The Direct and Indirect Effects of Fiscal Policy on Stock Market in Developing Countries: A SVAR Model

Carlos Chavez*

**Faculty of Economics Sciences, National University of San Marcos, Peru*

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Corresponding author:
carlos.chavez2@unmsm.edu.pe

Abstract

This study estimate the effects of Fiscal Policy on Stock Market using a Structural Vector Autoregressive with short-terms restricctions for Peru and Mexico in 2003q2 – 2018q2 and 1998q1 – 2018q2 periods respectively and we add a dummy variable for control the finincial crisis period. The results show that Fiscal Policy have positive impact on Stock Market in both countries with directs and indirect effects. Fiscal Policy affects the Monetary Policy for Mexico. And Monetary Policy haven't direct effects on stock market in both countries.

Keywords: Stock Market, Fiscal Policy, Monetary Policy, SVAR, Developing Countries.

JEL Code Classification: C58, C32, E44, G18.

1. Introduction

In the 90's, due to the Washington Consensus, there were processes of liberalization of emerging economies, which include Latin American countries. This liberalization of the economy allowed foreign investments to reach countries such as Peru and Mexico, causing increases in GDP per capita, lower volatility and lower long-term debt, Bekaert and Havery (2000). The liberalization processes have had booms in the financial system for the short term that stabilized in the long term, Kaminsky and Schmukler (2008). After the liberalization processes, the financial systems of Latin American countries began cooperation and integration processes, Heany et al. (2002), Lizarzuburu et al. (2015) and Romero-Meza et al. (2015).

It has also allowed economies to dollarize in different degrees, Carrera (2013). However, despite the progress thanks to liberalization, these markets are still very illiquid, small and unstable, Ananchotikul and Eichengreen (2008).

There is strong empirical evidence showing that there is a positive relationship between the financial system and economic growth. King and Levine (1993), Levine (1997), Levine (2002), Carp (2012), Hailemariam, A. (2014), De Gregorio and Guidotti (1995), Rajan and Zingales (1998), Ang and Mckibbin (2007) and Njikham (2017). There is a positive relationship between the stock market and the economic growth of Mexico, Castillo-Ponce et al. (2015). This market is cointegrated with the world capital market, López et al. (2015), and has become more efficient over the years, Santillán (2011). In Peru, the capital market has had positive impacts on the real economy, Lahura and Vega (2016).

The incipient development of capital markets, among other factors, in these emerging countries meant that institutions such as the Central Bank modified their policies. In the case of Peru, in 2007, it began publishing financial stability reports in order to report its policies to sustain financial stability, (BCRP, 2018), and likewise with Mexico (Banxico, 2017). Central governments followed policies in favor of the strengthening and development of financial markets, Corbo et al. (1999) and Mishkin and Savastano (2000).

As a result of which these markets became more important, for the year 2017, the share of the stock market in the GDP was 43.55% for Peru and 33.25% for Mexico with an upward trend that may lead to GDP growth, Ake (2010). However, as noted by Schmukler, et al. (2007), these markets are still underdeveloped. Thus, the objective of the research document is to estimate the effects of fiscal policy on stock market through direct and indirect mechanisms and if its important the fiscal policy on monetary policy using a SVAR model for short-term restrictions.

In what follows, the research document is developed as follows: In section 2 a review of the literature is carried out, section 3 details the variables and the methodology used, section 4 and 5 conclude the results of our research and in section 6 the conclusions are presented.

2. Literature Review

2.1 Monetary Policy on Stock Market

The development of capital markets in emerging countries leads to lower capital costs, therefore, greater investment and growth, controls the behavior of investors making it more efficient, attract foreign capital and allows an increase in IPO's, Dailami, M. and Atkin, M. (1990).

Institutions such as the Central Bank can impact the real economy and the stock market through its direct instruments (control of the bank interest rate, issuance of money, credit limits, minimum banking capital ratios or asset supply) and indirect (variable reserve ratio and open market operations), Karunasena (1999).

According to the neo-Keynesian theoretical framework, monetary policy has several transmission channels that impact the real and financial economy, Woodford (2003), Ravenna and Walsh (2006). One of its transmission channels is the interest rate. A monetary policy shock impacts the stock market through its short-term interest rate, through several channels that can be direct or indirect. The direct is through the cost of capital and cash flow, and indirect through the exchange rate and credit channel, Ireland (2006), Minshki (2001) and Iacovello (2005).

In the case of Peru and Mexico, after the financial reforms of the 1990s, the Central Bank set the sole objective of keeping inflation at a range of 2 to 3% on average, Chong (1999), Cartens and Wener (2000), Jeanneau and Tovar (2008) and Carriére-Swallow et al. (2016), its main financial instrument was the monetary issue that controls the monetary policy rate and influences the inter-bank interest rate but also used unconventional policies to deal with it. to the 2008-2009 financial crisis, García-Cicco and Kawamura (2014).

The empirical evidence on the impact of monetary policy on the stock market is abundant but varied. Thorbecke (1997) finds that there are positive impacts of the expansive monetary policy on the stock market. Ehrmann and Fratzscher (2004) find a negative relationship. Ioannadis and Kontonikas (2008) find significant monetary policy impacts in the stock market of 30 developed countries in the period 1972 - 2002.

In the case of the United States, Laopodis (2010) points out that there is a dynamic relationship between the monetary policy of the FED and the stock market of the United States, and also finds that these markets are much more sensitive to this policy when it goes down than when it goes to the rise. In the period that Alan Greenspan handled the Federal Reserve, monetary policy compensated for the increases in stock market values, Hayford and Malliaris (2002). Other studies indicate that there is a negative relationship between monetary policy and the stock market, Bernanke and Kutner (2005) and Bomfim (2003). Galí (2014) points out that an expansionary monetary policy may cause falls in the price of shares in the short term but after some periods ends up increasing.

The FED's policies not only impact its local capital market but also the capital markets of other countries worldwide, Wongswan (2005), Durham (2001), Borallo et al. (2017) and Hernandez (2017) and even to other sectors of other countries, Cachanosky (2015). And it has allowed the Latin American capital markets (Argentina, Brazil, Chile and Mexico) to integrate more, Larech and Sylwester (2008).

Lütkepohl and Netšunajev (2018) find that monetary policies contracted by the European Central Bank has caused falls in the prices of the stock market for the euro zone. Fernandez-Amador (2016) finds that an expansive monetary policy of the European Central Bank has caused greater liquidity in the stock market. Harvey et al. (2017) finds that there have been positive impacts of monetary policy in the stock market for 12 countries in Africa. Acuña and Pinto (2015) finds that monetary policy surprises of the Chilean Central Bank have not had an impact on the capital market. García-Herrero et al. (2015) find that the monetary policy of the Central Bank of Mexico when communicated has positive impacts on the stock market.

2.2 Fiscal Policy on Stock Market

The Ministry of Economy and Finance (Peru) and the Ministry of Economy (Mexico) are basically responsible for preparing and executing the fiscal policy of their respective countries, but with their differences in the organizational sense and functions, Allen et al. (2015). In the case of Peru, expansive fiscal policies have had a great impact on the economy due to its multiplier effect during the economic boom and were complemented by fiscal policy by developing the capital market. Vtyurina and Leal (2016), Rossini et al. (2012), Orrego and Vega (2013) and Mendoza (2008).

In a neo-Keynesian theoretical framework, fiscal policy affects output and inflation in a positive and small way but there is a crowding-out effect on investment and private consumption, D'Auria (2015), Kuhn et al. (2008) , Aksoy et al. (2011) and Loayza and Schmidt-Hebbel (2002), however, extending this theoretical framework, such as assuming that the economy is in ZLB, as is the case in European countries, fiscal spending has a much greater impact because the multiplier is greater, Christiano et al. (2011) because the contractive effect on the real interest rate disappears, Eggertson (2011). Therefore, given the assumptions of the neo-Keynesian models and their variations, we should expect that a fiscal policy shock affects the interest rate, damaging the stock market. Razin (1987) finds that transitory fiscal policies have a positive impact on the average performance of the shares.

Empirical evidence on the impact of fiscal policy on the stock market is not as abundant as monetary policy. Jakova et al (2016) finds that for Bulgaria and Slovakia, a public spending shock has negative effects on the stock market while a public revenue shock has positive effects but for other countries such as the Czech Republic, Poland and Hungary there is no a strict relationship. Tavares and Valkanov (2003) finds that a public expenditure shock has significant impacts on the bond market, but not on the stock market. Alfonso and Sousa (2011) find that public spending shocks have positive and persistent impacts on real estate prices but negative for the stock market. Agnello and Sousa (2010) finds that industrialized countries in the euro zone and the United States, a

shock of public spending has negative impacts on the price of shares and houses. Laopodis (2009) finds that past fiscal deficits have negative impacts on current stock returns.

In this review of the empirical evidence we find that fiscal policy has negative impacts on the stock market, however, if these were well applied they can generate more inclusive and efficient financial systems, Kunt (2008), although there are also ineffective tax policy designs for strengthen the stock market, Lin and Swansson (2008), Zeng et al. (2016) and Wang et al. (2017).

2.3 Both Fiscal and Monetary Policy on Stock Market

The central study of this research is to estimate the direct and indirect effects of fiscal policy in the stock market. but we are also interested in estimating the importance of the fiscal policy in monetary policy for the impact on the stock market. In this section, a review of the empirical evidence is made. Giannoulakis (2017), in a neo-Keynesian framework, puts fiscal and monetary policy rules, finding that an expansive monetary policy has temporary positive impacts on the economy and expansive fiscal policy has a positive impact on GDP but has negative effects on consumption and private investment. Leith and Von Hadden (2006) point out that the effectiveness of fiscal and monetary policy is subject to the level of optimal debt. Muscatelli et al. (2005) and Galí (2002) find that after a spending shock there are co-movements between private consumption and public spending. Hayo and Niehof (2014) finds that fiscal policy can have negative impacts on the stock market trying to prevent a stock market crisis, however, the combination of fiscal and monetary policies can be effective to reduce welfare damage. Furceri and Zdziencka (2009) find that fiscal policy has had a greater impact than monetary policy in mitigating the financial crisis. Chatziantoniou et al. (2013) finds that both fiscal and monetary policy have direct impacts on the UK stock market, while for the German and US markets, monetary policy has direct impacts on the stock market and The fiscal indirect impacts through the interest rate.

Fetai (2017) finds that expansive fiscal policies can cut the periods of financial crises. Thi Thanh et al (2017) find that the Vietnam stock market is correlated with the interaction between that country's monetary and fiscal policy. Isola Laval et al. (2018) finds that Nigeria's stock market is sensitive to changes in fiscal and monetary policy.

The impacts of both fiscal and monetary policy by individual and interacting are varied in the stock market. The database and methodology are described in the next section.

3. Database and Methodology

To estimate the impact of fiscal policy and monetary policy in developing countries, such as Peru and Mexico individually, we use the availability of data according to each

country, for Mexico we have 82 for the period 1998Q1 to 2018Q2, and, for Peru we have 62 observations for the period 2003Q1 to 2018Q2.

The variables that we will use are: Gross Domestic Product (GDP), Consumer Price Index (CPI). Government Expenditure (GOV)[1], which we will use as a fiscal policy proxy. The M1, as a proxy for monetary policy. The three-month interest rate (INT). the exchange rate of each country with respect to the dollar (ER). The stock market index (SMI) for each country and also the global economic activity index (GEA) prepared by Killian (2009). The Mexican variables have been extracted from FRED St. Louis and those from Peru from the Central Reserve Bank for Peru. To avoid problems of self-correlation, in the case of Peru we use the embig (country risk indicator for emerging countries). All variables are adjusted seasonally and converted to natural logarithm.[2]

Structural Vector Autoregressive Model

Our objective is to estimate how important is the fiscal policy and its interaction with variables that influence the stock market. For this we estimate a Structural Vector Autoregresive with an exogenous dummy variable. The endogenous variables are converted into a natural logarithm. The model is presented as follows:

$$A_0 Y_t = A_0 + \sum_{i=1}^{p} A_i Y_{t-i} + dummy + \epsilon_t \quad . \quad . \quad . \quad (1)$$

Where Y_t is the vector endogenous variables mentioned previously, and dummy is the exogenous dichotomous variable that tries to control the financial crisis period so it takes the value 1 for the period 2008Q1-2009Q4 and 0 the other periods. A_0 represents the matrix of contemporary variables, A_i epresents the matrix of autoregressive coefficients of the vector of endogenous variables, and ϵ_t is the component of structural disturbances.

Now, to get the reduced form we multiply the equation (1) multiply both sides by A_0^{-1} that takes the following form:

$$Y_t = a_0 + \sum_{i=1}^{p} \Phi_i Y_{t-i} + v_t \ldots \quad . \quad (2)$$

Where, $a_0 = \alpha_0 A_0^{-1}$, $\Phi_i = A_i A_0^{-1}$ y $v_t = \epsilon_t A_0^{-1}$

In the table 1 below the test-statistics of the unit root of the selected variables are shown.

[1] For Mexico, we use the final consumption of the government while for Peru the current expenditure of the government.

[2] In the case of Peru, interpolations are made for 3-month interest rates due to the lack of data in certain quarters.

Table 1. Testing Stationarity in Endogenous Variables

VARIABLES	At level					1ST DIFFERENCE			
	1% Critical Value	Augmented Dickey-Fuller Test Statistics		Phillips-Perron Test Statistics		Augmented Dickey-Fuller Test Statistics		Phillips-Perron Test Statistics	
		PERU	MEXICO	PERU	MEXICO	PERU	MEXICO	PERU	MEXICO
GDP	-3.54	-1.81	-0.36	-1.7	-0.05	-6.14	-5.41	-6.14	-5.03
CPI	-3.54	-0.48	-7.33	-0.01	-3.89	-5.95	-3.69	-6.03	-3.52
GOV	-3.54	-1.74	-0.02	-0.94	-0.12	-7.25	-7.57	-26.6	-7.57
M1	-3.54	-3.96	-1.55	-3.7	-2.19	-5.37	-6.15	-5.49	-6.12
INT	-3.54	-4.34	-2.36	-2.69	-1.79	-5.55	-4.83	-4.84	-4.9
ER	-3.54	-1.75	-0.82	-1.51	-0.77	-5.71	-8.44	-5.65	-8.47
EMBIG	-3.54	-3.17		-3.05		-6.60		-6.54	
SMI	-3.54	-2.64	-1.57	-2.97	-1.24	-5.01	-6.89	-4.94	-6.86
GEA	-3.54	-2.46		-2.68		-7.59		-8.91	

To test the unit root hypothesis, two statistical tests are used, Augmented Dickey-Fuller and Phillips-Perron. The results show us that there is presence of unitary root, and, therefore, there is no stationarity in the variables. Therefore, using the first difference in all the variables, we find that the unit root hypothesis is not accepted in all the variables in both tests, so we assume stationarity in all the variables. So we work with the first logarithmic differences of these variables.

Once we found stationarity in the variables, we present our matrix of short-term restrictions in the variables for the three countries.

Matrixes of Short Term Restrictions

Mexico

$$\begin{bmatrix} \varepsilon_{1,t}^{gds} \\ \varepsilon_{2,t}^{is} \\ \varepsilon_{3,t}^{ps} \\ \varepsilon_{4.t}^{pss} \\ \varepsilon_{5.t}^{mss} \\ \varepsilon_{6,t}^{tp} \\ \varepsilon_{7,t}^{mpt} \\ \varepsilon_{8,t}^{ss} \end{bmatrix} = \begin{bmatrix} \alpha_{11} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{21} & \alpha_{22} & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & 0 & 0 & 0 & 0 & 0 \\ 0 & \alpha_{42} & \alpha_{43} & \alpha_{44} & 0 & 0 & 0 & 0 \\ 0 & 0 & \alpha_{53} & \alpha_{54} & \alpha_{55} & 0 & 0 & 0 \\ \alpha_{61} & \alpha_{62} & \alpha_{63} & \alpha_{64} & \alpha_{65} & \alpha_{66} & 0 & 0 \\ \alpha_{71} & 0 & 0 & \alpha_{74} & \alpha_{75} & \alpha_{76} & \alpha_{77} & 0 \\ \alpha_{81} & \alpha_{82} & \alpha_{83} & \alpha_{84} & \alpha_{85} & \alpha_{86} & \alpha_{87} & \alpha_{88} \end{bmatrix} \begin{bmatrix} e_{1.t}^{gea} \\ e_{2.t}^{gdp} \\ e_{3.t}^{cpi} \\ e_{4,t}^{gov} \\ e_{5,t}^{mp} \\ e_{6,t}^{er} \\ e_{7,t}^{int} \\ e_{8,t}^{smi} \end{bmatrix}$$

Peru

$$\begin{bmatrix} \varepsilon_{1,t}^{gds} \\ \varepsilon_{2,t}^{is} \\ \varepsilon_{3,t}^{ps} \\ \varepsilon_{4.t}^{pss} \\ \varepsilon_{5.t}^{mss} \\ \varepsilon_{6,t}^{tp} \\ \varepsilon_{7,t}^{mpt} \\ \varepsilon_{8,t}^{rcs} \\ \varepsilon_{9,t}^{sms} \end{bmatrix} = \begin{bmatrix} \alpha_{11} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{21} & \alpha_{22} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \alpha_{42} & \alpha_{43} & \alpha_{44} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \alpha_{53} & \alpha_{54} & \alpha_{55} & 0 & 0 & 0 & 0 \\ \alpha_{61} & \alpha_{62} & \alpha_{63} & \alpha_{64} & \alpha_{65} & \alpha_{66} & 0 & 0 & 0 \\ \alpha_{71} & 0 & 0 & \alpha_{74} & \alpha_{75} & \alpha_{76} & \alpha_{77} & 0 & 0 \\ \alpha_{81} & \alpha_{82} & \alpha_{83} & 0 & 0 & \alpha_{86} & \alpha_{87} & \alpha_{88} & 0 \\ \alpha_{91} & \alpha_{92} & \alpha_{93} & \alpha_{94} & \alpha_{95} & \alpha_{96} & \alpha_{97} & \alpha_{98} & \alpha_{99} \end{bmatrix} \begin{bmatrix} e_{1.t}^{gea} \\ e_{2.t}^{gdp} \\ e_{3.t}^{cpi} \\ e_{4,t}^{gov} \\ e_{5,t}^{mp} \\ e_{6,t}^{er} \\ e_{7,t}^{int} \\ e_{7,t}^{embig} \\ e_{9,t}^{smi} \end{bmatrix}$$

Where $\varepsilon_{1,t}^{gd}$ is the global demand shock, $\varepsilon_{2,t}^{is}$ is the income shock, $\varepsilon_{3,t}^{ps}$ is the price shock, $\varepsilon_{4.t}^{pss}$ is the publick spend shock , $\varepsilon_{5.t}^{mss}$ is the monetary supply shock, $\varepsilon_{6,t}^{tp}$ is the exchange rate shock, $\varepsilon_{7,t}^{mpt}$ is the interest rate shock y $\varepsilon_{8,t}^{sms}$ is the stock market shock. For Peru case, add $\varepsilon_{8,t}^{rcs}$ that is risk country shock .

The restrictions can be interpreted as follows:

The global demand is only influenced contemporaneously with its own shock. Income is simultaneously influenced by the global demand shock and by its own shock, but it is not influenced contemporarily by the other variables. Inflation is influenced at the same time by the income shock, the global demand shock and the price shock. Fiscal policy is influenced at the same time by the price shock, the income shock and its own shock. Monetary policy is influenced at the same time by the price shock, the public expenditure shock and its own shock. The exchange rate is influenced at the same time by the global demand shock, income shock, price shock, spending shock, money supply shock and its own shock. (Surgent et al (2010), Di Mauro et al (2008), Di Giorgio (2016), Cakrani (2013), Miyamoto (2016)). The interest rate is influenced contemporarily by the global demand shock, Salami (2018), Bosworth (2014) and Odhiambo (2009), the public expenditure shock, Barro (1987), Mankiw (1987) and Hassan and Raja (2015), the money supply shock, the exchange rate, Belke, et al. (2004), Sanchez (2005) and by his own shock. In the case of Peru, the country risk shock is influenced contemporaneously by global demand, GDP, inflation, exchange rate and interest rate, Couset and Roy (1991), Palic et al. (2017) and Damodaran (2018). And finally, the stock market index is influenced by all the shocks. Once we found the stationarity of the variables and raised the short-term restrictions through our matrix of structural perturbations, we proceeded to identify the optimal size of lags of our VAR (p) through the likelihood ratio.

Table 2. Length Optimal Lag

	Likelihood Ratio	
Lag	**Perú**	**México**
0	NA	NA
1	153.42	178.96
2	100.52	91.23*
3	108.38*	70.26
4	79.71	81.40

* Optimal lag

Following Hatemi-J and Hacker (2009), we chose the LR test to choose the optimal lag when there are different orders among the other information criteria (see appendice) and because it allows us to find good results in the other tests.

As can be appreciated, the optimal lags for country found are Mexico (2) and Peru (3). Now we proceed to test auto serial correlation, for this we use the LM test.

Table 3. Test Lagrange Multiplier of Serial Correlation

Null hypothesis: No serial correlation at lag h						
	LRE* stat		**Df**		**Prob.**	
Lag	**Perú**	**México**	**Perú**	**México**	**Perú**	**México**
1	76.82	59.91	81	49	0.61	0.14
2	70.37	54.43	81	49	0.79	0.28
3	94.37	47.94	81	49	0.15	0.52
4	88.16	47.86	81	49	0.27	0.52

The table shows that the null hypothesis of no serial correlation is accepted in our models, that is, the perturbations of the model are not correlated.

Finally, to test the heteroscedasticity of the SVARs, we apply the White test

Table 4. White Heteroskedasticity Test

VAR Residual Heteroskedasticity Tests (Levels and Squares)

	Joint Test	
	Peru	**Mexico**
Chi-sq	2515.56	1190.77
Df	2475	1188
Prob.	0.28	0.47

The results show us that the null hypothesis of non-heterocedasticity is accepted, so that constant variances in errors are assumed.

In summary, in the case of Mexico, a VAR (2) and in the case of Peru, a VAR (3), without self-correlation or heterocedasticity.

4. Results for Model with Fiscal Policy

4.1 Estimation of Contemporary Coefficients

After reviewing the tests, we proceed with the estimations of the coefficients, in Table 07 the results of the SVAR for each country are shown:

Table 5. Results of Contemporary Effects with Fiscal Policy

	COUNTRIES	
COEFFICIENTS	**PERU**	**MEXICO**
α_{11}	3.80* [10.68] (0.00)	3.10* [12.57] (0.00)
α_{21}	0.00* [2.07] (0.04)	0.00 [1.59] (0.11)
α_{22}	-0.00 [-1.81] (0.07)	-0.00 [-0.00] (0.99)
α_{31}	-0.01 [-1.51] (0.13)	-0.00 [-0.78] (0.43)
α_{32}	0.02 [1.51] (0.13)	-0.01 [-1.18] (0.24)
α_{33}	-0.02 [-0.92] (0.36)	0.00 [0.11] (0.92)
α_{42}	0.02 [1.75] (0.08)	0.01* [12.51] (0.00)
α_{43}	0.01* [10.68] (0.00)	0.00 [1.57] (0.12)
α_{44}	0.00* [6.39] (0.00)	0.00* [2.81] (0.00)
α_{53}	0.00 [0.18] (0.86)	-0.00 [-0.23] (0.82)
α_{54}	-0.00 [-0.20] (0.84)	0.02* [3.31] (0.00)
α_{55}	0.00 [0.08]	0.00* [12.57]

	(0.94)	(0.00)
	-0.00	-0.00
α_{61}	[-0.09]	[-0.16]
	(0.93)	(0.87)
	0.00*	0.000
α_{62}	[10.67]	[0.18]
	(0.00)	(0.86)
	-0.01	0.01
α_{63}	[-0.83]	[1.33]
	(0.40)	(0.18)
	-0.00	-0.01
α_{64}	[-1.12]	[-1.58]
	(0.24)	(0.11)
	-0.00	0.01*
α_{65}	[-1.11]	[12.52]
	(0.27)	(0.00)
	0.02	0.00*
α_{66}	[1.34]	[2.63]
	(0.18)	(0.01)
	-0.01	0.00
α_{71}	[-0.86]	[0.03]
	(0.39)	(0.98)
	0.07*	-0.01
α_{74}	[10.67]	[-0.86]
	(0.00)	(0.39)
	-0.00	0.01
α_{75}	[-1.31]	[0.87]
	(0.19)	(0.39)
	0.00	0.01*
α_{76}	[0.578]	[12.56]
	(0.56)	(0.00)
	0.01	0.02*
α_{77}	[0.40]	[2.97]
	(0.69)	(0.00)
	-0.01	
α_{81}	[-0.82]	
	(0.41)	
	0.02*	
α_{82}	[10.67]	
	(0.00)	
	-0.00	
α_{83}	[-0.02]	
	(0.99)	
	-0.00	
α_{86}	[-0.04]	
	(0.97)	

	0.03	
α_{87}	[1.95]	
	(0.05)	
	0.03*	
α_{88}	[10.52]	
	(0.00)	
	0.02	-0.00
α_{91}	[1.24]	[-0.09]
	(0.22)	(0.93)
	0.02	-0.02*
α_{92}	[1.32]	[-3.07]
	(0.19)	(0.00)
	-0.03*	0.05*
α_{93}	[-2.26]	[12.52]
	(0.02)	(0.00)
	0.11*	0.03*
α_{94}	[10.51]	[3.25]
	(0.00)	(0.00)
	-0.01	-0.01
α_{95}	[-0.64]	[-1.44]
	(0.519)	(0.15)
	-0.02	0.07*
α_{96}	[-1.30]	[12.52]
	(0.19)	(0.00)
	0.12*	-0.03*
α_{97}	[10.67]	[-4.08]
	(0.00)	(0.00)
	-0.04*	
α_{98}	[-3.34]	
	(0.00)	
	0.09*	0.06*
α_{99}	[10.68]	[12.57]
	(0.00)	(0.00)

* Respresent significance
[] Represent t-statistics
() Reperesent p-value

In the case of Peru, we find that a global demand shock positively impacts the GDP. An income shock positively impacts the exchange rate and country risk. A price shock has a positive impact on fiscal policy and negatively on the stock market index. A public expenditure shock positively impacts the interbank interest rate and the stock market index. An interest rate shock positively impacts the stock market and a country risk shock negatively with the stock market index. On the other hand, a global and national income shock has a positive impact on the stock market, but it is not significant, whereas the

shock of monetary policy and exchange rate has a negative impact on the stock market but not significantly.

In the case of Mexico, an income shock has a positive impact on fiscal policy and a negative impact on the stock market index. A price shock has a positive impact on the stock market. or

A shock to public spending has positive impacts on monetary policy and the stock market index. A money supply shock positively impacts the exchange rate. An exchange rate shock positively impacts the interest rate and the stock market. An interest rate shock negatively impacts the stock market.

In summary, both for the case of Peru and Mexico, fiscal policy has positive impacts on the stock market index. In the case of Peru, as the fiscal policy also positively impacts the interest rate and this in turn positively impacts the stock market, we can say that there are both direct and indirect impacts. In the case of Mexico, fiscal policy impacts monetary policy positively, monetary policy in the same way at the exchange rate and the latter, positively in the stock market.

5. The Model without Fiscal Policy

In this section, what we will do is estimate the same model, but without the presence of fiscal policy, so the matrixes proposed will change:

Matrixes of Short Term Restrictions without Fiscal Policy

Mexico

$$\begin{bmatrix} \varepsilon_{1,t}^{gds} \\ \varepsilon_{2,t}^{is} \\ \varepsilon_{3,t}^{ps} \\ \varepsilon_{4.t}^{mss} \\ \varepsilon_{5,t}^{tp} \\ \varepsilon_{6,t}^{mpt} \\ \varepsilon_{7,t}^{ss} \end{bmatrix} = \begin{bmatrix} \alpha_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{21} & \alpha_{22} & 0 & 0 & 0 & 0 & 0 \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & 0 & 0 & 0 & 0 \\ 0 & 0 & \alpha_{43} & \alpha_{44} & 0 & 0 & 0 \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & \alpha_{55} & 0 & 0 \\ \alpha_{61} & 0 & 0 & \alpha_{64} & \alpha_{65} & \alpha_{66} & 0 \\ \alpha_{71} & \alpha_{72} & \alpha_{73} & \alpha_{74} & \alpha_{75} & \alpha_{76} & \alpha_{77} \end{bmatrix} \begin{bmatrix} e_{1,t}^{gea} \\ e_{2,t}^{gdp} \\ e_{3,t}^{cpi} \\ e_{4.t}^{ms} \\ e_{5,t}^{tc} \\ e_{6,t}^{int} \\ e_{7,t}^{smi} \end{bmatrix}$$

Peru

$$\begin{bmatrix} \varepsilon_{1,t}^{gds} \\ \varepsilon_{2,t}^{is} \\ \varepsilon_{3,t}^{ps} \\ \varepsilon_{4.t}^{mss} \\ \varepsilon_{5.t}^{tp} \\ \varepsilon_{6,t}^{mpt} \\ \varepsilon_{7,t}^{rc} \\ \varepsilon_{8,t}^{sms} \end{bmatrix} = \begin{bmatrix} \alpha_{11} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{21} & \alpha_{22} & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \alpha_{43} & \alpha_{44} & 0 & 0 & 0 & 0 \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & \alpha_{55} & 0 & 0 & 0 \\ \alpha_{61} & 0 & 0 & \alpha_{64} & \alpha_{65} & \alpha_{66} & 0 & 0 \\ \alpha_{71} & \alpha_{72} & \alpha_{73} & 0 & \alpha_{75} & \alpha_{76} & \alpha_{77} & 0 \\ \alpha_{81} & \alpha_{82} & \alpha_{83} & \alpha_{84} & \alpha_{85} & \alpha_{86} & \alpha_{87} & \alpha_{88} \end{bmatrix} \begin{bmatrix} e_{1.t}^{gea} \\ e_{2.t}^{gdp} \\ e_{3.t}^{cpi} \\ e_{4,t}^{ms} \\ e_{5,t}^{er} \\ e_{6,t}^{int} \\ e_{7,t}^{embig} \\ e_{8,t}^{smi} \end{bmatrix}$$

These matrices are identical to those already presented in the previous section except that the fiscal policy is not present. In the following, the same procedure is performed, estimating the optimal size of lags, testing autocorrelation, heteroscedasticity and presenting the results

Table 6. Length Optimal Lag

	Likelihood Rate	
Lag	**Peru**	**Mexico**
0	NA	NA
1	123.63	167.19
2	74.70	69.63*
3	93.25*	51.58
4	64.77	65.95

* Optimal lag

Table 7. Test Lagrange Multiplier of Serial Correlation

Null hypothesis: No serial correlation at lag h

	LRE stat		Df		Prob.	
Lag	**Peru**	**Mexico**	**Peru**	**Mexico**	**Peru**	**Mexico**
1	64.13213	59.909	64	49	0.986443	0.1366
2	58.97616	54.42761	64	49	0.887904	0.2756
3	50.04725	47.94072	64	49	0.726251	0.5161
4	64.25889	47.85638	64	49	0.988915	0.5195

Table 8. White Heteroskedasticity Test

VAR Residual Heteroskedasticity Tests (Levels and Squares)

Joint test		
	Peru	**Mexico**
Chi-sq	1767.02	836.74
Df	1764	812
Prob.	0.48	0.27

6. Results without Fiscal Policy in the Model

6.1 Estimation of Contemporary Coefficients

After reviewing the tests, we proceed with the estimations of the coefficients, in Table 11 the results of the SVAR for each country are shown:

Table 9. Results of Contemporary Effects without Fiscal Policy

Coefficients	**Countries**	
	Peru	**Mexico**
α_{11}	3.72*	3.10*
	[10.68]	[12.57]
	(0.00)	(0.00)
α_{21}	0.00*	0.00
	[2.49]	[1.53]
	(0.01)	(0.13)
α_{22}	-0.00	-0.00
	[-1.95]	[-0.06]
	(0.05)	(0.95)
α_{31}	-0.01	-0.01
	[-1.34]	[-1.18]
	(0.18)	(0.24)
α_{32}	0.01	-0.01
	[0.83]	[-1.40]
	(0.41)	(0.16)
α_{33}	-0.01	0.01
	[-0.35]	[0.72]
	(0.72)	(0.47)
α_{43}	0.02	0.01*
	[1.30]	[12.57]
	(0.19)	(0.00)
α_{44}	0.01*	0.00
	[10.68]	[1.68]
	(0.00)	(0.09)
α_{51}	0.00*	0.00

	[5.94]	[0.14]
	(0.00)	(0.89)
	-0.00	0.02*
α_{52}	[-0.01]	[2.98]
	(0.99)	(0.00)
	0.03	0.00*
α_{53}	[1.41]	[12.57]
	(0.16)	(0.00)
	-0.02	-0.00
α_{54}	[-1.25]	[-0.11]
	(0.21)	(0.91)
	0.00*	0.01
α_{55}	[10.68]	[1.264]
	(0.00)	(0.21)
	-0.00	-0.01
α_{61}	[-0.94]	[-1.26]
	(0.35)	(0.21)
	-0.00	0.01*
α_{64}	[-1.10]	[12.57]
	(0.27)	(0.00)
	0.01	0.02*
α_{65}	[0.63]	[3.07]
	(0.53)	(0.00)
	-0.01	-0.00
α_{66}	[-0.43]	[-0.42]
	(0.67)	(0.67)
	0.02*	
α_{71}	[10.67]	
	(0.00)	
	-0.00	
α_{72}	[-0.05]	
	(0.96)	
	0.01	
α_{73}	[0.33]	
	(0.74)	
	0.02	
α_{75}	[1.61]	
	(0.11)	
	0.03*	
α_{76}	[10.58]	
	(0.00)	
	0.02	
α_{77}	[1.13]	
	(0.26)	
	0.01	-0.02*
α_{81}	[0.52]	[-3.09]

	(0.60)	(0.00)
	-0.03	0.05*
α_{82}	[-1.94]	[12.52]
	(0.05)	(0.00)
	0.11*	0.03*
α_{83}	[10.58]	[3.29]
	(0.00)	(0.00)
	-0.02	-0.01
α_{84}	[-0.90]	[-1.64]
	(0.37)	(0.10)
	-0.02	0.070*
α_{85}	[-0.99]	[12.52]
	(0.32)	(0.00)
	0.14*	-0.03*
α_{86}	[10.68]	[-3.96]
	(0.00)	(0.00)
	-0.07*	
α_{87}	[-4.48]	
	(0.00)	
	0.09*	0.06*
α_{88}	[10.68]	[12.57]
	(0.00)	(0.00)

***** represent significante
[] represent t-statistics
() represent p-value

In the case of Peru, we find that a global demand shock positively impacts the GDP, the exchange rate and the country risk. A price shock positively impacts the stock market index. An interest rate shock positively impacts country risk and the stock market index and a country risk shock negatively impacts the stock market index.

In the case of Mexico, a global demand shock negatively impacts the stock market index. An income shock positively impacts inflation and the stock market. A price shock positively impacts the Fiscal Policy, the exchange rate and the stock market index. A money supply shock positively impacts the interest rate. An exchange rate shock positively impacts the interest rate and the stock market. An interest rate shock negatively impacts the stock market.

7. Comparing the Results

In the case of Peru, the shock impact of global demand becomes positive when the model has no fiscal policy. An income shock ceases to positively impact the exchange rate and country risk when fiscal policy is not included. A price shock goes from negative to positive without the presence of fiscal policy. An interest rate shock positively impacts

the country risk and also the stock market when the model does not contain a fiscal policy unlike a model with fiscal policy that only impacts the stock market.

In the case of Mexico, a global demand shock becomes negatively significant when going from a model with fiscal policy to one without fiscal policy. An income shock becomes negative when it moves to a model without fiscal policy and attains positive significance with respect to the exchange rate. A price shock becomes positively significant with respect to the stock market in a model with fiscal policy to be significant in addition to monetary policy and the exchange rate. A shock of money supply ceases to significantly impact the exchange rate and positively impacts the interest rate when going from a one-to-one model without fiscal policy. The tables with the impacts in terms of signs of both models are shown in the appendix.

8. Conclusions

We find that a fiscal policy directly impacts the stock market in a positive way for both Peru and Mexico. In turn, we find indirect impacts through the interest rate in the case of Peru and through the exchange rate and monetary policy for the case of Mexico. We can conclude that the fiscal policy has impacts on the stock market and that it influences the monetary policy but only for the case of Mexico in indirect effect. Monetary policy haven't direct effect for both Peru and Mexico Stock Market.

When we present the model without fiscal policy, we find that some variables cease to be significant or change sign, for the case of Peru, an income shock ceases to significantly impact the country risk and a price shock passes to impact negatively a positive to the stock market and a shock of interest rate begins to impact the country risk. For its part, in Mexico, the global demand shock begins to negatively impact the stock market, an income shock goes from negatively impacting positively to the stock market, a price shock begins to positively impact the monetary policy and the type of exchange, a shock of the exchange rate goes from positively impacting the stock market to negatively and stops impacting the interest rate.

Declarations

Consent for publication:

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Authors' contributions

The papers was entirely write for me. I did the econometric part, tables and figures, and I did write each part of this paper.

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Ethics approval and consent to participate

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Competing interests

The authors declare that they have no competing interests.

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Data Availiable in:

Banco Central de Reserva del Peru (2019). Estadisticas Economicas, avaliable from http://www.bcrp.gob.pe/estadisticas.html

Federal Reserve Bank of St. Louis (2019). Economic Data, avaliable from https://fred.stlouisfed.org/search?st=mexico

Data Availability Statement:

The data that support the findings of this study are available in https://github.com/CesarCienfuegos/IJFE-19-0381 . These data were derived from the following resources available in the public domain:

- http://www.bcrp.gob.pe/ for Peru
- https://fred.stlouisfed.org/ for Mexico

Appendix

Table 10. Comparative effects with and without fiscal policy[3]

WITHOUT FISCAL POLICY

PERU	GEA	Y	PI	PM	TC	INT	EMBIG	SMI
GEA	+	0	0	0	0	0	0	0
Y	+	-NS	0	0	0	0	0	0
PI	- NS	+NS	-NS	0	0	0	0	0
PM	0	0	+NS	+	0	0	0	0
TC	+	-NS	+NS	-NS	+	0	0	0
INT	-NS	0	0	-NS	+NS	-NS	0	0
EMBIG	+	-NS	+NS	0	+NS	+	+ NS	0
SMI	+NS	-NS	+	-NS	-NS	+	-	+

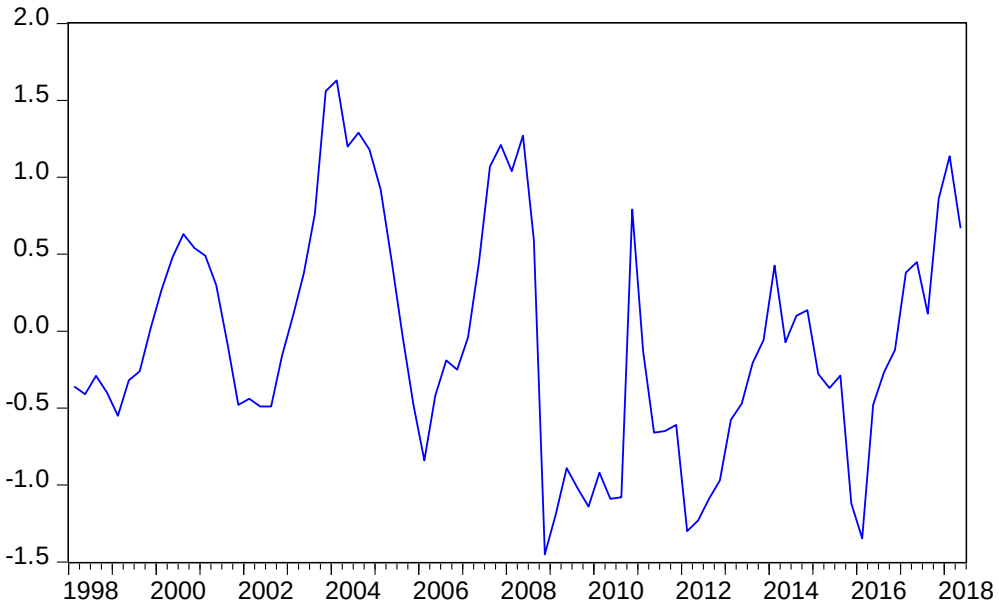
WITH FISCAL POLCY

PERÚ	GEA	Y	PI	PF	PM	TC	INT	EMBIG	SMI
GEA	+	0	0	0	0	0	0	0	0
Y	+	-NS	0	0	0	0	0	0	0
PI	- NS	+NS	-NS	0	0	0	0	0	0
PF	0	+NS	+	+	0	0	0	0	0
PM	0	0	+NS	-NS	-NS	0	0	0	0
TC	-NS	+	-NS	-NS	-NS	+NS	0	0	0
INT	-NS	0	0	+	-NS	+NS	+NS	0	0
EMBIG	-NS	+	-NS	0	0	-NS	+NS	+	0
SMI	- NS	+NS	-	+	- NS	-NS	+	-	+

MEXICO	GEA	Y	PI	PM	TC	INT	SMI
GEA	+	0	0	0	0	0	0
Y	+NS	+NS	0	0	0	0	0
PI	-NS	-NS	+NS	0	0	0	0
PM	0	0	+	+NS	0	0	0
TC	+NS	+	+	-NS	+NS	0	0
INT	-NS	0	0	+	+	+NS	0
SMI	-	+	+	-NS	+	-	+

MEXICO	GEA	Y	PI	PF	PM	TC	INT	SMI
GEA	+	0	0	0	0	0	0	0
Y	+ NS	+ NS	0	0	0	0	0	0
PI	- NS	-NS	-NS	0	0	0	0	0
PF	0	+	+ NS	+	0	0	0	0
PM	0	0	- NS	+	+	0	0	0
TC	- NS	+ NS	+ NS	- NS	+	+	0	0
INT	+ NS	0	0	- NS	+ NS	+	+	0
SMI	- NS	-	+	+	-NS	+	-	+

Figure 1. Global Economy Activity



[3] NS is not significance

Figure 2. Peru (1st Difference)

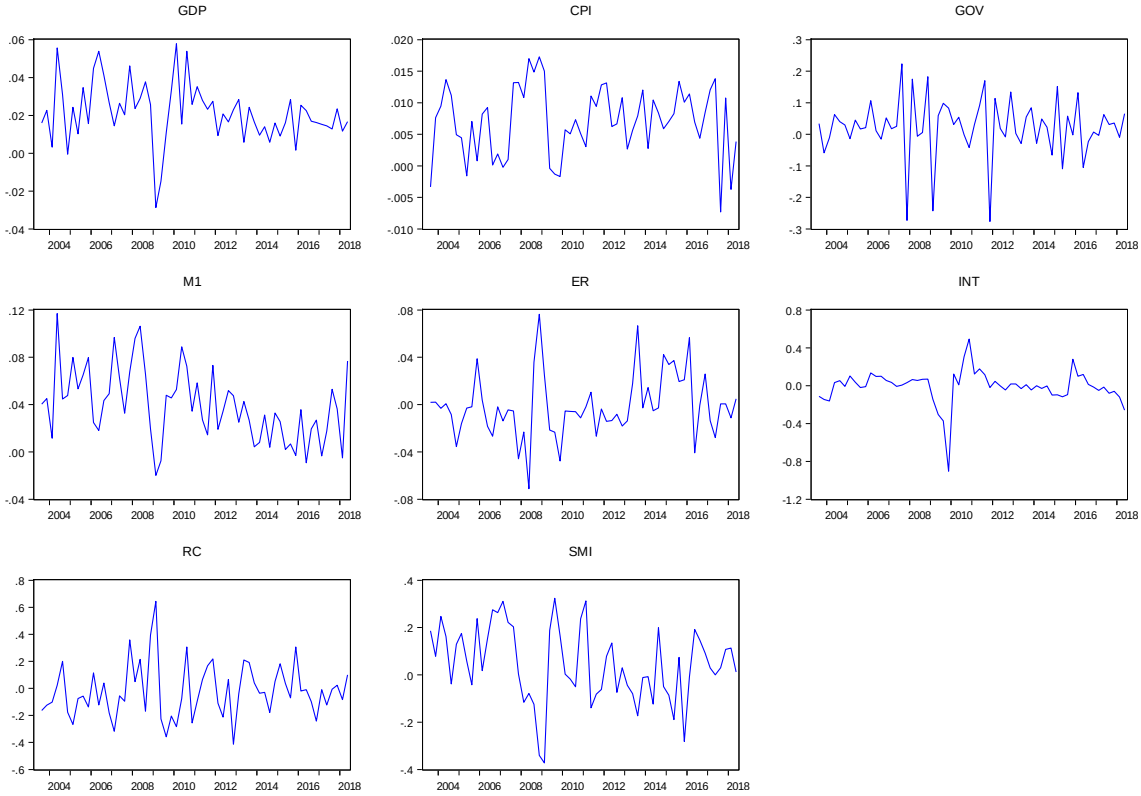


Figure 3. Mexico (1st Difference)

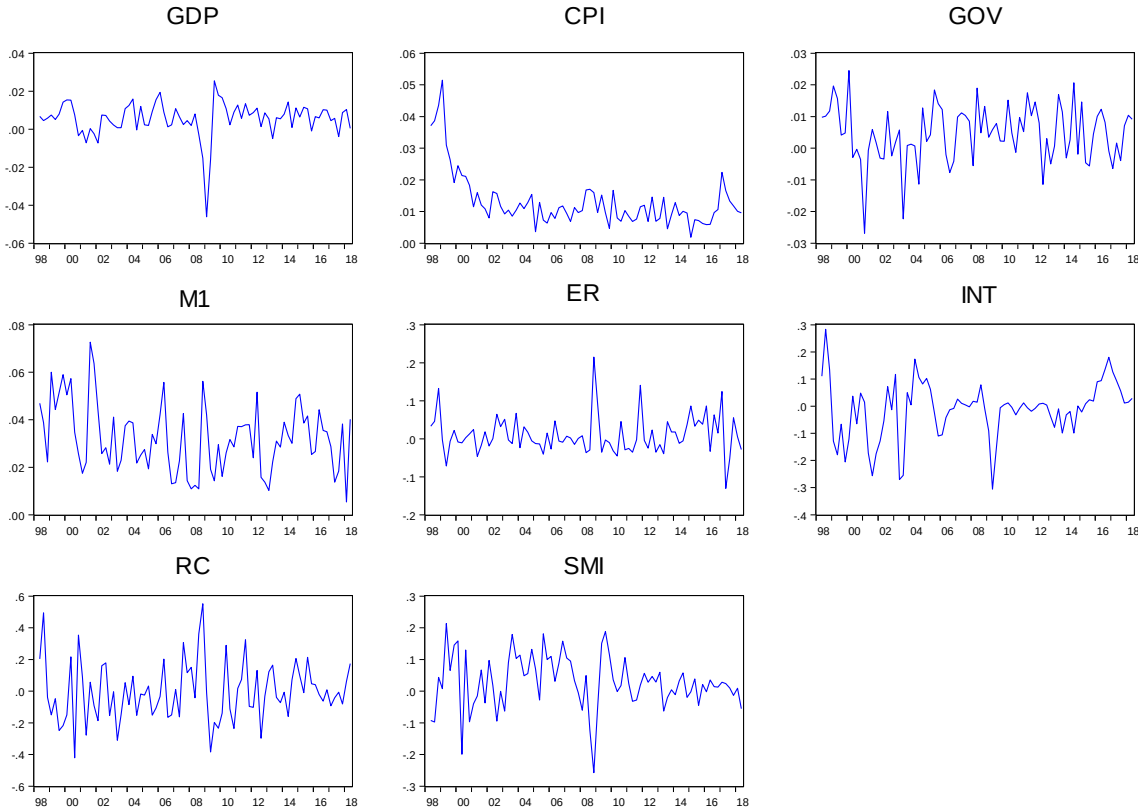
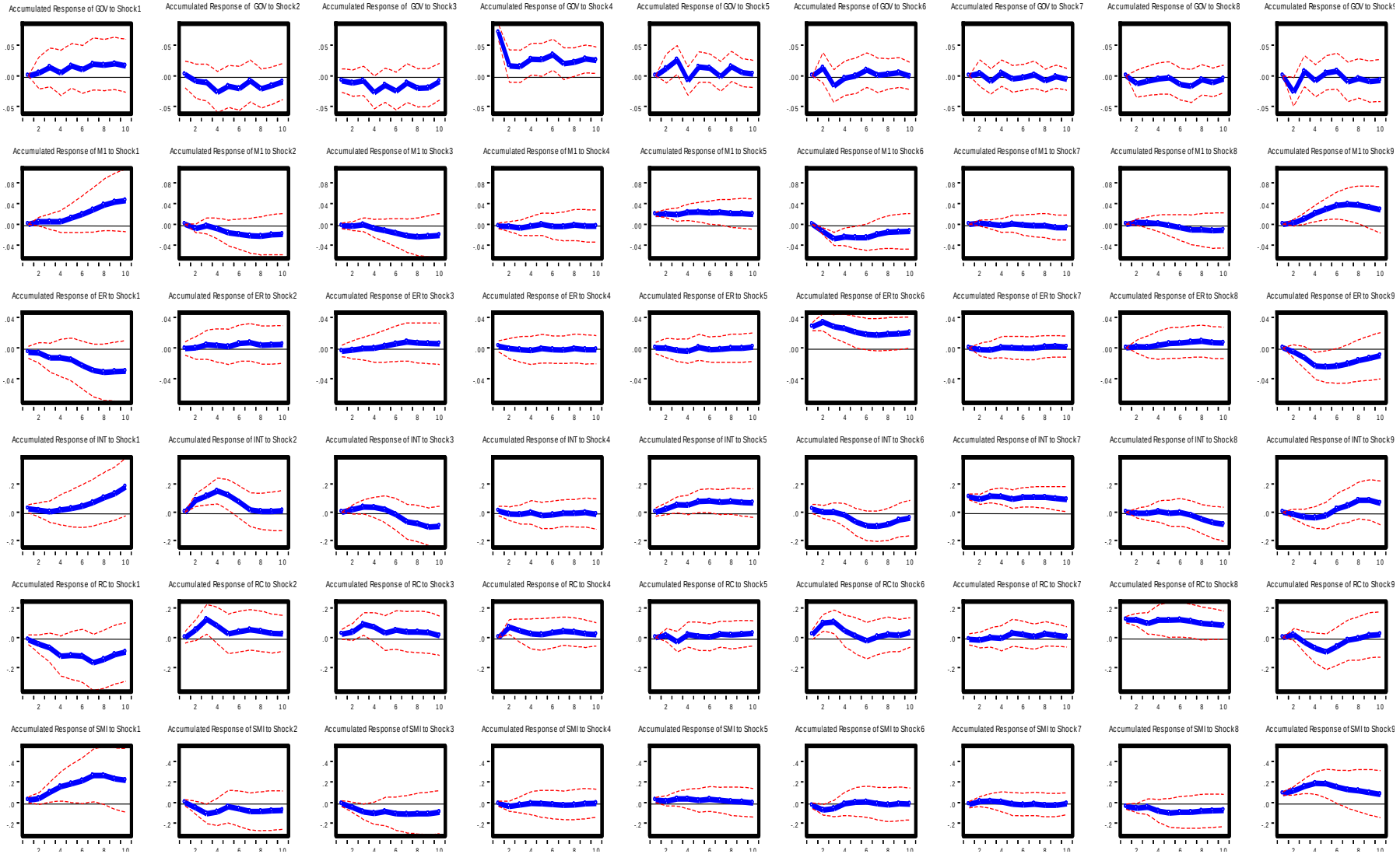
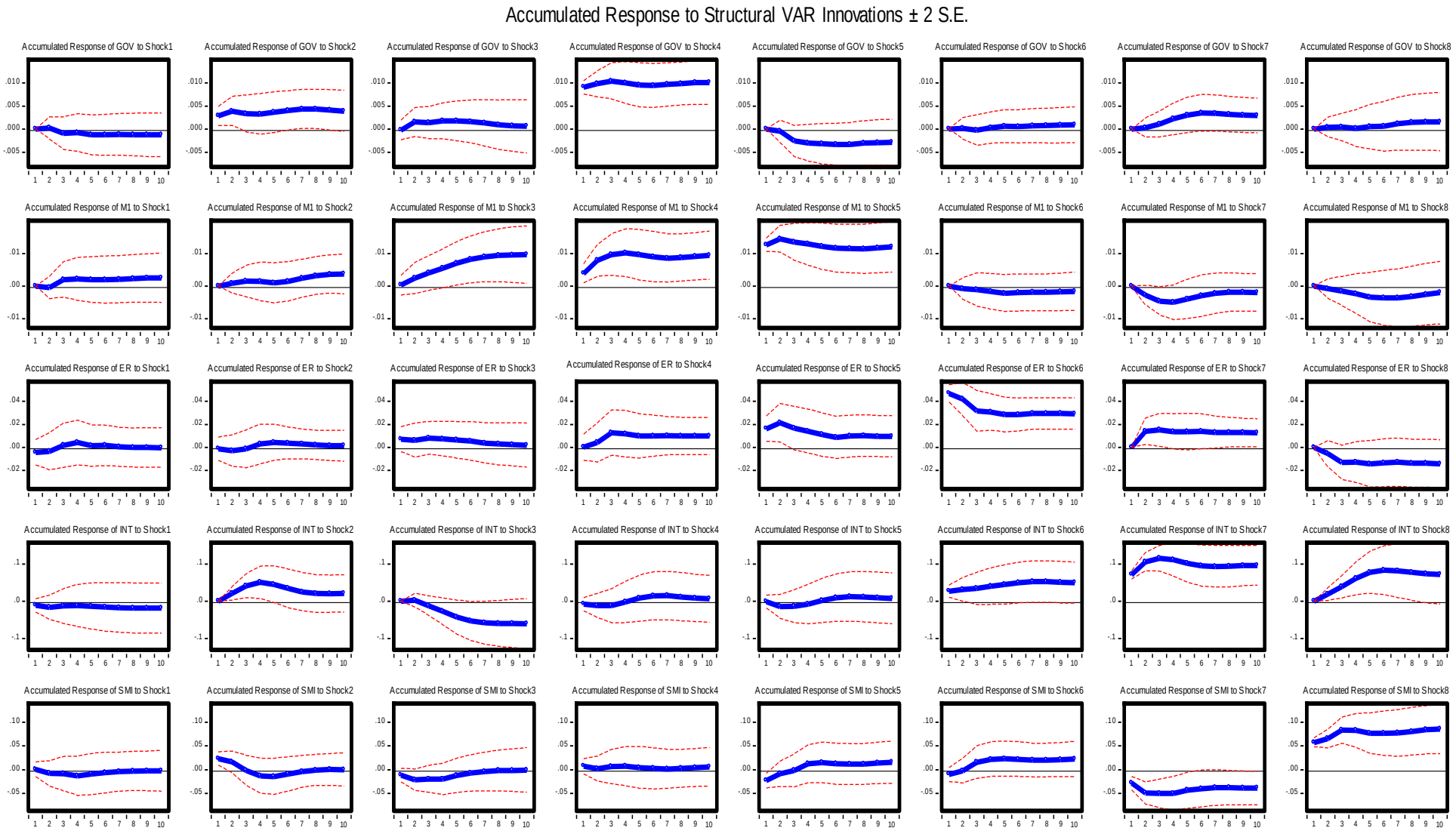


Figure 4. Cumulative Response-Impulse - Model that includes fiscal policy - Peru



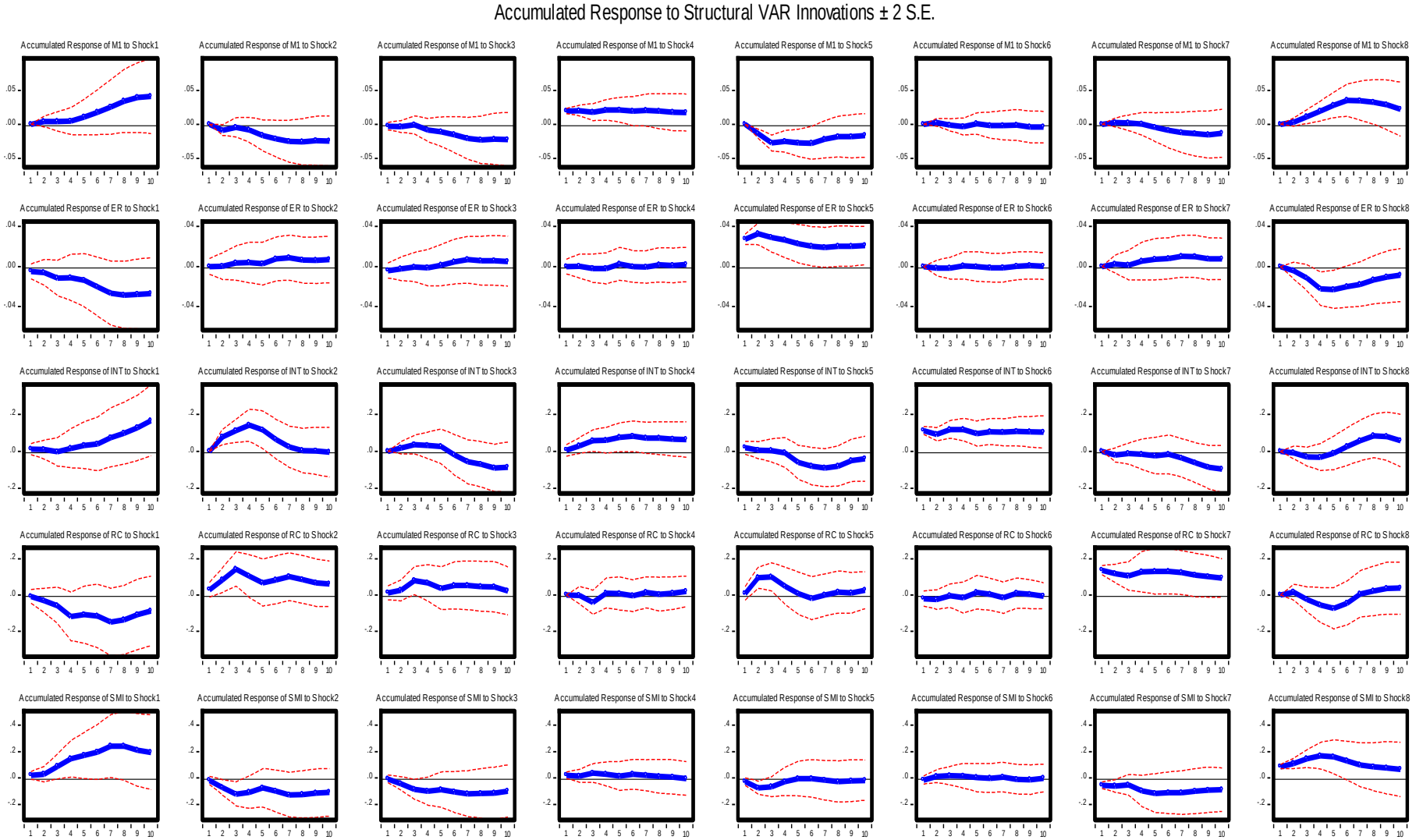
Note: Shock 1, 2, 3, 4, 5, 6, 7 and 8 are the GDP, inflation, public expenditure, monetary policy, interest rate, risk country and stock market index shocks respectively

Figure 5. Cumulative Impulse-Response - Model that includes fiscal policy - Mexico



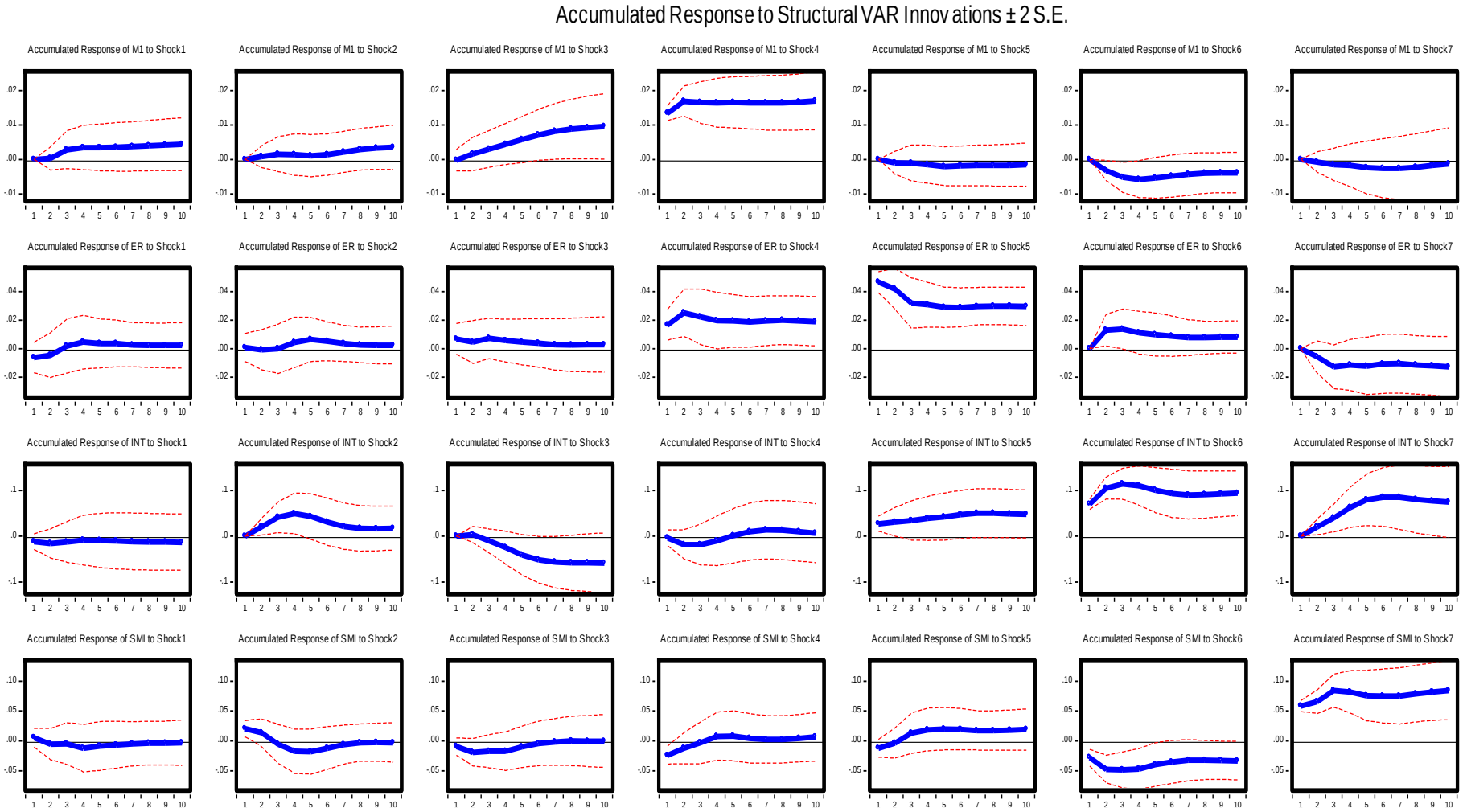
Note: The shocks 1, 2, 3, 4, 5, 6 and 7 are the gdp, inflation, public expenditure, monetary policy, interest rate, and stock market index shocks respectively

Figure 6. Cumulative Impulse-Response - Model without fiscal policy - Peru



Note: Shocks 1, 2, 3, 4, 5, 6 and 7 are the GDP, inflation, monetary policy, interest rate, risk country and stock market index shocks respective

Figure 7. Cumulative Response-Impulse - Model without fiscal policy - Mexico



Note: Shocks 1, 2, 3, 4, 5, 6 and 7 are the gdp, inflation, monetary policy, interest rate, and stock market index shocks respec