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El impacto de la incertidumbre global en los ciclos económicos peruanos

TRABAJO DE INVESTIGACIÓN PARA OBTENER EL GRADO DE BACHILLER EN CIENCIAS SOCIALES CON MENCIÓN EN ECONOMÍA

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RESUMEN

En esta investigación se utiliza un modelo SVAR extendido para estimar los efectos de un incremento de la incertidumbre global sobre la economía peruana. A diferencia de otros estudios que estiman los efectos los choques externos en la economía peruana, en esta investigación me centro en el impacto de un incremento de la volatilidad de estos choques externos. Las extensiones al modelo SVAR incluyen: (i) permitir que la varianza varíe en el tiempo, a través de una especificación de volatilidad estocástica; y (ii) permitir interacción entre las variables endógenas y la volatilidad cambiante en el tiempo. Usando este modelo, estimo que un incremento de una desviación estándar en la volatilidad de los choques al PBI mundial se asocia con una caída del PBI de alrededor de -3,3% relativo a su tendencia nueve trimestres luego del choque. Los componentes de la demanda agregada parecen tener una respuesta negativa más grande que los sectores productivos. En particular, el crecimiento de la inversión cae alrededor de -7,7% relativo a su tendencia.

Palabras clave: incertidumbre, modelos SVAR, macroeconomía, choques externos.

ABSTRACT

This study uses an extended SVAR model to estimate the effects of an increase in global uncertainty on the Peruvian economic activity. Unlike other studies that estimate the effects of external shocks on the Peruvian economy, in this paper I focus on the impact of an increase in the volatility of these foreign shocks. The extensions of the SVAR model include allowing for time-varying variance of structural shocks via a stochastic volatility specification and allowing interaction between the endogenous variables and the time-varying volatility. Using this model, I estimate that a one standard deviation increase in the volatility of the shocks to the world's GDP leads to a decline on Peruvian GDP of around -3,3% relative to its trend, nine quarters after the shock. Aggregate demand components appear to have a larger negative response than supply sectors. In particular, investment's growth falls around -7,7% relative to trend.

Keywords: uncertainty, SVAR models, macroeconomics, foreign shocks

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1. INTRODUCTION

In recent years, an ample body of economic literature has committed to estimating the effects of changes in global aggregates on the business cycles of small, open economies like Peru[1]. While the impact of these shocks have been studied, the role played by changes in global uncertainty on the Peruvian economy have mostly been neglected. The majority of the empirical research on the macroeconomic effects of uncertainty has focused on large and advanced economies such as the United States[2], where domestic shocks are more relevant drivers of the business cycle than foreign shocks (Castelnuovo and Pellegrino 2017). However, empirical studies have shown that external volatility shocks can also be responsible for considerable shares of the fluctuations of GDP in emerging economies (Fernández-Villaverde et al. 2011). In the particular case of Perú, studies related to the importance of external volatility shocks are practically nonexistent[3].

This study seeks to fill this gap in literature by using an extended VAR model to gauge the effects of an increase in global uncertainty on the most important productive sectors and components of aggregate demand of the Peruvian economy, following the framework proposed by Mumtaz and Theodoridis (2015). This framework allows to measure uncertainty as the unanticipated changes to the time-varying volatility of the structural shocks. The extensions to this SVAR model include: (i) allowing for time-varying variance of structural shocks via a stochastic volatility specification and (ii) allowing a dynamic interaction between the level of the endogenous variables in the VAR and this time-varying volatility. This extended VAR model can therefore be used to not only estimate the effect

1 See, for example, Dancourt, Mendoza, and Vilcapoma (1997), Carrera, Pérez, and Ramírez-Rondán (2015), Rodríguez, Villanueva Vega, and Castillo Bardalez (2018)

2 Some few studies that differ in this regard are those of Carrière-Swallow and Céspedes (2013), Colombo (2013), Jones and Olson (2015), Stockhammar and Österholm (2017), Choi (2018), Gupta, Lau, and Wohar (2019), and Kang, Ratti, and Vespignani (2019)

3 Only other known study on this topic for the Peruvian economy is Carrière-Swallow and Céspedes (2013).

of foreign shocks but also the impact of changes in the volatility of the shock in question.

The model is estimated using quarterly data for the period 1996Q1 - 2019Q2. For Perú, the variables used in the estimations include GDP (both total and sectoral), CPI, interbank interest rate, private and public investment and consumption. For the global aggregates, we use World GDP, Global Price Index of All Commodities and the US federal funds rate. The negative effects of uncertainty are computed using the impulse-response functions of the endogenous variables for a volatility shock in global real activity.

Since the global financial crisis, uncertainty in global financial markets have increased, both by the policy responses of central banks and because of the larger volatilities in financial markets and capital flows. This is shown both by the evolution of the CBOE Market Volatility Index (one of the most utilized stock market volatility indicators) and the IMF's World Uncertainty Index (Ahir, Bloom, and Furceri 2018), as seen in figures 11 and 12.

Increases in uncertainty can have severe effects in a country macroeconomics aggregates. For example, uncertainty about future returns of investment can cause a more cautious investment behavior, as it creates an option value for waiting to commit to a project. This can cause the rate of current investment to decline (Bernanke 1983). It can also reduce the supply of credit, as it increases bank's demand for precautionary savings and liquidity, lowers collateral values and increases credit spreads (Christiano, Motto, and Rostagno (2014), Valencia (2017)). Moreover, it can have an impact in consumption, as income uncertainty causes an increase in precautionary savings and a reduction in current consumption (Christelis et al. 2020).

The main contribution of this study is to estimate the effects of global uncertainty shocks to the business cycles of the Peruvian economy, particularly in GDP, investment and consumption. In terms of empirical application, this paper is associated to the literature that investigates the impact of uncertainty in business cycles[4]. There are significant differences between the existing studies in relation to the methods adopted to identify uncertainty shocks. Following the contribution of Bloom (2009), a large group of empirical literature have adopted the implied volatility derived from stock market returns as a measure of forward looking uncertainty[5]. A different group of studies have opted for estimating uncertainty, a latent variable, to then evaluate its impact on the macroeconomy based on diverse econometric models[6]. This study corresponds to the latter group, as opposed to others that estimate the impact of uncertainty in the Peruvian economy[7].

By estimating this model, I conclude that a one standard deviation increase in the volatility of the shock to the world's GDP causes to a decline of Peruvian GDP of about -2.06% relative to trend at it's minimum, seven periods after the shock. Non primary sector's response to this shock (-0.57%) seem to be larger that the one observed on primary sectors. In particular, a large negative response to an uncertainty shock is observed for the construction sector. As for the aggregate demand, the component that appear to be more affected is investment, presenting a deviation of -1.4% relative to trend, in comparison with private consumption, that presents a drop of around -1.1%. An increase in public investment's growth is observed after a shock, largely compensating for a drop in private investment.

The paper is organized as follows: in section 2, I review related literature. In section 3, the methodological approach is described and I present the econometric model to be estimated. In section 4, the data used for the estimations is presented. In section 5, I show and examine the results of the estimations for each of the selected sectors of the economy. In section 6, a variant of the

4 See, for example, Bloom (2009), Fernández-Villaverde et al. (2015), Caggiano, Castelnuovo, and Figueres (2020) and Cross, Hou, and Poon (2018)

5 See, for example, Carrière-Swallow and Céspedes (2013), Stockhammar and Österholm (2017), Kang, Ratti, and Vespignani (2019)

6 See, for example, Fernández-Villaverde et al. (2011), Mumtaz and Theodoridis (2015), Cross, Hou, and Poon (2018) and Crespo, Huber, and Onorante (2019)

7 See Carrière-Swallow and Medel (2011)

benchmark model is used to examine the robustness of the results. Finally, conclusions are presented and policy implications are discussed.

2. RELATED LITERATURE

There is an old tradition in economic theory that links uncertainty to the business cycle. A relationship between both elements was proposed as early as Keynes (1937), who suggested the volume of investment was the most volatile component of the aggregate demand, because it depends on two types of judgements about the future, neither of which rely on adequate or secure foundations: the propensity to hoard and the future yields of capital assets.

Furthermore, Dixit and Pindyck (1994) stated that, in the presence of uncertainty associated with future profits from the investment, investors can postpone actions to get more information about the future, although never entire certainty. This implies that waiting can have positive value, which means that as long as the opportunity to invest is still available, a posterior commitment may be a better one. As waiting to commit to a project may be an option value in the presence of uncertainty about the future returns, the rate of current investment may be lowered. This is the case even when agents are risk-neutral (Bernanke 1983). As documented by Bloom, Bond, and Van Reenen (2007), uncertainty about future returns of investment causes more cautious investment behaviour, and limits the short-run adjustment of investment in response to demand shocks. Past research has demonstrated that aggregation does not erase the impact of various micro-investment decisions on aggregated investment dynamics.

A second transmission channel through which uncertainty can affect the real economy is the supply of credit. Greater uncertainty or risk can diminish collateral values and augment credit spreads in a context with financial frictions, limiting the supply of credit to economic agents, and decreasing economic activity (Christiano, Motto, and Rostagno 2014). It can also expand the demand for precautionary savings and liquidity, altering economic activity and credit usage (Di Maggio et al. 2017). For example, Valencia (2017) presents a dynamic bank model, where a self-insurance mechanism induces the bank to accumulate capital when uncertainty increases. In the process of increasing capital safeguards, the bank limits its credit supply.

Aggregate uncertainty may also manifest in consumer behaviour. The notion of precautionary savings (Caballero 1990) portrays how uncertainty can affect consumption. The consumption behavior life-cycle models usually suggest that more uncertainty about one's income increases precautionary savings and consumption growth by reducing current consumption (Christelis et al. 2020). Some stylized facts about this relationship are that: (i) consumption and uncertainty co-move; (ii) move in opposite directions; and (iii) a rise in uncertainty can lead to a serious decline in consumption (Castelnuovo and Pellegrino 2017). However, the decrease in consumption may be lower than the one observed in investment, as firms appear to be more forward-looking than individuals (Bloom, Bond, and Van Reenen 2007).

This study is linked with two branches of empirical literature. First, it is related to the literature of time-varying volatility in macroeconomics. While the effects of time-varying volatility have been vastly discussed in finances, the issue have mostly been overlooked in macroeconomics. Several recent investigations highlight the negative impact of volatility shocks to macroeconomic variables, in particular, for output growth (See, for example, Justiniano and Primiceri (2008), Fernández-Villaverde and Rubio-Ramírez (2007), Fernández-Villaverde et al. (2015) and Primiceri (2005)). A small number of empirical studies in recent year have been conducted for the Peruvian economy using this approach, for example, the ones of Castillo, Montoya, and Quineche (2016), Guevara and Rodríguez (2017) and Martínez and Rodríguez (2020). This research is different to the ones presented before in that we allow dynamic interaction between time-varying volatility and the level of the endogenous variables in the VAR.

Second, this study is also related to the literature that have studied the relation between uncertainty and business cycles. As we have discussed earlier, there are two large groups in this literature, their main difference being the identification approach of uncertainty. On one hand, there are several papers that followed the approach proposed by Bloom (2009), who identified uncertainty as the implied volatility that stems from from stock market returns as a measure of forward looking uncertainty. Using daily data of the U.S. stock market S&P500 index, uncertainty shocks were identified as the occasions when the highest point of the

Hodrick-Prescott filtered volatility level incremented substantially, surpassing the mean. This indicator function is utilized to certify that identification comes only from these big, and presumably exogenous volatility shocks, instead than from the smaller fluctuations. For example, Jones and Olson (2015) adopted this measure of uncertainty to gauge the international effects of U.S uncertainty shocks on the Japanese and British economies, concluding that these shocks (i) reduce foreign input; (ii) causes a depreciation of the domestic currency; (iii) reduce foreign imports; and (iv) slow foreign inflation.

Carrière-Swallow and Céspedes (2013) also used this form of shock identification to examine to what extent global uncertainty spikes affected a large group of countries. The indicator used on this study was constructed based on the VXO index. Uncertainty shocks are identified as periods in which the Hodrick–Prescott detrended VXO passes its own mean by more than 1.65 standard deviations. This study provided evidence that, emerging economies suffer much more serious drops in investment and private consumption, in comparison to developed countries, following an foreign uncertainty shock. Following this shocks, the median gap drops by four times the experienced in developed economies. Peru was included in the group considered as an extended sample in this study.

Similar to the previous study, Carrière-Swallow and Medel (2011) estimated the impact of global uncertainty on sectors of the Chilean and Peruvian economy, identifying uncertainty shocks as proposed by Bloom (2009) using the S&P500 stock market index. They documented that, for Peru, the results were fairly consistent. Private investment was the part of the aggregate demand that suffered a deeper impact (-7.0%) two quarters after the shock, and that, from the side of the offer, it was the manufacture sector, falling up to 4.1% three quarters after the shock. It is notable that public investment seems to play a stabilizing role in mitigating its private counterpart’s drop, growing up to 5.0%. However, it is not sufficient to dissipate the negative effect.

On the other hand, a different set of papers have opted for estimating uncertainty, a latent variable, to then evaluate its impact on the macroeconomy based on diverse econometric models. As of empirical method, this study is intimately related to this literature. For example, Cross, Hou, and Poon (2018) used a structural VAR model with stochastic volatility in mean component to gauge the effects of domestic and foreign sources of macroeconomic uncertainty in three SOEs (Australia, Canada and New Zealand). They concluded that foreign uncertainty spillovers have a considerable impact in the macroeconomic conditions in all of the economies considered in the study, by reducing GDP, raising inflation and interest rates.

In this line, (Crespo, Huber, and Onorante 2019) used a large-scale BVAR-SV to estimate the macroeconomic effects of international uncertainty shocks in G7 countries. As stated by the authors, the modelling framework used in this study allows the simultaneous estimation of the autoregressive parameters and of the uncertainty index. This implies that uncertainty is a latent variable and depends on systematic failures of economic agents to form correct expectations about future macroeconomic developments. They concluded that these shocks have significant effects on all countries and variables considered.

As for emerging economies, Fernández-Villaverde et al. (2011) demostrated how fluctuations in the volatility of the real interest rate at which SOEs and emerging economies[8] borrow causes a significant effect on indicators like GDP, consumption and investment. By estimating a typical SOE model with incomplete asset markets, the authors conclude that that volatility shocks may be a significant component that affects the business cycles for some economies.

The framework proposed in this paper follows closely the one presented in Mumtaz and Theodoridis (2015), who estimate the effects of the international transmission of U.S volatility shocks and its effect on the U.K. real economy, using a small and open economy assumption for the U.K. The VAR model with time-varying volatility used in this study allow a dynamic interaction between the level of the endogenous variables in the VAR and this time-varying volatility. In this framework, contemporaneous and lagged U.K. variables and volatilities have an unimportant effect on the U.S. variables. Results show that a one standard deviation increment in the volatility of the shock to the U.S. real GDP causes to a

8 The sample for this study included Venezuela, Ecuador, Argentina and Brasil.

fall in U.K. GDP of about 1% relative to it’s trend and a 0.7% increase in U.K. CPI relative to trend at a two-year horizon.

3. EMPIRICAL MODEL

The next VAR model with stochastic volatility is estimated:

$$Z_t = c + \tau_t + \sum_{j=1}^{p} \beta_j \, Z_{t-j} + \sum_{j=0}^{q} \gamma_j \, \tilde{h}_{t-j} + \Omega_t^{1/2} e_t, \qquad e_t \sim N(0,1)$$

where

$$\Omega_t = A^{-1} H_t A^{-1\prime}$$

In equation (1), c represents the intercepts, τ_t is a linear time trend, Z_t stands for the N macroeconomic variables, while $\tilde{h}_t = [h_{1t}, h_{2t}, \ldots, h_{Nt}]$ indicates the log volatility of the structural shocks in the VAR. The structure of the prior on β and the γ matrices puts together a SOE assumption for the Peruvian economy. In particular, the prior assumption that the lagged Peruvian variables and stochastic volatilities have a trivial infuence on the global aggregates is incorporated. The lag length of the endogenous variables is set at two. In this benchmark model, we allow the contemporaneous and the lagged value of $\tilde{h}_t$ it is allowed to have an impact on Z_t . Considering that quarterly data is employed, we allow the possibility of an impact of $\tilde{h}_t$ in a three-month period range.

In equation (2), we show the structure of H_t:

$$H_t = \begin{pmatrix} exp(h_{1t}) & 0 & 0 & 0 & 0 & & 0 \\ 0 & exp(h_{2t}) & 0 & 0 & 0 & & 0 \\ 0 & 0 & exp(h_{3t}) & 0 & 0 & & 0 \\ 0 & 0 & 0 & exp(h_{4t}) & 0 & \ldots & 0 \\ 0 & 0 & 0 & 0 & exp(h_{5t}) & & 0 \\ & & & \ldots & & & \\ 0 & 0 & 0 & 0 & 0 & & exp(h_{Nt}) \end{pmatrix}$$

With the aim of identifying the World GDP shock we consider the following recursive structure for $\tilde{A} = A^{-1}$:

$$\tilde{A} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & & 0 \\ \tilde{a}_{2,1} & 1 & 0 & 0 & 0 & & 0 \\ \tilde{a}_{3,1} & \tilde{a}_{3,2} & 1 & 0 & 0 & & 0 \\ \tilde{a}_{4,1} & \tilde{a}_{4,2} & \tilde{a}_{4,3} & 1 & 0 & \dots & 0 \\ \tilde{a}_{5,1} & \tilde{a}_{5,2} & \tilde{a}_{5,3} & \tilde{a}_{5,4} & 1 & & 0 \\ & & & \dots & & & \\ \tilde{a}_{N,1} & \tilde{a}_{N,2} & \tilde{a}_{N,3} & \tilde{a}_{N,4} & \tilde{a}_{N,5} & & 1 \end{pmatrix}$$

Considering the ordering of the endogenous variables, the presented structure for $\tilde{A}$ indicated that the first shock is identified as an exogenous innovation in global real activity. Since Peruvian variables are located at the end of the ordering, shocks to the Peruvian economy have no contemporaneous effects on the rest of the world. Considering this and with the *a priori* structure of the lagged coefficient matrices, we implement a SOE assumption for Perú.

The transition equation for the stochastic volatility is the following:

$$\tilde{h}_t = \alpha + \theta \tilde{h}_{t-1} + \eta_t, \qquad \eta_t \sim N(0, Q), \quad E(e_t, \eta_t) = 0$$

where α is a vector of constants and θ is a diagonal matrix implying that each element of $\tilde{h}_t$ follows an AR(1) process. There are two noticeable things in the system defined by equations (1), (2), (4) and (5). In first place, equation (1) allows the volatility of the structural shocks $\tilde{h}_t$ to have an impact on the endogenous variables Z_t. In this model the log volatility is present in the VAR equations rather than its level.

Second, it is remarkable that the structure of the A matrix in equation (2) determines the interpretation of structural shocks and therefore their volatility H_t. With Z_t containing, in the following order, World GDP, Terms of trade, US federal funds rate, Peruvian GDP, Peruvian CPI and Peruvian interbank interest rate, a lower triangular structure for A_t would mean that we can interpret h_{1t} as the log volatility of the shock to global activity.

Equation (4) represents the premise that the shocks to the volatility equation η_t and the main equation e_t are uncorrelated and Q is a diagonal matrix. With these assumptions, η_t can be interpreted as a shock to volatility of the structural shock of interest, and then calculate the response of h_t and Z_t. The assumptions in equation (4) allow the use of standard identification schemes (that apply to the contemporaneous relationships amongst the level of the reduced-form shocks). To retain this ease of interpretation of $\tilde{h}_t$, I incorporate the assumption of a diagonal Q and no correlation between e_t and η_t in the benchmark model.

4. DATA

Quarterly data for sectorial GDP and components of aggregate internal demand of Peru were obtained from the National Institute of Statistics (INEI) and the Peruvian Central Bank of Reserve (BCRP). The sample corresponds to the period 1996Q1 - 2019Q2 and are measured in millions of soles (2007). For global aggregates, the variables used are World GDP, Commodities Price Index and the federal funds rate. World GDP is obtained from World Bank's Global Economic Monitor database. The last two are obtained from the FRED database for the same period. The FRED codes are as follows: (1) Global Price Index of All Commodities: PALLFNFINDEXM, (2) Federal Funds rate: FEDFUNDS. Series were seasonally adjusted using X12-ARIMA methodology.

Table 1: Supply sectors and components of aggregate demand - Peru

Demand		Supply	
(1) Internal demand		(1) Primary sectors GDP	
(1.1) Private consumption*			(1.1) Electricity and water (1.2) Fishing
			(1.3) Mining and hydrocarbons
(1.2) Internal brute investment*		(2) Non-primary sectors GDP	
(1.2.1) Fixed brute investment			(2.1) Commerce*
	(1.2.1.1) Private*		(2.2) Manufacturing*
	(1.2.1.2) Public*		(2.3) Construction*
(1.2.2) Stock variation			(2.4) Agricultural
(1.3) Public consumption		(3) Others	
(2) External demand			

(*) Indicated the variable is used for the analysis. Global Peruvian GDP is also included.

Source: Own elaboration.

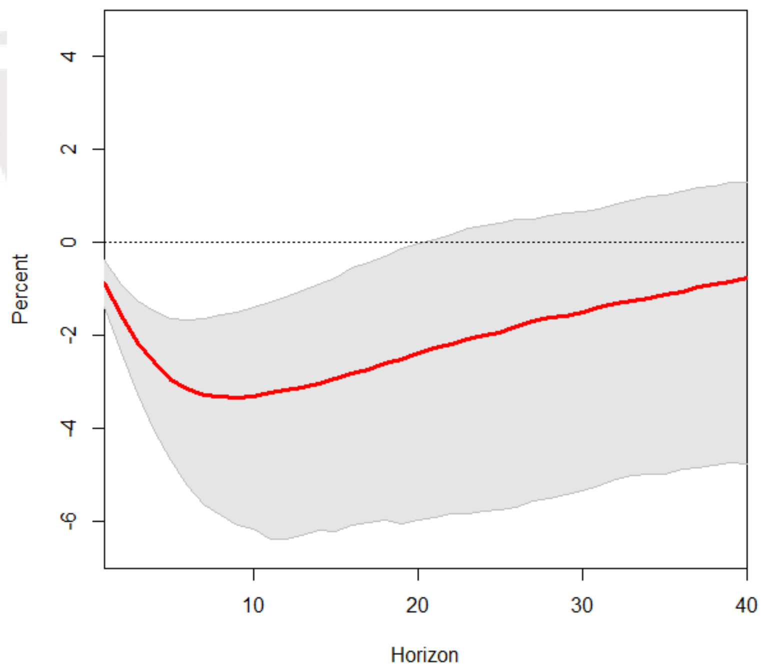
The response of the different productive sectors of Peruvian to global uncertainty shocks is of special interest, as this results will allow us to suggest which of them are more sensitive to increases in external uncertainty. As for the aggregate demand, private consumption and private and public investment are the variables included in the analysis. Finally, the response of BCRP's Business Confidence Index is estimated. Several estimations are performed, each of which contains a variable of interest for the Peruvian economy.

5. RESULTS

The effects of uncertainty on the different variables included in this analysis are computed using the impulse-response function of these variables for a one standard deviation increase in the variance of *global real activity*. Results are presented in terms of percentage points of deviation from each variable's trend. Mean and 68% error bands are showed in the following figures.

Figure 1 shows the response of total Peruvian GDP to the mentioned shock, estimated in around -3.3% after nine quarters. This results exceeds greatly the estimation presented in Carrière-Swallow and Céspedes (2013) for the same variable, which was a reduction of around -1.0%. It also suggests the recovery period of Peruvian GDP after a volatility shock in global activity is larger than the one presented in the mentioned study.

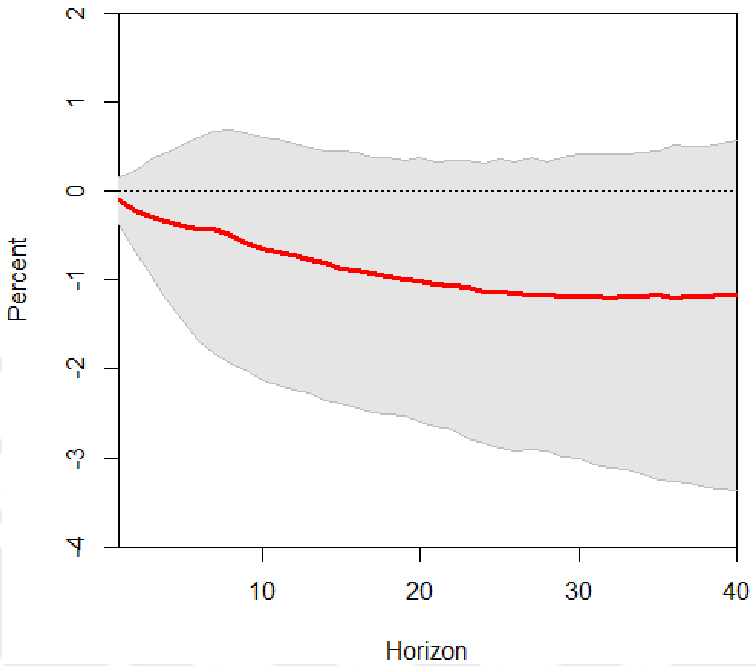
Figure 1: Impulse response function: Peruvian GDP



Source: Own elaboration.

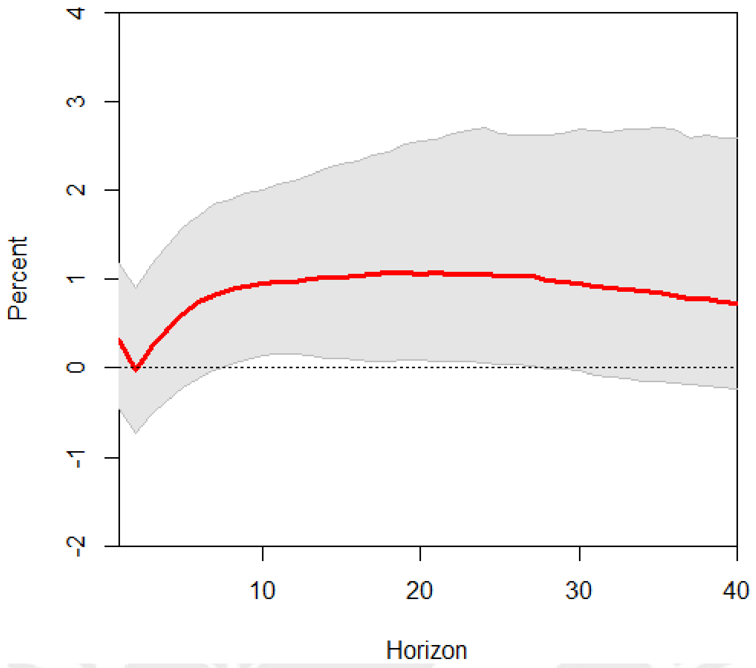
In order to examine the response of the different components of the supply, in figures 2 and 3 the response of primary sectors and non-primary sectors of GDP are shown. The former is estimated at around -0.5% after two quarters, and the later at around -1.0%. Although it seems to be the case that non primary sector's GDP suffers a small but permanent drop, this results aren't statistically significant. As explained by Carrière-Swallow and Céspedes (2013), the small response of the primary sectors can be attributed to the endogenous productive cycle, which isn't affected neither by domestic economic conditions nor external ones.

Figure 2: Impulse response function: Non-primary sectors



Source: Own elaboration.

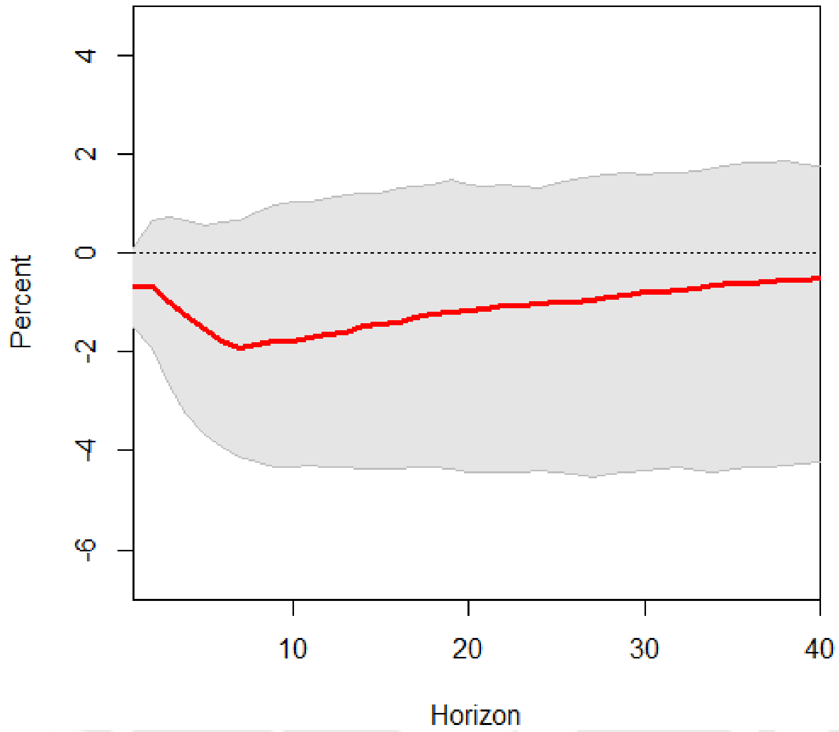
Figure 3: Impulse response function: Primary sectors



Source: Own elaboration.

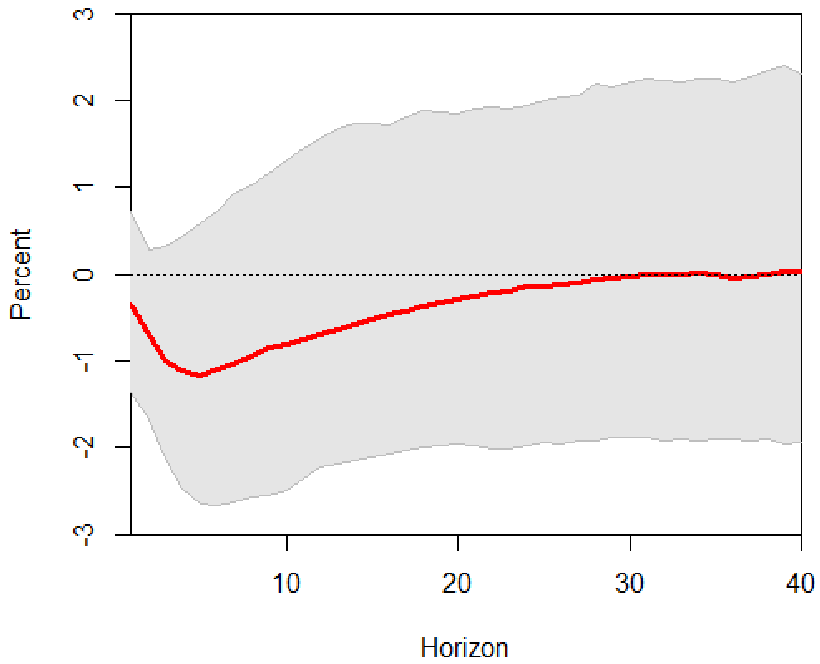
As for the non-primary sectors, effects of a shock in global activity in some of the most important sectors is shown in figure 4 through 7. Small reductions are observed in relation to construction and manufacturing and sectors, but results appear not to be significant. However, a large drop in the mining and hydrocarbons sector's growth is observed, quantified at around -2.3% at it's lowest. This takes place 14 quarters after the shock. In the case of the commerce sector, no significant effect is found.

Figure 4: Impulse response function: Construction sector



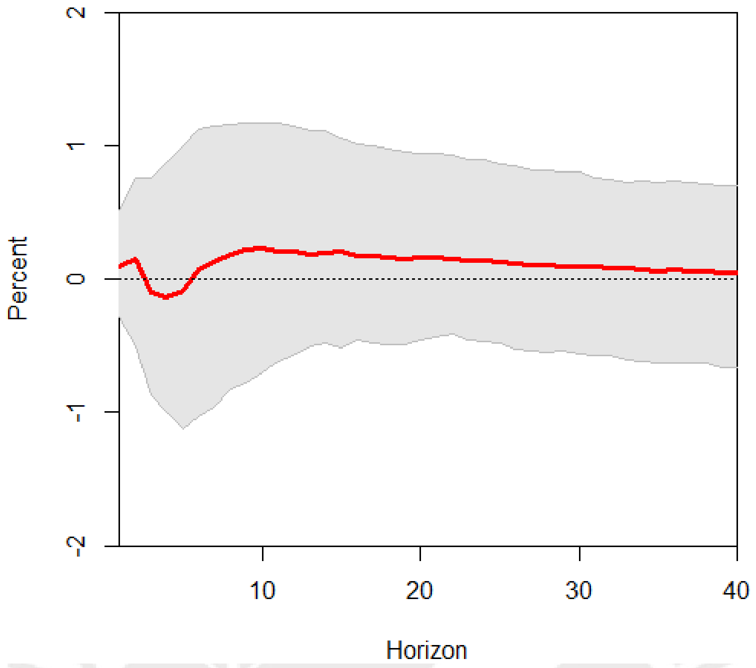
Source: Own elaboration.

Figure 5: Impulse response function: Manufacturing sector



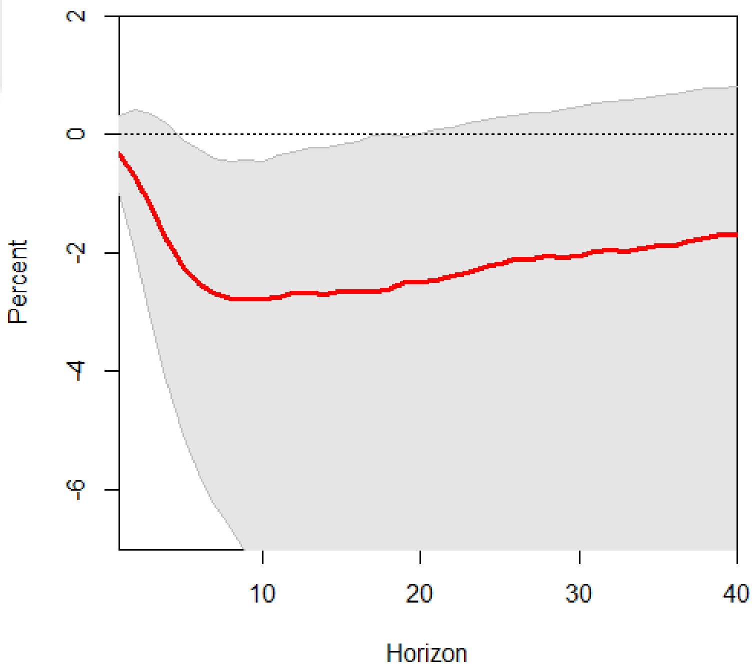
Source: Own elaboration.

Figure 6: Impulse response function: Commerce sector



Source: Own elaboration.

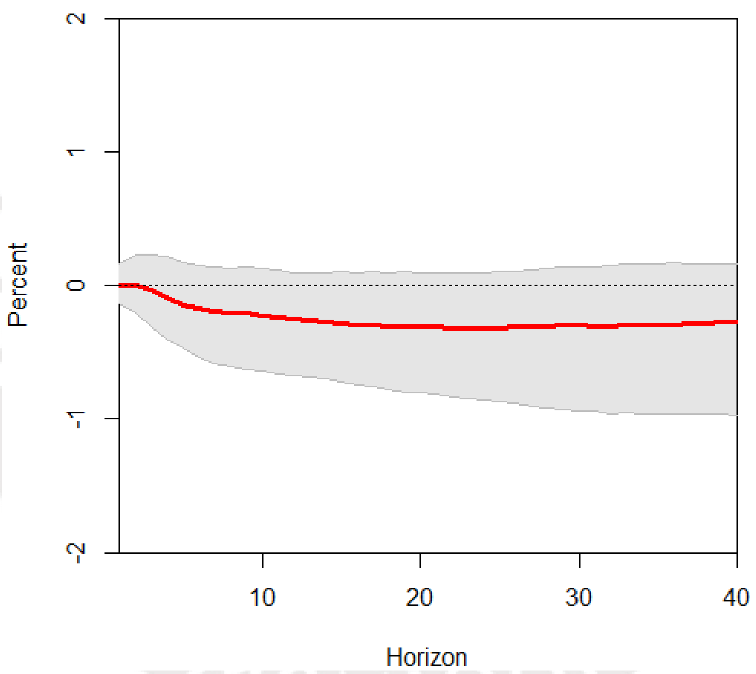
Figure 7: Impulse response function: Mining and hydrocarbons



Source: Own elaboration.

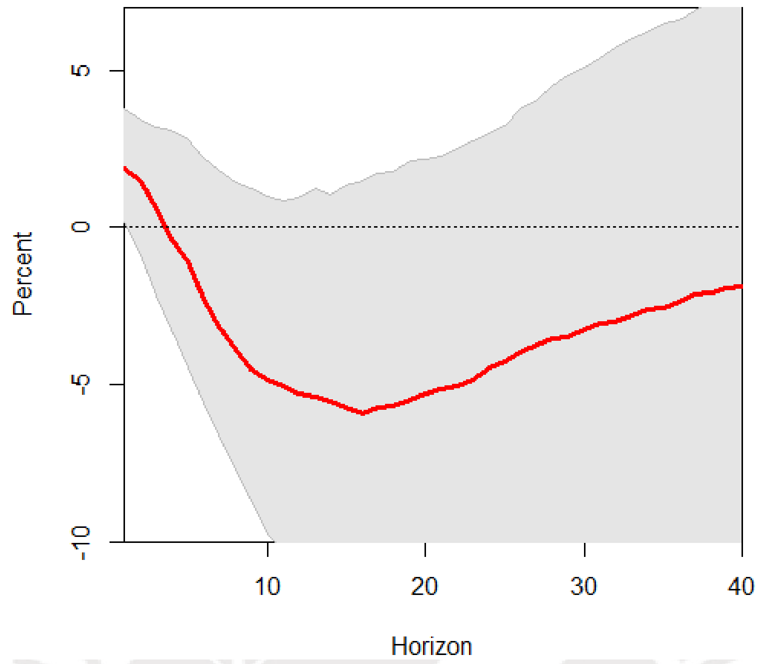
In order to analyze the main components of the Peruvian aggregate demand, impulse response functions for private consumption and internal brute investment are shown. A small but persistent drop in private consumption is estimated, that reaches -0.3% at its lowest point. As for total brute investment, a bigger reduction is observed, deviating -7.7% from it's trend. This result is consistent with Bloom, Bond, and Van Reenen (2007), who proposed that in the presence of uncertainty, the decrease in consumption may be lower than the one observed in investment, as firms appear to be more forward-looking than individuals.

Figure 8: Impulse response function: Private Consumption



Source: Own elaboration.

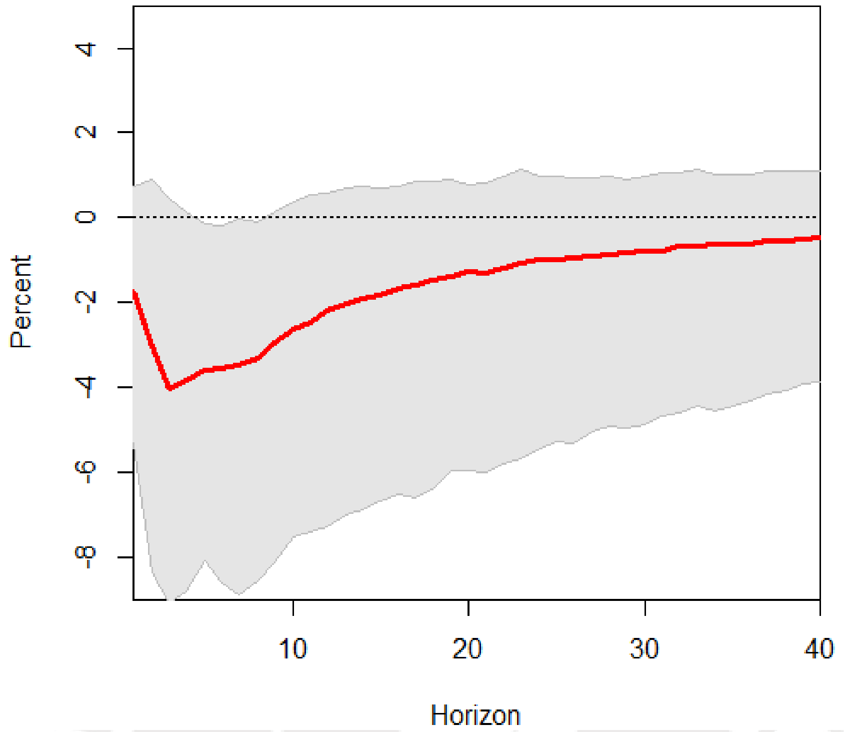
Figure 9: Impulse response function: Internal Brute Investment



Source: Own elaboration.

Finally, the response of the business confidence indicator to a shock to the variance of global output is shown in figure 10. The business confidence indicator provides information on future developments, based upon opinion surveys. Results show that, for Peru, this indicator suffers an estimated 2.0% drop shortly after the shock.

Figure 10: Impulse response function: Business Confidence Index (BCRP)



Fuente: Own elaboration.

6. CONCLUSIONS

This paper investigates the transmission of volatility shocks to global economic activity in the Peruvian business cycles and its components. In order to accomplish this, I estimate a open economy structural VAR model that allows the volatility of World GDP shocks to be time varying and to have an impact in the endogenous variables.

A one standard deviation increase in the variance of global economic activity result in a fall of Peruvian GDP, that is estimated to be around -3.3% at its lowest (after nine quarters). For primary sectors, a large drop in mining and hydrocarbons sector's GDP is estimated. For non primary sectors, significant negative effects are presented for the construction and manufacturing sector. In relation to the side of the aggregate demand, investment seems to be the most affected component, as its estimated response to the shock is significantly larger than the one estimated in the case of private consumption. Finally, it is shown that business confidence indicators also suffer a negative impact shortly after the shock.

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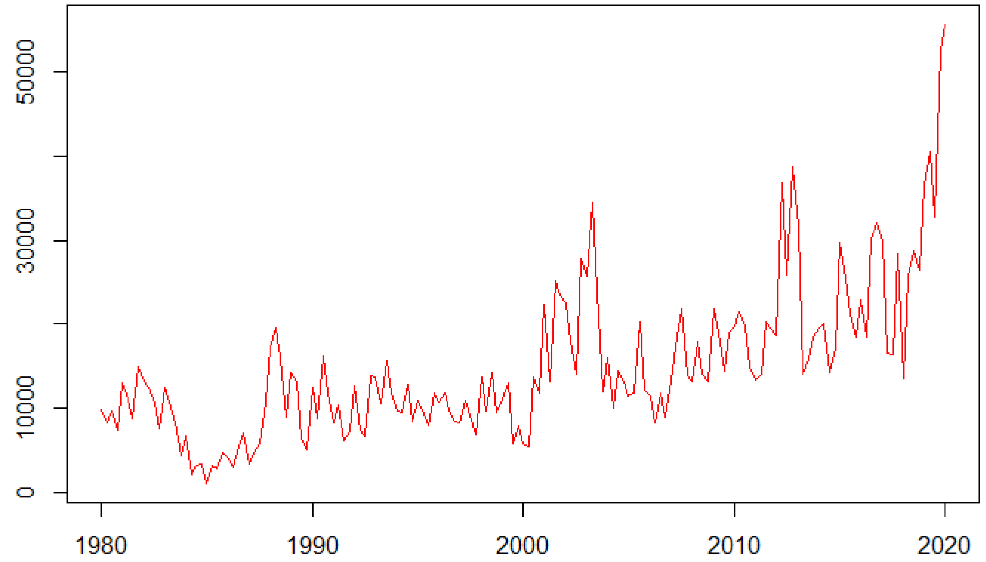
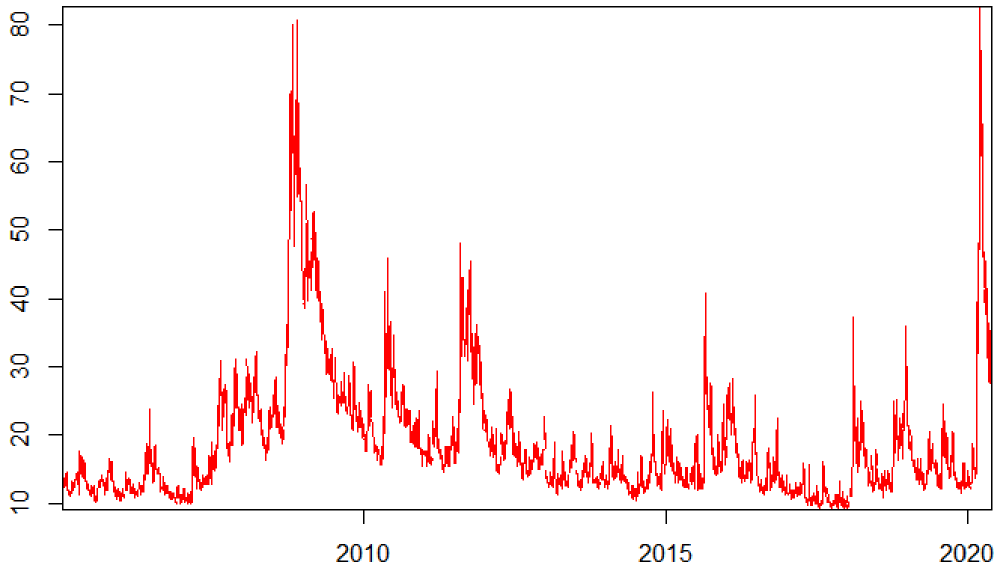
APPENDIX: GRAPHS

Figure 11: World Uncertainty Index (1980-2020)



Source: FRED. Own elaboration.

Figure 12: CBOE Volatility Index: VIX (2005-2020)



Source: FRED. Own elaboration.