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# The response of inflation to budgetary shocks in Russia: an (S)VAR approach in economically uncertain times

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**Aim:** The motivation for this research stems from Russia's notable high levels of government expenditure due to its continual involvement in armed conflicts, which often result in budgetary imbalances and economic policy uncertainty. These factors impact the inflation rate. This study delves into the complex relationship between budgetary shocks, economic uncertainty, and inflation within the context of the Russian economy. The aim of this study is to unravel how budgetary decisions, made amidst a globally uncertain economic environment, influence inflation dynamics. In other words, the objective of this study is to analyse the effects of budgetary shocks on the inflation rate in Russia, taking into account the uncertain context of her economic policy.

**Design / Research methods:** To achieve the objective, we employ a Structural Vector AutoRegression (S)VAR approach, covering the period from 2003-Q1 to 2022-Q4. This methodological approach allows for a comprehensive analysis of how economic uncertainty influences the identification of budgetary shocks within an (S)VAR model.

**Conclusions / findings:** The findings underscore that incorporating the economic uncertainty index into the model yields statistically significant estimates, suggesting that variations in economic uncertainty shape the relationship between budgetary shocks and inflation. This sheds light on the intricate mechanisms through which economic uncertainty influences the behaviours of economic agents and policy decisions, thereby affecting the transmission of budgetary shocks to inflation. In contrast, without the economic uncertainty index, the response of the inflation rate to budgetary shocks is insignificant.

**Originality / value of the article:** This study makes an original contribution by incorporating the Economic Uncertainty Index to better capture budgetary shocks. By showing how uncertainty affects the effectiveness of fiscal policies on inflation, it offers new perspectives on macroeconomic stability. This

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approach provides a more detailed analysis of the responses of economic actors and their implications for policymakers in volatile economic environments.

*Keywords: Russia, economic policy uncertainty, inflation, budgetary shocks, (S)VAR.*
JEL: E31; E62; C51

## 1. Introduction

Russia's economic resilience stems from its dependency on oil and gas exports, which contribute to 30% and 45% of the country's total exports, respectively, according to the Russian Ministry of Finance. This structural characteristic of its economy becomes particularly sensitive during periods of instability due to armed conflicts that often lead to increased government expenditures, triggering consequential adjustments in fiscal policy. This, in turn, directly affects the economic equilibrium by influencing various dimensions of the economy.

Indeed, such a course of action results in an increase in military expenditures, subsequently causing a rise in government spending and a decline in tax revenues (Itskhoki, Mukhin 2022). For instance, since the onset of the conflict in Ukraine in February 2022, government expenditures within the Russian Federation has surged by 25% between the first and third quarters, while tax revenues experienced a 20% decrease during the same period. These budgetary fluctuations are accompanied by a rise in the inflation rate, which escalated to 21.6% in November 2022, in contrast to the 6.7% observed in November 2021 (Russian Ministry of Finance). Given the pivotal role inflation plays in transmitting effects among macroeconomic aggregates (Diop, Diaw 2015), such circumstances have prompted significant interest in empirical research concerning the impact of fiscal shocks on the inflation rate.

In this context, we aim to examine the repercussions of fiscal shocks on inflation in Russia by adopting a multivariate analytical approach using the structural vector autoregressive (S)VAR model.

Analysing the effects of fiscal policy shocks within the framework of a (S)VAR model remains challenging due to the difficulty in identifying structural shocks (Ramey 2011). Since the emergence of the neo-Keynesian model, researchers have explored various indicators to capture structural shocks in a timely manner. Among these indicators are inflation predictions and the output gap, which offer informed perspectives on the economic situation by revealing business cycles. However, it is essential to note that these indices, while valuable, remain unobservable and involve monetary aggregates such as interest rates, potentially leading to less robust estimations when introduced into the model (Mazzi et al. 2016).

According to Keynes (1936: 186), the uncertainty of economic policy leads economic actors to adopt a cautious approach towards consumption and investment. This uncertainty is evaluated using three fundamental elements (Baker et al. 2014): fiscal provisions, forecast divergences from consensus, and the number of articles published in official journals incorporating terms like “uncertain” or “economic uncertainty,” along with other relevant terms related to economic policies.[1] Consequently, we propose that considering economic uncertainty in Russia can help us understand the stance of its fiscal policy and can provide the (S)VAR model with the means to determine structural shocks. Our study therefore aims to examine the response of the inflation rate to fiscal shocks in Russia over the period 2003Q1–2022Q4 within a context of economic policy uncertainty. The innovative contribution of our study lies in integrating economic uncertainty, measured by the Economic Policy Uncertainty Index, as a determining factor in analysing fiscal shocks and their impact on inflation. This approach introduces a novel factor that helps capture shocks within the (S)VAR model. By exploring the interaction between economic uncertainty and fiscal policies, our research provides a new and essential dimension to the understanding of Russian economic dynamics, a perspective that has not yet been fully explored in the existing literature.

We formulate two main hypotheses: 1) A positive budgetary shock in an uncertain economic environment results in a significant increase in the inflation rate; 2) A negative budgetary shock in an uncertain economic environment leads to a decrease in the inflation rate.

[1] This is the standard deviation among economists' forecasts for the variables (inflation and government spending), which serve as measures of economic policy uncertainty. The economists are selected by the Philadelphia Fed and the comprehensive list is available at: https://www.philadelphiafed.org/research-and-data/economists (BSI Economics, Quentin Blanc 2015).

The rest of the paper is organised as follows: section two provides a brief overview of the existing literature focusing on the impact of fiscal shocks on macroeconomic aggregates, with a specific emphasis on the inflation rate. Section three elaborates on the methodological framework of the (S)VAR model. Section four outlines the outcomes extracted from our analysis. Section five provides an interpretation of the findings based on pertinent economic theory. Lastly, Section 6 summarises our concluding remarks.

## 2. Research background

The topic of interactions between fiscal shocks and macroeconomic aggregates, particularly the inflation rate, has often sparked conflicting theoretical and empirical debates.

On a theoretical level, the post-Keynesian theory provides a valuable framework for analysing the effects of fiscal shocks on inflation in the context of economic uncertainty. Under this perspective, a notable effect is that government spending can play a stabilising role in times of economic uncertainty by supporting overall demand without necessarily generating excessive inflation. This phenomenon is explained by the fact that, in conditions of uncertainty, economic actors and consumers tend to save rather than spend, which alleviates inflationary pressures (Davidson 1991).

On an empirical level, the analysis of fiscal shocks began with pioneering work by Blanchard and Perotti (2002), who used a structural vector autoregressive (S)VAR model to study the post-war American economy. Their goal was to investigate the effects of shocks related to government expenditures and fiscal constraints on economic growth and private consumption. Their findings indicated that positive expenditure shocks led to increases in both growth and consumption, suggesting that increased government expenditures can stimulate economic activity by boosting demand. Conversely, positive tax shocks resulted in decreases, implying that higher taxes reduce disposable income and thus lower consumption and economic activity.

Perotti (2004) used a VAR(S) model to examine the impact of fiscal shocks on inflation in five OECD countries from 1961 to 2001. The results show that fiscal shocks often have short-lived effects on inflation. This suggests that fiscal policy may not be a good way to change the economy over the long term. This is likely because shocks are not captured well enough in this model.

Mountford (2005) employed an (S)VAR model with American data to show that tax revenue shocks negatively impact private consumption and gross domestic product (GDP). Higher taxes reduce consumer spending and overall economic output. In contrast, government expenditure shocks did not reduce consumption but instead created a crowding-out effect on private investment, where increased government expenditures lead to reduced private sector investment, ultimately lowering the inflation rate by reducing aggregate demand.

Afonso and Sousa (2009) applied a Bayesian (S)VAR approach to the United States, Germany, Italy, and the United Kingdom. They found that government expenditure shocks did not affect inflation, indicating that government expenditure increases did not translate into higher prices.

Burriel et al. (2010) used a (S)VAR model for the euro area and found that the inflation response to fiscal shocks was neutral. This neutrality implies that fiscal shocks have not consistently resulted in changes in the inflation rate. However, the output response depended on the budget stress index. When the budgetary tension index was high, inflation tended to rise as a result of positive shocks in government spending, indicating that fiscal uncertainty exacerbates inflationary pressures. On the contrary, when fiscal uncertainty was low, inflation tended to decline, suggesting that fiscal insecurity mitigated the inflationary impact of government spending. According Davidson (1991), the budget stress index has increased economic uncertainty by fuelling uncertainties about financial stability, which diminishes the confidence of economic players.

Baum and Koester (2011) conduct an analysis using a Threshold VAR model and find that the impact of fiscal shocks on economic activity and inflation depends heavily on the initial level of economic uncertainty. They note that high levels of uncertainty can weaken the economy’s response to fiscal shocks, often by reducing the expected stimulus effect on growth and mitigating inflationary pressures.

Auerbach and Gorodnichenko (2012), show in their study that the effectiveness of fiscal policies varies significantly depending on the level of economic uncertainty. In periods of high uncertainty, the effects of fiscal shocks are less predictable and may have differentiated impacts on inflation. This suggests that economic uncertainty alters the transmission of fiscal policies to the real economy.

The Ramey and Zubairy study (2014) analyses the multipliers of government spending in the United States based on the uncertain economic context. They found that the effects of government expenditure on economic growth vary significantly during periods of low economic uncertainty compared to periods with high economic insecurity, where spending effectiveness may be affected by the level of increased economic insecurity.

Beetsma et al. (2015), their study deals with the effects of fiscal consolidation on the confidence of economic operators in Europe. They find that fiscal consolidation measures can hurt confidence, thereby exacerbating economic uncertainty and potentially curbing economic recovery by increasing inflation and decreasing consumption.

Fort et al. (2017), although his paper does not deal directly with fiscal shocks, it examines employment trends in the manufacturing sector in the United States. It highlights how economic uncertainty can influence employment dynamics through government spending.

Olamid et al. (2022) use the (S)VAR method to analyse the impact of fiscal and monetary shocks on the economic dynamics of the East African Community (CAE). By focusing on the effects on the inflation rate, exchange rate, and GDP of member countries, it aims to understand how these variables interact in a context of persistent economic uncertainty.

In summary, this literature review highlights that despite the recognition of a significant link between fiscal shocks and inflation in the literature, there is a noticeable variability in the importance of economic uncertainty as a moderator of this relationship. Some works pay particular attention to this factor, while others treat it in a more marginal way. This diversity of perspectives underlines the importance of our study to deepen these nuances and strengthen the reliability of our findings in this complex area of economic research.

## 3. Methodology

This section elucidates the methodological approach of the (S)VAR model along with the selected data, aiming to address the objective of the present study.

### 3.1. The theoretical framework of the (S)VAR approach

Adopting the (S)VAR approach as presented by Blanchard and Perotti (2002: 1329–1368) offers several advantages: *i*) it relies on economic theory to interpret shocks, establishing conceptual links between variables in contrast to a standard VAR, which generates economically uninterpretable innovations (D'amico, King 2023); *ii*) it simplifies the identification of policy-related shocks by employing time lags to determine when a shock occurs and when corrective measures are enacted (Perotti, 2002); *iii*) it accounts for the simultaneity of effects among variables, an essential feature when analyzing interactions between variables (Kuma 2018); and *iv*) it provides insights into the characteristics of fiscal policy instruments in relation to economic activity (Burriel et al. 2010).

Our starting point (Step 1) is the primitive form of the VAR model, formulated as follows:

$$AY_t = \lambda + \sum_{i=1}^{P} \beta_i Y_{t-i} + v_t \quad (1)$$

*A:* square matrix of order (k×k); $Y_t$: vector of k endogenous random variables of order (k×1); $\boldsymbol{\lambda}$**:** constant terms vector; *P:* lag order; $\beta_i$: Square matrix of coefficients associated with lags of order (k×k); $v_t$**:** diagonal matrix of error terms for the system of order (k×1).[2]

We assume weak stationarity for input variables, as well as an absence of autocorrelation among the error terms of equation (1) (Ljung-Box P-value > 0.05) for each lag. Additionally, a normal distribution of error terms is recommended (Jarque-Bera P-value > 0.05) to validate the VAR model.

[2] The assumption of matrix diagonalization $v_t \sim iid(0,\sigma_v^2)$ highlights the possibility of defining orthogonal structural shocks in pairs, which are at the core of the main objective of the (S)VAR.

By validating the VAR model, we proceed to the configuration of the (S)VAR for its estimation (Step 2), as follows:

$$Y_t = A^{-1}\lambda + \sum_{i=1}^{p} A^{-1}\beta_i Y_{t-i} + A^{-1}v_t \quad (2)$$

$A^{-1}\lambda = \boldsymbol{\alpha}$ ; $A^{-1}\beta_i = \boldsymbol{\phi_i}$ ; $A^{-1}v_t = \boldsymbol{e_t}$

Where:

$\beta_i$: Diagonal matrix with non-zero elements only on its main diagonal; $A^{-1}$: The inverse of the unit triangular lower matrix *A*. We assume that the responses to shocks are likely to be observed in the own lagged values of each variable, thus the matrix *A* is lower diagonal (Kuma 2018). The equation (2) in its reduced form is therefore:

$$Y_t = \alpha + \sum_{i=1}^{p} \phi_i \, Y_{t-i} + e_t \quad (3)$$

The matrix *A* of order ($k$×$k$) in its primitive form (equation 1) represents an identity matrix, employed in constructing the Structural Vector Autoregressive (S) VAR model to facilitate shock identification. Equation (2) $v_t = Ae_t$, elucidates the relationship between unobserved shocks and endogenous variables. $e_t$ Signifies unobserved disturbances impacting endogenous variables, with its economic significance discernible only through its linear combination with instantaneous structural shocks (Diop, Diaw 2015).

The autoregressive elasticities of matrix *A* mirror the influence of past values of variables on their current values. They illustrate how each endogenous variable depends on its own past values. However, they are not directly linked to shocks. The elasticities of matrix *B* quantify the propagation of these shocks to the observed variables.

### 3.2. Data and source

The variable selection for our (S) VAR model applied to the Russian economy is based on the theoretical framework developed by Burriel et al. (2010) and the foundational theoretical rule.

The vector $Y_t$ is, thus, composed of $(p_t, y_t, r_t, c_t, u_t, t_t, g_t)$, where:

- ($p$) Inflation rate is represented by the Consumer Price Index (CPI) (excerpted from Concise Economic Indicators Compilation Flex database).
- ($c$) Private final consumption is expressed in the Russian national currency, the ruble (excerpted from Global Economy database).
- ($r$) Short-term interest rate measuring the yield for 3 months up to 90 days, expressed as a percentage (excerpted from Federal Reserve Economic Database). [3]
- ($u$) Index of economic policy uncertainty expressed in points (excerpted from Federal Reserve Economic Database).[4]
- ($y$) Production is represented by the real Gross Domestic Product (GDP), expressed in the Russian national currency, the ruble (excerpted from Federal Reserve Economic Database).
- ($t$) Total tax revenues expressed as a percentage of GDP (excerpted from Global Economy database).[5]
- ($g$) Government consumption expenditures expressed in the Russian national currency, the ruble (excerpted from Concise Economic Indicators Compilation Flex database). [6]

Except for the variables ($u$), ($y$) and ($t$), the remaining variables are measured at constant prices (100 = 2015). The data are transformed into logarithms. Data have been collected at a quarterly frequency, spanning from 2003:Q1 to 2022:Q4.[7]

[3] The selection of a short-term interest rate relates to its connection with the inflation rate, which impacts private consumption and investment decisions (Patterson, Lygnerud 1999).

[4] The data were collected at a monthly frequency, and we computed the arithmetic mean over three months corresponding to each quarter.

[5] We opt for the utilisation of total tax revenues as they encompass income derived from the value-added tax (VAT) as well as direct taxation, such as the Global Income Tax (GIT), both of which exert an influence on the inflation rate due to the portion of savings derived from individual incomes (Mountford 2005).

[6] We have chosen to consider government consumption expenditures for several reasons: our study highlights military expenditures, which are accounted for within the consumption category in terms of national accounting; Consumption expenditures also encompass the repayment of public debt; Contemporary literature places particular emphasis on consumption expenditures due to their significant impact on aggregate demand within the economy (Keynes 1936).

[7] The chosen period encompasses events marked by instability across various dimensions: financial, economic, health-related, and political.

### 3.3. Theoretical identification of short- term structural constraints

Given our interest in analysing the inflation response to budgetary shocks, it becomes imperative to examine the linear combination formed by inflation residuals, expenditure residuals, and revenue tax residuals within the simplified formulation of the system (Burriel 2010). Furthermore, since our modelling approach is situated within a structural context, it is crucial to present the linear combination of structural shocks from other variables, contributing to the determination of the matrix of structural shocks.

To establish the constraints, we draw upon Perotti's (2004) approach, which suggests that quarterly variables respond to structural shocks with a lag exceeding three (3) months, implying that the instantaneous responses of certain variables to shocks are null.

The number of constraints required in an (S)VAR model is contingent upon the research objectives as well as the complexity of inter-variable relationships.[8] Furthermore, it is important to note the pivotal role that the order of variables plays in setting up constraints. The system of structural equations within the framework of our (S)VAR model is as follows:

$$v_t^p = \phi_{p,c}\, v_t^c + \phi_{p,r} v_t^r + \phi_{p,u} v_t^u + \phi_{p,y} v_t^y + \beta_{p,t} e_t^t + \beta_{p,g} e_t^g + e_t^p$$
$$v_t^c = \phi_{c,p}\, v_t^p + \phi_{c,r} v_t^r + \phi_{c,u} v_t^u + \phi_{c,y} v_t^y + \beta_{c,t} e_t^t + \beta_{c,g} e_t^g + e_t^c$$
$$v_t^r = \phi_{r,p}\, v_t^p + \phi_{r,c} v_t^c + \phi_{r,u} v_t^u + \phi_{r,y} v_t^y + \beta_{r,t} e_t^t + \beta_{r,g} e_t^g + e_t^r$$
$$v_t^u = \phi_{u,p}\, v_t^p + \phi_{u,c} v_t^c + \phi_{u,r} v_t^r + \phi_{u,y} v_t^y + \beta_{u,t} e_t^t + \beta_{u,g} e_t^g + e_t^u$$
$$v_t^y = \phi_{y,p}\, v_t^p + \phi_{y,c} v_t^c + \phi_{y,r} v_t^r + \phi_{y,u} v_t^u + \beta_{y,t} e_t^t + \beta_{y,g} e_t^g + e_t^y$$
$$v_t^t = \phi_{t,p}\, v_t^p + \phi_{t,c}\, v_t^c + \phi_{t,r} v_t^r + \phi_{t,u} v_t^u + \phi_{t,y} v_t^y + \beta_{t,g} e_t^g + e_t^t$$
$$v_t^g = \phi_{g,p}\, v_t^p + \phi_{g,c}\, v_t^c + \phi_{g,r} v_t^r + \phi_{g,u} v_t^u + \phi_{g,y} v_t^y + \beta_{g,t} e_t^t + e_t^g$$

$e_t^i$, $v_t^i$ are the structural shocks, and the residual terms of the variables, respectively.

[8] The number of restrictions to be retained in the (S)VAR is given by: n = k(k-1)/2, where k represents the number of endogenous variables (Blanchard, Perotti 2002). Nevertheless, it is imperative to refer to economic definitions and the outcomes of non-causality tests in various previous studies. The number of restrictions for our model is n = 21.

Our initial approach prioritises variables subject to constraints (Perotti 2004) to ensure that the matrix structure ($A$) remains coherent and to promptly introduce relationships mandated by the constraints.

Following the reasoning advocated by Burriel (2010), we formulate short-term restrictions as follows:

– An instantaneous shock to the inflation rate has no effect on private consumption ($c$), interest rate ($r$), economic uncertainty ($u$), production ($y$), tax revenues ($t$), or government expenditures ($g$), which entails (6) restrictions:

$$\phi_{p,c} = \phi_{p,r} = \phi_{p,u} = \phi_{p,y} = \beta_{p,t} = \beta_{p,g} = 0.$$

– An instantaneous shock to private consumption ($c$) does not influence economic uncertainty ($u$), production ($y$), tax revenues (t), or government expenditures ($g$) which entails (5) restrictions:

$$\phi_{y,r} = \phi_{y,u} = \phi_{y,y} = \beta_{y,t} = \beta_{y,g} = 0.$$

– An instantaneous shock to the interest rate ($r$) has no effect on economic uncertainty ($u$), production ($y$), tax revenues ($t$), or government expenditures ($g$) which entails (4) restrictions:

$$\phi_{r,c} = \phi_{r,u} = \phi_{r,y} = \beta_{r,t} = \beta_{r,g} = 0.$$

– An instantaneous shock to economic uncertainty ($u$) has no effect on production (y), tax revenues ($t$), or government expenditures ($g$) which entails (3) restrictions:

$$\phi_{u,y} = \beta_{u,t} = \beta_{u,g} =0$$

– An instantaneous shock to production ($y$) does not react to tax revenues ($t$) and government expenditures ($g$) which entails (2) restrictions:

$$\beta_{y,t} = \beta_{y,g} = 0.$$

– An instantaneous shock to tax revenues ($t$) does not react to government expenditures ($g$) which entails (1) restriction:

$$\beta_{t,g} = 0.$$

## 4. Results

Table 1 provides the statistical description of the variables utilized.

**Table 1. Statistical description of the data**

| | l(*p*) | l(*y*) | l(*r*) | l(*c*) | l(*u*) | l(*t*) | l(*g*) |
|---|---|---|---|---|---|---|---|
| Mean | 4.319 | 16.818 | 2.036 | 4.551 | 5.077 | 2.645 | 4.296 |
| Median | 4.358 | 16.836 | 1.999 | 4.624 | 4.978 | 2.597 | 4.514 |
| Maximum | 5.053 | 17.132 | 3.051 | 5.079 | 6.559 | 3.163 | 5.195 |
| Minimum | 3.444 | 16.376 | 1.442 | 3.877 | 4.072 | 2.217 | 2.811 |
| Std. Dev | 0.452 | 0.156 | 0.334 | 0.246 | 0.611 | 0.236 | 0.677 |
| Observation | 80 | 80 | 80 | 80 | 80 | 80 | 80 |

Source: Authors' compilation from EViews Outputs.

### 4.1. (S)VAR model estimation

The initial step in estimating (S) VAR involves examining the stationarity of the variables (Table 2).

**Table 2. Dickey-Fuller Augmented (ADF) and Phillips-Perron (PP) stationarity tests**

| | | **ADF** | | | **PP** | | |
|---|---|---|---|---|---|---|---|
| | | I(0) | I (1) | I(2) | I(0) | I(1) | I(2) |
| *l(p)* | t- statistic<br>prob | [-1.864]<br>(0.663) | [-6.290]**<br>(0.000) | - | [-1.838]<br>(0.676) | [-6.306]**<br>(0.000) | - |
| *l(c)* | t- statistic<br>prob | [-2.241]<br>(0.459) | [-5.686]**<br>(0.000) | - | [-3.438]<br>(0.053) | [-13.880]**<br>(0.000) | - |
| *l(r)* | t- statistic<br>prob | [-2.974]<br>(0.146) | [-8.122]**<br>(0.000) | - | [-2.960]<br>(0.150) | [-8.122]**<br>(0.000) | - |
| *l(u)* | t- statistic<br>prob | [-6.086]<br>(0.000) | - | - | [-6.090]<br>(0.000) | - | - |
| *l(y)* | t- statistic<br>prob | [-3.225]<br>(0.088) | [-2.306]<br>(0.422) | [-5.091]**<br>(0.000) | [-3.189]<br>(0.072) | [-2.012]<br>(0.127) | [-6.619]**<br>(0.000) |
| *l(t)* | t- statistic<br>prob | [-0.884]<br>(0.952) | [-7.580]**<br>(0.000) | - | [-0.974]<br>(0.941) | [-7.580]**<br>(0.000) | - |
| *l(g)* | t- statistic<br>prob | [-2.626]<br>(0.270) | [-2.398]<br>(0.397) | [-18.680]**<br>(0.000) | [-2.826]<br>(0.060) | [-9.044]**<br>(0.000) | - |

Source: Authors' compilation from EViews Outputs. ** The null hypothesis of non-stationarity is rejected at a 5% level.

Except for the economic uncertainty variable '$u$', all other variables are non-stationary at level I(0).

Subsequently, the optimal lag order (P) is determined using the Akaike Information Criterion (AIC) and Schwartz Criterion (SC). These criteria aim to select the model that provides the best data description, considering the limited sample size and the model's fit in terms of normality and absence of residual autocorrelation.[9]

The optimal lag order that minimises the AIC and SC criteria for our model is P=6. In the model estimated, the variables are significant (P-value < 0.05) at optimal lag: P=6. It is noteworthy at this juncture that the signs of the parameters are not extensively considered in the VAR model. Resolution stems from the estimation of the (S) VAR due to its incorporation of economic constraints (Perotti 2004).

### 4.2. Empirical identification of short-term structural constraints

By applying the conversion constraints to the residuals, which are formed by a linear combination of the orthogonal impulse response structure, we derive the matrix of contemporaneous relationships associated with the various instantaneous shocks as follows:

$$= \mathrm{x} \begin{pmatrix} p \\ c \\ r \\ u \\ y \\ t \\ g \end{pmatrix} \quad \begin{pmatrix} 1.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ \mathbf{0.75} & 1.00 & 0.00 & 0.0 & 0.00 & 0.00 & 0.00 \\ \mathbf{-2.42} & \mathbf{0.09} & 1.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ \mathbf{4.44} & \mathbf{1.51} & \mathbf{1.73} & 1.00 & 0.00 & 0.00 & 0.00 \\ \mathbf{-0.54} & \mathbf{-0.35} & \mathbf{0.25} & \mathbf{-0.02} & 1.00 & 0.00 & 0.00 \\ \mathbf{1.53} & \mathbf{-0.77} & \mathbf{0.18} & \mathbf{-0.03} & \mathbf{-0.78} & 1.00 & 0.00 \\ \mathbf{1.22} & \mathbf{-0.01} & \mathbf{0.28} & \mathbf{-0.00} & \mathbf{-0.02} & \mathbf{0.15} & 1.00 \end{pmatrix} \begin{pmatrix} \quad \end{pmatrix} \quad \begin{matrix} v_p \\ v_c \\ v_r \\ v_u \\ v_y \\ v_t \\ v_g \end{matrix}$$

The structural factorization of the matrix ($A$) reveals that variations in government consumption expenditures ($g$) and levels of economic uncertainty ($u$) exert a positive and significant impact on the inflation rate (+1.22; +4.44), which confirms the initial hypothesis. However, fluctuations in tax revenues ($t$) also lead to an increase in the

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[9] The results of optimal lag selection and the validity testing of the model are provided in Appendix (A).

inflation rate; thus, the second hypothesis of this study is refuted. These findings align with those of Sriyana (2019) and Asandului et al. (2021).

The variations in short-term interest rate (*r*) and production (*y*) demonstrate a negative and significant influence on the inflation rate (-2.42; -0.54). It is worth noting that the private consumption variable (*c*) does not exhibit statistical significance.[10]

### 4.3. Estimation of budgetary shocks

Our aim in this estimation is to provide an overview of the convergence between empirically determined budgetary shocks and the budgetary shocks that have occurred in the Russian economy (Figure 1).

The positive revenue shocks in Russia observed during the studied period are associated with *i*) administrative reform involving the introduction of new sections

in Part II of the Russian Federation Tax Code[11]; *ii*) incorporation of the Electronic Tax Register into savings banks to enhance control and reduce tax disputes; *iii*) the tax administration modernization project (2008); and *iv*) a substantial increase in the value-added tax rate (2019).

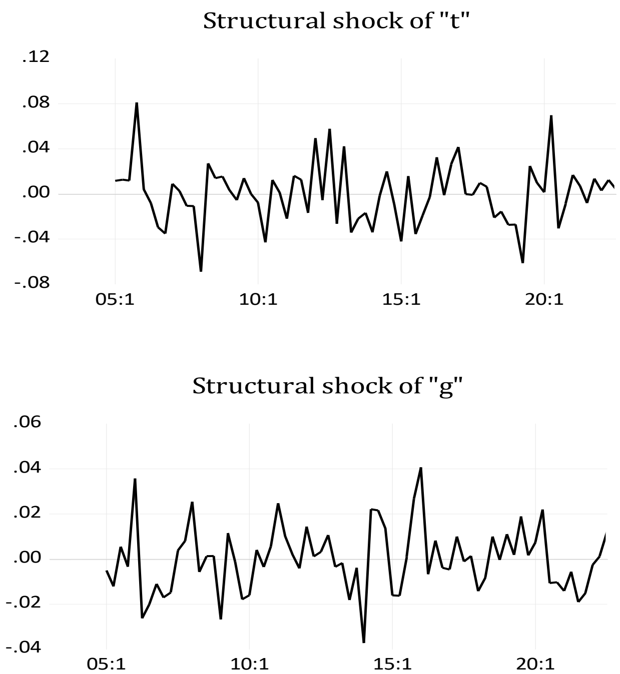
We also identify negative revenue shocks related to *i*) Federalism reforms and the reinforcement of fiscal system centralization; *ii*) Russia committing to abolish the interregional sales tax, leading to a significant revenue decrease estimated at nearly 5% for each region[12] ; *iii*) social issues review resulting in a political crisis in January 2005 (Daucé, Walter 2006); *iv*) as part of economic revitalization through the National Projects, Russia reduced the taxation rate for self-employed workers ; and *v*) the COVID-19 health crisis led to reduced tax revenues due to decreased gross value added in the mining industry (Malkina 2021).

[10] The (S)VAR model estimation is presented in Appendix (B).

[11] During the years 2004, 2005, 2006, and 2007, the Federal Tax Service introduced new chapters to the Tax Code of the Russian Federation, namely Chapter 29: Tax on Gambling; Chapter 30: Social Goods; Chapter 25: Levies for the Use of Wildlife and Marine Biological Resources; Chapter 26: Unified Agricultural Tax – abolished sales tax; Chapters 25.3: State Duty and 31: Land Tax of the Tax Code of the Russian Federation; Water Tax, Chapter 02.25 of the Tax Code of the Russian Federation. Exemption from fees for the use of water bodies (Presidential Decree of the Russian Federation). Furthermore, the Ministry of Taxes and Levies of the Russian Federation underwent a transformation into the Federal Tax Service with the aim of enhancing the functions of executive bodies and optimizing tax management.

[12] Refer to Novikov (2005), where he discusses the reforms of federalist doctrine in Russia in his article.

**Figure 1. Estimating budgetary shocks**




Source: Authors' compilation from EViews Outputs.

Regarding positive government expenditure shocks, we observe: *i*) strong production growth triggering an expansionary budget policy aiming for significant public ownership expansion by the end of 2004 (Novikov 2005); *ii*) Russian military intervention in the Syrian conflict (2015); *iii*) preparations for a potential invasion of Ukrainian territory, illustrated by land, air, and maritime military manoeuvres, resulting in a significant increase in government expenditures (2021) and *iv*) Russian annexation of Ukrainian territories (2022).

As for negative government expenditure shocks, they are linked to economic regulation moments. *i*) Increased global demand in 2004 led to higher import rates, intensifying inflationary pressures. To control this inflation, Russian budgetary authorities adopted an approach of stringent government expenditure restriction; *ii*) the increase in foreign exchange reserves before the 2008 global financial crisis, driven by energy export tariffs, reached its peak level, enabling partial debt cancellation and a decrease in government expenditures. Moreover, there was: *iii*) an oil shock manifested by a drastic price drop of over 70% and *iv*) restructuring within the oil industry to reduce export duties and implicit fuel consumption subsidies (2019).

### 4.4. Structural variance decomposition

The analysis of the inflation rate's variance decomposition due to budgetary shocks is presented in Table 3.

According to the analysis of the variance decomposition, it is clearly observable that a budgetary shock can contribute up to 15.5% to the variation of the inflation rate. In comparison, a shock to tax revenues can contribute up to 4.4% to the variation of the inflation rate. We estimate that the contribution of budgetary shocks to inflation variability is relatively low.[13]

**Table 3. Contribution of budgetary shocks to inflation variability**

| | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Tax revenue shock | 0,0 | 0,06 | 0,4 | 0,5 | 1,9 | 2,0 | 1,7 | 1,5 | 4,4 | 7,6 |
| Government consumption expenditure shock | 0,0 | 3,4 | 3,6 | 4,5 | 6,9 | 9,2 | 11,2 | 11,0 | 15,4 | 13,5 |

Source: Authors' compilation from EViews Outputs. 'T' stands for the quarter.

### 4.5. Inflation response to budgetary shocks in the absence of an economic policy uncertainty index

This section focuses on examining the effects of budgetary shocks on inflation after eliminating the economic policy uncertainty variable '*u*' and estimating the (S) VAR model, which comprises just six (06) variables.[14]

The estimation of the matrix (*A*) reveals that the autoregressive elasticities of the short-term interest rate and government consumption expenditure variables hold

[13] The impulse responses to budgetary shocks are reported in Appendix (B).

[14] The (S)VAR model estimation in the absence of the variable (*u*) is presented in Appendix (C).

negative statistical significance (-2.91 [-4.12]; -0.72 [-3.08], respectively). Conversely, the coefficients of the other variables do not exhibit any statistical significance.

Despite the statistical insignificance of the autoregressive elasticity of tax revenues at optimal lag level, we persist in our analysis of structural shocks. We remove the constraints related to economic uncertainty (parameters in matrix *A* are set to 0) to continue our investigation.

The impulse response of the inflation rate to budgetary shocks does not hold any statistical significance. In other words, we are not able to adequately identify the effects of structural budgetary shocks due to a lack of information, notably related to the economic uncertainty variable and potentially other variables.[15]

## 5. Interpretation

Observing a modest positive inflation rate response to a positive shock in government consumption expenditures can be attributed to the fact that the rise in the overall price level does not stem from an increase in aggregate demand but rather from expenditures allocated to non-productive sectors such as defence. In this context, the accentuation of the persistence of government expenditure shocks in Russia is primarily associated with military expenditures. During economic uncertainty, economic agents are not motivated to enhance consumption levels when expenditures that stimulate aggregate demand remain at their current level. This response arises from economic agents' concern over economic uncertainty, which may influence their spending decisions, resulting in a mild inflation level increase. From a post-Keynesian perspective, such modest inflationary responses underscore the theory's emphasis on effective demand, the role of expectations and economic agents' behaviour, as well as the impact of institutional and public policy frameworks. The theory posits that increases in government expenditures, particularly in non-productive sectors, during

[15] The impulse responses to budgetary shocks in the (S)VAR model, in the absence of the variable ($u$), are reported in Appendix (C).

economic uncertainty may not significantly boost aggregate demand due to cautious consumer and business responses. This view suggests that economic actors adjust their behaviour based on expectations of future economic conditions, influencing the effectiveness of fiscal measures in stimulating the economy (Davidson 1991).

The explanation behind the modest positive inflation rate response to a positive shock in tax revenues lies in the following mechanism: when tax revenues increase through indirect taxes indexed to prices (such as VAT), the prices of consumer goods increase in value, leading to inflation growth (Sagramoso 2004). Conversely, revenues from income tax and social contributions remain constant in Russia, resulting in a favourable wage dynamic to compensate for the increased tax burden on consumer goods (Sokoloff 2005). This dynamic translates into a relatively mild inflation rate increase, aligning with the findings of Sagramoso (2004).

We consider the multipliers relatively low due to Russia's history of high inflation rates. Furthermore, the results exhibit a slight and statistically significant reduction in private consumption in response to tax revenue shocks, while the impact of consumption expenditure shocks holds no statistical significance. These findings are in line with the study by Jørgensen and Ravn (2022). Specifically, private consumption is closely linked to short-term interest rates, highlighting the mechanism of budgetary shock transmission. An increase in inflation due to tax revenue shocks leads to an uptick in short-term interest rates, prompting economic agents in an uncertain environment to curtail their consumption.

A positive shock to tax revenues yields a significantly positive response in short-term interest rates. Increased tax rates result in reduced asset demand in an uncertain economy, leading to a decline in long-term interest rates and an increase in short-term interest rates.

A positive shock to government expenditures generates a significant and positive effect on short-term interest rates and borrowing rates linked to public debt. Higher expenditures lead to growth in current public debt and a reduction in its stock, contributing to an increase in interest rates. This dynamic aligns with Giovannini and De Melo's theory (1993). Furthermore, short-term interest rates react more strongly to tax revenue shocks than to government expenditure shocks (Lachaine 2017). This observation can be explained by the shock transmission mechanism. According to this economic logic, decisions regarding tax revenues stem from expenditure decisions. Therefore, an increase in tax revenues aimed at financing expenditures tends to mitigate the positive impact generated by expenditure shocks on short-term interest rates, resulting in a relatively subdued effect (Jørgensen, Ravn 2022).

The economic uncertainty index exhibits a significant negative reaction to tax revenue shocks, while a positive and significant reaction is observed following government expenditure shocks. This observation can be interpreted by considering the determination of the economic uncertainty index, which is largely influenced by the pace of fiscal measures (Favero, Giavazzi 2007: 4–7). Thus, an increase in tax revenues signifies more stable fiscal governance (by definition), contributing to reduced uncertainty associated with economic policy. Conversely, an increase in non-productive consumption expenditures leads to heightened economic uncertainty (OECD 2011).

A positive shock to tax revenues triggers significantly positive short-term production reactions. This response is explained by the revenue increase, subsequently leading to capital expenditure growth (Akpan 2005: 51–69). Conversely, a positive shock to consumption expenditures induces a decrease in production. This decreases stems from increased non-productive expenditures, such as defence-related expenses, resulting in increased tax pressure to cover their magnitude. This tax pressure leads to a decline in aggregate demand, translating into reduced production (OECD 2011).

The impulse response plots of variables to budgetary shocks exhibit substantial coherence with previous results, considering that the significance of the curves relies on trends coherent with economic theory’s expectations and prior knowledge (Hu, Sanyal 2016).

## 6. Conclusion

This article aims to identify the response of the inflation rate to fiscal shocks in the Russian economy during the period 2003T1-2022T4 while recognising the importance of the uncertain economic environment in which budgetary decisions are taken and their effects on inflation. To do this, we have focused on government spending, including military expenditure, and total revenue to estimate a two-part VAR(S) model. By introducing the economic uncertainty index in the (S)VAR model, we found that the estimate of fiscal shocks on inflation is statistically significant. Statistically, this indicates that variations in economic uncertainty influence the relationship between fiscal shocks and inflation. Economically, this implies that economic uncertainty can change the behaviour and political decisions of economic actors, thereby affecting the transmission of fiscal shocks to inflation.

However, when the economic uncertainty index is excluded from the VAR(S) model, estimates become statistically insignificant, which means that the effects of fiscal shocks are not properly captured. Statistically, economic uncertainty plays a crucial role in revealing the underlying economic dynamics and providing key clues on how to grasp these shocks. Economically, this suggests that increases in government spending to boost demand may be ineffective in a context of high uncertainty, as consumers may be reluctant to react immediately to budgetary measures due to a lack of clarity. Similarly, the impact of tax revenue increases on inflation could be mitigated by uncertainty, with economic operators reacting differently to tax adjustments depending on their perception of the economic future.

An interesting observation by the authors of this study is that the effects of fiscal shocks in Russia do not seem to significantly disrupt the level of inflation. One possible explanation lies in the robustness of the Russian economy, which is heavily dependent on revenues from oil and gas exports to Europe. During the first months of the Ukrainian conflict, these exports increased by about $47 billion, according to the country's finance ministry.

Some recommendations for Russian economic policies and future research may be expressed by:

- Integration of the Economic Uncertainty Index: to improve the effectiveness of budgetary policies, it is essential to integrate the economic uncertainty index into their formulation. This will help to better understand the reactions of economic actors and optimise the impact of government spending on aggregate demand, especially in times of high uncertainty.
- Strengthening communication and transparency in economic policies: improved communication and transparency of economic policies can reduce economic

uncertainty. The Russian authorities should provide clear and regular information on the planned budgetary objectives and measures. This includes transparent economic forecasts, evaluation reports of budgetary policies, and public consultations. Better communication could help stabilise business and consumer expectations, thereby promoting a faster and more effective response to budgetary measures.

- Using high-frequency data and extending the analysis to other countries: To deepen this understanding, future research could further explore the complex interactions between economic uncertainty, fiscal shocks, and other macroeconomic variables through the use of high-frequency data applicable to other countries, which could enrich that understanding and generalise our idea.

In summary, the introduction of the Economic Uncertainty Index in our model has enabled us to capture its moderating effect on the relationship between fiscal shocks and inflation in Russia, improving our understanding of how the changes in economic uncertainties affect the transmission of shocks and, in particular, how they mitigate the rate of inflation. Each time, some recommendations are proposed.

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## Appendices

### *Appendix (A)*

#### Table (A.1). Optimal Lag order selection

| Lag | AIC | SC | HQ |
|---|---|---|---|
| 0 | -9.658 | -9.395 | -9.569 |
| 1 | -11.180 | -9.496* | -10.471 |
| 2 | -11.646 | -8.300 | -10.315 |
| 3 | -14.058 | -9.150 | -12.106 |
| 4 | -14.718 | -8.248 | -12.145* |
| 5 | -14.886 | -6.856 | -11.693 |
| 6 | -15.079* | -5.486 | -11.264 |

Source: Authors’ compilation from EViews Outputs. (*) Indicates the selected optimal lag order by the information criteria.

**Table (A.2). Residuals normality tests**

| Skewness | Kurtosis | Jarque-Bera |
|---|---|---|
| (0.1179)<br>[11.5089] | (0.1124)<br>[11.6584] | (0.0776)<br>[23.1624] |

Source: Authors' compilation from Eviews outputs. ( ) P-value and [ ] statistic. P-value > 0 leads us to reject the null hypothesis of non-normality in residuals.

**Table (A.3). LM test for error autocorrelation**

| Lag | LRE* stat | df | Prob. | Rao F-stat | df | Prob. |
|---|---|---|---|---|---|---|
| 1 | 54.83356 | 49 | 0.2630 | 1.140773 | (49, 85.7) | 0.2933 |
| 2 | 69.54737 | 49 | 0.0883 | 1.557650 | (49, 85.7) | 0.0964 |
| 3 | 54.10241 | 49 | 0.2859 | 1.121487 | (49, 85.7) | 0.3170 |
| 4 | 68.98799 | 49 | 0.3814 | 1.140752 | (49, 85.7) | 0.4800 |
| 5 | 64.59247 | 49 | 0.0669 | 1.410946 | (49, 85.7) | 0.0815 |
| 6 | 31.88112 | 49 | 0.9723 | 0.592939 | (49, 85.7) | 0.9759 |
| 7 | 70.22240 | 49 | 0.3250 | 1.578156 | (49, 85.7) | 0.3923 |

Source: Authors' compilation from EViews Outputs. Null hypothesis: The series are not correlated at the p level and are rejected if Prob < 0.05.

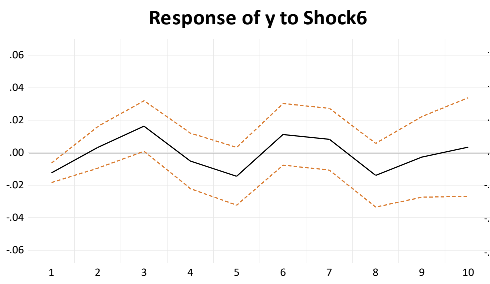
***Appendix (B)***

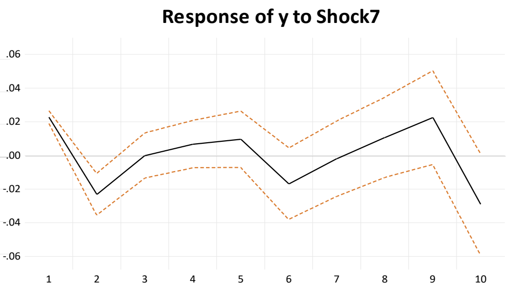
**Table (B.1). (S)VAR model estimation**

| Coefficient | Std. Error | z-Statistic | Prob. | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|---|---|---|
| 0.757711 | 0.654326 | 1.158002 | 0.2469 | 1.302698 | 0.737316 | 1.766812 | 0.0896 |
| -2.426556 | 0.664199 | -3.653358 | 0.0003 | -2.777178 | 0.657863 | -4.221513 | 0.0145 |
| 4.444862 | 2.082123 | 2.134774 | 0.0028 | -0.005973 | 0.064782 | -0.092201 | 0.8901 |
| -0.541817 | 0.271510 | -1.995567 | 0.0399 | 1.778604 | 0.194510 | 9.144027 | 0.0061 |
| 1.536655 | 0.585079 | 2.626407 | 0.0039 | 0.023784 | 0.052722 | 0.451123 | 0.4005 |
| 1.224578 | 0.245759 | 4.982840 | 0.0000 | -3.781255 | 0.351045 | -10.771422 | 0.0009 |
| 0.239743 | 0.118531 | 2.022609 | 0.0107 | 2.182755 | 0.300860 | 7.255044 | 0.0018 |
| 1.517995 | 0.507558 | 2.990783 | 0.0028 | -0.000588 | 0.000682 | -0.861682 | 0.2397 |
| -0.359081 | 0.048018 | -7.478039 | 0.0000 | -0.007831 | 0,001203 | -6.512113 | 0.0045 |
| -0.772601 | 0.135368 | -5.707428 | 0.0000 | -0.004988 | 0,001400 | -3.562701 | 0.0177 |
| -0.019799 | 0.067301 | -0.294186 | 0.7686 | -1.008407 | 24,699513 | -0.040827 | 0.8861 |
| -1.739041 | 0.502294 | -3.462200 | 0.0005 | 0.000663 | 0,000095 | 7.007823 | 0.0005 |
| 0.253003 | 0.048405 | 5.226816 | 0.0000 | -0.002155 | 0,000229 | -9.427312 | 0.0054 |
| 0.283251 | 0.050443 | 5.615256 | 0.0000 | -0.007355 | -0,000700 | 10.502594 | 0.0002 |
| 0.260755 | 0.120239 | 2.168644 | 0.0167 | 0.010702 | 0,000892 | 12.00000 | 0.0000 |
| -0.026300 | 0.010515 | -2.501096 | 0.0124 | 0.059418 | 0.004952 | 12.00000 | 0.0000 |
| -2.777178 | 0.523186 | -5.308204 | 0.0000 | 0.059761 | 0.004980 | 12.00000 | 0.0000 |
| 0.493752 | 0.219678 | -2.247619 | 0.0247 | 0.254707 | 0.021226 | 12.00000 | 0.0000 |
| 0.787604 | 0.249253 | 3.159863 | 0.0016 | 0.022726 | 0.001894 | 12.00000 | 0.0000 |
| -0.299024 | 0.109723 | -2.725266 | 0.0218 | 0.048066 | 0.004006 | 12.00000 | 0.0000 |
| 0.152578 | 0.048618 | 3.138322 | 0.0017 | 0.019829 | 0.001652 | 12.00000 | 0.0000 |

Source: Authors' compilation from EViews Outputs. Note: The significance of autoregressive elasticity if prob <0.05.

**Figure (B.1). Responses to budgetary structural shocks in the (S)VAR model**




Source: Authors' compilation from EViews Outputs. Note: shock 6 = a fiscal revenue shock; shock 7 = a government expenditures shock.

***Appendix (C)***

**Table (C.1). Optimal lag order selection for the model estimated, excluding the '*u*' variable**

| Lag | AIC | SC | HQ |
|---|---|---|---|
| 0 | -11.38773 | -11.19501 | -11.31118 |
| 1 | -12.04241 | -10.69331 | -11.50653 |
| 2 | -12.55955 | -10.05408 | -11.56435 |
| 3 | -15.07394 | -11.41210* | -13.61941* |
| 4 | -15.46561 | -10.64741 | -13.55176 |
| 5 | -15.41095 | -9.436378 | -13.03778 |
| 6 | -15.46579 | -8.334852 | -12.63330 |
| 7 | -16.62894* | -8.341628 | -12.33712 |
| 8 | -14. 65739 | -8.362854 | -12.54128 |

Source: Authors compilation from Eviews outputs. (*) Indicates the selected optimal lag order by the information criteria.

**Table (C.2). Residual normality tests for the model estimated, excluding the '*u*' variable**

| Skewness | Kurtosis | Jarque-Bera |
|---|---|---|
| (0.1326) | (0.5264) | (0.2441) |
| [9.815495] | [5.136531] | [14.95203] |

Source: Authors' compilation from EViews Outputs. ( ) P-value and [ ] statistic. P-value > 0 leads us to reject the null hypothesis of non-normality in residuals.

**Table (C.3). LM test for the model estimated, excluding the '*u*' variable**

| Lag | LRE* stat | df | Prob. | Rao F-stat | df | Prob. |
|---|---|---|---|---|---|---|
| 1 | 31.60282 | 42 | 0.6778 | 0.853075 | (42, 73.6) | 0.6954 |
| 2 | 41.37039 | 42 | 0.2477 | 1.183312 | (42, 73.6) | 0.2678 |
| 3 | 22.24488 | 42 | 0.9648 | 0.568584 | (42, 73.6) | 0.9677 |
| 4 | 45.76537 | 42 | 0.1276 | 1.344001 | (42, 73.6) | 0.1423 |
| 5 | 38.25361 | 42 | 0.3675 | 1.074017 | (42, 73.6) | 0.3896 |
| 6 | 42.91570 | 42 | 0.1989 | 1.238919 | (42, 73.6) | 0.2173 |
| 7 | 35.88579 | 42 | 0.4740 | 0.993480 | (42, 73.6) | 0.4960 |
| 8 | 23.64619 | 42 | 0.9436 | 0.609326 | (42, 73.6) | 0.9480 |

Source: authors' compilation from EViews Outputs. Note: Null hypothesis: The series are not correlated at the p level and are rejected if Prob < 0.05.

## Table (C.4). (S)VAR model estimation, excluding the ‘*u*’ variable

| Coefficient | Std Error | z-Statistic | Prob | Coefficient | Std Error | z-Statistic | Prob |
|---|---|---|---|---|---|---|---|
| 0,005021 | 0,002838 | 1,769832 | 0,0623 | -0,393231 | 0,045894 | -8,568331 | 0,0092 |
| -0,456741 | 1,305552 | -0,349826 | 0,3256 | 0,008538 | 0,004373 | 1,952623 | 0,0532 |
| -2,915562 | 0,408877 | -7,128012 | 0,0002 | -2,362894 | 1,243856 | -1,899652 | 0,1294 |
| -1,570430 | 0,895424 | -1,753968 | 0,0789 | 1,002158 | 0,309330 | 3,239768 | 0,0068 |
| 0,086582 | 0,165595 | 0,522633 | 0,1173 | -0,154647 | 0,125222 | -1,234986 | 0,2630 |
| -0,729856 | 0,236638 | -3,085514 | 0,0014 | -0,007821 | 0,000804 | -9,721627 | 0,0013 |
| -2,303921 | 1,263115 | -1,823999 | 0,1888 | -1,004393 | 0,518378 | -1,937568 | 0,0992 |
| -0,880346 | 0,538320 | -1,635359 | 0,4790 | 3,865082 | 14,666963 | 0,263523 | 0,7526 |
| -5,991072 | 7,071389 | -0,847227 | 0,7903 | 0,077788 | 0,036872 | 2,109652 | 0,3754 |
| -1,004393 | 0,507893 | -1,977568 | 0,0992 | 2,210508 | 0,464159 | 4,762398 | 0,0073 |
| 3,082865 | 8,742666 | 0,352623 | 0,7932 | -0,641457 | 0,323585 | -1,982346 | 0,3056 |
| 2,770788 | 1,378740 | 2,009652 | 0,4794 | -2,820071 | -3,907934 | 0,721627 | 0,0047 |
| -1,407686 | 0,485471 | -2,899632 | 0,0231 | -5,390043 | 2,781860 | -1,937568 | 0,0877 |
| 0,015889 | 0,005987 | 2,653859 | 0,0156 | 2,088652 | 7,925881 | 0,263523 | 0,2657 |
| -0,094837 | 0,051374 | -1,846017 | 0,0933 | 0,057892 | 0,030300 | 1,910652 | 0,5436 |
| 0,108158 | 0,062211 | 1,738566 | 0,1263 | 0,026701 | 0,115183 | 11,00000 | 0,0000 |
| 0,097918 | 0,277685 | 0,352623 | 0,2329 | 1,770925 | 0,089087 | 11,00000 | 0,0000 |
| 3,667023 | 1,886666 | 1,943652 | 0,0562 | 0,050001 | 0,160993 | 11,00000 | 0,0000 |
| 4,035792 | 15,745193 | 0,256319 | 0,5216 | 0,049375 | 0,136364 | 11,00000 | 0,0000 |
| -0,084662 | 0,081724 | -1,035947 | 0,3791 | 0,079386 | 0,162988 | 11,00000 | 0,0000 |
| 0,097211 | 0,077403 | 1,255907 | 0,3203 | 0,070723 | 0,064294 | 11,00000 | 0,0000 |

Source: Authors’ compilation from EViews Outputs. Note: The significance of autoregressive elasticity if prob <0.05.

**Figure (C.1). Responses to budgetary structural shocks in the SVAR model, excluding the variable '*u*'**


Source: Authors' compilation from EViews Outputs. Note: shock 6 = a fiscal revenue shock; shock 7 = a government expenditures shock.