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DO MONETARY AND FISCAL POLICIES INTERACT IN OIL-EXPORTING COUNTRIES? EVIDENCE FROM AZERBAIJAN

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Do monetary and fiscal policies interact in oil-exporting countries? Evidence from Azerbaijan[1]

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Abstract

This paper examines the interaction between the fiscal and monetary policies in Azerbaijan using the VAR methodology and quarterly data for the period 2003Q1-2018Q4. The results of the Granger causality tests and impulse response analysis show that although both the monetary and fiscal policies demonstrate activity, the fiscal policy dominates over the monetary policy. In terms of the fiscal regime classification, we find the regime in the country to be non-Ricardian.

Keywords: fiscal policy, monetary policy, interaction, policy regimes, Azerbaijan

JEL Classification: F31, F39

Introduction

Historically, the interaction between fiscal and monetary policies has been one of the key issues of building an optimal macroeconomic policy because there is a risk that the government and the central bank can set conflicting goals and their actions or inactions can have undesirable consequences for each other. The primary objective of the government is to stimulate economic growth mainly through increasing public spending and reducing tax rates, which results in an excessive budget deficit and therefore leads to the accumulation of public debt. Large public debt gives the government the temptation to finance it through emission, which puts at risk the price stability - the main goal of the central bank. Moreover, if the central bank raises the interest rate to combat inflation, the cost of public debt service can increase and therefore in turn can threaten fiscal sustainability. The presence of conflicting goals of monetary and fiscal policies calls for cooperation between two authorities for the sake of achieving the common goal that is ensuring sustainable economic growth.

The interaction between fiscal and monetary policies has been explored for developed as well as developing countries. The empirical results show the strong or moderate coordination between fiscal and monetary policies in developed countries and suggest that in this group of countries, the monetary policy mainly dominates over the fiscal policy (Muscatelli et al., 2002; Favero, 2002; Afonso et al., 2019; Clausen and Hayo, 2002; Bianchi and Ilut, 2017; Zang, 2003). For developing countries (except Indonesia), the studies find

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mostly the weak coordination between fiscal and monetary authorities and generally confirm the dominance of the fiscal policy over the monetary, (Guo et al, 2011; Cevik and Dibooglu, 2014, Javed and Sahinoz, 2005; Canzoneri et al., 2000; Fialho and Portugal, 2005).

To our best knowledge, the number of studies on the coordination between monetary and fiscal policies in oil-exporting countries is limited. Chibi et al. (2019) conduct an empirical study to examine the interaction between monetary and fiscal policy in Algeria. Sanchez et al. (2018) do a similar study for Mexico, Musa et al. (2013) - for Nigeria, and Baldini and Riberio (2008) - for Sub-Saharan Africa countries. Their results show that in oil-exporting countries the fiscal dominance does not allow the interaction of the policies.

The motivation for this study arises from the scarcity of research on the interaction of monetary and fiscal policies in oil-exporting countries, and particularly in Azerbaijan. During the last decade, Azerbaijan's economy has witnessed a large fiscal expansion fueled by an increase in oil revenues. The boom in public spending coupled with an increase in inflation has formulated an opinion that there is a strong fiscal dominance in the economy. This proposition encouraged us to examine the extent of fiscal dominance in the Azerbaijani economy.

Our results obtained through the analysis of the results of the Granger-causality tests and impulse responses conducted over the quarterly data for the period 2003Q1-2018Q4 show that both the monetary and fiscal authorities implement active policies; however, the results of the interaction analysis support the belief in the presence of strong fiscal dominance in the economy. Furthermore, the analysis points to the prevalence of the non-Ricardian regime.

The rest of the paper is organized as follows. The next section provides a review of the related literature. The third section discusses the macroeconomic developments in the Azerbaijani economy. The following section describes the data and methodology. The fifth section presents and discusses the results. The final section summarizing the main findings concludes the paper.

Literature review

In general, the literature distinguishes two theoretical approaches that explain the mechanics of the interaction between monetary and fiscal policies. The first approach relies on the Fiscal theory of price level and focuses on public debt sustainability and inflation (Sargent and Wallace, 1981; Leeper, 1991; Woodford, 1994, 1995, 2001; Sims, 1994, 1997; Cochrane, 1998, 2001, 2005). The second approach examines the interaction between monetary and fiscal authorities within the game theory framework and describes the issue of policy coordination as an optimal strategic relation. Thus, policy coordination is identified as a dynamic game between two policies for achieving a balanced result when choosing inflation and economic growth. (Blinder, 1982; Tabellini, 1985, 1986, 1987; Alesina and Tabellini, 1987; Petit, 1989; Tabellini and Lavia, 1989; Nordhaus, Schultze, and Fischer, 1994; Tabellini, 1986; Dixit and Lambertini, 2001).

In this paper, we follow the first approach leaving the second approach for further studies. The first step in this direction was made by Sargent and Wallace (1981), who state that the coordination scheme of monetary and fiscal policies is determined under certain

circumstances depending on the type of dominance. They argue that under the coordination scheme and monetary dominance, the monetary authority can control inflation for the long term because under the monetary dominance the monetary authority can freely choose the level of money base.

Aiyagari and Gertler (1985) differentiate government behavior between the Ricardian and non-Ricardian regimes and state that in the non-Ricardian regime, the government sets the primary fiscal balance independently, whereas the prices are determined endogenously. In subsequent periods, the fiscal authority does not raise taxes to repay public debt and therefore it leads to monetization of the deficit by the central bank.

Leeper (1991) further advances the discussion on the interactions of monetary and fiscal policies and suggests that the policy can be either active or passive in response to a public debt shock. In other words, he shows that the steady-state with a stable level of public debt and inflation can only be achieved with a combination of active and passive policies (when one policy active and another must be passive). Leeper (1991) characterizes the behavior of the fiscal authorities as active if policy actions necessary to achieve the target are not constrained by the amount of public debt. However, if the government cares about the amount of public debt, then this behavior is passive because any action of the government will be limited by the need to stabilize the public debt.

Woodford (1995) uses a different interpretation to identify the behavior of fiscal authorities regarding public debt. He suggests that if the Ricardian equivalence holds, then the policy is passive and if the Ricardian equivalence does not hold, then the policy is active. If the central bank cares only about inflation and does not take into account the size and dynamics of public debt, then this behavior corresponds to an active monetary policy.

The majority of empirical studies that discuss the interaction between monetary and fiscal policies focused on developed countries (Muscatelli et al., 2002; Leeper and Davig, 2009; Lagoa, 2016; Belova et al., 2017; Afonso et al., 2019). For example, Belova, Perevishin, and Merzlyakov (2017) carry out an econometric analysis of the monetary policy regime of the Reserve Bank of New Zealand for the period 1990Q1-2016Q4. Using models with Markov switching regimes, the authors show that the monetary policy was in the active mode from 1990 to 2002, as well as from 2006 to mid-2009. The passive regime for the monetary policy of the Bank of New Zealand was prevalent from 2003 to 2006 and from the third quarter of 2009 to the present.

Afonso et al. (2019) investigate the relationship between monetary and fiscal policies for the 28 EU countries using panel data set for the period 1970-2015. They find out that inflation has significantly affected monetary policy, and governments raise their primary balances when facing increases in government debt. The analysis of the period of the introduction of the euro showed a negative effect on fiscal policy by leading to a decrease in the primary balance. They suggest that in the Ricardian regime, the monetary authority determines the stock of money and the price level, and the government has to ensure that it will have a surplus in the balance to repay the debt and guarantee fiscal solvency.

The growing independence of central banks in developing countries boosts the interest in analyzing the relationship between fiscal and monetary policies and their implications for macroeconomic stability. For example, Cevik and Dibooglu (2014) study the interaction between the policies in European emerging countries such as Czech Republic, Estonia,

Hungary, Poland, Slovenia, and Slovakia using Markov regime-switching model for the period 1995Q1-2010Q4. The empirical results show that the countries experience both passive and active monetary regimes; however, the passive monetary policy is persistent for a long period for all countries except Poland. Concerning the fiscal policy, the Czech Republic, Estonia, Hungary, and Slovenia demonstrate different fiscal policy regimes during the period, but the Slovak Republic and Poland always exhibit active fiscal policies.

The papers of Metin (1998), Tekin-Koru and Ozmen (2003), Çekin (2013), Javed and Sahinoz (2005), Tetik and Ceylan (2016) examine the interaction of two policies in Turkey. Çekin (2013) applying Markow-Switching simple policy rules before and after 2001 finds out that the success of inflation targeting in Turkey is due to the central bank independence. Tekin-Koru and Ozmen (2003) investigate the relationship between budget deficits, inflation, and monetary growth in Turkey. Their results suggest that deficit financing leads to the creation of near money and restricts the scope for an effective monetary policy. Similar results are obtained by Metin (1998), who analyzes the empirical relationship between inflation and the budget deficit for the Turkish economy employing a multivariate co-integration analysis.

Abdel-Haleim (2014) examines the interaction between monetary and fiscal policies and their effects on macroeconomic aggregates for 1975-2011 in Egypt. Using SVAR model with four variables (annual data for the benchmark model and quarterly data for the sub-period models), the author finds that shocks to monetary policy have a transitory effect, while fiscal policy, aggregate supply, and inflation shocks have permanent effects on at least one of the variables in the model. The estimation results of the benchmark model also indicate the presence of fiscal dominance, but the results of sub-period models confirm the successful move toward monetary dominance in the later period.

Abdlib, Khan, and UlHag (2012) evaluate the extent of coordination between monetary and fiscal policies in Pakistan using the VAR approach. Their findings imply the weak coordination between the two policies since the results show weak responses of fiscal variables to monetary shocks and weak responses of monetary variables to fiscal shocks. Their results support the view that the main source of inflation for more than two decades was a budget deficit.

Kuncoro and Sebayang (2013) and Sumando (2005), who study the relationship between the two policies in Indonesia for the periods 1999-2010 and 2000-2003 respectively, find the monetary dominance in Indonesia. Raj et al. (2011) evaluate the interaction of policies and their effects on macroeconomic objectives in India using the VAR approach for a period that witnessed reforms to eliminate the fiscal dominance over monetary policy. They conclude that despite the institutional changes the fiscal policy continues influencing the monetary policy.

The number of empirical studies on oil-exporting countries is very limited. We find only one empirical paper that examines the interactions of monetary and fiscal policies in an oil-exporting country[4]. Thus, Chibi, Benbouziane, and Chekouri (2019) analyze the

[4] We also find the study by Pekarckiy, Atamanchuk, and Merzlyakov (2010) who analyze the relationship between monetary and fiscal policies in export-oriented economies using game theory. In their view, the effectiveness of macroeconomic policies substantially depends on the form of interaction between the

interaction of two policies in Algeria for the period 1963-2017 using VAR, MSVAR, and ARDL models. The estimation results show that the fiscal theory of price level holds in this country. The other findings of the study include the absence of responsiveness of the fiscal and monetary policies to each other. All results suggest the presence of fiscal dominance in Algeria. Sanchez et al. (2018) estimate the Markov-switching DSGE model to analyze the interaction between the monetary and fiscal policy in Mexico, whose budget significantly depends on oil revenues. Their results show the types of policies were changing during more than 30 year period due to institutional and macroeconomic policy reforms. They conclude that the periods of active monetary policy and passive fiscal policy (1988Q3 - 1995Q1 & 1999Q1 - 2008Q3) witness low inflation and stable public debt. Baldini and Ribeiro (2008) examine the fiscal and monetary determinants of inflation in Sub-Saharan countries during 1980-2005. The results of the VAR analysis show that in Nigeria, the monetary policy dominates over the fiscal policy. Musa et al. (2013) analyze the interaction between the fiscal and monetary policies in Nigeria using the VECM methodology during 1970-2010. They conclude that there is a need for sustainable coordination between the policies because both policies have dominant effects.

This paper will contribute to the existing literature in several ways. First, the interaction between fiscal and monetary policies has not been examined for Azerbaijan yet and this study will extend the limited literature on oil-exporting countries. Second, in this study, as an indicator of the budget balance, we use the non-oil budget balance, which helps to take into account the oil factor in the analysis. Finally, this paper uses a novel approach to the definition of public debt in Azerbaijan. In particular, we suggest that the transfers from the State Oil Fund (SOFAZ) to the budget have to be considered as public debt because this amount does not represent the income of the government.

Background information about the Azerbaijan economy

Macroeconomic development path

The goal of the monetary policy of the Central Bank of Azerbaijan (CBA) as of many central banks around the world is price stability.

The history of monetary and exchange rate policy in Azerbaijan could be divided into the following periods.

1992-1994: the early period. During these years, the institutional framework was changed, new laws were introduced, manat was declared the only legal tender in the country, preventive measures were taken against monetary emission, and a mechanism of monetary

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government and the central bank. Their analysis shows that their interaction on the Cournot in an export-oriented economy is the poorest, which is due to sufficiently high inflation rates and a significant deviation of output from the target level, which, in turn, results in high social losses. Effective interaction of fiscal and monetary policies is possible both according to the Stackelberg model with the leading role of the government and in the case of coordination. When conducting stimulating fiscal and monetary policies and thereby allowing the output to increase close to its potential, social losses will be minimal for any of the two forms of interaction of policies. In Stackelberg's interaction, the combined losses of the government and the central bank will be slightly larger, mainly due to an increase in government losses. However, the condition of independence of the central bank, in this case, does not play a decisive role and is more a political issue.

policy management was introduced. Inflation reached the four-digit level (1886.7% in 1994), and the exchange rate depreciated 18 times.

1995-2002: the period of stabilization. During this period, the CBA started accumulating foreign exchange reserves, and the foreign exchange market stabilized. The CBA also eased the monetary policy and undertook the moderate devaluation of the national currency. Subsequently, the exchange rate of the national currency was stabilized, the inflation rate declined from three-digit to one-digit numbers (from 411.8% in 1995 to 2.8% in 2002).

2003-2008: the oil boom. Over this period, the double-digit economic growth increased the real demand for money and greatly expanded the money supply. The fiscal expansion fueled by increasing oil revenues through the state budget has been an important factor in increasing demand for money. In this period, we also observe an increase in the non-cash money supply that to a certain extent strengthened the impact of the monetary policy on the economy. Although inflation was at a low level until 2005, growing oil prices again pushed up oil revenues that further stimulated fiscal expansion. This, in turn, raised the monetary base in national currency 7 times and inflation by 11.2% and led to the appreciation of the exchange rate by 14% during 2005-2008.

2009 – 2014: the post-boom period. Since 2007, the high level of inflation forced the central bank to tighten the monetary policy; however, due to the decline in budget expenditure provoked by the decline in oil prices during the global financial crisis, inflation slumped to 1.5%. Meanwhile, increased oil production during this period supported exports, and the high GDP growth rate allowed the country to minimize the contractionary effects of the global crisis. As a part of the anti-crisis measures in 2009, the CBA decreased the refinancing rate and reserve requirement ratios and provided liquidity support to the economy. During this period, the transfers from SOFAZ to the state budget increased significantly, if, in 2008, the transfers were 4.6 bln. USD, in 2013, it already amounted to 14.6 bln. USD.

2015 - 2016: the crisis. The dependence of the economy on oil revenues has amplified its sensitivity to oil prices (the fuels made 93% of merchandise exports in 2014). Therefore, the sharp decline in the global energy markets in the second half of 2014 (more than three times drop) hurt the economy of Azerbaijan. The negative external shocks narrowed channels of economic stimulus, the country's foreign currency earnings declined, and the current account balance entered the negative zone. Correspondingly, the SOFAZ transfers to the budget had been reduced almost threefold compared to the peak year (in USD) and the budget was consolidated. The budget consolidation led to a significant decline in investment activity and economic growth. Growth rates dropped from 2.8% in 2014 to 1.1% in 2015 and -3.1% in 2016.

The deficit in the balance of payments caused by the fall in oil prices, slumping down dollar transfers from SOFAZ to state budget, and the rapid rise of dollarization destabilized the foreign exchange market, which led to a 2.7-fold decrease in foreign exchange reserves of the Central Bank and about a twofold devaluation of the national currency. The devaluation, in turn, led to an increase in inflation and triggered a crisis in the banking system.

2017- present: the new normal. The monetary policy was significantly tightened to restore confidence in the national currency and stabilize the foreign exchange market; particularly, the CBA increased the refinancing rate from 3.5% in 2015 to 15% in 2018.

At the same time, as major de-dollarization measures, the CBA differentiated reserve requirements and interest rate cells on insured deposits by currency (interest rate cells on insured deposits: 3% in foreign currency and 12% in the national currency). Additionally, to withdraw excess liquidity from the market, the CBA has started organizing regular deposit auctions where the commercial banks have the opportunity to place deposits with the CBA.

The CBA has also developed a monetary program aimed at targeting the annual growth rate of the money supply. According to this program, the growth rate of the monetary base must not exceed 10% by the end of the year to slow down the dollarization. Due to the implementation of the proposed monetary program, the loans from Central Bank to the real sector have been suspended. These measures allowed achieving low inflation as well as stabilizing the exchange rate at around 1.7 USD/AZN. Since 2017, the observed moderate economic recovery and low inflation have allowed a gradual easing of monetary policy. However, the high volatility of oil prices remains a major risk for the economy.

Fiscal sector

Following the signing of the Century Contract in 1994 to save and manage the exhaustible oil revenues for future generations, a long-term oil strategy program was adopted and the State Oil Fund (SOFAZ) was established in 2001. All oil revenues are accumulated and managed by the SOFAZ. The sharp increase in oil revenues stimulated the growth of the budget spending through the transfers from SOFAZ to the state budget, thus the SOFAZ transfers became a component of budget revenues. The value of transfers from the SOFAZ to budget as a ratio to the non-oil GDP increased from 19% in 2003 to 25% in 2018. This shows that a large proportion of fiscal expenditures is financed through transfers. Therefore, the ratio of the non-oil budget deficit to non-oil GDP rose to 32% in 2018.

The oil price decline in 2014 also made pressure on the budget, thus state budget expenses shrank by 2% in 2014 and 5% in 2015. This shortening mainly was due to a decline in capital expenditures. Moreover, some structural reforms were implemented in the tax system.

Over the past 10 years, the non-oil budget deficit has accounted for 37% of non-oil GDP. The financing of the deficit has been done mainly by the transfers from the SOFAZ. If the transfers were not available, the government had to borrow to balance the budget, for this reason, we can consider transfers as a form of debt. However, the difference is that the transfers are “issued” on a non-repayable basis and directly expand the monetary base.

Experience shows that if the financial market is undeveloped and the financial instruments are not functioning properly, then the long-term accumulation of the money base leads to the disruption in the foreign exchange market when a shock hits the economy as the economic agents’ rush to exchange the domestic currency for the stable foreign currency. In such a situation, the central bank is forced to devaluate an exchange rate to protect its foreign exchange reserves.

On the other hand, the form of financing of non-oil budget deficit through transfers from the SOFAZ for a long time has provided necessary conditions for fiscal dominance in

the economy. Moreover, the limited use of the government's debt instruments harms the development of the securities markets. Thus, the volume of government T-bills makes only 2% of non-oil GDP.

Data and methodology

To analyze the interactions between monetary and fiscal policies in Azerbaijan, we use the VAR methodology as it provides a sufficient number of analytical tools to undertake an in-depth analysis of the nature of the interactions. For the analysis, we carry out pairwise Granger causality tests and compute impulse responses. The Granger causality test is the Wald test for the joint significance of each of the lagged endogenous variables in each equation except the lags of the dependent variable. In other words, it tests whether the past values of one variable can help to predict the future values of another. As the VAR represents the dynamic structure, a shock to one of the variables not only affects the variable itself but also affects all other endogenous variables in the model. Innovations are usually correlated, so it becomes difficult to attribute them to certain variables. For this reason, the innovations are transformed to make them contemporaneously uncorrelated. The common approach is to use the Cholesky factorization that attributes the first shock to the first variable of the VAR model. Although such an approach is straightforward, the outcomes of the impulse responses, as a rule, are sensitive to the ordering of the variables. To address this shortcoming of the Cholesky decomposition, we calculate the generalized impulses suggested by Pesaran and Shin (1998) which does require the orthogonalization of innovations. Their approach assumes computing the impulse responses to the innovation to a certain variable by putting it in the first place of the Cholesky ordering, so the results become invariant to the order of variables.

In our study, we assume that the monetary policy follows the modified version of the Taylor rule. In particular, we augment the classic Taylor rule with the real effective exchange rate and monetary base in the national currency as both of these indicators are considered to produce large effects on inflation dynamics. Therefore, the monetary policy has the following form:

$$\Pi(L)\begin{pmatrix} Rate_t \\ Infl_t \\ Gap_t \\ Reer_t \\ Mb_t \end{pmatrix} = c_t + \varepsilon_t$$

where $\Pi(L) = I_n - \Pi_1 L - \cdots - \Pi_p L^p$, Π_i are n×n coefficient matrices, c_t is an n×1 vector of intercepts, and ε_t is an n×1 white noise innovation process.

In general, the fiscal policy analysis usually focuses on the primary budget balance, and as the factors that affect the budget balance researchers usually consider public debt, output gap, and temporary government spending. However, for Azerbaijan due to the specifics of budget financing, we take another approach. Since the mid-2000s when the oil boom started the importance of tax collection in budget financing declined significantly, almost to 50%, and the role of transfers from SOFAZ has increased. The transfers can be considered as debt

but which have not to be repaid because if there were no transfers from SOFAZ, the government would need to borrow in the market. The government also has been issuing short-term T-bills but its importance for budget financing is limited due to small volumes. Given the importance of oil revenues, instead of focusing on the primary budget balance, we analyze the non-oil primary budget balance that is the difference between non-oil revenues and total expenditure. The resulting fiscal policy model is the following:

$$\Pi(L)\begin{pmatrix} Balance_t \\ Transfers_t \\ Tbills_t \end{pmatrix} = c_t + \varepsilon_t$$

To study the interactions between monetary and fiscal policies, we extend the monetary policy model by adding a non-oil budget balance:

$$\Pi(L)\begin{pmatrix} Rate_t \\ Infl_t \\ Gap_t \\ Reer_t \\ Mb_t \\ Balance_t \end{pmatrix} = c_t + \varepsilon_t$$

The precise definitions of the variables and their sources are presented in Table 1. The sample spans the period from 2003Q1 to 2018Q4. In the analysis, we use annualized figures. The Augmented Dickey-Fuller (ADF)[5] and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) show that refinancing rate, non-oil GDP gap, and inflation variables are stationary variables, while the others are first difference stationary (Table 2). Therefore, in the VAR models, we include refinancing rate, non-oil GDP gap, and inflation in level and the other variables in first differences. To account for two devaluations that happened in 2015, we include a binary variable (0 before 2015Q1 and 1 afterward) as an exogenous variable in the models.

The results of the VAR models are very sensitive to the choice of a lag order. Given the relatively small sample size, as an optimal lag order, we choose the minimum lag length at which the model is stable and does not suffer from serial correlation. The VAR stability condition checks and residual serial correlation LM tests show that for the fiscal policy model, the appropriate lag order is one, and for the monetary policy and interaction models, the appropriate lag orders are three.

Table 1. **Data description**

Variable	Description	Source
Balance	Non-oil budget balance in percent of non-oil GDP	Ministry of Finance (MoF), SOFAZ, State Statistical Committee (SSC), authors' calculations
Transfers	Transfers from SOFAZ to the budget in percent of non-oil GDP	MoF, SOFAZ, SSC, authors' calculations

[5] We use the Schwarz information criterion to select the optimal lag length.

Rate	The refinancing rate in percent	CBAR
Gap	Non-oil GDP gap in percent of potential GDP (HP filter)	SSC, authors' calculations
Infl	Annual inflation in percent	SSC, authors' calculations
Reer	Non-oil real effective exchange rate, index (2000=100)	CBAR
Mb	Monetary base in the national currency in percent of non-oil GDP	CBAR, SSC, authors' calculations
Tbills	Government T-bills in the national currency in percent of non-oil GDP	CBAR, SSC, authors' calculations

Table 2. **Unit root tests** (t-statistics)

	ADF test H0: There is a unit root			**KPSS test** H0: There is no unit root		
Variable	Level	1st diff.	2nd diff.	Level	1st diff.	2nd diff.
Balance	-1.85	-5.09***	-11.05***	0.41**	0.28*	0.13*
Transfers	-1.11	-5.62***	-6.25***	0.41**	0.11*	0.04*
Rate	-2.91**	-3.93***	-7.27***	0.13*	0.06*	0.22*
Gap	-3.17**	-4.20***	-8.54***	0.07*	0.25*	0.26*
Infl	-3.19**	-5.16***	-6.99***	0.27*	0.05*	0.02*
Log(Reer)	-1.33	-7.48***	-12.19***	0.42**	0.16*	0.05*
Mb	-1.82	-5.55***	-8.69***	0.58***	0.31*	0.29*
Tbills	0.87	-7.69***	-7.52***	0.62***	0.41**	0.17*

Note: ***, **, * determine significance at 1%, 5%, and 10% level respectively.

Empirical results

Monetary policy

We start our analysis of the monetary policy by examining the results of the Granger causality tests (Table 3). The results show that the past changes in the refinancing rate have a significant effect only on the future value of the real effective exchange rate. However, the past movements in the non-oil output gap, inflation, real effective exchange rate, and monetary base help to predict refinancing rate. It is also found that those past movements in the output gap can help to forecast inflation.

Table 3. **VAR Granger Causality/Block Exogeneity Wald Tests – the monetary policy** (H0: There is no Granger causality.)

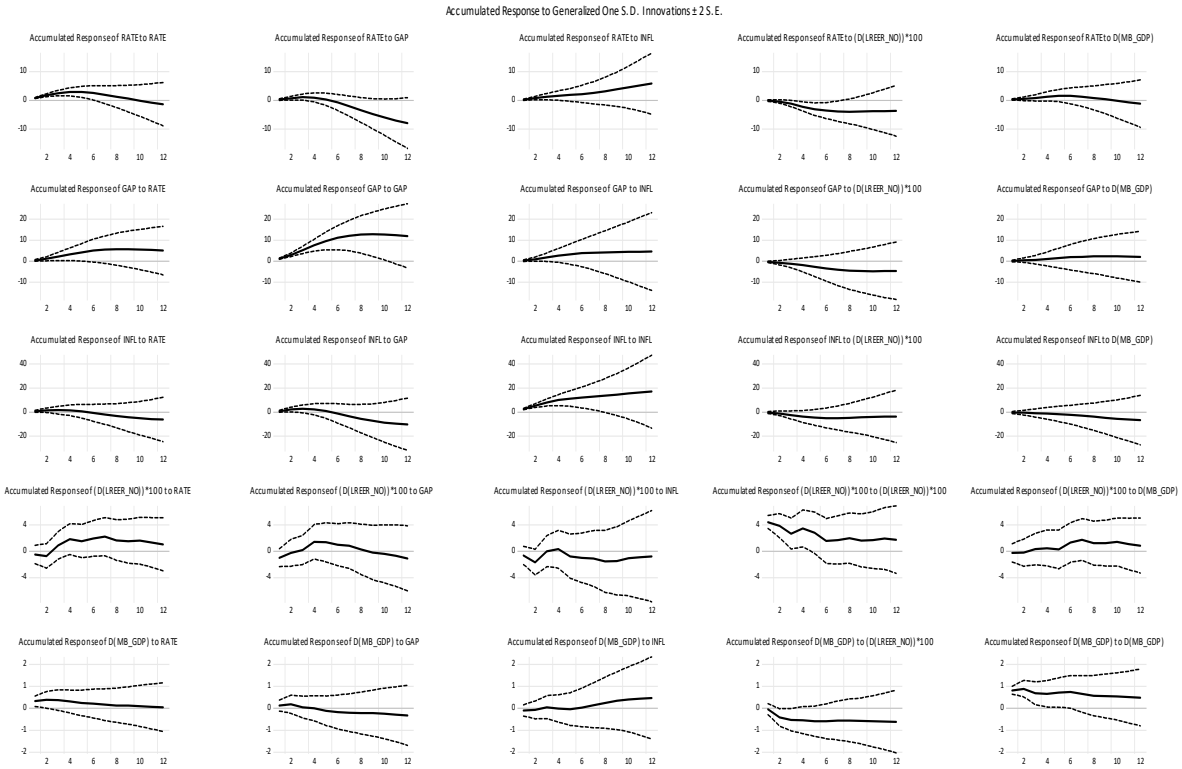
Variables	Chi-sq
Gap → Rate	24.32***
Infl → Rate	19.74***
D(Log(Reer)) → Rate	18.89***
D(MB) → Rate	12.66***
Rate → Gap	2.85
Infl → Gap	2.92
D(Log(Reer)) → Gap	1.50

D(MB) → Gap	0.22
Rate → Infl	2.59
Gap → Infl	17.42***
D(Log(Reer)) → Infl	5.40
D(MB) → Infl	0.82
Rate → D(Log(Reer))	9.82**
Gap → D(Log(Reer))	3.20
Infl → D(Log(Reer))	10.92**
D(MB) → D(Log(Reer))	0.50
Rate → D(MB)	4.14
Gap → D(MB)	1.22
Infl → D(MB)	0.04
D(Log(Reer)) → D(MB)	10.40**

Note: ***, **, * determine significance at 1%, 5%, and 10% level respectively.

As a next step of the analysis, we compute accumulated impulse response functions for 12 quarters. The response standard errors are calculated using 10 000 replications. The computed impulse response graphs for 12 quarters together with their 95% standard error bands are presented in Graph 1. The results show that a positive refinancing rate shock has a significant positive effect on the output gap and monetary base. Furthermore, we find that positive inflation, output gap, and monetary base shocks have significant positive effects on the refinancing rate, while a positive exchange rate (appreciation) shock has a significant negative effect on the refinancing rate.

Graph 1. **Impulse response functions – the monetary policy**



Quantitatively, we find that a 10% positive output gap shock increases refinancing rate by 9% in the third quarter, a 10% positive inflation shock increases the refinancing rate by 0.04% in the third quarter, a 10% positive exchange rate shock leads to a decline in refinancing rate by 8.62% in the seventh quarter, and a 10% positive monetary base shock raises refinancing rate by 3.8% in the first quarter (all responses are accumulated). Finding that changes in the refinancing rate produce significant effects on some macro variables indicate on the active monetary policy.

Fiscal policy

The results of the Granger causality test show that there exists only a one-way Granger causal relationship between non-oil budget balance and transfers to the budget. The failure to find that transfers and T-bills help to forecast budget balance indicates the active fiscal policy.

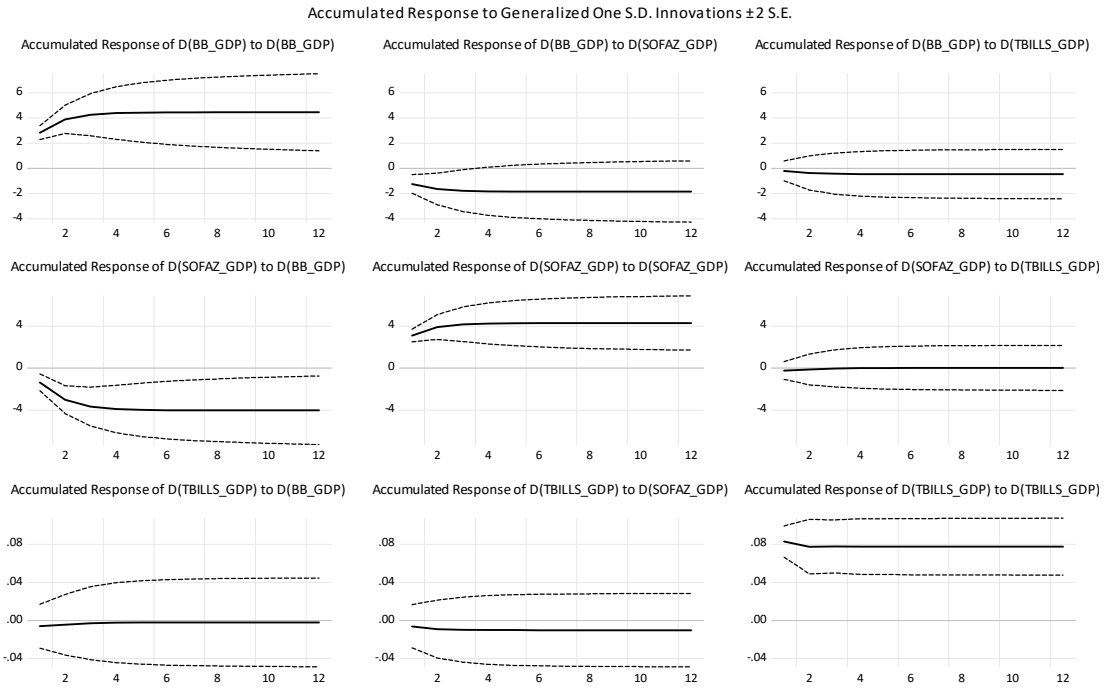
Table 4. **VAR Granger Causality/Block Exogeneity Wald Tests – the fiscal policy**
(H0: There is no Granger causality.)

Variables	**Chi-sq**
D(Transfers) → D(Balance)	0.03
D(Tbills) → D(Balance)	0.05
D(Balance) → D(Transfers)	11.67***
D(Tbills) → D(Transfers)	0.00
D(Balance) → D(Tbills)	0.00
D(Transfers) → D(Tbills)	0.10

Note: ***, **, * determine significance at 1%, 5%, and 10% level respectively.

The impulse response function analysis shows that a positive transfer shock produces a positive effect on the non-oil budget balance. Thus, a 10% positive transfer shock increases the non-oil budget balance by 5.7% in the third quarter. We also find that a 10% positive non-oil budget balance shock decreases transfers by 14% by the seventh quarter. Findings that transfers affect budget balance and budget balance affect transfers show that the fiscal policy in Azerbaijan demonstrates both activeness and passiveness. However, the comparison of the magnitudes points that the active fiscal policy dominates over the passive one. In terms of Ricardian and non-Ricardian regime classification, the behavior of the Azerbaijani fiscal authorities resembles the non-Ricardian regime as the fiscal policy is active.

Graph 2. **Impulse response functions – the fiscal policy**



Interactions between monetary and fiscal policies

The Granger causality test results show that past movements in the non-oil budget balance do not help to forecast the refinancing rate (Table 5). The test results also demonstrate that no monetary variable can help predict changes in fiscal variables. What we also find is that a non-oil budget balance can help forecast movements in the monetary base.

Table 5. **VAR Granger Causality/Block Exogeneity Wald Tests – the interaction**
(H0: There is no Granger causality.)

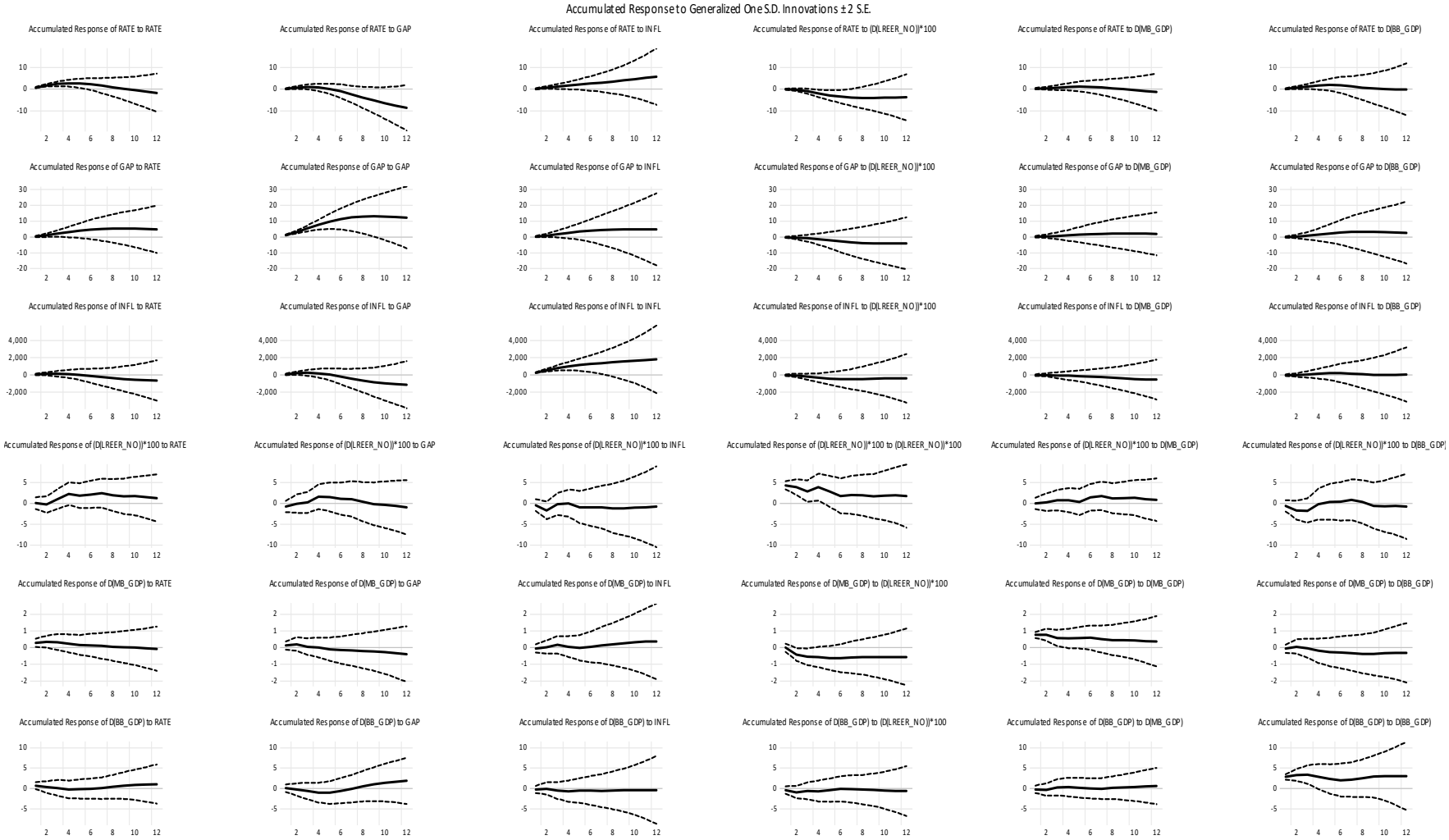
Variables	Chi-sq
Gap→ Rate	23.20***
Infl → Rate	19.85***
D(Log(Reer)) → Rate	19.61***
D(MB) → Rate	9.53**
D(Balance) → Rate	3.61
Rate → Gap	1.66
Infl → Gap	2.53
D(Log(Reer)) → Gap	1.99
D(MB) → Gap	0.25
D(Balance) → Gap	1.16
Rate → Infl	3.55
Gap → Infl	17.45***
D(Log(Reer)) → Infl	3.89
D(MB) → Infl	0.81
D(Balance) → Infl	2.26

Rate → D(Log(Reer))	6.78*
Gap → D(Log(Reer))	2.61
Infl → D(Log(Reer))	11.69***
D(MB) → D(Log(Reer))	0.80
D(Balance) → D(Log(Reer))	5.45
Rate → D(MB)	7.83**
Gap → D(MB)	1.96
Infl → D(MB)	1.60
D(Log(Reer)) → D(MB)	14.81***
D(Balance) → D(MB)	7.82**
Rate → D(Balance)	3.22
Gap → D(Balance)	1.13
Infl → D(Balance)	1.28
D(Log(Reer)) → D(Balance)	2.23
D(MB) → D(Balance)	3.05

Note: ***, **, * determine significance at 1%, 5%, and 10% level respectively.

Graph 3 shows the accumulated impulse responses of the monetary and fiscal policy interaction model. The results demonstrate that a positive non-oil budget balance shock (e.g. a decline in budget deficit) leads to an increase in the refinancing rate. 10% improvement in the non-oil budget balance results in a 5.8% increase in refinancing rate in the fourth quarter (albeit only at a 10% significance level). However, neither of the monetary variables appears to produce a significant effect on the non-oil budget balance. The fact that the budget balance shock affects the refinancing (policy) rate provides evidence that the monetary policy is not active from the point of view of the interaction between the fiscal and monetary policies, so there is fiscal dominance. The insignificant response of the budget balance to a refinancing rate shock indicates the prevalence of the non-Ricardian regime in the country.

Graph 3. **Impulse response functions – the interaction**



Conclusions

In this paper, we examine the interaction between the fiscal and monetary policies in Azerbaijan using the quarterly data from 2003 to 2018 and the VAR methodology. The results of the Granger causality tests and generalized impulse response function analysis show that the fiscal policy is active as the effect of the SOFAZ transfers on the non-oil budget balance is larger than the effect of the budget balance on the transfers. The monetary policy also demonstrates activity through affecting output gap and real effective exchange rate. However, the fiscal policy dominates over the monetary policy as the budget balance affects the refinancing rate but the refinancing rate has no impact on the budget balance. In terms of regime classification, we find the regime in the country to be non-Ricardian as the refinancing rate, the SOFAZ transfers, and the volume of T-bills do not produce a significant influence on the non-oil budget balance.

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