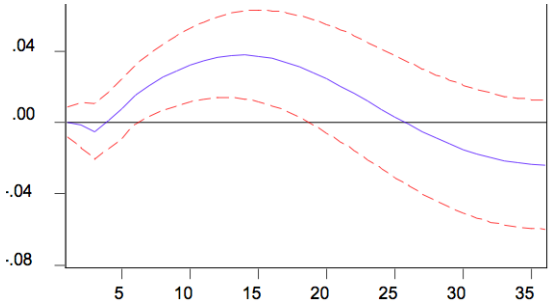
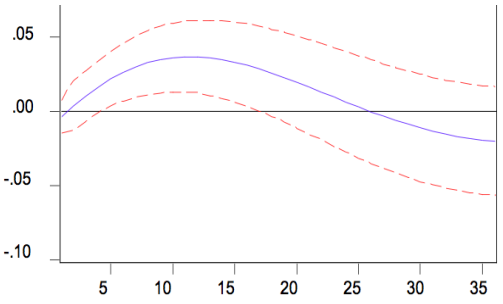
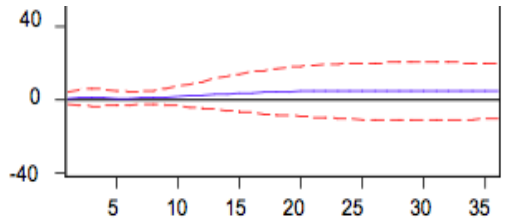
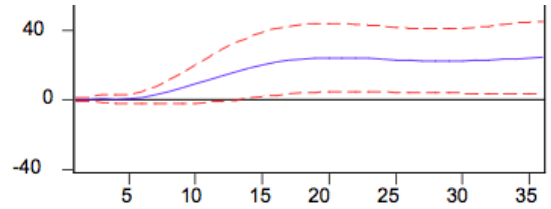
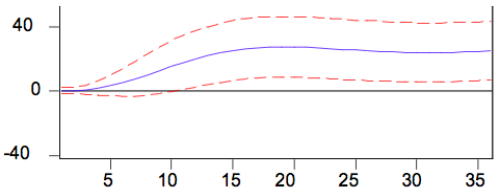


Robustness

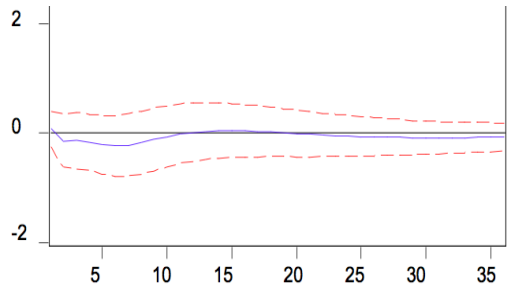
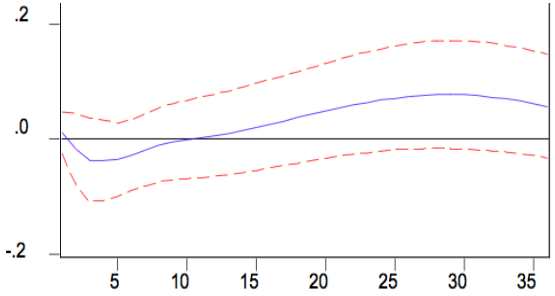
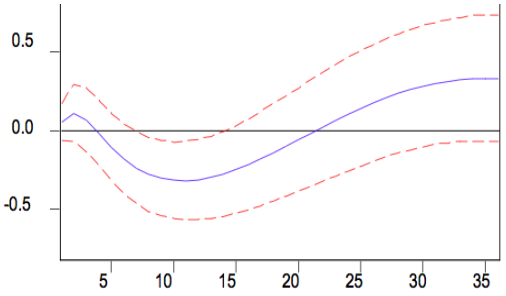
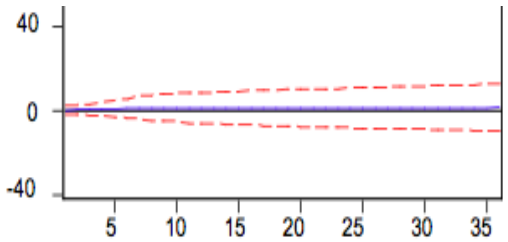
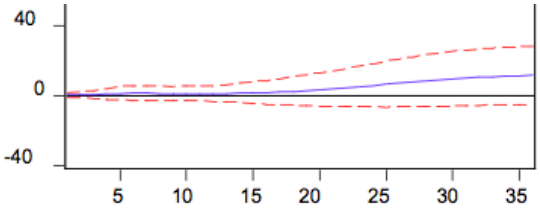
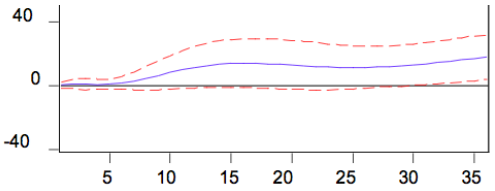
Robust to subsample? YES
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? NO
Robust to other monetary aggregate? YES
Robust to FULL- VAR? YES
Changing results due to financial openness? YES

Robust to subsample? NO
Robust to lag structure? YES
Robust to ordering? YES
Robust to VECM? NO
Robust to other monetary aggregate? NO
Robust to FULL- VAR? YES
Changing results due to financial openness? NO

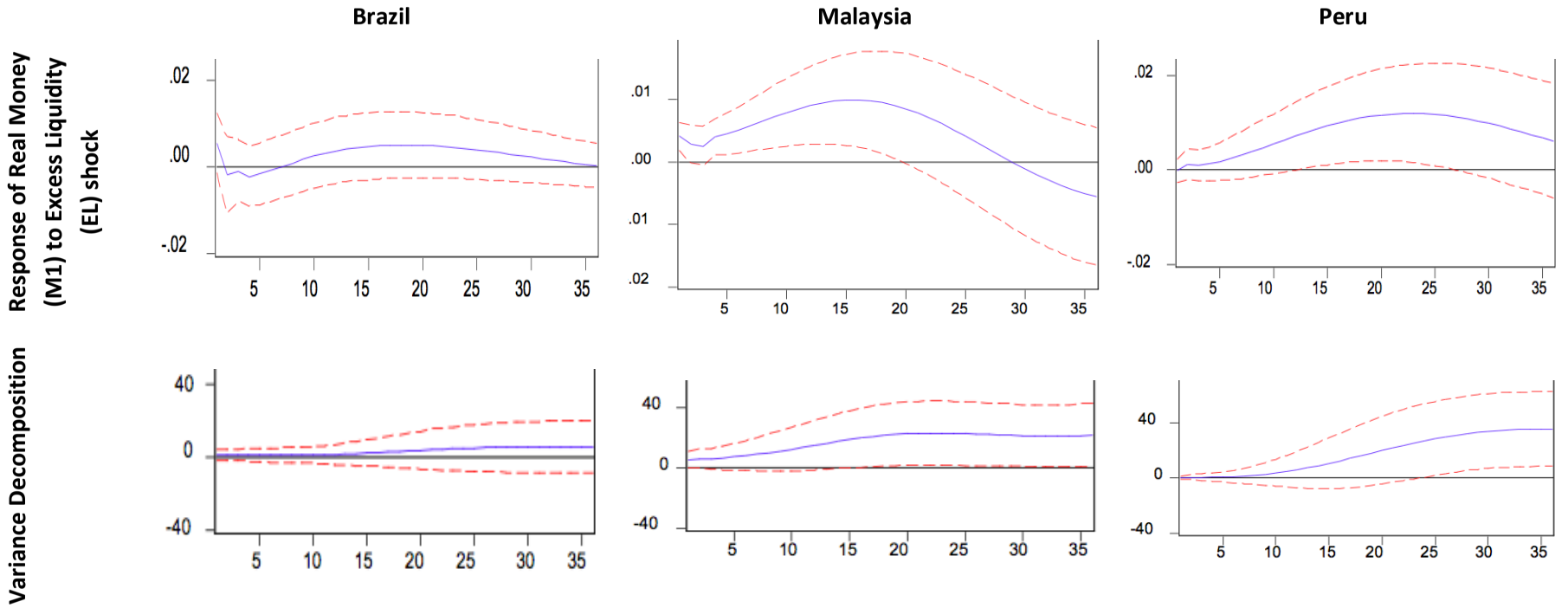
3.3.6 International Transmission via The Stock Price Channel

	Brazil	Malaysia	Peru
Response of Real Stock Prices (Stocks) to Excess Liquidity (EL) shock			
Variance Decomposition			
Robustness	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? NO Robust to FULL- VAR? YES	Robust to subsample? NO Robust to lag structure? NO Robust to ordering? YES Robust to VECM? NO Robust to other monetary aggregate? NO Robust to FULL- VAR? NO	Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? NO Robust to other monetary aggregate? YES Robust to FULL- VAR? YES

3.3.7 International Transmission via The Interest Rate

	Brazil	Malaysia	Peru
Response of the Policy Rate (IR) to Excess Liquidity (EL) shock			
Variance Decomposition			
Robustness	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES	Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? NO

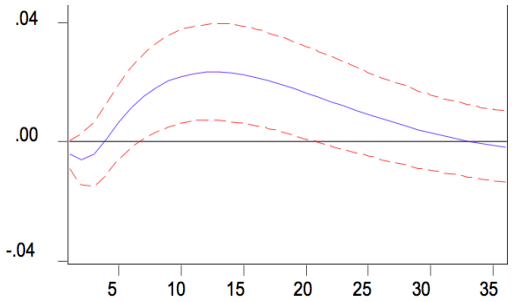
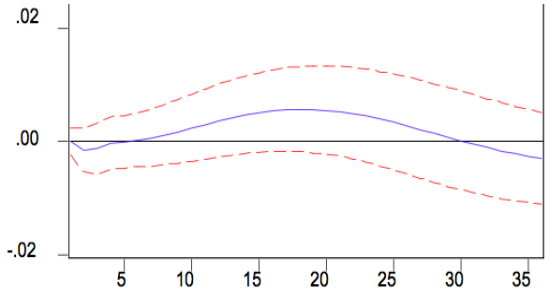
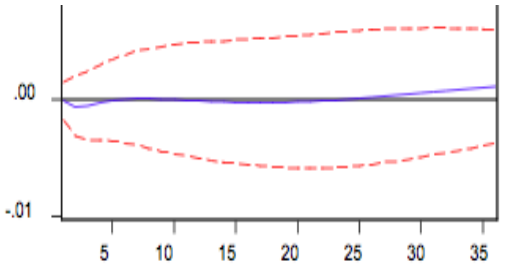
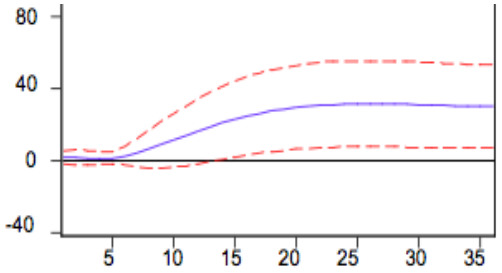
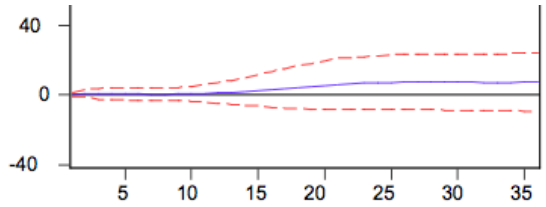
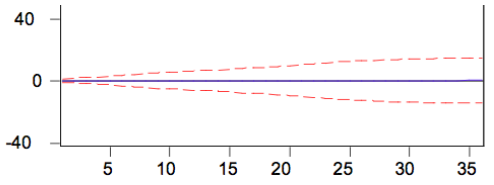
3.3.8 International Transmission via Real Money



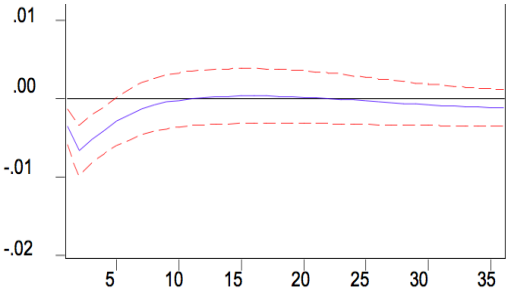
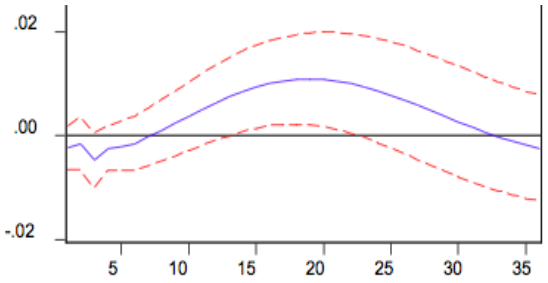
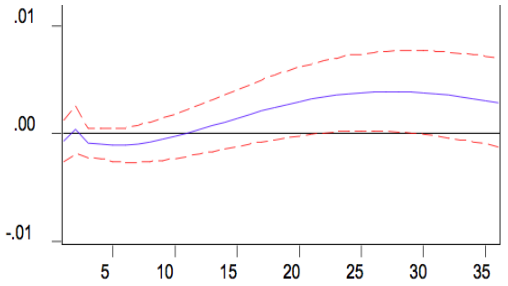
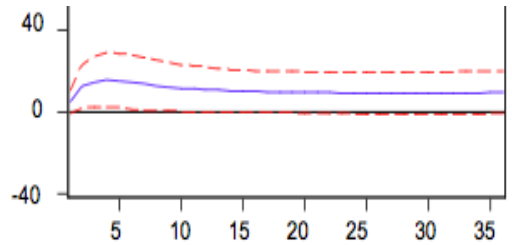
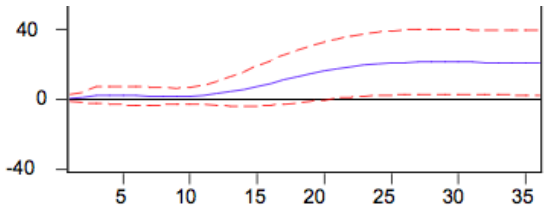
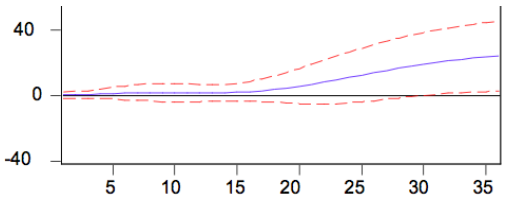
Robustness

Brazil	Malaysia	Peru
Robust to subsample? YES	Robust to subsample? NO	Robust to subsample? NO
Robust to lag structure? YES	Robust to lag structure? YES	Robust to lag structure? YES
Robust to ordering? YES	Robust to ordering? YES	Robust to ordering? YES
Robust to VECM? YES	Robust to VECM? NO	Robust to VECM? NO
Robust to other monetary aggregate? YES	Robust to other monetary aggregate? NO	Robust to other monetary aggregate? NO
Robust to FULL- VAR? YES	Robust to FULL- VAR? NO	Robust to FULL- VAR? NO

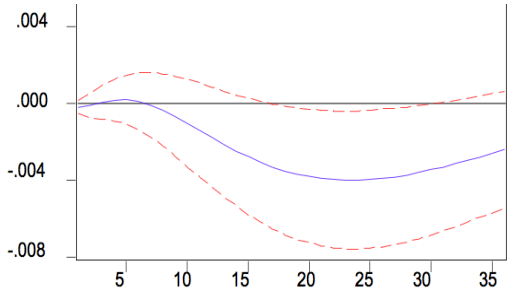
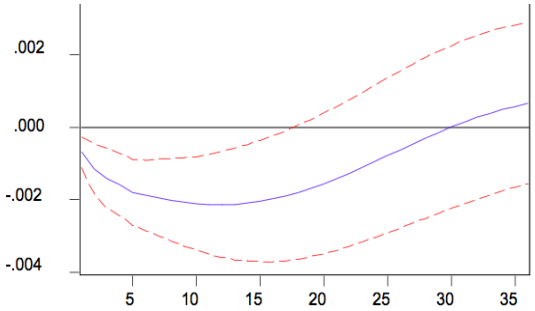
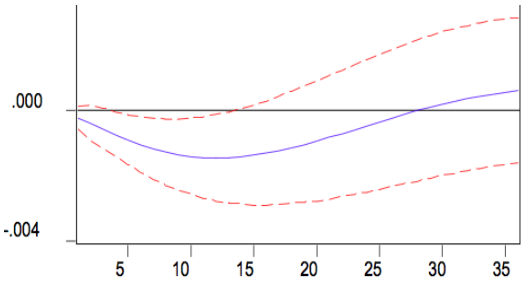
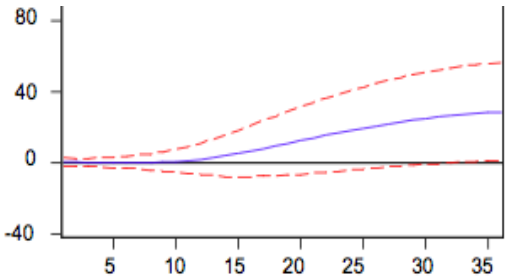
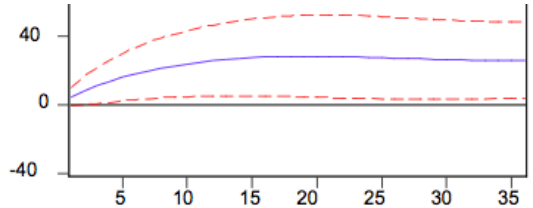
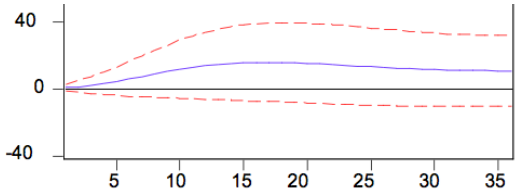
3.3.9 *International Transmission Via The Real Effective Exchange Rate*

	Brazil	Malaysia	Peru
Response of the Real Effective Exchange Rate (REER) to Excess Liquidity (EL) shock			
Variance Decomposition			
Robustness	Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? NO Robust to other monetary aggregate? NO Robust to FULL- VAR? NO	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES

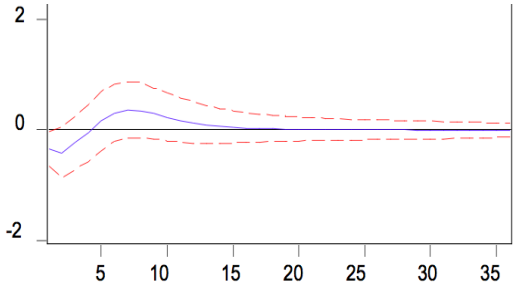
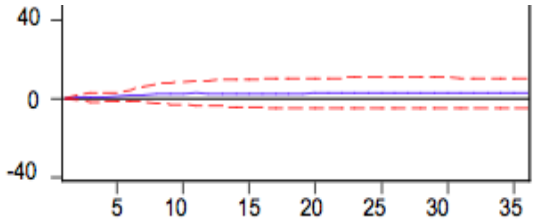
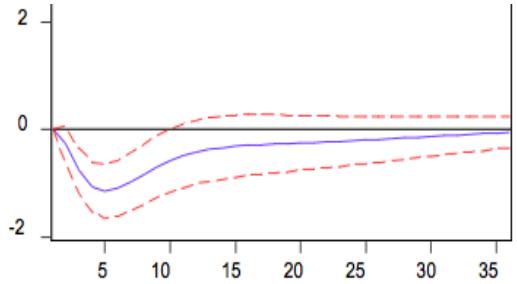
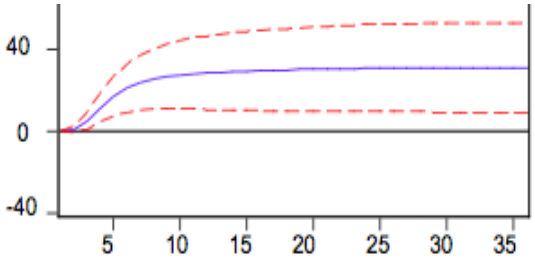
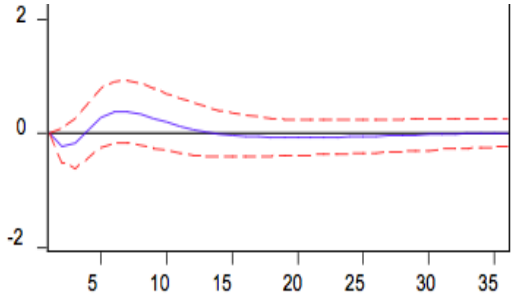
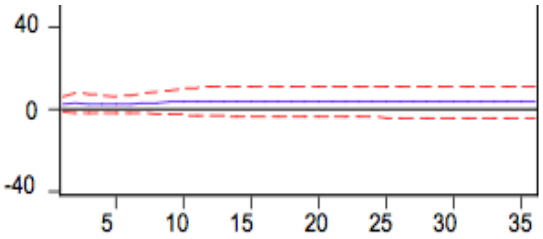
3.3.10 International Transmission Via Output

	Brazil	Malaysia	Peru
Response of Output (INDPR) to Excess Liquidity (EL) shock			
Variance Decomposition			
Robustness	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES	Robust to subsample? NO Robust to lag structure? NO Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? NO	Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES

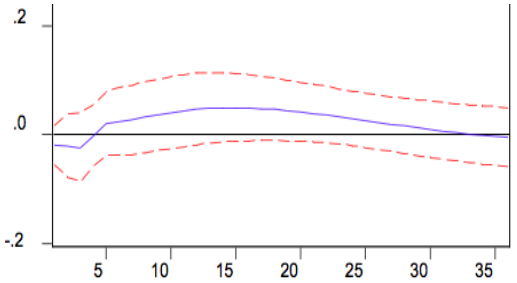
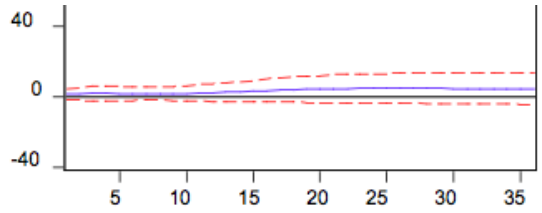
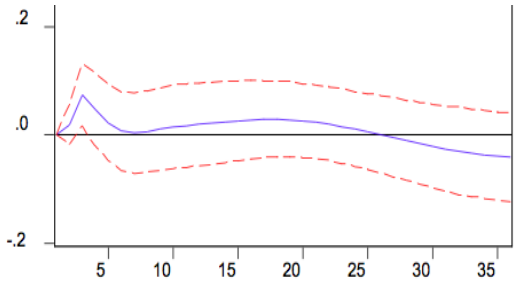
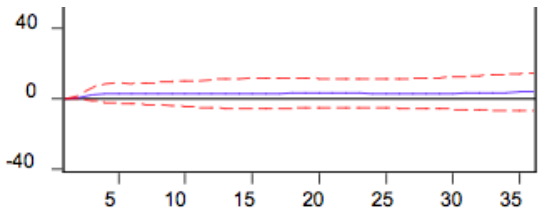
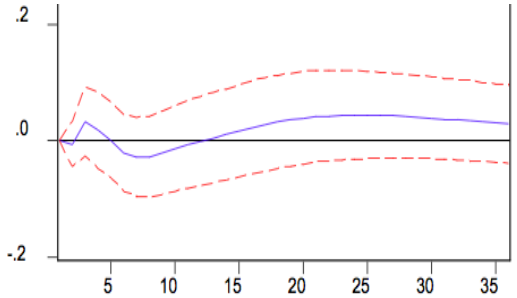
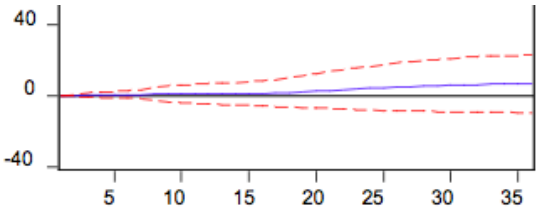
3.3.11 *International Transmission via Domestic Consumer Prices*

	Brazil	Malaysia	Peru
Response of Consumer Prices (CPI) to Excess Liquidity (EL) shock			
Variance Decomposition			
Robustness	Robust to subsample? NO Robust to lag structure? NO Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? NO	Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? NO	Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? NO

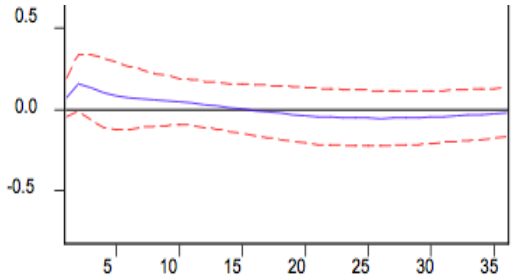
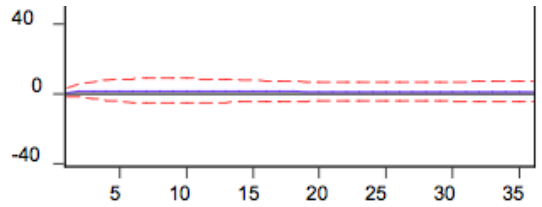
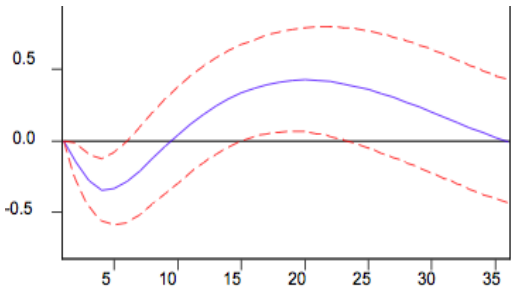
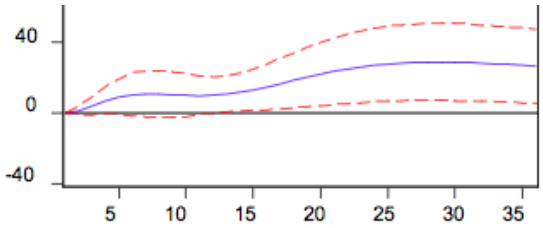
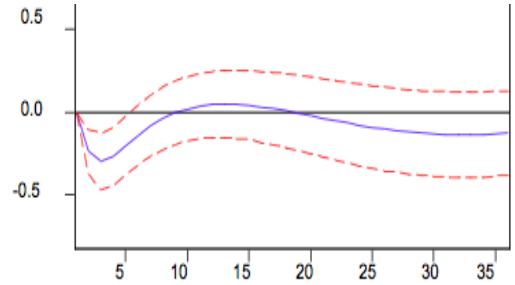
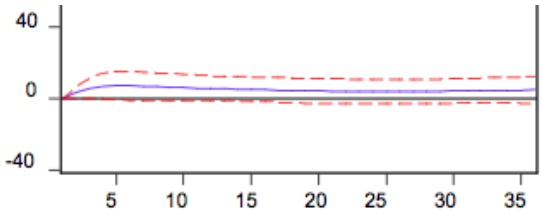
3.3.12 Countercyclical Monetary Policy for Brazil

	Impulse Response	Variance Decomposition	Robustness
Response of the policy rate (IR) to Real Output (INDPR) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES Changing results due to financial openness? NO
Response of the policy rate (IR) to Real Stock Prices (Stocks) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES Changing results due to financial openness? NO
Response of the policy rate (IR) to Real Effective Exchange rate (REER) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES Changing results due to financial openness? /

3.3.13 Countercyclical Monetary Policy For Malaysia

	Impulse Response	Variance Decomposition	Robustness
Response of the policy rate (IR) to Real Output (INDPR) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES Changing results due to financial openness? NO
Response of the policy rate (IR) to Real Stock Prices (Stocks) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES Changing results due to financial openness? NO
Response of the policy rate (IR) to Real Effective Exchange rate (REER) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES Changing results due to financial openness? /

3.3.14 Countercyclical Monetary Policy for Peru

	Impulse Response	Variance Decomposition	Robustness
Response of the policy rate (IR) to Real Output (INDPR) shock			Robust to subsample? YES Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? NO Robust to FULL- VAR? YES Changing results due to financial openness? NO
Response of the policy rate (IR) to Real Stock Prices (Stocks) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? NO Changing results due to financial openness? NO
Response of the policy rate (IR) to Real Effective Exchange rate (REER) shock			Robust to subsample? NO Robust to lag structure? YES Robust to ordering? YES Robust to VECM? YES Robust to other monetary aggregate? YES Robust to FULL- VAR? YES Changing results due to financial openness? /

3.4 Explanation of Changing Results

3.4.1 Brazil

Response of the policy rate (IR) to Real Money (M1) Shock:

- Effect gets insignificant.

Response of Real Stock Prices (Stocks) to Policy Rate (IR) shock:

- Policy rate shock has no direct effect for the period 2000-2013. It reaches its highest significant effect of ±2% after 5 months.

Response of Consumer Prices (CPI) Real Stock Price (Stocks) shock:

- Effect disappears when estimating a FULL-VAR.

Response of Real Stock Prices (Stocks) to Excess Liquidity (EL) shock:

- The effect is significant at month 5 and reaches 2,5%.

Response of the Real Effective Exchange Rate (REER) to Excess Liquidity (EL) shock:

- The effect disappears when estimating a FULL-VAR, VECM or when using M2. Furthermore, it gets insignificant for subperiod 1996-2008.

Response of Consumer Prices (CPI) to Excess Liquidity (EL) shock:

- The effect disappears when estimating a FULL-VAR or when using M2. Furthermore, it gets insignificant when using 3 lags. Furthermore, it is insignificant for both subperiods.

Response of the policy rate (IR) to Real Output (INDPR) shock:

- The effect is directly significant until month 10 and reaches a maximum of 0,5 at month 6.

Response of the policy rate (IR) to Real Stock Prices (Stocks) shock:

- The effect is shortly significant around month 6 and reaches a maximum of -0,22%.

Response of the policy rate (IR) to Real Effective Exchange rate (REER) shock:

- The effect is shortly significant around month 7 and reaches a maximum of -0,29%.

3.4.2 Canada

Response of consumer prices (CPI) to Real Money (M1) Shock:

- If the ordering is changed, real money shocks directly increase inflation and the trend goes on up till month 36, where it reaches an increase of 0,25%.

Response of the policy rate (IR) to Real Money (M1) Shock:

- The policy rate significantly increases after a real money shock for the subperiod 1994-2007 and significantly decreases for the period 2000-2013.

Response of Real Stock Prices (Stocks) to Policy Rate (IR) shock:

- Stock prices directly decrease with 2% after a policy rate shock for the period 1994-2007 (significant).

Response of Real Stock Prices (Stocks) to Real Money (M1) shock:

- There is no significant effect when estimated with a VECM, M2, other ordering or for the subperiod 1994-2007.

Response of Real Effective Exchange Rate (REER) to Excess Liquidity (EL) shock:

- If estimated from 1994-2007, the REER decrease with 0,75% at month 5.

3.4.3 Malaysia

Response of the policy rate (IR) to Real Money (M1) Shock:

- Effect disappears for subsample 2000-2013.

Response of Real Stock Prices (Stocks) to Policy Rate (IR) shock:

- Point estimates are more significant (-3% instead of -2%). This effect disappears for subsample 2000-2013.

Response of Real Stock Prices (Stocks) to Real Money (M1) shock:

- The effect does not dampen out and remains 4% from the beginning till month 36. Concerning the lag structure and subsample 2000-2013, the effect is significant but only reaches a maximum of ±2%.

Response of Real Output (INDPR) to Real Stock Price (Stocks) shock:

- Effect is insignificant when estimating a FULL-VAR.

Response of Real Stock Prices (Stocks) to Excess Liquidity (EL) shock:

- The effect reaches a maximum of 7% at month 21 and is still at 6% at month 36 when estimating a VECM. The effect is insignificant for period 1994-2007. For subperiod 2000-2013, 1 & 2 lags and M2, the effect is significant and reaches maximum 2%. Furthermore, it gets insignificant when estimating a FULL-VAR.

Response of Real Money (M1) to Excess Liquidity (EL) shock:

- The effect reaches a maximum of 2% at month 25 and remains stable thereafter. The effect disappears when working with M2 or when estimating a FULL-VAR. It gets insignificant for both subperiods.

Response of Real Output (INDPR) to Excess Liquidity (EL) shock:

- The effect disappears for subperiod 1994-2007, the different lag structures and when estimating a FULL-VAR.

Response of Consumer Prices (CPI) to Excess Liquidity (EL) shock:

- The effect disappears for subperiod 1994-2007 and when estimating a FULL-VAR.

Response of the policy rate (IR) to Real Output (INDPR) shock:

- Maximum significant increase of 0,05% for period 1994-2007.

Response of the policy rate (IR) to Real Stock Prices (Stocks) shock

- Maximum significant increase of 0,05% for period 1994-2007.

Response of the policy rate (IR) to Real Effective Exchange rate (REER) shock

- Maximum significant increase of 0,05% for period 1994-2007.

3.4.4 Peru

Response of the policy rate (IR) to Real Money (M1) Shock:

- The effect gets insignificant when using M2 and for subperiod 2000-2013. Furthermore, it gets insignificant if estimating a FULL-VAR.

Response of Real Stock Prices (Stocks) to Policy Rate (IR) shock:

- The effect is significant for subperiod 1994-2007 and reaches -2% directly after the shock.

Response of Real Output (INDPR) to Real Stock Price (Stocks) shock:

- Insignificant for subperiod 1994-2007, when using M2 and when estimating a VECM.

Response of Consumer Prices (CPI) Real Stock Price (Stocks) shock:

- Effect gets insignificant when estimating the foreign model, whilst when estimating a VECM, the maximum effect is 0,7% at month 36.

Response of Real Stock Prices (Stocks) to Excess Liquidity (EL) shock:

- There is no effect when estimating a VECM and for subperiod 1994-2007. For period 2000-2013, the effect is significant but reaches a maximum of 1%.

Response of the Policy Rate (IR) to Excess Liquidity (EL) shock:

- Effect is insignificant for 1994-2007 and when estimating a FULL-VAR.

Response of Real Money (M1) to Excess Liquidity (EL) shock:

- The effect disappears for both subperiods and when estimating a VECM and FULL-VAR or when using M2.

Response of Consumer Prices (CPI) to Excess Liquidity (EL) shock:

- Effect gets insignificant for both subperiods and when estimating a FULL-VAR.

Response of the policy rate (IR) to Real Output (INDPR) shock:

- Interest rate significantly increases with 0,25% after 3 months.

Response of the policy rate (IR) to Real Stock Prices (Stocks) shock:

- Effect disappears for subperiod 2000-2013. Concerning the FULL-VAR: the interest rate significantly decreases in the first periods but does not significantly increase anymore at period 15.

Response of the policy rate (IR) to Real Effective Exchange rate (REER) shock

- Effect disappears for subperiod 2000-2013.

3.4.5 U.S.

Response of the policy rate (IR) to Real Money (M1) Shock:

- Effect is directly negative (-0,5%) and dampens out quickly if the model is estimated with 1 lag.
- When changing the ordering, the effect is insignificant.

Response of Real Stock Prices (Stocks) to Policy Rate (IR) shock:

- When estimated from 2000 to 2013, there is a positive effect of real stock prices. It reaches a maximum of +1% at month 16.
- It gets significant after 24 months and reaches -2% at the 36th month when the model is estimated with 2 lags.

Response of Real Stock Prices (Stocks) to Real Money (M1) shock:

- When estimated from 2000 to 2013, a real money shock has small positive effect that gets significant around month 10.
- When estimated from 1994-2007: a real money shock has a negative effect on stock prices and gets significant after 20 months. It reaches -1% at month 36.

Response of Real Output (INDPR) to Real Stock Prices (Stocks) shock:

- The effect is never significant for subsample 1994-2007.

Response of the policy rate (IR) to Real Output (INDPR) shock:

- When estimated with 1 lag, there is a 0,75% policy rate increase after a real output shock.
- For the period 1994-2007, policy rate increases after output shocks.

Response of the policy rate (IR) to Real Stock Prices (Stocks) shock:

- It gets non-significant for subsample 2000-2013

3.5 Robustness: Other Excess Liquidity Measures And The Response Of Real Stock Prices

3.5.1 Brazil

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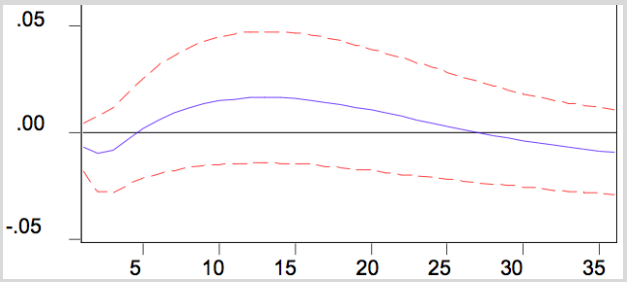

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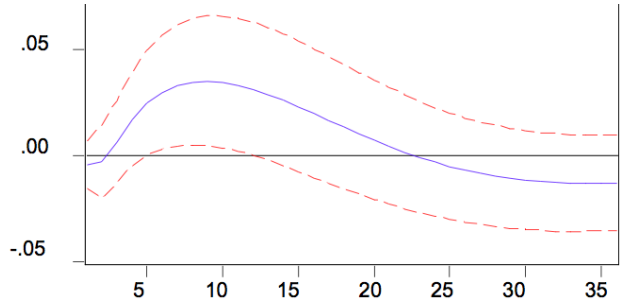

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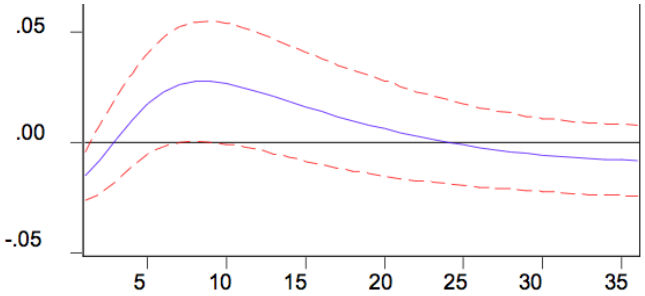

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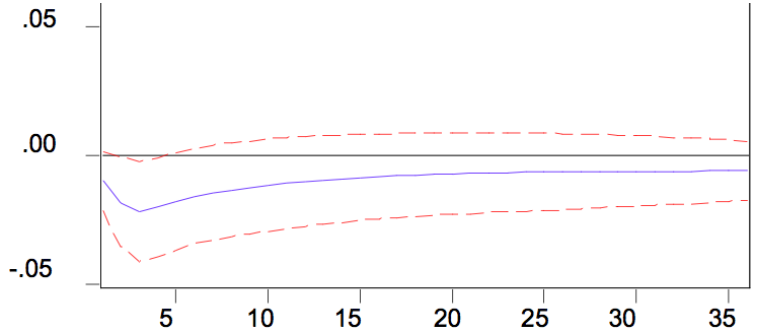

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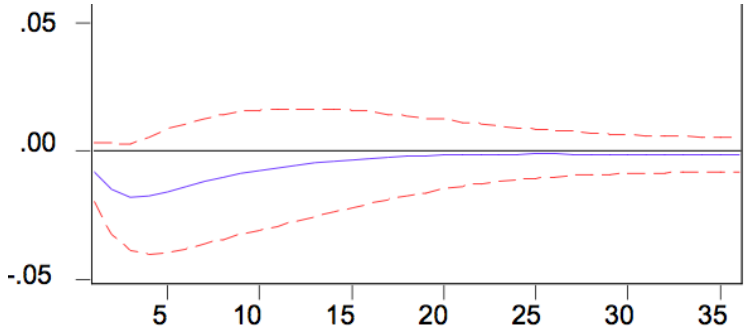
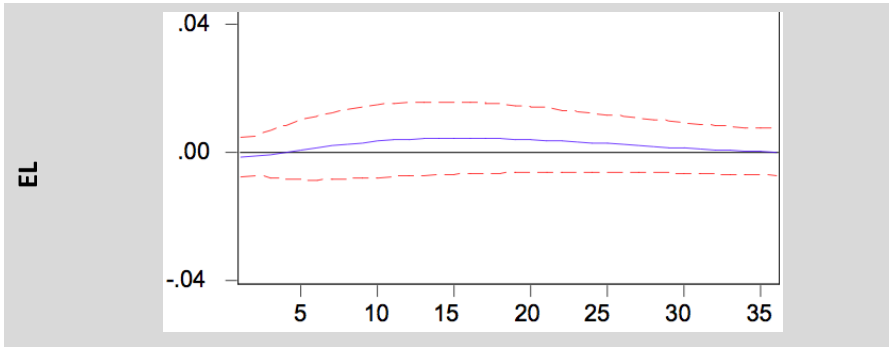


3.5.2 Canada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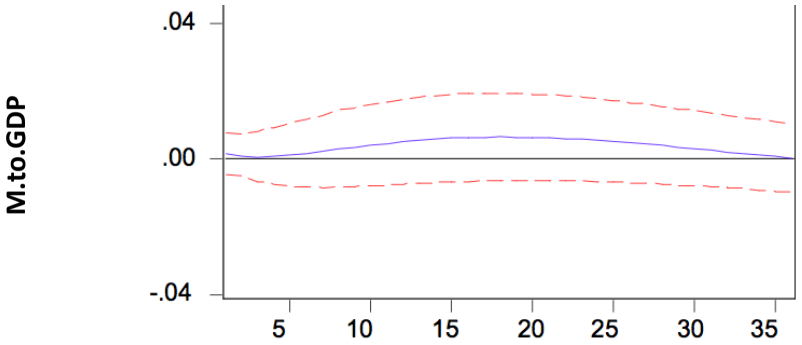
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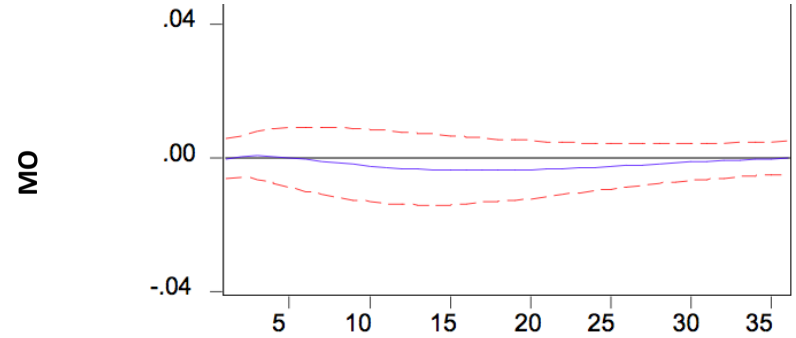
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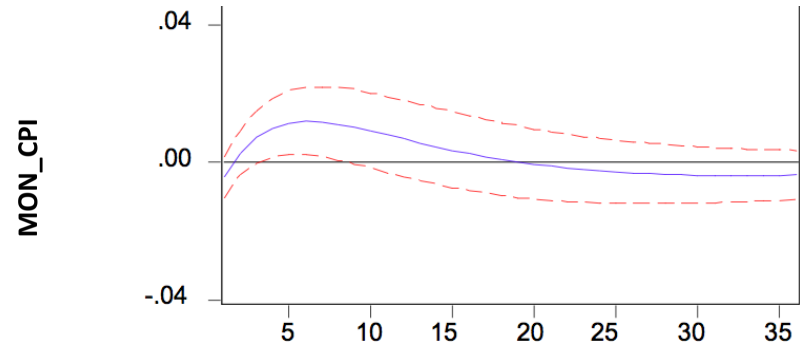
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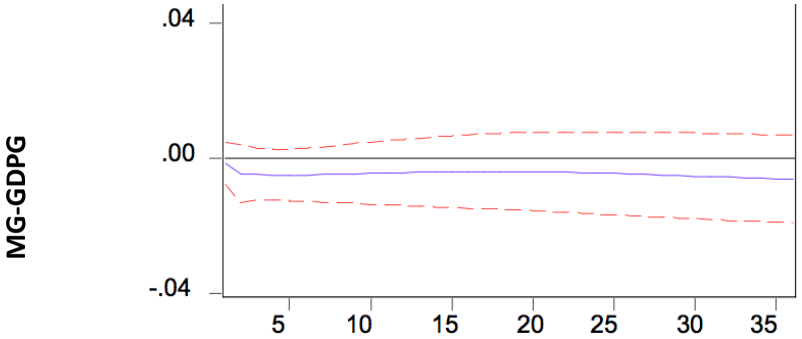
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3.5.3 *Malaysia*

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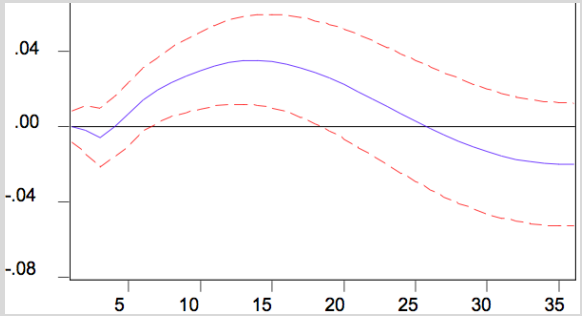

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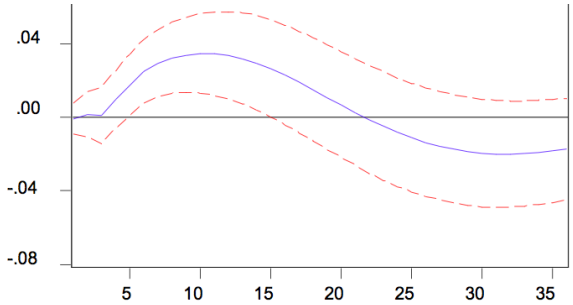

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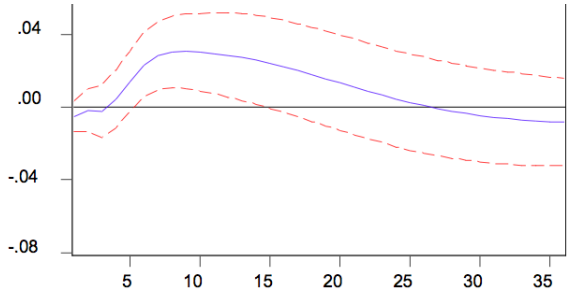

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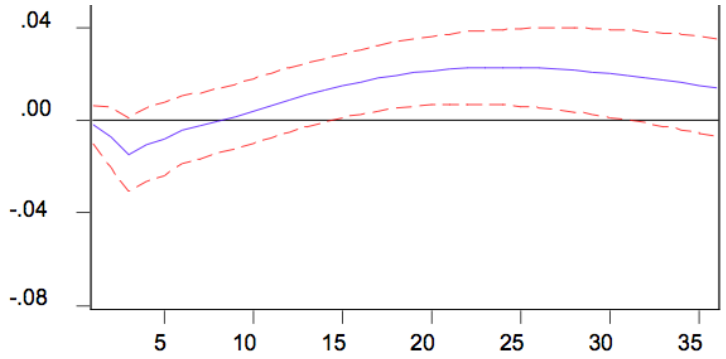

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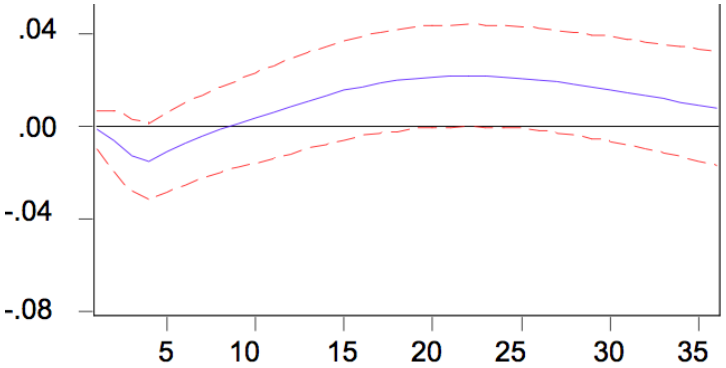

3.5.4 Peru

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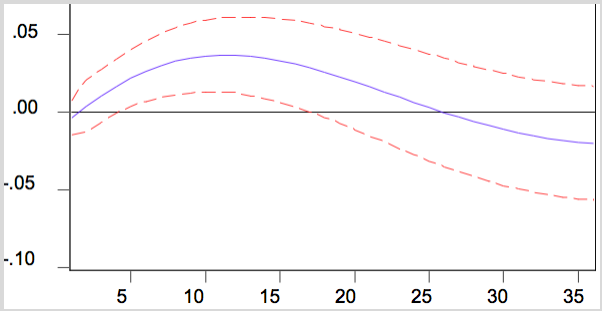

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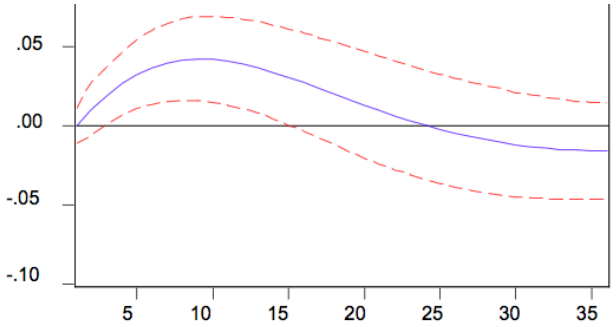

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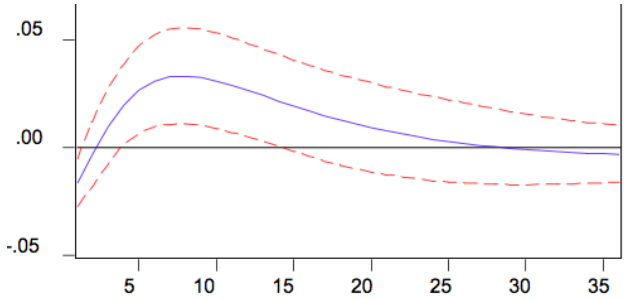

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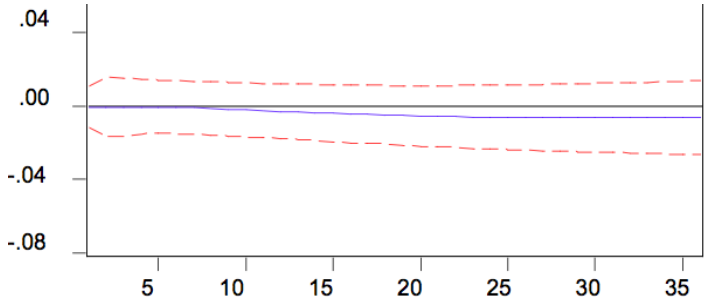

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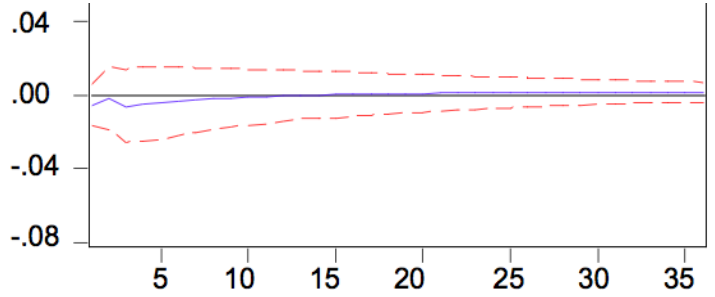
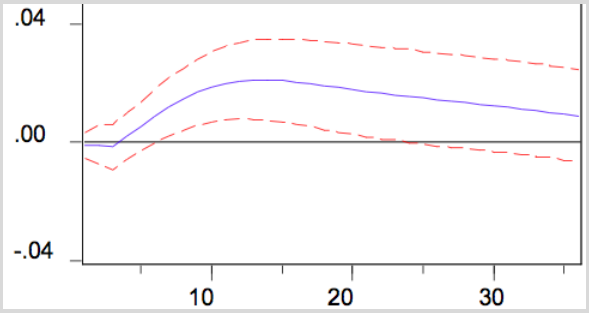


3.5.5 U.S.

EL



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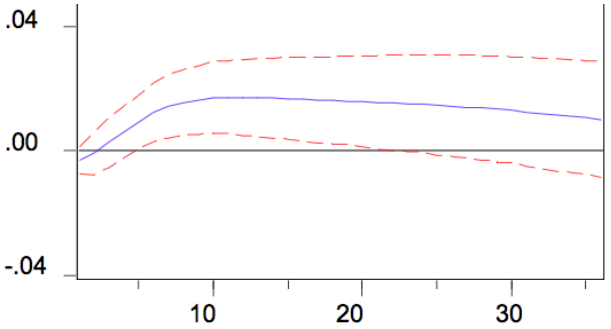

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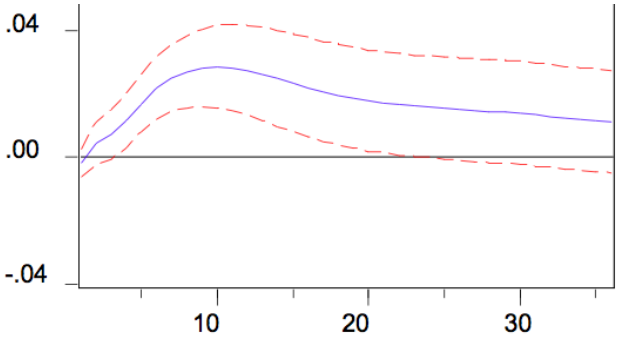

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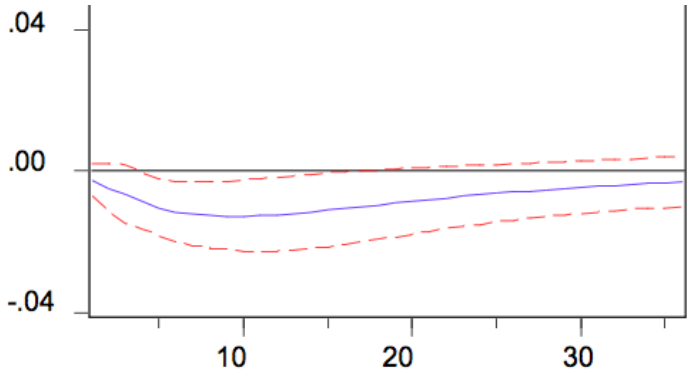

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