MONETARY POLICY TRANSMISSION MECHANISM: A CASE STUDY ON THE MEXICAN ECONOMY

A Thesis By

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California State University, Fullerton
Spring, 2022

In partial fulfillment of the degree:
Master of Arts in Economics

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DOI:
10.5281/zenodo.6578736

Keywords:
structured var, monetary policy, impulse response functions, time series

Abstract:
This paper uses a seven variable structured VAR (SVAR) to analyze the Mexican economy. The data is monthly data from January 1995 to April 2021, and we are using the Kim and Roubini specification as well as a Taylor Rule like specification for the Short Term Interest Rate equation. Furthermore, we restrict oil prices and exchange rate to see if there are any puzzles that are commonly discussed in the literature. Lastly, we set out to see if foreign monetary shocks affect domestic variables as well as which policy instrument plays a significant role in explaining the movement in the economics activities in Mexico. With that in mind we will use impulse response function and variance decomposition to analyze the relationship of the variables. Our empirical findings show that foreign shock do affect the domestic variables and that best domestic monetary policy variable that explains the movements in the Mexican economy is the short term interest rate.

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ACKNOWLEDGMENTS

The author would like to express their gratitude to Dr. Gabriela Best for putting up with the author's ordeal and the helpful guidance. The author would like to thank Dr. Radha Bhattacharya, Dr. Gabriela Best, and Aida Duran for the emotional push, support, and trust. Additionally, the author would like to thank Dr. Aaron Popp and Dr. Gabriela Best for all the helpful feedback on this project. Lastly, a huge thanks to the CSUF's Department of Economics, Department of Mathematics, and Department of Physics for having such amazing faculty that made the author into the researcher he is today.

CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

Monetary policy is used by central banks as a stabilization toolkit in guiding their country's economies. A strong belief of monetary policy-making is that a surprise increase in the short-term interest rate will lower price inflation. Thus, it is imperative that the central bank makes accurate assessments of the impact monetary policy has on domestic variables. However, it has been troubling to macroeconomics that many empirical estimates have suggested that a surprise interest rate increase is followed immediately by a sustained increase in the inflation rate. This result has been known as the "price puzzle".

In 1980, Chris Sims developed a vector autoregressive model (VAR) technique for providing a theory-free method to estimate economic relationships. Modern economic literature can contain many "puzzles" that arise empirically when comparing to what the theory predicts.

Some of these puzzles include (Kim and Roubini, 2000) the liquidity puzzle, a shock in the money aggregates that cause the market interest rate to increase rather than what the theory predicts: a decrease. Price puzzle, a positive shock in the interest rate causes the inflation rate to increase which, again, is inconsistent with macroeconomic theory. Exchange rate puzzle, a positive shock in the short term interest rate causes the home currency to depreciate which is inconsistent with economic theory. This is commonly referred to Dornbush's exchange rate overshooting. Delayed overshooting puzzle, where the uncovered interest rate parity (UIP) is a parity condition stating that the difference in interest rates between two countries is equal to the expected change in exchange rates between the countries' currencies. However, it has been found that following a positive shock in the home countries' interest rate, the currency kept appreciating for a longer time that expected, before depreciating.

A review of past empirical works reveals that no study has examined the effect of foreign and domestic monetary policy shocks on macroeconomic variables, while using a structured vector autoregressive model (SVAR) framework developed by Kim and Roubini with Mexican context.

Moreover, since the Mexican Central Bank targets short-term interest rate (STIR) with a Taylor Rule, we also will analyze a SVAR specification with a Taylor Rule like specification. This paper seeks to answer the following research questions: (i) which policy instrument plays a significant role in explaining movement in the economic activities of Mexico? (ii) Do foreign monetary policy shocks, namely United States Federal Funds Rate (US FFR) shocks, affect the domestic variables? (iii) Does the inclusion of oil price resolve the problem of price puzzles, and how much do variations in oil price account for output and price fluctuations? This is an interesting comparison since US accounts for almost 70% of Mexico's exports, while for the U.S., Mexico takes up 14% of their exports, as well as Mexico is an oil exporting country (Congressional Research Service, 2020).

The empirical analysis shows that the Mexican Central Bank favors STIR in the domestic monetary policy movements. Moreover, we find that US FFR shocks explain most of the variation in the domestic non-policy variables, Industry Production Index (IPI) and Consumer Price Index (CPI). More surprisingly, we find that oil prices do not explain any of the variation in the domestic non-policy variables. Galindo and Catalan (2005) find that the Taylor Rule with exchange rate modification explains the Mexican economy closely. With that in mind we modify the Kim and Roubini (2000) framework to test robustness. We find that both models are perform similarly. So while incorporating exchange rate (ER) in the short-term interest rate equation might give better results, the results are sufficient without exchange rate. When analyzing the impulse response function we found the prize puzzle and thus the inclusion of oil does not resolve the puzzles.

Balcilar et al. (2014) and Oni (2013) both do not find puzzles in their estimations. Balcilar et al. (2014) estimated a Bayesian MS-VAR model with a linear VAR indicator, to investigate the oil prices in different states: high growth- low oil price volatility and low growth-high oil price volatility from 1960Q2 to 2013Q3. Moreover, they find that oil price shocks increase the probability to be in a low growth state. The impulse responses showed that the oil price shocks tend to be more persistent during low growth states compared to high growth states and that the impact on real output growth is statistical significant. Oni (2013) investigated the inflation targeting policy South Africa adopted in the early 2000s. Oni finds that the inflation rate responds to by a 2.1% to a positive monetary policy compared to a 1% percent in the pre-inflation period.

The price puzzle was first noted by Eichenbaum (1992). However, finding the puzzle is not enough to explain it. Hanson (2004) showed that is not easy to explain away the puzzle, especially pre-1980. Moreover, Kim and Roubini (2000) state that Grilli and Roubini (1995) used money stock as the primary monetary policy and found the “delayed overshooting puzzle”. Kim and Roubini notes that the unrestricted VAR approach with measure of expected inflation resolve the exchange rate puzzle for most countries is a limited approach. If an open economy is concern about the effects of exchange rate depreciate on their inflation rate, they might react quite rapidly to exchange rates shocks. With that said, for most developed nations, monetary policy is the most useful tool of the central bank to impact their economy.

Capistran et al. (2019), use a SVEC to identify the exchange rate puzzle. In their paper, the authors, specify and estimate a structured VAR that considers explicitly a set of long run relations among the purchasing power parity, interest parity, money demand, and relation between domestic and U.S. output levels. The authors find that the response to the exchange rate to monetary policy shocks are consistent with Dornbush’s model. Carrillo et al. (2020) analyze the business cycle co-movement between Mexico and the U.S. They find that the U.S. shocks explain about 75% of the expected fluctuation in Mexico at a three year horizon. Their model includes an economics policy uncertainty, TFP growth, output gap, inflation rate, policy rate, term premium, and a mea- sure of the cost of external finance. In their findings they find the following: (1) the yield of dollar-denominated long-term bonds issued by the Mexican government rises after an unexpected increase in the Fed funds rate; (2) the response of peso-denominated, long-term bond yields depends on the reaction of the U.S. term premium to said shock; (3) domestic real activity may fall persistently if the domestic term premium steepens after the shock; and (4) the responses of domestic inflation and the policy rates are ambiguous. This all falls in line with the growing literature of the propagation of shocks across borders.

Vargas et al. (2021) analyzes the most appropriate monetary policy position for Mexico. The value of the neutral interest rate in Mexico for the next five years is estimated based on Taylor's rule and a co-integrated VAR model. The results suggest that the monetary policy rate is above the neutral interest rate and combined with the potential international rate cut, it could grant the central bank for almost the entire six-year period a degree of freedom to maintain its rate below the current level; in the short term the current monetary policy rate could be cut by at least 25 points without risking convergence to the inflation target. Galindo and Catalan (2005) analyze the relevance of the Taylor Rule including real exchange rate. They find that the inclusion of the exchange rate is statistically significant and moreover that the Taylor Rule describe the reaction function of the Mexican Central Bank more closely.

Decuir et al. (2020) use an SVAR theorized by Mundell-Fleming for open economies. The authors used a SVAR popularized by Blanchard and Perotti in 1999 where they find a positive contemporary effect of a budget on a deficit shock on economic activity as well as a positive contemporary effect on the exchange rate shock on the economy. Loria et al. (2010) find evidence supporting the validity of both short and long run of the monetary approach of exchange rate determination for the peso/USD exchange rate using a cointegratied SVAR model.

CHAPTER 2

MONETARY POLICY IN MEXICO

The Banco de Mexico (Banxico) is the national authority responsible for implementing monetary policy in Mexico. Since 1994, the aim of the Banxico has been to promote the purchase power of the Mexican Peso and high and sustained level of output while keeping inflation at a desirable rate and exchange rate monitoring. Furthermore, the current policies implemented by the Banxico have created sustained economic growth reaching in July 2021 an inflation rate of 5.81% with forecast showing it will reach annual levels of 2.7%. They have managed to accumulate international reserves exceeded 193 billion USD. In November of 2020, the International Monetary Fund ratified the flexible credit line extended Mexico to 61 billion USD. Both of these netted together, yield Mexico over 254 billion USD in funds (Proyectos Mexico, 2021).

While we will be focusing on post 1994 for our paper, we start with the history of monetary policy in Mexico since the mid-70s. The main two crisis happened in 1982 and 1994. During this period, the government implemented major reforms. Post 1995, Mexico began experiencing a slow growth but this was interrupted by the 2008 crisis. Exchange rates have had a strong influence on economic growth and development. Early on Mexico had a rigid exchanged rate targeting policy. They were able to keep the peso close to the US dollar value, this however came at a huge cost. This lead to Mexico having an annual inflation of about 31% and money reserves extremely low by 1982, about 1.6 billion USD (Meza, 2019). That same year Mexico faced a depreciation of their coin by about 80% and their lack of money reserves lead to a debt crisis and thus Mexico moved to a nationalization of the banking system. However, Mexico still wanted to match the depreciation and appreciation of the USD, this resulted to an inflation rate of 179% by March of 1988. After 1988, Mexico would slowly move away from a rigid exchange rate, and like many other countries (Like South Africa in 1999, Sri Lank in 2000) they will phase out into an interest rate based policy for inflation targeting (Weidner, 2017). Currently, the Banco de Mexico uses a Taylor Rule to set their target short-term interest rate. This was a huge inspiration to devise a Taylor Rule Like for one of the specifications.

From the 1970s to 1982, Mexico went through a period of rapid growth and fiscal expansion. Since 1938, the oil industry had been under the control of the government and by 1968, Mexico was not exporting oil, only limiting extraction to the domestic requirements (Meza, 2019). However, as prices started soaring after 1973 oil crisis, it was a crucial driver for Mexico becoming a net exporter of oil by 1974. In 1970, the deficits were close to zero. However, by the time 1976 had rolled around, the peso had suffered a devaluation for the first time in nearly twenty years. In response the government had increased spending. However, this spending was financed with foreign resources and with money creation of the central bank, Banxico. With the discovery of Cantrell in 1976, heavy oil extraction started in 1979. During this time the government decided to invest in the oil infrastructure and by 1982, the oil exports had grown extremely rapidly. Arezki et al. (2016) find that small open economies that discover giant oil fields lead to an increase in consumption, borrowing, and investment. Due to the increase in income of the economy, there was an increase in foreign borrowing. During this time there was also policy expansion into the Mexican people. Programs that targeted health and education. While the increase in oil reserves made it seem like the economy was entering an era of growth, the opposite happened. Total government spending increased drastically: 30.9% of GDP in 1978 to 40.6% of GDP in 1981 (Meza, 2019). Eventually the administration in 1982 would default on the principal payments of the foreign debt and it was in this instance that the government blamed the Mexican banks and chose to nationalize the banks. 1982 was a terrible year for Mexico. After the nationalization of the Mexican banks, there as increases in fiscal deficit and current account deficit. International banks reduced their lending and the US had increased it interest rate. More importantly, oil prices fell. The international reserves of Banxico had reached an alarmingly low level and the peso devalued by almost 80%.

There were some reforms to combat this post 1982. In the period of 1982 to 1994, the primary goal was to control inflation. To this end, the government committed to reducing spending and the privatization of many government owned firms. The government created Pacto de Solidaridad Economica. Where business owner would not increase prices and workers would not try to increase their wages. However, this did nothing for controlling inflation and at this point inflation was at 100%. The next regime, Carlos Salinas, took a different approach. The government began selling previously government institutions like the national telephone company TELMEX and the banks that had previously been nationalized. Moreover, the biggest aspect this regime had was that it opened Mexico to the world via the North American Free Trade Agreement (NAFTA). Eventually, the government started to renegotiate the debt and eventually the government was able to regain access to international financial markets (Chong and Lopez-De-Silanes, 2004). During 1993, there was a constitutional reform that granted Banxico its autonomy from the government. Its main task was to protect the purchasing power of the peso. La Ley del Banco de Mexico, was signed into law in 1993. In this this document 68 articles are outlined with the powers of the Banxico and as well as their objectives. In article 3, we see that the main function of the bank is to regulate the emission and circulation of the currency. It will operate with credit institutions as a reserve bank and as creditor. Provide treasury services to the Federal Government and act as financial agent. Act as advisor to the Federal Government in economic matters and, particularly, financial. Participate in the International Monetary Fund and in other cooperation organizations international finance or that group central banks. Lastly, operate with the agencies previously mentioned with central banks and with other foreign legal entities that exercise functions of authority in financial matters (Banco de Mexico, 2022b).

Immediately before the autonomy of Banxico, the monetary policy was on the exchange rate. It was not as rigid as it was in 1970s and early 1980s, the peso was allowed to fluctuate within an expectation. However, starting 1995, Banxico started to implement policies managed the cost of liquidity in the interbank market. This operational objective was used from September 13, 1995 to April 9, 2003. The implementation of the monetary policy under this regime is essentially the same as the operational objective on daily balances with the difference that the accumulated balances in a period of several days as a goal. The accumulated balances used as a target were the average balances of the current accounts of the credit institutions within the Banxico in a period of 28 days. Banxico would carry out open market operations to reduce liquidity during the measurement period, but part of it. Then Banxico would provide the liquidity at an interest rate double that of the market rate. In response the banks would increase interest rates on loans and deposits to combat the penalty rate. Starting 1998, Banxico started to publish their policy targets to the public with their reasoning. In 2001, Banxico announced it would implement an inflation targeting regime. Moreover, it announced that their target was 3% annual inflation with a band of 1%. By 2008, Banxico announced it would operationally target the short term interest rate in their “Anuncios de las decisiones de política monetaria” webpage (Banco de Mexico, 2022a).

CHAPTER 3

DATA AND VARIABLES

We now describe the data that we used in our model. We split the data into two groups: a foreign block and a domestic block. Following Kim and Roubini (2000), Brischetto and Voss (1999), and Vinayagathasan (2013) we chose a seven variable SVAR model to analyze the Mexican economy. The aforementioned papers postulate that these seven variables are adequate in explaining monetary policy framework in small open economies. We select the following variables: (i) World Oil Prices (WOP) (ii) US Federals Funds Rate (USFFR) (iii) Total Industrial Production Index (IPI) (iv) Consumer Price Index (CPI) (v) Exchange Rate (ER) (vi) Short-Term Interest Rate (STIR) (vii) Money Supply (M1). See Table 1 for the definition as well as the abbreviation we will use through the paper and Table 2 for the sources. Refer to Figure 1 for plots of each of these variables.

Table 1. Variables Included in the Model

Variable	Definition	Abbreviation
Foreign		
World Oil Prices	Crude Oil Prices (USD/Barrel)	WOP
US Federal Funds Rate	US Interest Rate (%)	FFR
Domestic		
Output	Total Industrial Production Index (Base Year 2013 = 100)	IPI
Price Index	Consumer Price Index (Base Year 2015 = 100)	CPI
Exchange Rate	Exchange Rate (Peso/US$)	ER
Short Term Interest Rate	Call Money/Interbank Rate for Mexico (%)	STIR
Money Supply	Money Supply M1 (Peso)	M1

In this framework we are assuming the foreign block, US Federal Funds Rate and World Oil Prices, are exogenous. Thus in our specification, the domestic variables will not enter in the equations for the foreign block. This is a crucial component in analyzing a small open economy. An interesting inclusion is World Oil Prices since Mexico is huge exporter of the world’s oil. Regarding the selection of Kim and Roubini (2000), most of the countries selected were not huge oil producers so analyzing Mexico can add to the literature. Moreover, historically oil prices and levels of inflation are often seen as being connected in a cause-and-effect relationship. That is, as oil prices move up, inflation follows the same direction and if oil prices fall, the inflationary pressure will start to ease (FRED, 2018).

Table 2. Data Sources

Variable	Source
WOP	https://fred.stlouisfed.org/series/DCOILWTICO
FFR	https://fred.stlouisfed.org/series/FEDFUNDS
IPI	https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=2&accion=consultarCuadro&idCuadro=CR205&locale=es
CPI	https://fred.stlouisfed.org/series/MEXCPIALLMINMEI
ER	https://fred.stlouisfed.org/series/DEXMXUS
STIR	https://fred.stlouisfed.org/series/IRSTCI01MXM156N
M1	https://fred.stlouisfed.org/series/MANMM101MXM189N

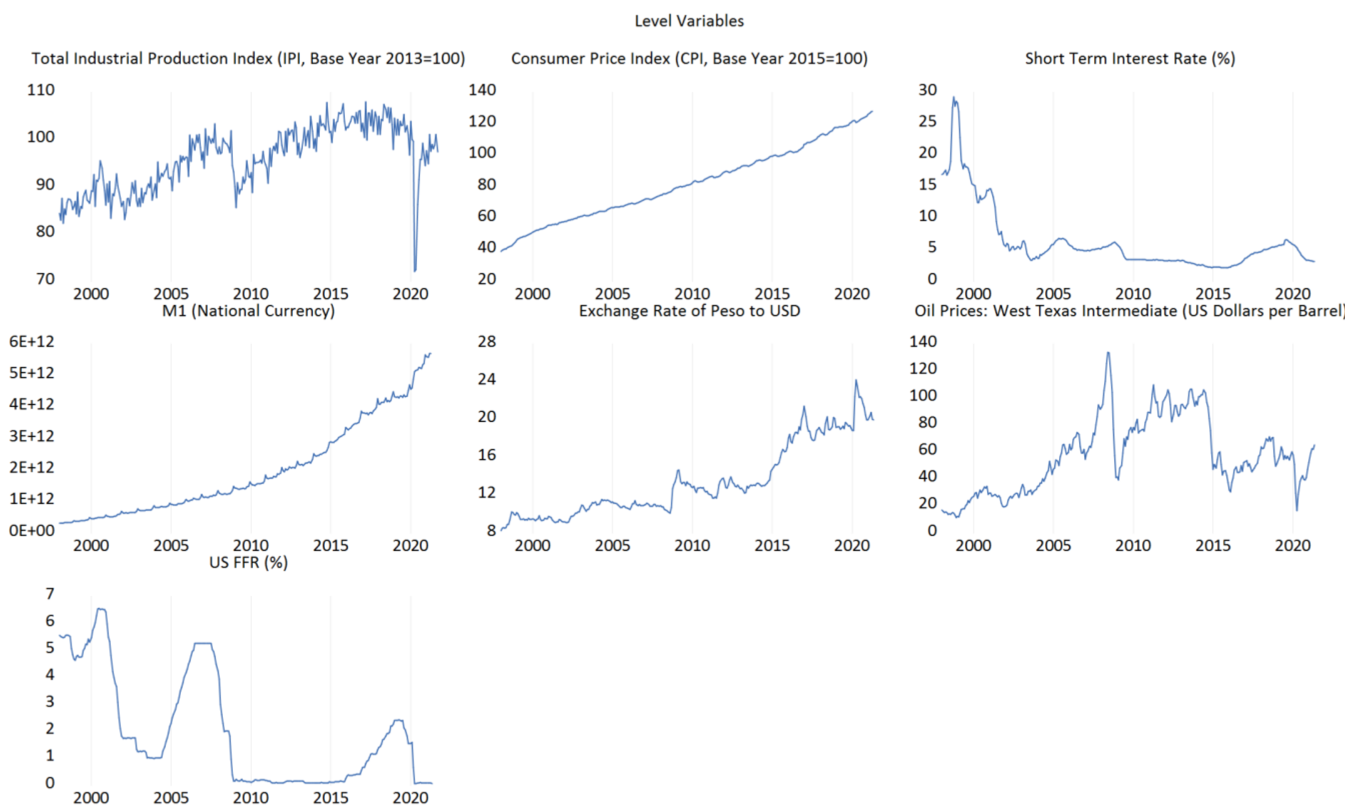

Figure 1. Time series plot of the variables in our study.

The domestic variables we use are IPI, CPI, STIR, ER, and M1. These can further be categorized into two other sub groups: policy and non-policy variables. For the policy variables, we have ER, STIR, and M1. The centrals banks have the controlled each of these in the past. In modern monetary policy, we have that most of the central bank's target an inflation target system (Weider, 2017). Historically, a lot of developing nations have used an exchange rate targeting policy, and as we saw in the case of Mexico, it lead to disastrous levels of inflation. IPI and CPI are non-policy domestic variables used in our framework. These two are used to see the impact the shocks due to monetary policy and foreign variables have on the real sector and price level. This is in line with what most of the literature has done. In all the variables that we are using are all nominal. We use monthly data from January 1995 until April 2021.

CHAPTER 4

METHODS

SVAR Model

We use a seven variable structured vector autoregressive (SVAR) model. This is in line with what Kim and Roubini (2000) to analyze a small open economy. Furthermore, we assume the economy is described by a structural form equation,

$$G(L)y_t = e_t \tag{1}$$

$G(L)$ Is a matrix polynomial in the lag operator L, y_t is a $n \times 1$ data matrix, and e_t is a $n \times 1$ structural disturbances vector. Additionally, we assume that e_t is serially uncorrelated and $var(e_t) = \Lambda$ where Λ is a diagonal matrix with the variances of structural disturbances as its entries. The reduced form can be estimated from the following form,

$$y_t = B(L)y_t + u_t \tag{2}$$

$B(L)$ is a matrix polynomial in the lag operator and $var(u_t) = \Sigma$. With this we could estimate the parameters. However, for this we would need to impose some restriction on the element. The most fundamental procedure is to use a Cholesky decomposition and from there use a recursive ordering to estimate the disturbances (e.g., Sims 1980). Other group of studies have used a generalized method with non-recursive structures (SVAR) which impose restrictions only contemporaneously (e.g. Sims 1986, Bernanke 1986, Kim and Roubini 2000, see reference for many more examples).

The residual u_t can be obtained by estimating N equations from Equation 2 using OLS. Let G_0 be the contemporaneous coefficient nonsingular matrix in the structural form equation and $G^0(L)$ be the coefficient matrix without a contemporaneous coefficient in the structural equation. This relationship can be represented as follows,

$$G(L) = G_0 + G^0(L) \tag{3}$$

Following Equation 3, the structural form equation parameters and those in the reduced form equation are related by

$$B(L) = -G_0^{-1}G^0(L) \tag{4}$$

From Equation 4, the structural disturbances are given by

$$e_t = G_0 u_t \tag{5}$$

which yields,

$$\Sigma = G_0^{-1} \Lambda G_0^{-1} \tag{6}$$

We can find consistent estimates of Λ and G_0 using estimate samples of Σ. For this we can use Maximum Likelihood estimates. Observe that Σ has ($n \times \frac{n+1}{2}$) restrictions to be estimated. However by normalizing the n diagonal elements of G_0 to 1, we go from having $n \times (n+1)$ parameters to be estimated to $n \times (n-1)$. So now, we need at least $n \times \frac{(n-1)}{2}$ restrictions on G_0 to reach identification. Moving forward we discuss the restrictions on G_0 using past findings.

Identification

Following Kim and Roubini (2000), we use $\{IPI, CPI, STIR, M1, ER, WOP, FFR\}$ as our data vector where the variables are defined in Table 1. Furthermore, we use the following identification based on Equation 5,

$$\begin{pmatrix} e_{IPI} \\ e_{CPI} \\ e_{STIR} \\ e_{M1} \\ e_{ER} \\ e_{WOP} \\ e_{FFR} \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & b_{16} & 0 \\ b_{21} & 1 & 0 & 0 & 0 & b_{26} & 0 \\ b_{31} & b_{32} & 1 & b_{34} & b_{35} & b_{36} & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 & 0 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 & b_{56} & b_{57} \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{76} & 1 \end{pmatrix} \begin{pmatrix} u_{IPI} \\ u_{CPI} \\ u_{STIR} \\ u_{M1} \\ u_{ER} \\ u_{WOP} \\ u_{FFR} \end{pmatrix} \tag{7}$$

where $e_{IPI}, e_{CPI}, e_{STIR}, e_{M1}, e_{ER}, e_{WOP}$, and e_{FFR} are the structural shocks of IPI shocks, CPI shocks, STIR shocks, M1 shocks, exchange rate shocks, oil price shocks, and FFR shocks, respectively. The residuals in the reduced form equation are given by $u_{IPI}, u_{CPI}, u_{STIR}, u_{M1}, u_{ER}, u_{WOP}$, and u_{FFR}.

Let's start our discussion with the last two equations. As it is common in the literature, we also adopted a framework in which WOP and FFR are exogenous to our domestic variables. That is, the domestic variables do not affect these two variables. In line with Kim and Roubini (2000), we assume that the FFR can react to change in oil prices. As it has done historically. Next we discuss our non-policy domestic variables: IPI and CPI. Here since Mexico's a huge producer of oil, we use the restriction that their IPI shocks depend on WOP. That is, that WOP affect the domestic production.

We discuss the policy domestic variables: M1, ER, and STIR. Here we follow Kim and Roubini (2000) and assume that every variable we selected affects exchange rate contemporaneously. This allows us to see how foreign variables influence domestic variables. Lastly, M1 and STIR, relate the money supply and demand. For STIR, we use the specification from Kim and Roubini (2000) in which we have STIR dependent on M1, ER, and WOP. The reasoning behind this is that the data IPI and CPI are not available within a month so they only affect STIR with a lag. However M1, ER, and WOP are available and can affect STIR without a lag term. Moreover, FFR is not in the equation of STIR, because we care more about unexpected changes in ER relative to the USD rather than the unexpected change in FFR. Note that in our discussion, we mentioned that the Banco de Mexico has adopted a more inflation targeting tool for their monetary policy. So with that said, we will check for robustness by making specifications in which we add a Taylor Rule like structure for STIR. That is, we assume that CPI, GDP, and WOP affect it contemporaneously. Moreover, WOP is included to control for inflationary pressure. This is often done in literature because the theory predicts that there is a relationship between inflation and investments. Vinayagathasan (2013) does a similar change for his analysis of Sri Lanka. Another version of the specification that we will study will be as follows: since Mexico is a small open economy, we relax the restriction that the STIR shocks are not affected by Exchange Rate contemporaneously. Furthermore, it has been well documented that the inclusion of WOP helps remove many of the puzzles discussed in the opening of this paper. Hence, we will further restrict our model by setting $b_{36} = 0$. Lastly, we assume M1 follows the theory; that is contemporaneously affected by GDP, CPI, and STIR.

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 & b_{16} & 0 \\ b_{21} & 1 & 0 & 0 & 0 & b_{26} & 0 \\ b_{31} & b_{32} & 1 & b_{34} & b_{35} & b_{36} & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 & 0 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 & b_{56} & b_{57} \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{76} & 1 \end{pmatrix} \tag{8}$$

The models that we will be running (and also using for robustness) will be as follows:

I. Kim and Roubini Specification: $b_{31} = b_{32} = 0$

II. Taylor Rule Like Specification: $b_{34} = b_{35} = 0$

III. Taylor Rule Like with Exchange Rate Specification: $b_{34} = 0$

IV. Taylor Rule Like with Exchange Rate with No Oil Specification: $b_{34} = b_{36} = 0$

CHAPTER 5

RESULTS

Testing Stationarity and Lag Length Criteria

Stationarity

Following the theory presented in Hamilton (1994), we make sure that our time series is stationary. In the case that it is not, we transform the data. To that end, we use the Augmented Dickey Fuller (ADF) to test for unit root. Refer to Table 3 for the results. In literature, the criteria is anything less than 5% or .05. From Table 3, we see that only STIR is stationary at a 1.5% level. While the first difference resolves most of the stationarity issue, it is not practical in interpretation. Transforming the variable with log will only benefits M1, while it is more meaningful to interpret log, we have a better alternative.

Table 3. Unit Root Test: ADF Probability

Variable	Level	Log	1^{st} Difference	1^{st} Log Difference
WOP	0.181386	0.272343	0.0000	0.0188
FFR	0.613183	0.749729	0.0000	0.0000
IPI	0.108735	0.169875	0.0000	0.0000
CPI	0.8719	0.071255	0.361666354	0.0093
ER	0.295412	0.126355	0.0000	0.0275
STIR	0.013712	0.541605	0.0000	0.0320
M1	0.999995	0.019093	0.0000	0.0117

We use the interest rates (STIR and FFR) at level and the remainder of the variables as difference of logarithm. This is essentially looking at the percentage change of the variable. With this we satisfy the conditions for our time series to be stationary with one glaring exception, FFR. Additionally, this allows us to look at the growth rate rather than the direct variable and in the case of CPI, we are effectively using the inflation rate. This falls more in line with Taylor Rule we will adopt and why we adopted this modification in the long-term identification matrix. Since our objective is to analyze the impulse response functions (IRFs) as well as the variance decomposition of the variables and not interpret the coefficient estimates (which that in itself is a challenging aspect to do), we will use FFR at a level even if it is not stationary. This procedure has been done in the literature, most notably Kim and Roubini (2000), Sims et al. (1990), Amissano and Gianni (1980). See Figure 2 for the transformed variables.

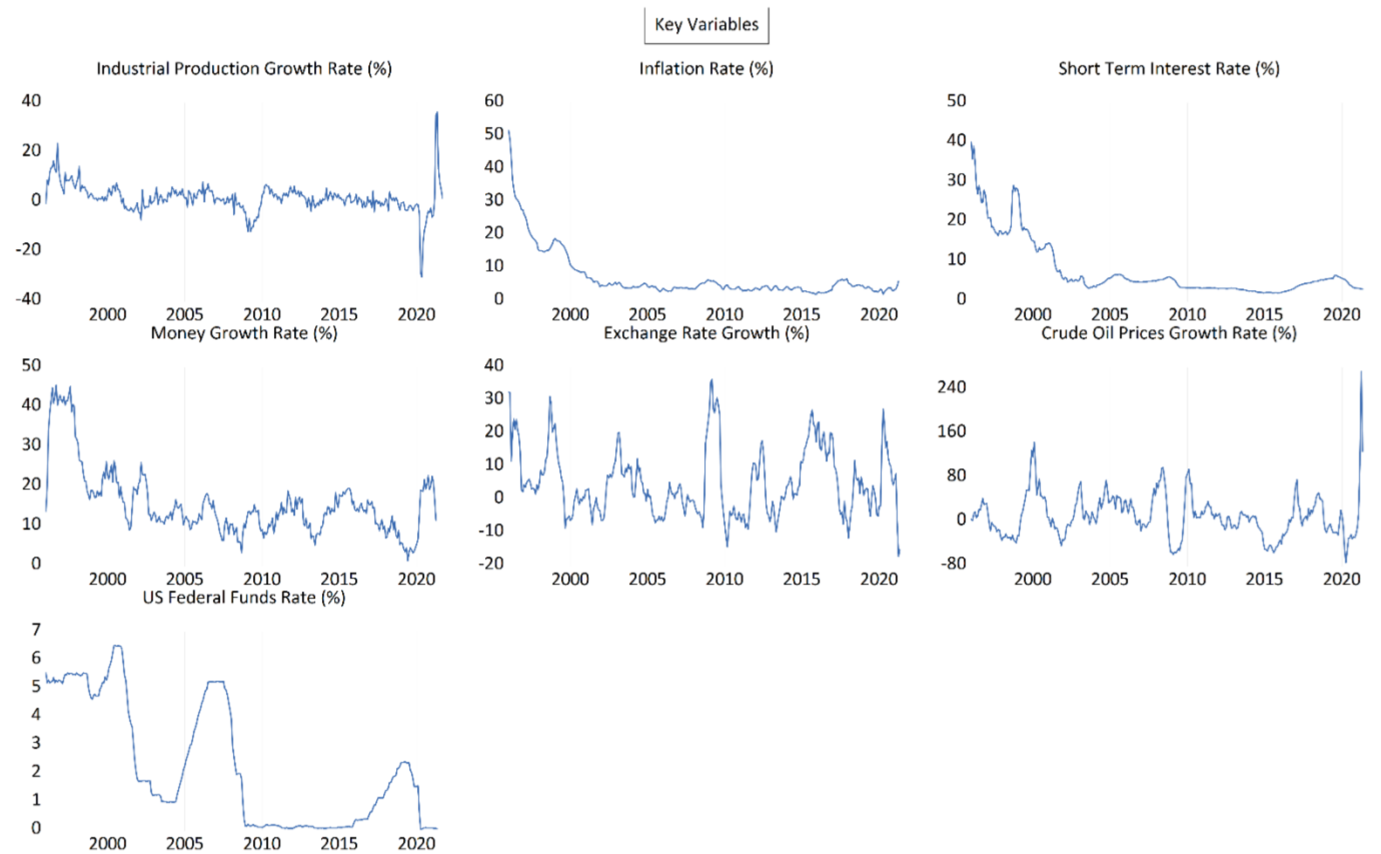

Figure 2. Key variable transformed for our analysis.

Lag Length Criteria

The model estimation is dependent on lag terms. So it is imperative to be able to find the optimal number of lags. For this there are multiple criteria to select from: Schwarz's Bayesian Information Criterion (SBIC), Akaike Information Criterion (AIC) and Hannan-Quinn Information Criterion (HQIC). In practice, we usually select one of these criterions with the lowest possible estimate. All these are estimators of prediction error and effectively measures how much information is lost. So picking the smallest possible estimate will lead, in theory, to a model with the least amount of information loss. Hamilton (1990) states that for monthly data the maximum lag length should be 6, 12, or 24 lags, given sufficient data points. For quarterly data using 1 to 8 lags is appropriate and for annual data using 1 to 2 lags. Since including too many lagged variables will consume degrees of freedom.

We can see from Table 4, that when using the AIC specification we have that the optimal lag length is 4. While both SC and HQ have lag 2 as their lowest, we will pick the AIC criterion since it return the smallest estimate.

Table 4. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-5935.03	NA	563000000.00	40.01	40.10	40.05
1	-3791.22	4172.14	420.78	25.91	26.60	26.19
2	-3596.51	369.75	157.82	24.93	26.23184*	25.44876*
3	-3552.97	80.62	163.95	24.96	26.88	25.73
4	-3485.70	121.42	145.3179*	24.83969*	27.36	25.85
5	-3444.44	72.51	153.71	24.89	28.03	26.15
6	-3392.19	89.36297*	151.29	24.87	28.61	26.37

* indicates lag level chosen by the criterion

Identification of Matrix Estimation

We report the coefficients of the structural model in Table 5. We use monthly data from January 1995 until April 2021. We used four lags. All the variables are in difference of logarithm with exception to STIR and FFR. As mentioned in the data section, since FFR is non-stationary, there could arise issues on the magnitude of the coefficient estimated. However, as in Kim and Roubini (2000), we are interested in the movements of the data and not so much the magnitude because there are other issues that were not taken into account such as cointegration. We did run a Johansen cointegration test and it detected at most two cointegrating relationship. In the literature this is allowed since we are focusing on our SVAR, which allows the cointegration of data in our analysis.

Table 5. Contemporaneous Coefficient in the Structural Model for Our Four Specifications

	I	Std. Error	II	Std. Error	III	Std. Error	IV	Std. Error
b_{16}	-0.0066	0.0036	-0.0069*	0.0036	-0.0065	0.0036	-0.0065	0.0036
b_{21}	0.0108	0.0193	0.0108	0.0193	0.0108	0.0193	0.0108	0.0193
b_{26}	-0.0010	0.0038	0.0039	0.0056	-0.0001	0.0038	0.0013	0.0037
b_{31}	-	-	0.0062	0.0197	0.0062	0.0267	0.0062	0.0270
b_{32}	-	-	0.2127	0.1850	0.2450	0.2557	0.2342	0.2496
b_{34}	-0.4228*	0.0592	-	-	-	-	-	-
b_{35}	-0.7553*	0.0445	-	-	-0.9226	0.0458	0.9467*	0.0463
b_{36}	0.0073	0.0040	-0.0003	0.0042	0.0083*	0.0037	-	-
b_{41}	-0.0308	0.0363	-0.0255	0.0202	-0.0253	0.0482	-0.0253	0.0508
b_{42}	-0.1823	0.3640	0.2442	0.2923	0.0638	0.4878	0.1303	0.5058
b_{43}	1.9663*	0.1354	-0.1564	0.0873	2.2825*	0.1355	-2.4319*	0.1448
b_{51}	-0.1006	0.0653	-0.0864*	0.0357	-0.0860	0.0766	-0.0858	0.0740
b_{52}	0.4428	0.6154	1.0638*	0.2862	0.9986	0.7073	1.0256	0.6758
b_{53}	3.8196*	0.2805	1.0158*	0.0924	2.8234*	0.2715	-2.6359*	0.2705
b_{54}	-2.1715*	0.1668	0.5103*	0.0302	-2.4020*	0.1652	-2.3822*	0.1609
b_{56}	-0.0422	0.0231	-0.0517*	0.0193	-0.0499*	0.0213	-0.0510*	0.0204
b_{57}	-5.1756*	1.5053	-4.9304*	0.4695	-4.6973*	1.6200	-4.4690*	1.5693
b_{76}	0.0012	0.0036	0.0012	0.0036	0.0012	0.0036	0.0012	0.0036

* denotes statistical significance at the 5% level.

Coefficients of the SVAR are estimated using OLS method. In the first specification we look at, Kim and Roubini, we see that $b_{34}$and b_{35} are both negative and significant. So with this implies that the central bank will decrease STIR in response to an increase in M1 and ER. While not statistically significant, when WOP increases we have an increase in STIR. We would have expected b_{36} to be negative, but it is not an issue since Mexico is an oil exporting country. That is, since a positive WOP shock does not necessarily lead to an increase in inflation. In line with economic theory, we see that both b_{16} and b_{26} are both negative.

In the second specification we, see that none of the estimates are significant for the STIR equation. We see that both increases in IPI and CPI lead to an increase in the STIR since both b_{31}

and b_{32} are positive. Since b_{36} is negative, this means that the central bank will pull back the STIR when WOP increases. As mentioned before when WOP increases, historically, so has inflation.

The other variable that is interesting to investigate is b_{41}, in theory we expect that an increase in STIR would decrease M1. However, after glancing at our results we see that only specifications two and four have this present. While the estimate is significant, specifications one and three have it so that M1 increases due to an increase in STIR. Like mentioned before, the main reason for the usage of the SVAR is to analyze the impulse response function and not to interpret the results for the coefficients.

Impulse Response Function

In this section we will discuss our impulse response functions (IRFs). The dotted orange lines in the figures about to be presented represent the 95% confidence interval. The responses are over an 80 month period and are due to a one standard deviation of the shock.

Specification I: Kim and Roubini

Responses to a Positive IPI Shock

We see that from a positive IPI shock (see Figure 3), there is an increase in inflation for the first period and for the second to fifth period, it is positive before bouncing off from periods 5 till 8. After about 12 periods CPI returns to pre-shock levels. However, these changes are not statistically significant. There is also an increase in STIR for about 6 periods before it turns negative where it converges to pre-shocks levels after about 40 periods. The positive IPI shocks sends M1 negative for about 8 periods and after it turns positive for about 30 periods before it starts heading to pre-shock levels. Similarly, ER has downward pressure for about 2 periods before turning positive for period 3 and then returning to negative for 18 periods. Then it heads towards pre-shocks levels for the next 40 periods.

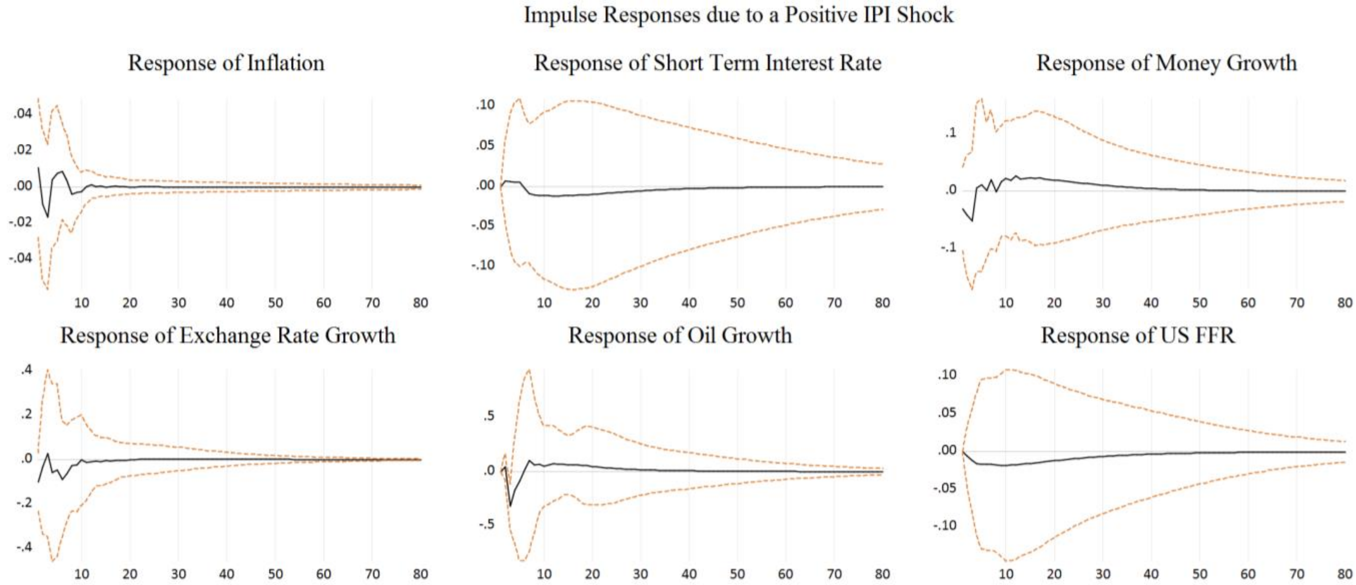

Figure 3. IRFs due to a positive IPI shock.

Responses to a Positive CPI Shock

From Figure 4 we see that there is a significant downwards pressure to IPI for about 3 periods. Moreover, there is downwards pressure to M1 and after 70 periods it returns to pre-shock levels. Also, we see that there is an increases in WOP that is significant for the initial 3 periods. Also, we see that there is a positive increase in ER for about 22 periods before it returns to pre-shock levels.

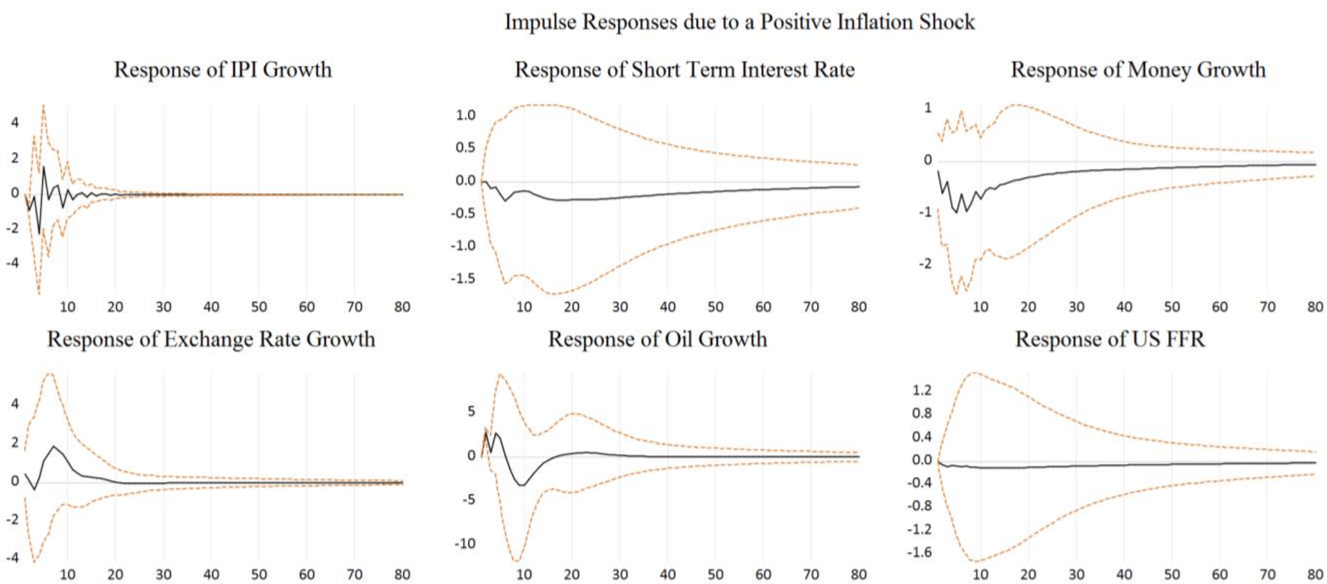

Figure 4. IRFs due to a positive CPI shock.

Responses to a Positive STIR Shock

We expect that after an increase in STIR, we expect that IPI, CPI, and M1 all will decrease. After a positive STIR shock (see Figure 5) we see an increase in increase in CPI, which is significant from periods 13 to 18 (prize puzzle). Even after 80 periods this response does not return to pre-shock levels. There is also a significant downwards pressure to IPI for the first 3 periods and it is only after 20 periods that it returns to pre-shock levels. There is a significant increase in M1 for the first 15 periods and the positive pressure still persist even after 80 periods. Moreover, we see a similar trend in the response of ER. There is upward pressure that is significant for about 8 periods and only after 25 periods does it return to pre-shock levels. Lastly, we see that there is a downwards pressure on WOP that is significant for about 5 periods. Only after 20 periods does it return to pre-shock levels.

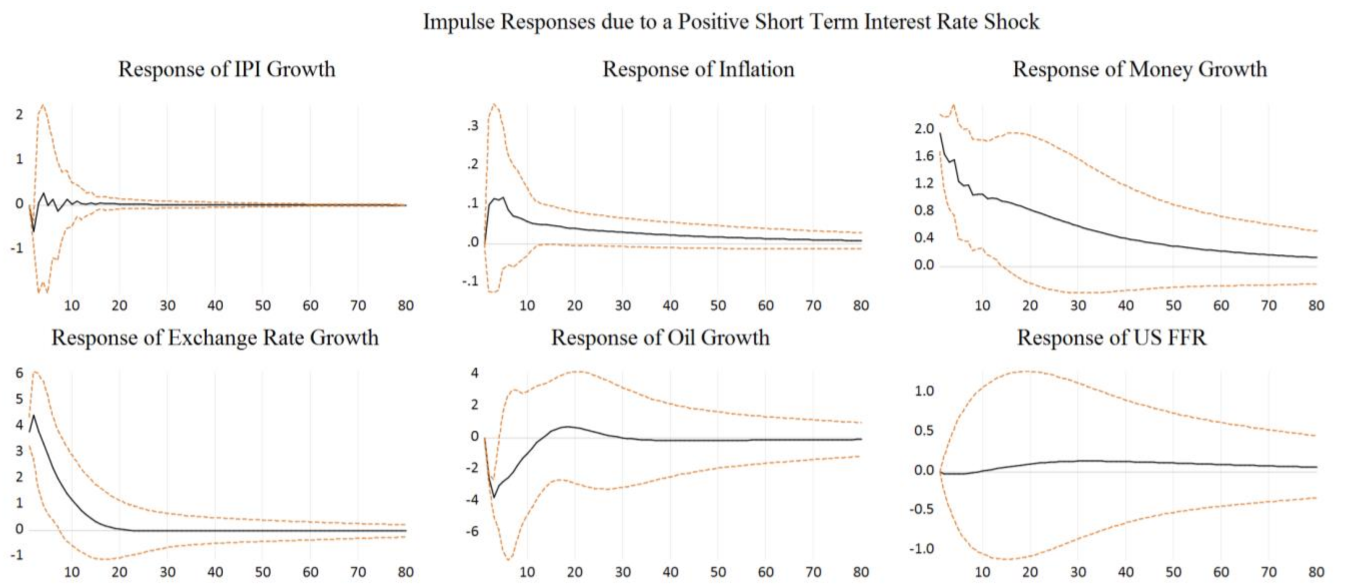

Figure 5. IRFs due to a positive STIR shock.

Responses to a Positive M1 Shock

A positive M1 shock leads, see Figure 6, to a short significant increase in IPI for about 3 periods. This is expected but the response is short-lived and after 9 periods, the response returns to pre-shock levels. In line with economic theory, we see that there is a decrease in STIR, which is significant for about 9 periods. It remains negative and even after 80 periods it doesn’t return to pre-shock levels. We also see that there is a significant downwards pressure of ER in the initial 9 periods.

This pressure persist for about 20 periods before it returns to pre-shock levels. There is a significant upwards pressure to WOP for about 10 periods.

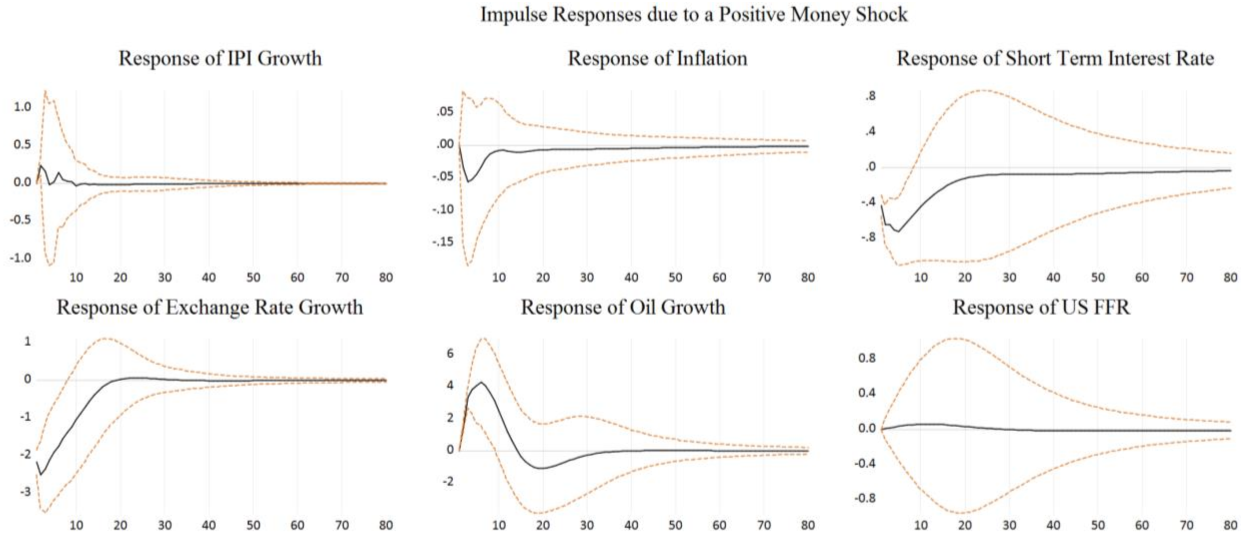

Figure 6. IRFs due to a positive M1 shock.

Responses to a Positive ER Shock

A positive ER shock is equivalent to the home currency depreciating. In Figure 7, we see that a positive ER shock leads to a significant downwards pressure for the first 3 periods of IPI. The ER shock leads to a negative pressure to STIR, which is significant for the first 10 periods and after it remains negative for the 80 periods, without returning to pre-shock levels. It also pushes WOP significantly for the first 3 periods. It returns to pre-shock levels after 34 periods.

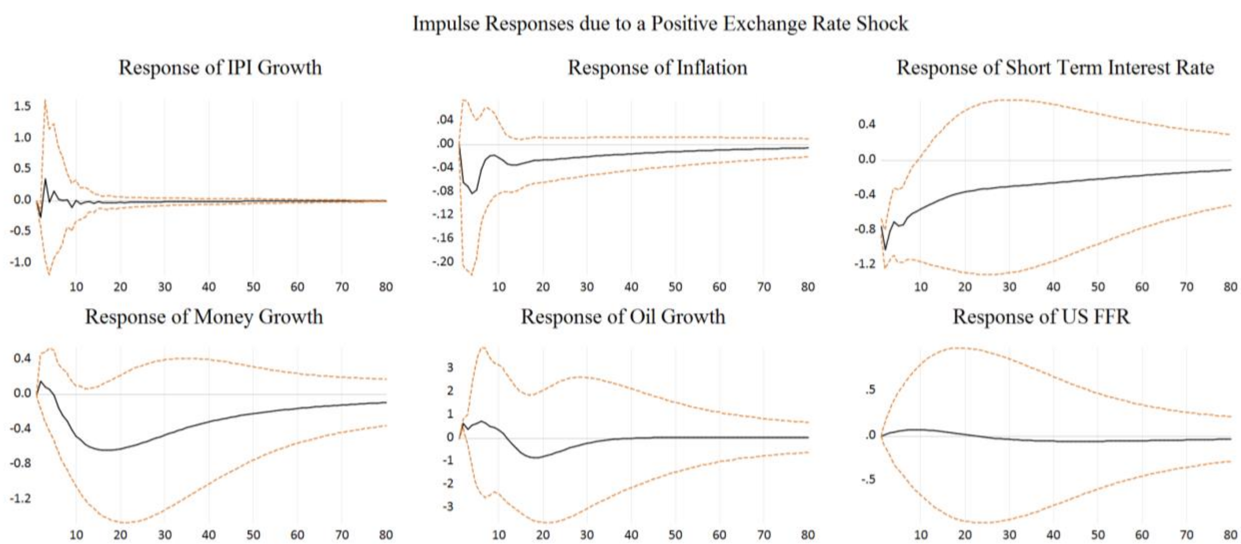

Figure 7. IRFs due to a positive ER shock.

Responses to a Positive WOP Shock

In Figure 8, we see the responses to a positive WOP shock. There is no change initially, but after 2 periods it increases for 5 periods and then decreases from periods 5 to 9. It returns to pre-shock levels after 14 periods. After an initial decrease in CPI, it increases for about 7 periods and from periods 8 to 14 it is negative before returning to pre-shock levels. The impact of these variables are negligible and not statistically significant. There is significant downwards pressure on M1 for about 6 periods. This persist for about 23 periods before returning to pre-shock levels. Similarly, there is a negative push on ER that is significant for about 8 periods and it persist for about 18 periods before it returns to pre-shock levels.

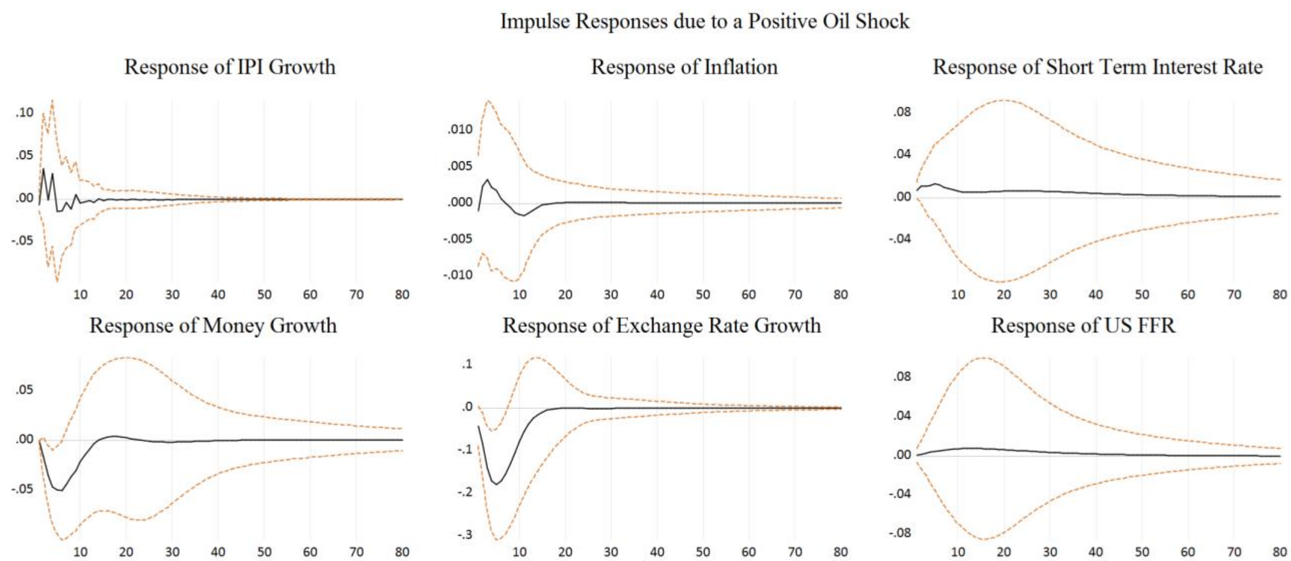

Figure 8. IRFs due to a positive WOP shock.

Responses to a Positive FFR Shock

Following a positive shock from FFR, refer to Figure 9, we see that there is increase in IPI that is significant for about 3 periods. This is in contrast to what we would expect since if FFR increases it would lower investments in the US and thus lowering investments would lead to less capital to be borrowed for foreign investments. Inflation moves in the direction the theory predicts but it is not significant. We see that there is also downwards pressure on ER that persist for about 30 periods before returning to pre-shock levels. Hence, the exchange rate puzzle is not present.

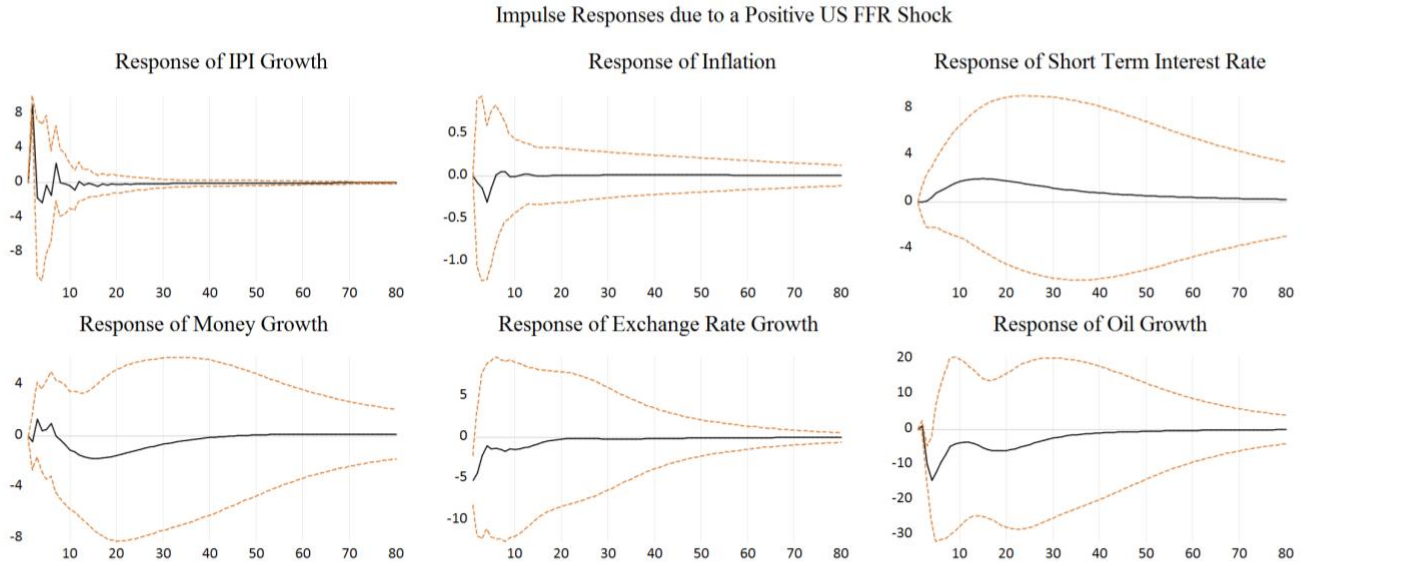

Figure 9. IRFs due to a positive FFR shock.

Specification II: Taylor Rule like $b_{34} = b_{35} = 0$

Since the models are similar, we will see a lot of the IRFs are similar. We will still present them in this paper but we will only discuss the ones where there are changes from what has been discussed or if there are noteworthy results.

Responses to a Positive IPI Shock

Refer to Figure 10 for the IRFs. The responses are similar to what was discussed in the first specification.

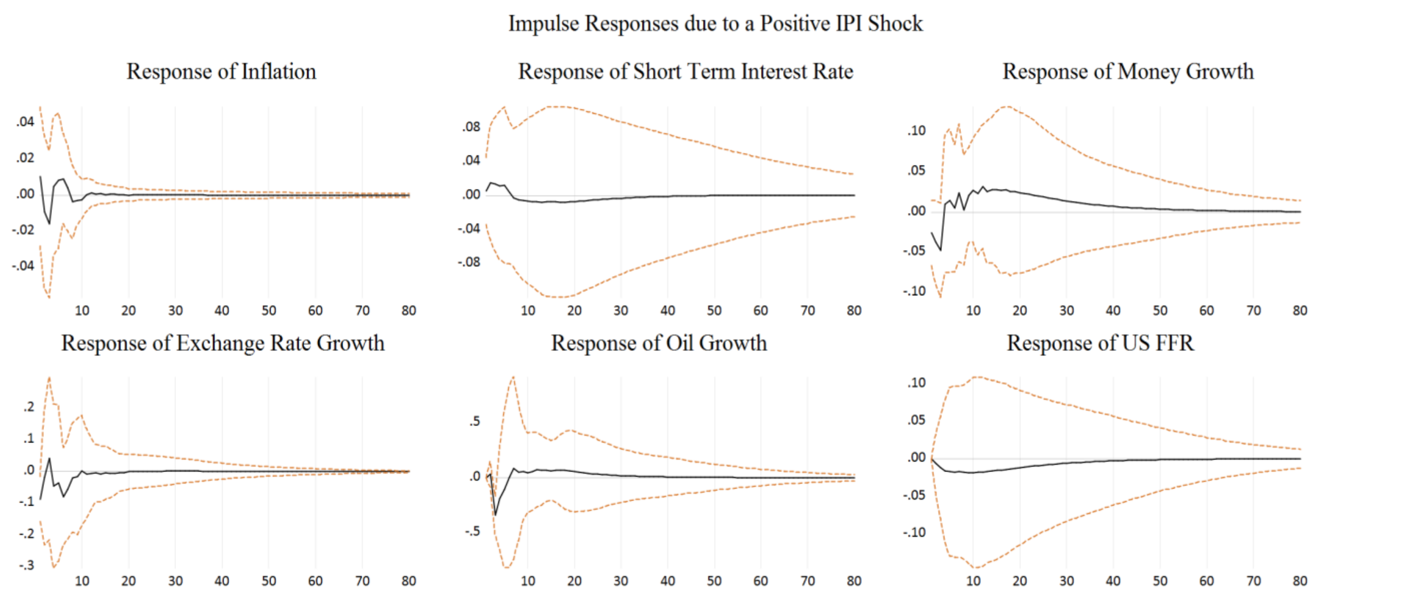

Figure 10. IRFs due to a positive IPI shock.

Responses to a Positive CPI Shock

The responses of IPI and WOP are very similar. The response of ER is similar but this time it remain positive through the entirety of the first 20 periods before returning to pre-shock levels. See Figure 11. This time we see that there is an initial positive pressure of STIR before it returns to being negative even after 80 periods. Similarly, there is negative response to M1 that persist for about 70 periods. This is what the economic theory predicts, however these results are not significant. As before, there only two significant results are the initial phase of IPI and WOP.

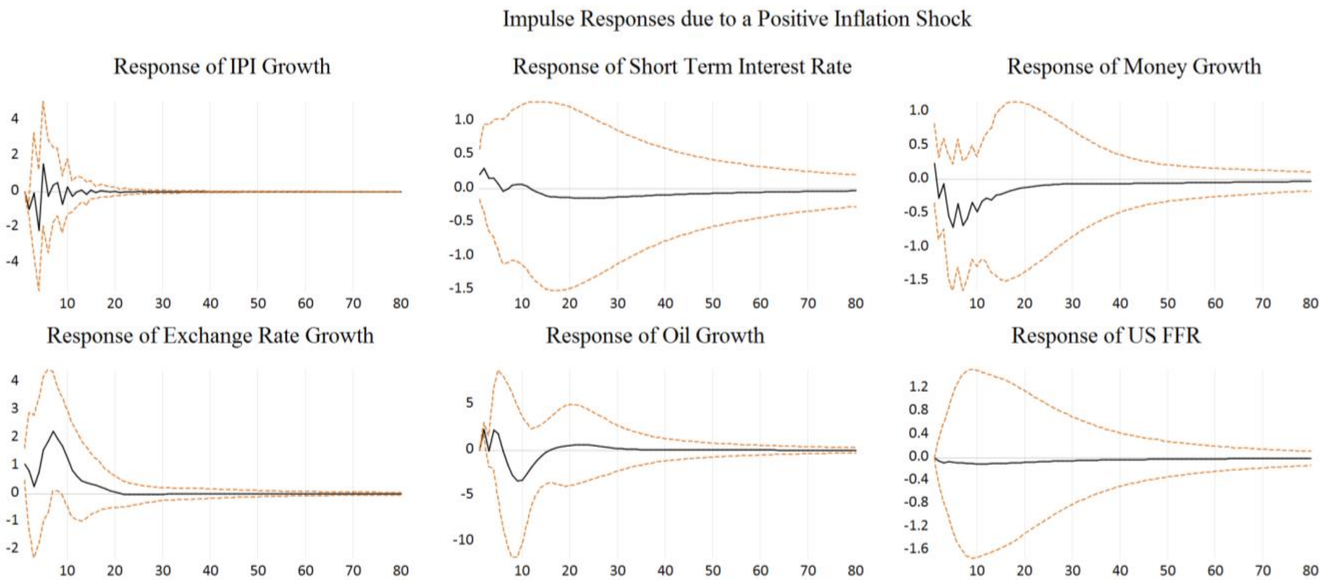

Figure 11. IRFs due to a positive CPI shock.

Responses to a Positive STIR Shock

While the trend of IPI is the same as before, now it is not statistically significant (see Figure 12). Similarly, we see an increase is CPI, which is not what we expect in the theory (prize puzzle). However, unlike last time this is not statistically significant for any period. Like before we see the response of ER is positive and significant for the first 3 periods and then it returns to pre-shock levels after 18 periods. The response of WOP is similar to before and it is significant for about 6 periods. The biggest change from what we have discussed before is the response of M1. This time there is negative pressure downwards that persist for 7 periods. After it has upward pressure that persist even after 80 periods. The increase is significant from periods 11 to 18.

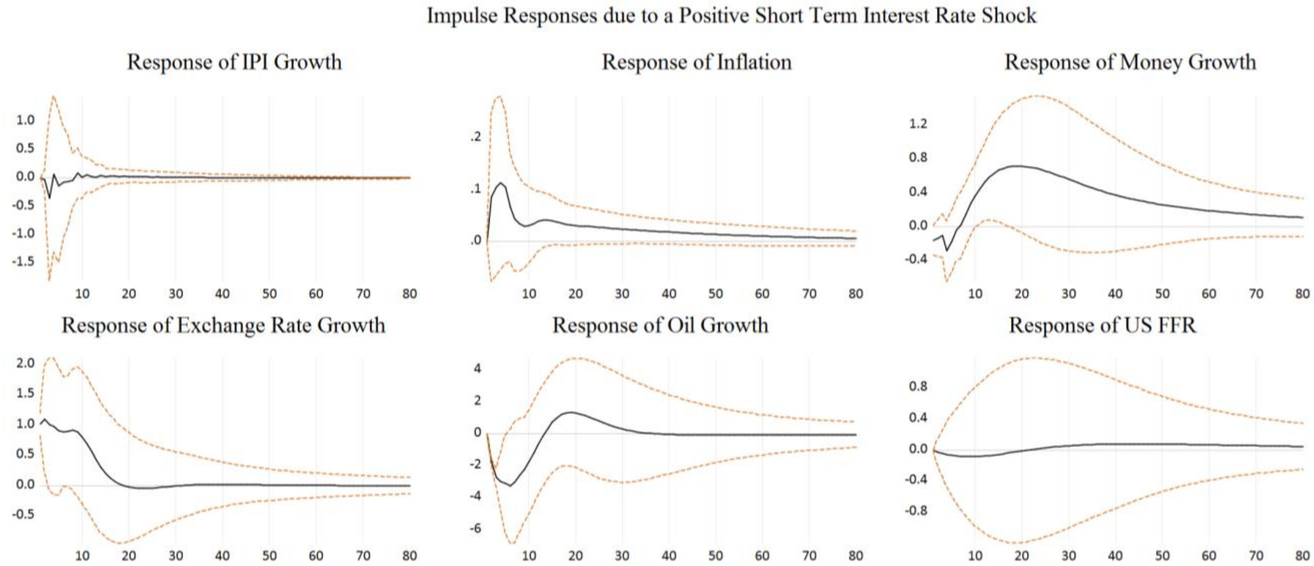

Figure 12. IRFs due to a positive STIR shock.

Responses to a Positive M1 Shock

Now we see the effect of a positive M1 shock (see Figure 13). Initially it puts negative pressure to IPI that is significant for about 3 periods. It has upwards pressure from periods 4 to 12 and it returns to pre-shock levels thereafter. We see that there is a positive response of CPI that persist for about 40 periods before returning to pre-shock levels. However, this response is not significant. The response of STIR shows that initially there is no response but after 3 periods there is pressure downwards for until about period 9 and then it turns to positive pressure that persist even after 80 periods. This time, this result is not significant. Lastly, we look at the ER. There is significant positive pressure upwards for the first 3 periods and then after period 9, it turns negative. After about 40 periods, it returns to pre-shock levels.

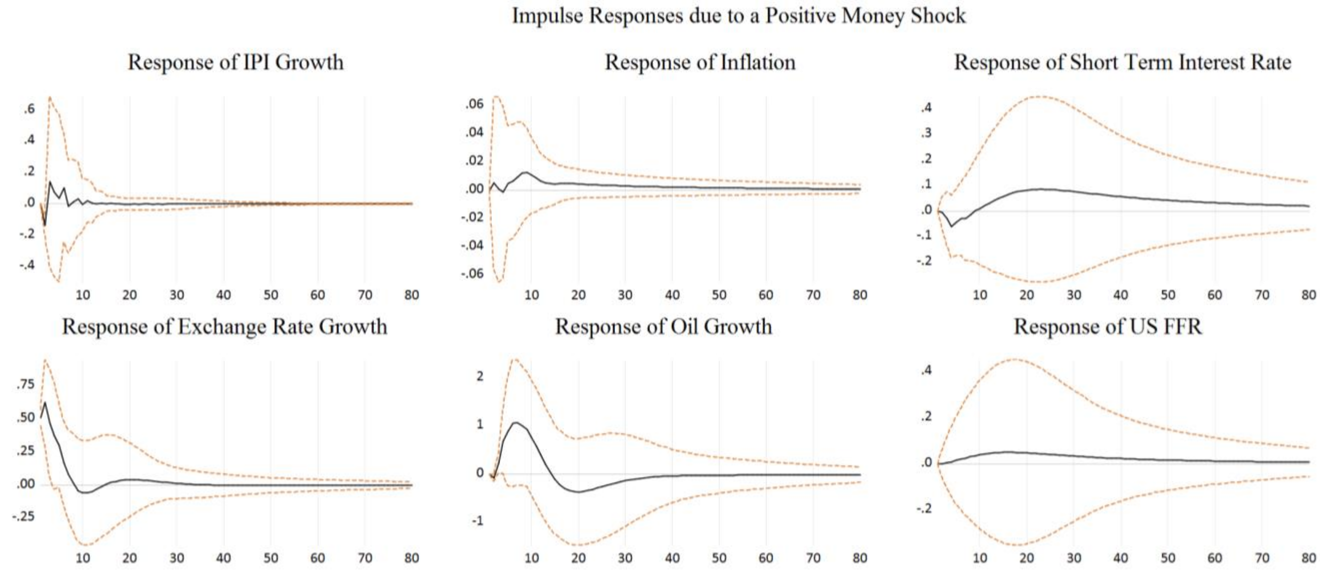

Figure 13. IRFs due to a positive M1 shock.

Responses to a Positive ER Shock

There is a positive pressure on STIR that stems from a positive ER shock (see Figure 14). This pressure is persistent for about 20 periods before returning to pre-shock levels. It is significant from only on period 5. There is significant pressure upwards of M1 for about 4 periods. IPI's initial increase in the first 3 periods is significant. After period 4, it decreases and this persist for about 60 periods, before returning to pre-shock levels.

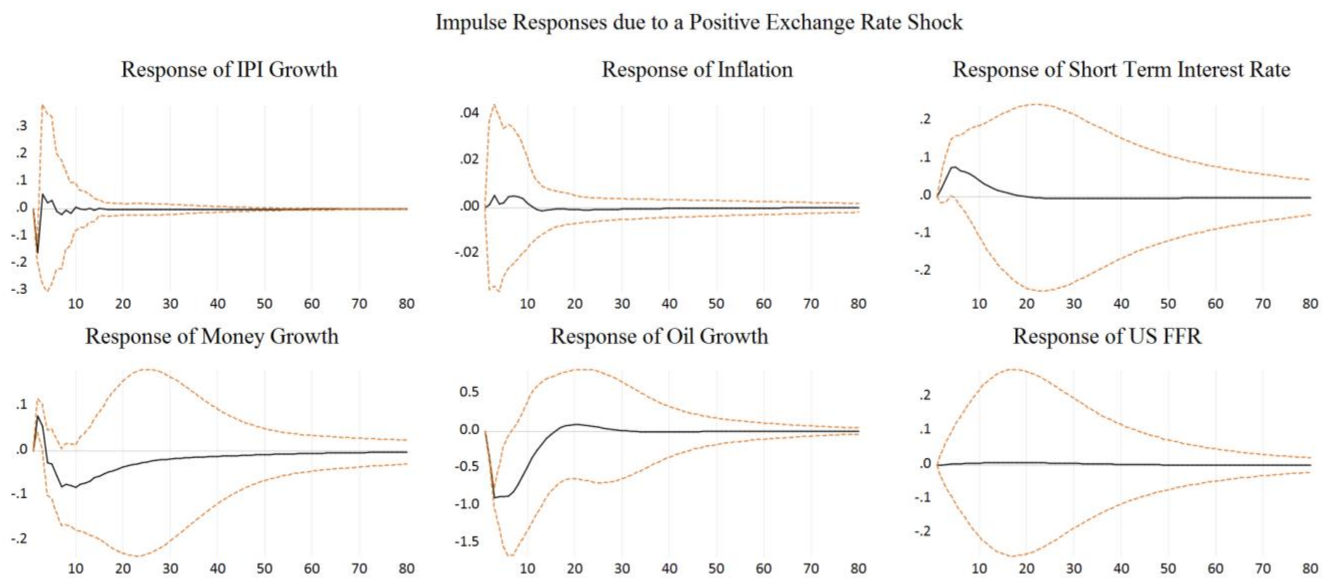

Figure 14. IRFs due to a positive ER shock.

Responses to a Positive WOP Shock

Refer to Figure 15. There is downwards pressure on M1 that is significant for the first 9 periods. This persist for about 58 periods, before returning to pre-shock levels. This time around the response of ER is significant for 10 periods but it has a response similar to the first specification. While the responses of IPI and CPI are not significant. Their responses are similar with the exception of CPI that initially is positive before having the similar trend to the first specification.

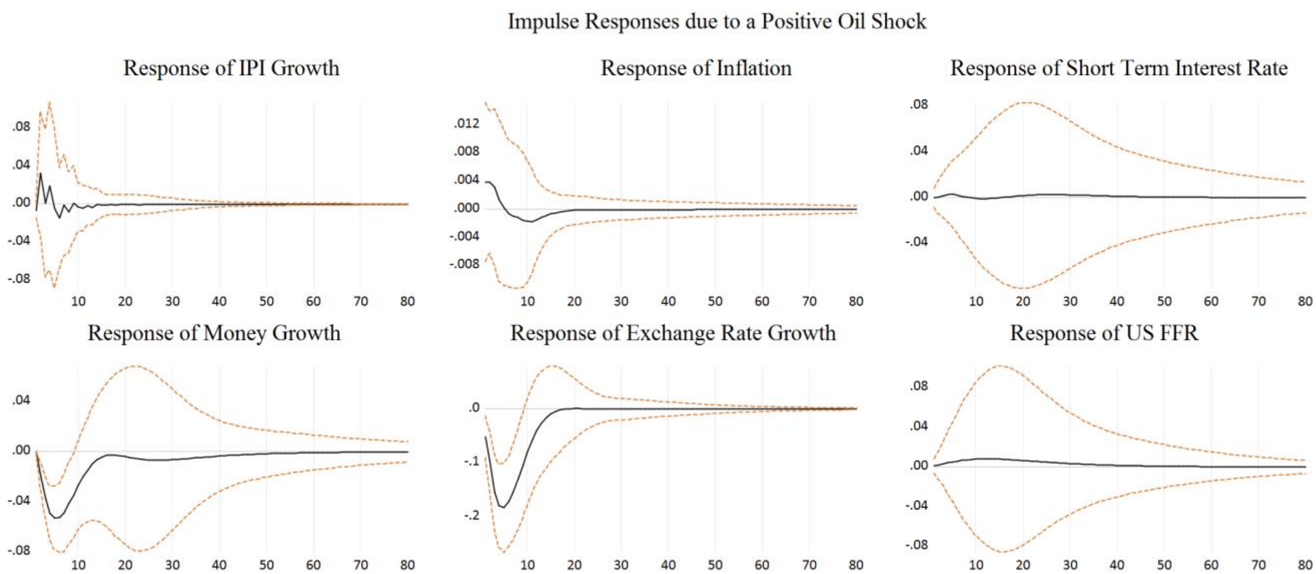

Figure 15. IRFs due to a positive WOP shock.

Responses to a Positive FFR Shock

Figure 16 presents the responses due to FFR shock. Looking at the response of ER, there is no exchange rate puzzle present. The responses to the domestic variables are similar to what we discussed in the first specification.

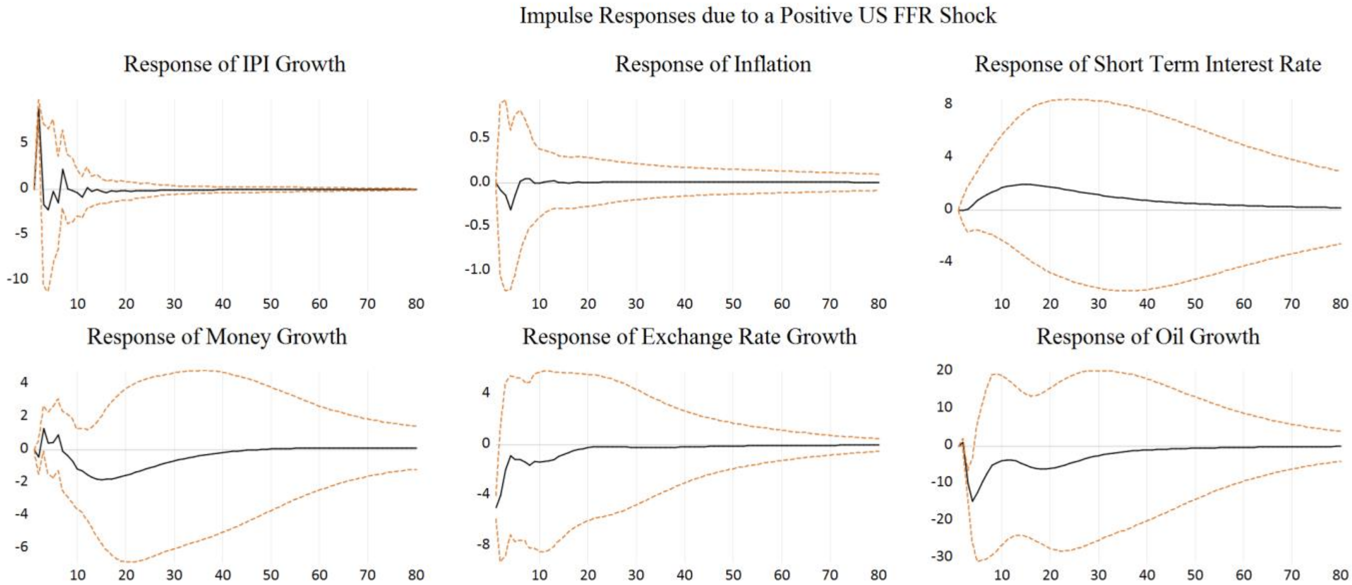

Figure 16. IRFs due to a positive FFR shock.

Specification III: Taylor Rule like with exchange rate $b_{34} = 0$

Responses to a Positive IPI Shock

Figure 17 shows the responses due to a positive IPI shock. The responses are very similar to what we had in the first and second specification.

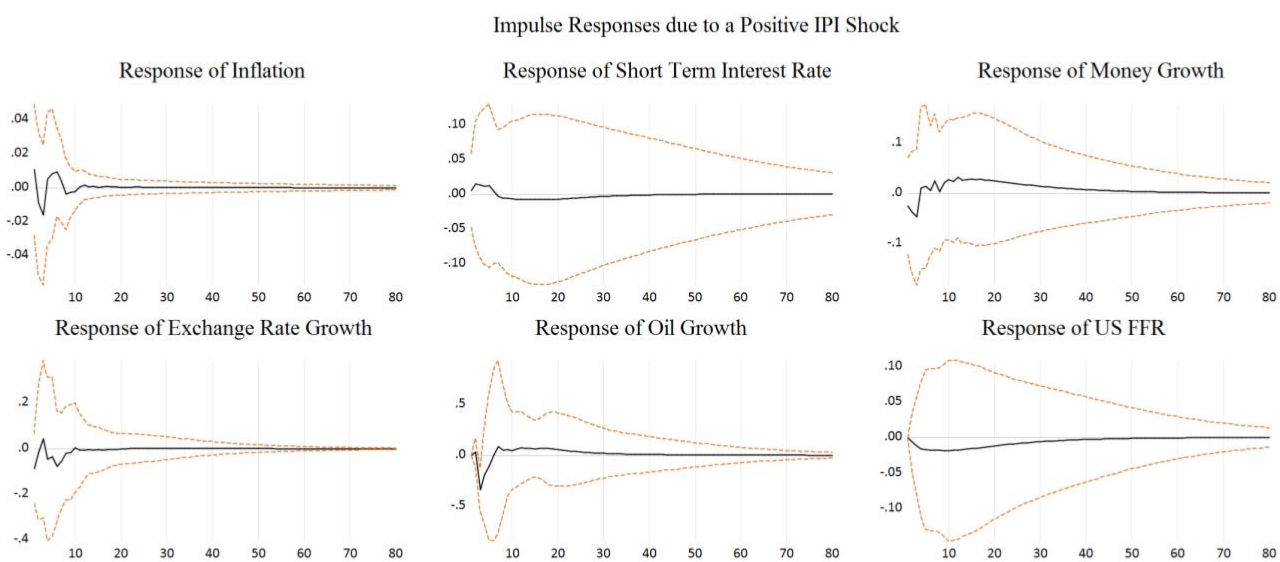

Figure 17. IRFs due to a positive IPI shock.

Responses to a Positive CPI Shock

The responses to positive CPI shock can be found in Figure 18. The IRFs are similar to those found in the second specification.

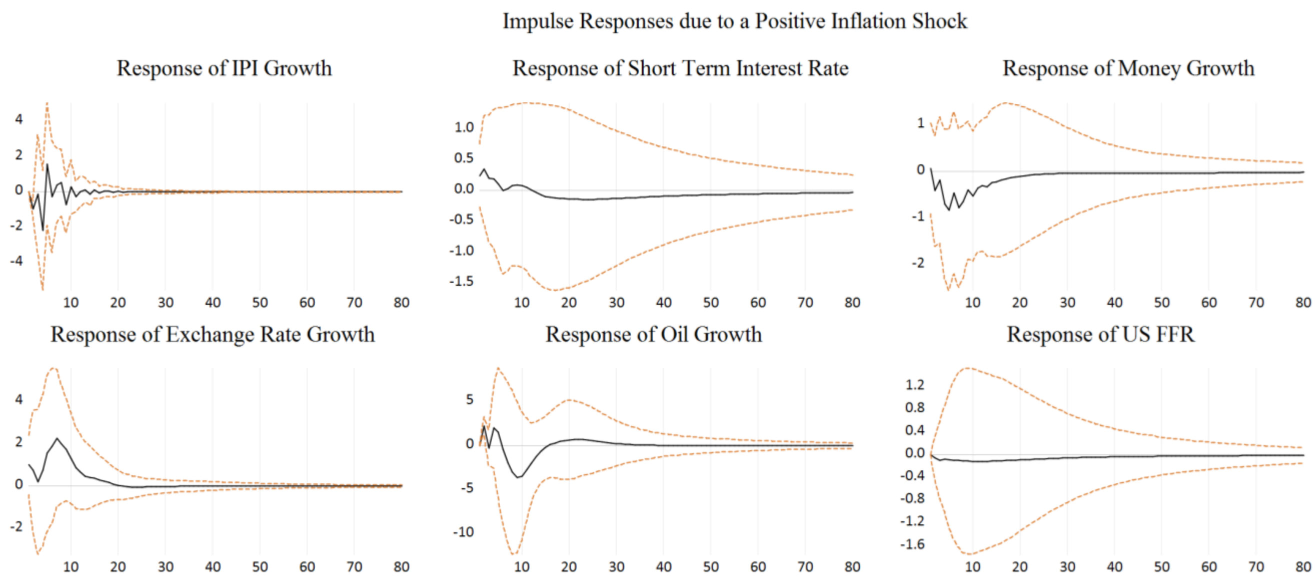

Figure 18. IRFs due to a positive CPI shock.

Responses to a Positive STIR Shock

The responses to positive STIR shocks can be found in Figure 19. The IRFs are similar to those found in the first specification.

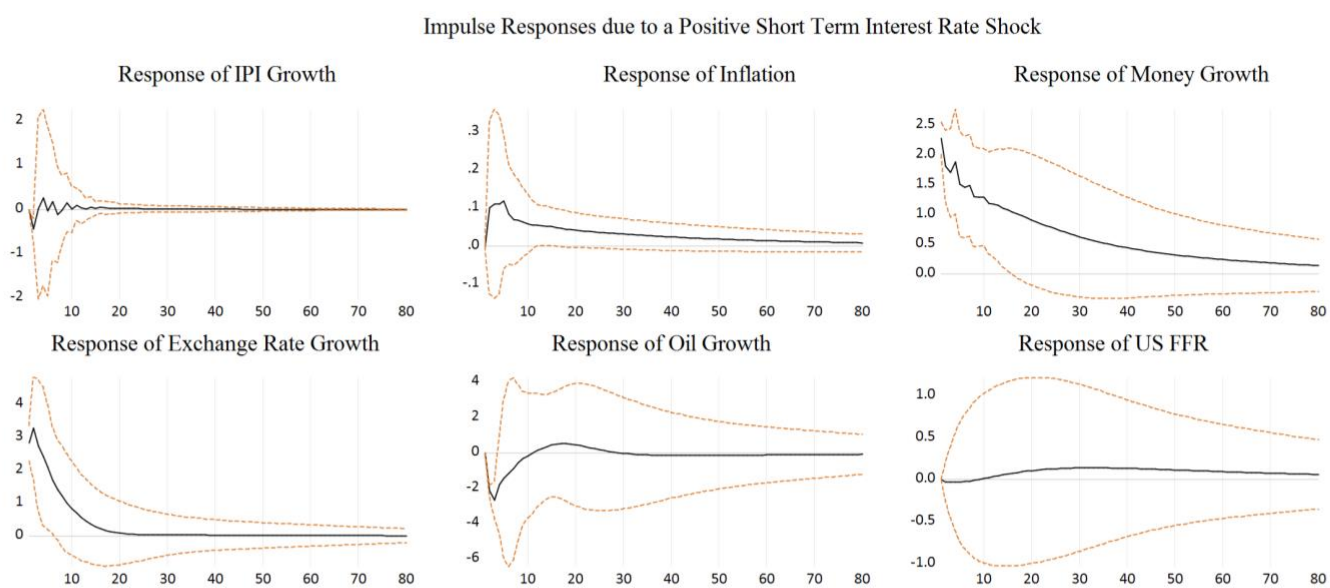

Figure 19. IRFs due to a positive STIR shock.

Responses to a Positive M1 Shock

See Figure 20 for the IRFs. The responses of IPI, WOP, and FFR are similar to those found in the first and second specification. The responses of CPI and STIR are similar to that in the second specification. The response of ER is similar to that of the first specification.

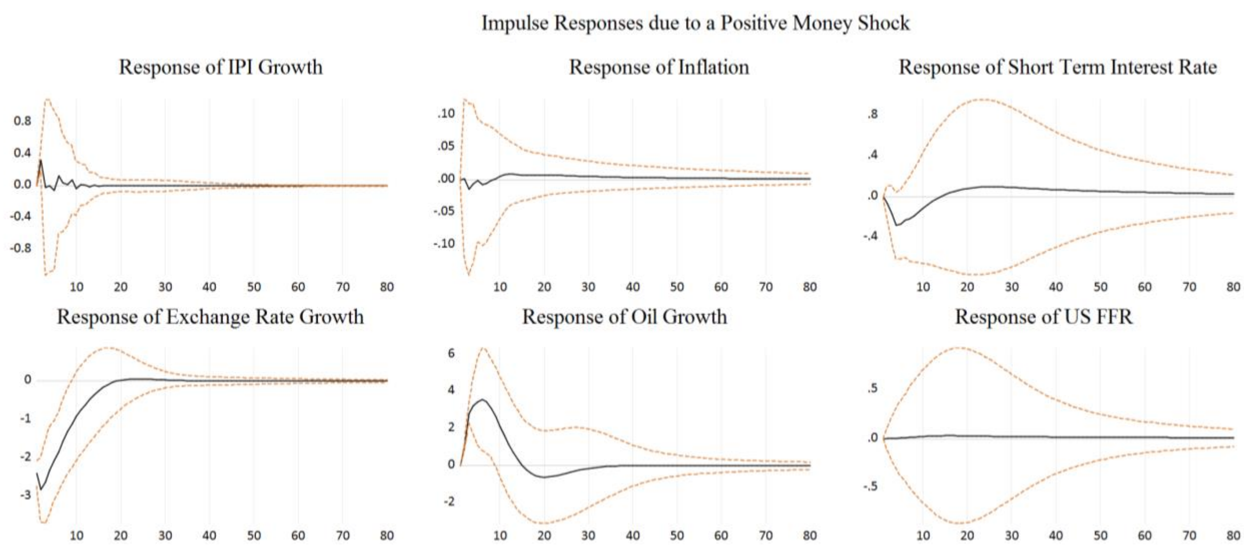

Figure 20. IRFs due to a positive M1 shock.

Responses to a Positive ER Shock

We see the effects of a positive ER shock in Figure 21. It shares a similar response of FFR, WOP to both the first and second specification. Moreover, the responses of IPI, CPI, STIR, and M1 are all similar to that found in the first specification.

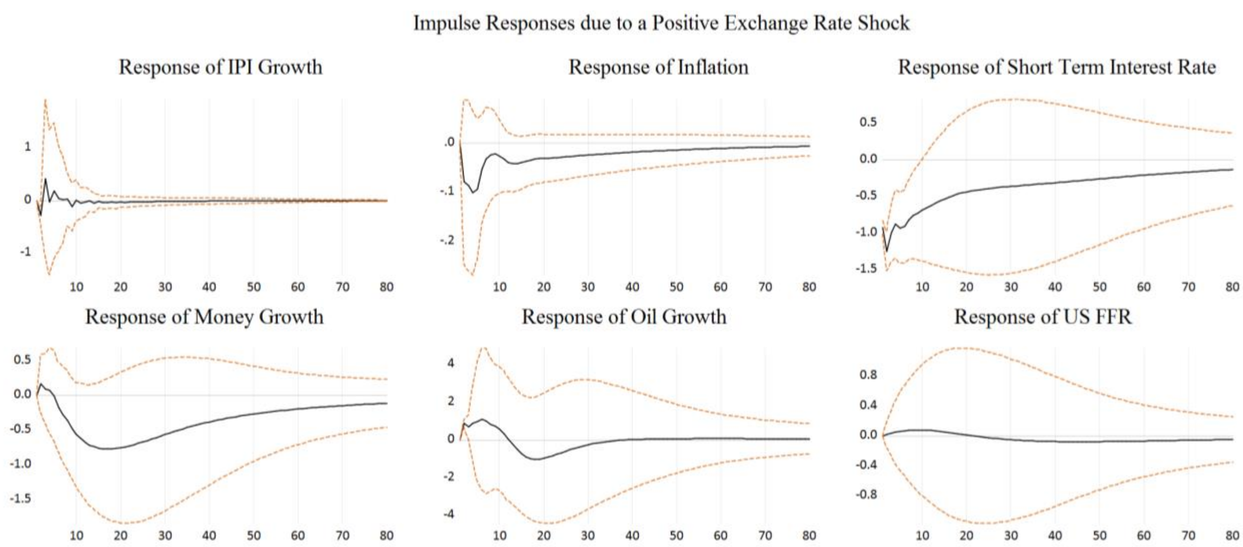

Figure 21. IRFs due to a positive ER shock.

Responses to a Positive WOP Shock

We see the effects of a positive ER shock in Figure 22. All the responses are similar to those found in the first specification.

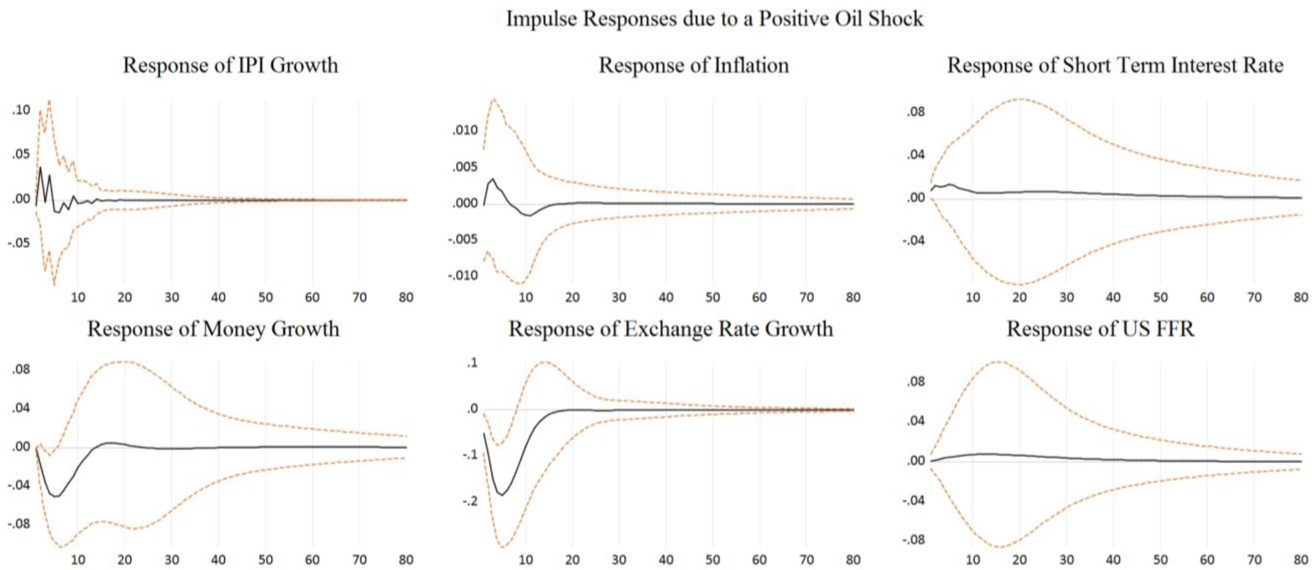

Figure 22. IRFs due to a positive WOP shock.

Responses to a Positive FFR Shock

Figure 23 has the responses due to a FFR shock. It shares the same IRFs are the first and second specification.

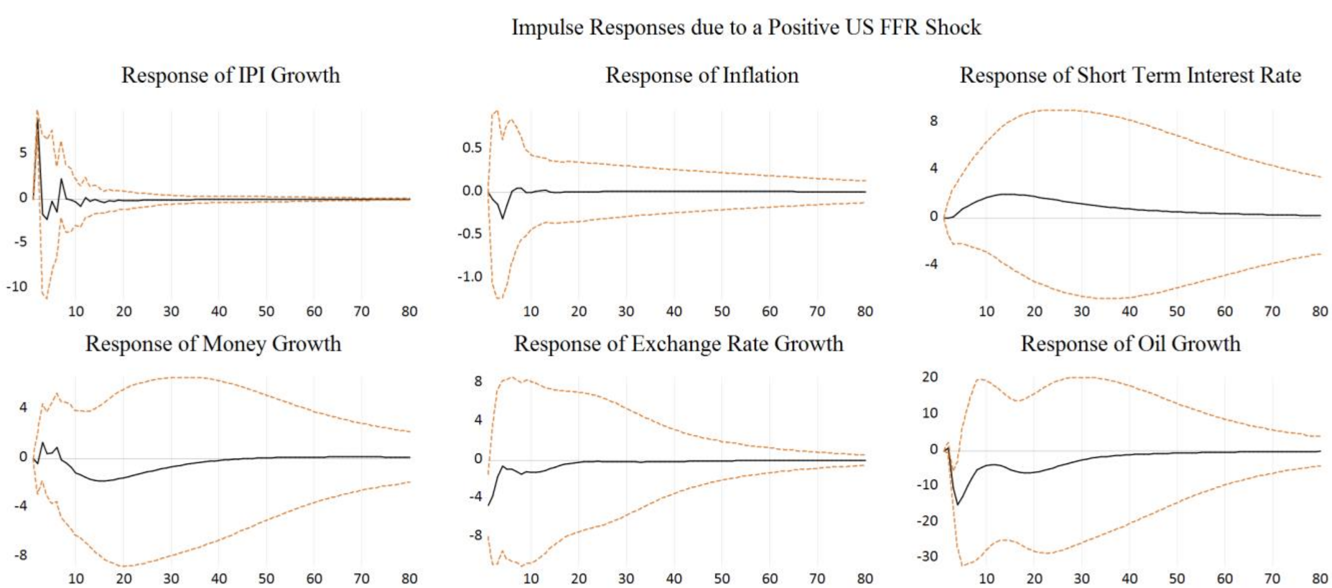

Figure 23. IRFs due to a positive FFR shock.

Specification IV: Taylor Rule like with exchange rate $b_{34} = b_{36} = 0$

The responses are similar to that found in the third specification. We present the two instance where it did not match third specification (or any of the other two specifications).

Responses to a Positive STIR Shock

Refer to Figure 24 for the IRFs. This is the first instance in which the ER has negative pressure that is significant in the first 5 periods and it persist for another 4 periods before it returns to pre-shock levels after 30 periods. The downward pressure to M1 in the first 9 periods is significant and it is in the direction of what we expected to move. Both the first and second specification had the movement in the opposite direction we would expect.

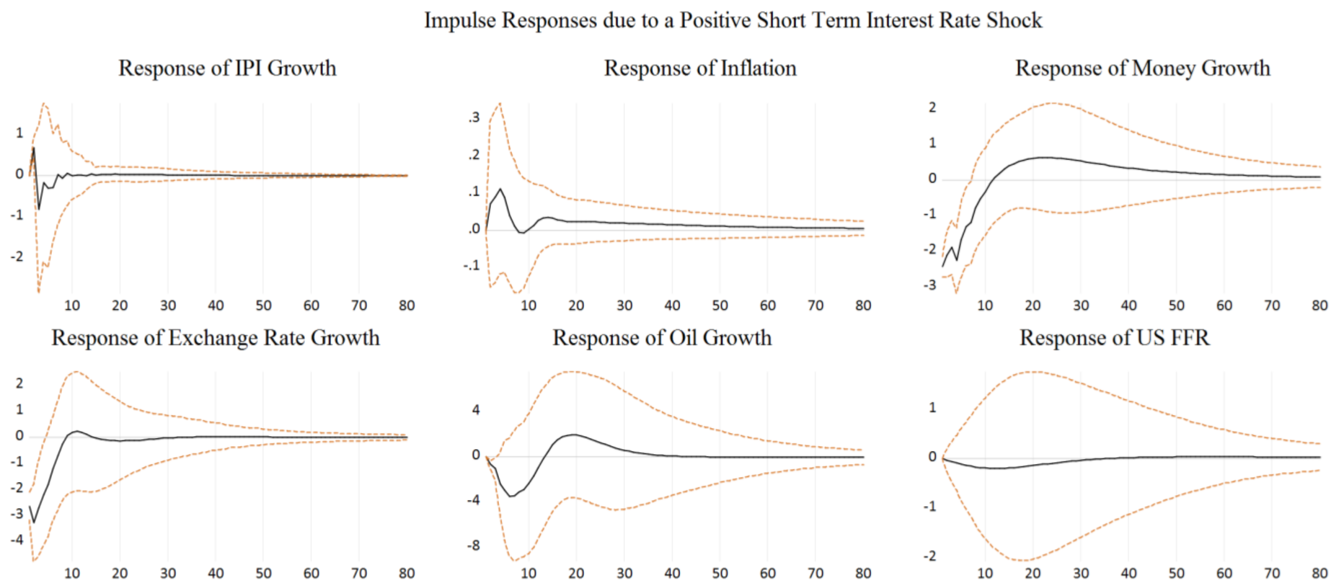

Figure 24. IRFs due to a positive STIR shock.

Responses to a Positive ER Shock

We can see the IRFs due to a positive ER shock in Figure 25. The responses are similar to the third specification with some exceptions. First, the response of STIR is positive, like on the second specification, but this time it is significant for the first 10 periods. This upwards pressure persist even after 80 periods. Unlike any of the previous specifications, M1 has no impact initially but after about 5 periods it starts having upward pressure that persist even after 80 periods. However, this is not significant.

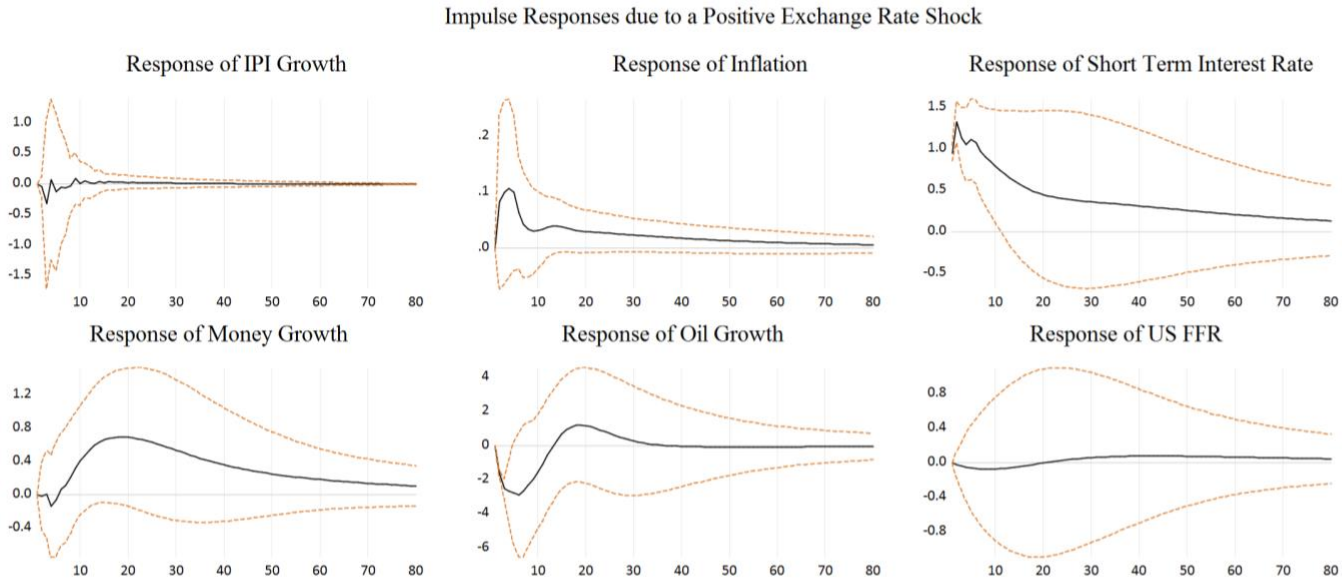

Figure 25. IRFs due to a positive ER shock.

Robustness

We have presented our IRFs for the different specifications. We will only focus on three responses: STIR, ER, and M1. First we would expect that if STIR increases then M1 would fall immediately. We would also expect an initial decrease in CPI and no change in IPI and after we might see that both CPI and IPI increase if the model is truly exogenous (Kim and Roubini 2000). Although the theory predicts that CPI should fall and that no real change should be present in IPI. Moreover, increases in M1 will lead to a decline in STIR. Only in the first, second, and third specification we have that IPI falls initially and then it increases. All four specification have that CPI doesn't respond initially but it increases shortly after. Only in the first and fourth specification do we see that M1 decreases initially. Lastly, we in the first, second, and third does ER increase initially. Now regarding shocks due to M1. Every specification has it that there is a decrease in STIR, as expected. Additionally, we see that IPI declines as theory would predict which was significant in every case initially. Lastly, we look at the shocks due to ER. Only in the second and third specification do we see STIR decrease. We also see that ER shocks lead to an increase of IPI, which is not what we expect. Overall most of the specification have aspects that we expect to see that matches the theory. So any of them would be appropriate in analyzing the Mexican economy. With that said, we would stick to second specification since it is the one that matches closely to how the central bank uses the Taylor Rule to set their rates.

Variance Decomposition

Variance decomposition is another tool we have to see the movements of variables over the impulse response function. It gives us a proportion of the variation in the variables that can be explain by the shocks. We will only report the second specification. Every specification gave us a similar variance decomposition. See Figure 26 and Table 6 for the breakdown of each of the variables. We start with the decomposition of IPI. We see that initially IPI explains 100% variation of IPI. However, after 5 periods moving forward, 89.59% of the variation is explain through FFR and about 8.36% is through CPI. For CPI, initially CPI explains 99.9% of its variation and by period 5, it only explains 85.3% whereas FFR explains about 9.15% of the variation in CPI. At 60 periods, the variation of CPI is broken as follows: 79.02% by CPI, 9.20% by FFR, 7.54% by STIR, and 4.09% by ER.

For STIR, the initial variation is explained mainly due to movements by itself followed by movements due to ER. The breakdown is as follows: 52.32% by STIR, 44.53% by ER, and 3.14% by CPI. By the period 10, the breakdown is: 35.64% by STIR, 35.11% by FFR, 25.12% by ER, and 1.15% by M1. When it reaches period 60, FFR explains about 66.83% of the variation of STIR. Moving to the decomposition of M1. Most of the variation is explain through the STIR at 83.93% during period 1 and by period 60, STIR explains only 40.66% of the variation of M1. At the 60 period mark, FFR explains about 38.31% of the variation while ER explain about 11.73% of the variation. Lastly, we look at the decomposition of ER. Initially we see that FFR explains about 58.35% of the variation in ER, STIR explains about 21.08%, M1 explains about 15.26%. By period 60, we see that FFR explains about 31.87%, STIR explains about 26.71%, M1 explains about 24.06%, and CPI explain about 13.87%.

Overall, we see that the domestic non-policy variables, IPI and CPI, are initially explained by foreign shock and in this instance only FFR. As time progresses, we see that for CPI, STIR plays a role in explaining the variation but much smaller than what CPI plays and FFR. FFR explaining much of the variation of the domestic non-policy variables makes sense if we look at how interlinked Mexico and the USA are. They are one of each other's biggest trading partner. As for the domestic policy variables, we see that STIR plays a big role in the variation of each of these variables. For similar reasons as the domestic non-policy variables, FFR plays a big role too in the variation of the domestic policy variables.

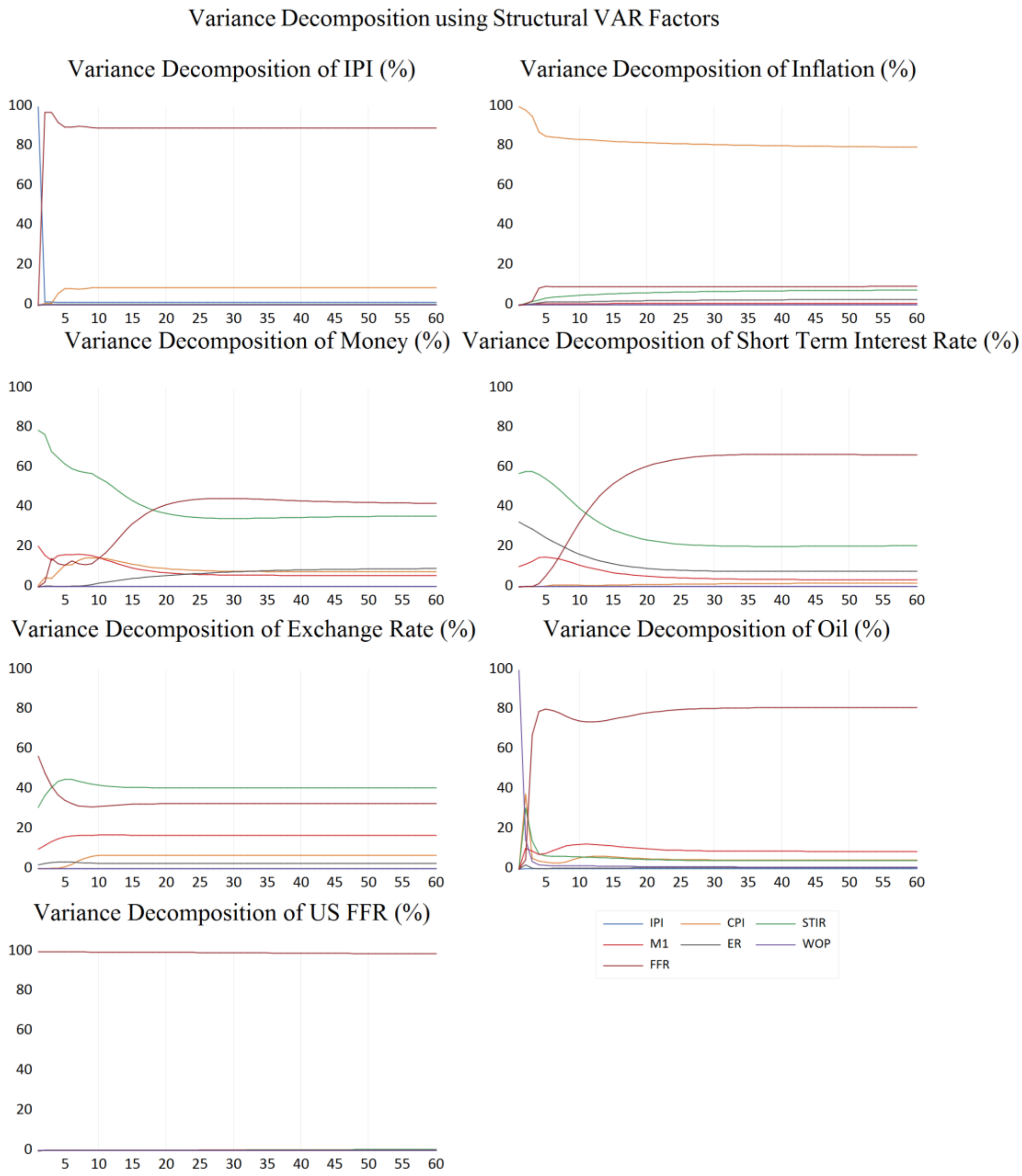

Figure 26. Variance Decompositon

Table 6. Variance Decompositon (%)

Period	IPI	CPI	STIR	M1	ER	WOP	FFR
Variance Decomposition of IPI							
1	100.00	0.00	0.00	0.00	0.00	0.00	0.00
5	1.35	8.36	0.28	0.11	0.30	0.00	89.59
10	1.31	8.70	0.32	0.13	0.29	0.00	89.24
20	1.30	8.71	0.34	0.13	0.30	0.00	89.22
40	1.29	8.70	0.34	0.13	0.30	0.00	89.24
60	1.29	8.69	0.34	0.13	0.30	0.00	89.24
Variance Decomposition of CPI							
1	0.00	100.00	0.00	0.00	0.00	0.00	0.00
5	0.00	86.32	3.42	0.00	2.35	0.01	7.90
10	0.01	84.19	5.16	0.00	2.68	0.00	7.96
20	0.01	82.72	6.12	0.01	3.07	0.00	8.08
40	0.01	80.05	7.05	0.02	4.01	0.00	8.87
60	0.01	79.02	7.54	0.02	4.09	0.00	9.20
Variance Decomposition of STIR							
1	0.00	3.14	52.32	0.00	44.53	0.00	0.00
5	0.01	2.13	51.01	1.45	39.07	0.01	6.32
10	0.00	0.96	36.64	1.16	26.12	0.00	35.11
20	0.00	0.51	22.11	0.51	14.32	0.00	62.53
40	0.00	0.60	19.72	0.47	11.66	0.00	67.55
60	0.00	0.63	20.27	0.48	11.79	0.00	66.83
Variance Decomposition of M1							
1	0.01	0.07	83.83	16.09	0.00	0.00	0.00
5	0.02	5.79	71.34	13.18	0.19	0.03	9.46
10	0.02	7.45	64.08	14.15	1.95	0.03	12.32
20	0.02	4.16	43.37	8.21	7.04	0.02	37.19
40	0.02	3.21	40.13	6.39	10.86	0.01	39.38
60	0.02	3.14	40.66	6.23	11.73	0.01	38.21

Period	IPI	CPI	STIR	M1	ER	WOP	FFR
Variance Decomposition of ER							
1	0.02	2.64	21.08	15.26	2.64	0.01	58.35
5	0.01	3.88	31.27	25.90	4.55	0.08	34.30
10	0.01	13.66	27.84	24.91	3.57	0.12	29.89
20	0.01	13.92	26.82	24.15	3.38	0.11	31.60
40	0.01	13.88	26.74	24.08	3.37	0.11	31.81
60	0.01	13.87	26.71	24.06	3.37	0.11	31.87
Variance Decomposition of WOP							
1	0.00	0.00	0.00	0.00	0.00	100.00	0.00
5	0.03	2.10	2.98	5.54	0.53	1.75	87.08
10	0.02	5.62	2.21	8.84	0.77	1.52	81.02
20	0.02	5.36	1.78	7.06	1.06	1.14	83.57
40	0.02	4.76	1.55	6.09	1.17	0.96	85.46
60	0.02	4.73	1.57	6.05	1.16	0.96	85.53
Variance Decomposition of FFR							
1	0.00	0.00	0.00	0.00	0.00	0.00	100.00
5	0.00	0.16	0.02	0.00	0.06	0.00	99.76
10	0.01	0.18	0.01	0.00	0.09	0.00	99.71
20	0.01	0.23	0.07	0.01	0.09	0.00	99.59
40	0.01	0.25	0.41	0.02	0.12	0.00	99.19
60	0.01	0.26	0.65	0.02	0.21	0.00	98.85

CHAPTER 6

CONCLUSION

In this paper, we tried to do the following. (i) Which policy instrument plays a significant role in explaining movement in the economic activities of Mexico? (ii) Do foreign monetary policy shocks affect the domestic variables? (iii) Does the inclusion of oil price resolve the problem of price puzzles, and how much do variations in oil price account for output and price fluctuations? (iv) Are any of the economic puzzled present? To that end, following the literature, we used a seven variable SVAR to analyze the movements of the macro variables of the Mexican economy using monthly data from January 1995 to April 2021.

Overall, we see that STIR plays a significant role in explaining the monetary policy transmission mechanism of Mexico. We found that foreign monetary policies had a big impact in explaining much of the variation of the domestic non-policy variables. In fact, we found that apart from the lesser contribution of STIR, the other variables explain little to none of the variation of IPI or CPI. FFR explained most of the variation of the domestic non-policy variable. Surprisingly, WOP had very little impact in explaining the variation of any of the domestic variables. In fact in the specification with a Taylor Rule like, we found that the shock due to STIR lead to an increase in inflation and it was significant for about 3 periods. So we were able to see the prize puzzle. We also saw that the ER increased initially which meant that the home currency had depreciated. However, no liquidity puzzle was found. In each of the specifications, we had the response of STIR due to a positive shock of M1 made it decreases initially. Lastly, we mentioned that in the past Mexico had an ER targeting policy. ER explained very little in the variation of the variables. Even in the Kim and Roubini framework where ER was used as a main driver for STIR. As a future project it would be interesting to see how these results compare to analyzing the Mexican economy using a small DSGE model.

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