INSTITUTIONAL PROBLEMS REGARDING THE INTERACTION BETWEEN MONETARY AND FISCAL POLICY IN THE CONTEXT OF TARGETING INFLATION

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Abstract. *In this work, the nature of the mutual influence of monetary and fiscal policy on one of the key problems of the macroeconomic equilibrium of the economy of the Republic of Armenia and the accuracy of forecasting in the context of the application of policies targeting inflation is investigated. The problem of coordination between the two main macroeconomic pillars of economic policy is studied in the context of behavioral and institutional interactions between the Government and the Central Bank of the Republic of Armenia, which implies mutual adaptation and flexibility of reactions within certain rules of the game. Within the framework of the methodology developed in the article, the mutual influence of monetary and fiscal policy is studied using Markov transition models, taking the ratio of tax revenues to GDP and the interest rate on loans issued in the national currency in the Republic of Armenia as a basis.*

Keywords: *monetary policy; fiscal policy; inflation; econometrics; Tellor's law; inflation targeting; game theory; Markov transition models.*

Reikšminiai žodžiai: *pinigų politika; fiskalinė politika; infliacija; ekonometrija; Telloro dėsnis; infliacijos nustatymas; žaidimų teorija; Markovo perėjimo modeliai.*

Introduction

The nature of interactions between monetary and fiscal policies is of fundamental importance from the point of view of the development of the macroeconomic situation in any country. In this regard, issues of the effective implementation of fiscal and mon-

etary policies and, even more so, their coordination are the subject of serious debates in terms of theoretical discussions and the implementation of practical policies. Nevertheless, even in the presence of certain contradictions, the effective coordination of monetary and fiscal policies is essential for the stable development of the economy. It is obvious that the aforementioned economic policies cannot be implemented completely independently of each other, because all processes taking place in the economy are connected by many visible and invisible threads. Therefore, monetary and fiscal policy instruments have tangible effects on each other. In this sense, it is also obvious that the effective coordination of these two most important pillars of macroeconomic policy is, first of all, a behavioral-institutional issue, and for the entities managing it (the central bank, the government) it means cooperation and mutual adaptation within the framework of certain rules.

In the framework of this review, the question of what kind of situation can develop in the economy of the Republic of Armenia (RA) was asked. As a result, the combination of different regimes (active/passive) of monetary and fiscal policies was employed. In this context, the experience of countries operating inflation-targeting regimes in the field of monetary and fiscal policy coordination was studied. Within the framework of the research, the consequences of the transition to the inflation-targeting policy in RA were addressed from the point of view of changes in the levels of the state budget deficit and inflation indicators.

Methodology

In this research, the question of the nature of the fiscal and monetary policies implemented in RA in 2000–2021 is considered. In this regard, the behaviors of the bodies implementing these policies were studied from the point of view of changes in the tax revenue/GDP ratio and the interest rates of loans provided in the national currency. At the same time, the impact of factors such as inflation, the gap between nominal GDP and the real effective exchange rate, and the foreign debt/GDP ratio were considered through a series of indicators. For this purpose, econometric models with Markov transitions describing the behavior of bodies implementing fiscal and monetary policies are put forward. Certain tools were used to obtain the corresponding 2000–2021 series of GDP and real effective exchange rate gap data which was included in the models. After completing the process of collecting statistical data regarding the above indicators, the dynamics of tax revenues to GDP and loan interest rates expressed in AMD were studied from different angles. Then, the statistical problems present in all the series were assessed, after which the econometric models with Markov transitions were evaluated. As a result of the evaluation of these models, not only were the dependencies between the relevant indicators obtained, but it was also possible to determine the prospects of staying in different modes or switching from one mode to another, as well as the optimal time of remaining in each mode.

Within the framework of this analysis, the relationship between the budget deficit and inflation was addressed in two periods: with inflation-targeting policy, 2006–2021;

and without inflation-targeting policy, 2000–2005. The state budget deficit is represented by the consolidated budget deficit/GDP ratio, and inflation is represented by the cumulative consumer price index (CPI) compared to the previous year. These indicators were taken from the RA Statistical Committee database. In order to study the behavior of the bodies implementing monetary and fiscal policy, the dynamics of two key indicators were studied: tax revenues/GDP; and the interest rates of AMD loans in the 2000–2021 period. The tax revenue/GDP indicator was taken from the World Bank, and the interest rates of AMD loans were taken from the Central Bank databases. Two econometric models with Markov transitions were proposed to study the behavior of the bodies implementing monetary and fiscal policy in the studied period. Taylor's rule was used to study CB behavior, where the proposed econometric model includes a dependent variable: the nominal interest rate of loans provided in AMD. Independent variables affecting it include the inflation index, nominal GDP, and real effective exchange rate gaps. The average interest rate of loans (with a term of up to 1 year, except for demand) was observed. Based on the available statistical data, the trend component of the two series was separated using the Hodrick Prescott filter in order to present the gaps between the nominal GDP and the real effective exchange rate. When describing the government's fiscal policy, an econometric model was considered, the explanatory variable of which is the ratio of tax revenues to GDP. The GDP gap, government expenditures/GDP, and external public debt/GDP act as explanatory variables. When evaluating the econometric models, the statistical data of the indicators included in the two behavioral models from 2000–2021 were used. All preliminary statistical procedures were performed prior to evaluation. During the assessment of models with Markov transitions, models with different specializations were considered, from which the models with the most acceptable statistical properties were selected.

Literatue review

Various experts, researchers, analysts and economists have addressed the study of various aspects of the possible coordination of monetary and fiscal policies. The latter have published many works, some of which were considered within the framework of this research.

From a monetary policy perspective, if central banks' actions are focused on price stability and economic growth, fiscal policy can be favorable to the extent that revenue collection is enhanced, spending efficiency is increased, and the cost of borrowing is reduced. The interaction between fiscal and monetary policies plays a fundamental role in the functioning of financial and currency markets, as well as in the rules that guide these policies (Lozano-Espitia and Arias-Rodríguez 2022). Inflation is influenced by numerous factors over the long term, including debt maturity, yields, and the primary surplus. In principle, coordination between monetary and fiscal policy can determine the combination of these factors with regard to the inflation target. Historical evidence suggests that the small impact of unconventional monetary policy on inflation is attributed to irresponsible fiscal policy (Reichlin, Ricco, and Tarbé 2022, 37).

There is a good chance that over the next decade, as the fourth industrial revolution unfolds, we will face some difficulties in effectively coordinating monetary and fiscal policies. This situation may also be aggravated by trade wars and associated deglobalization, which could neutralize some positive effects. However, this complexity aside, the recipe for monetary policy over the longer term is likely to look very similar to that of the Greenspan era. As long as inflation remains low, economic growth should be allowed to continue, as this is a good way to provide growth potential for those who are adversely affected by new technologies. Meanwhile, developments in the field of financial stability should be closely monitored. Finally, better strategies must be developed to synthesize macroeconomic and financial stability risks and take into account the implications of macroprudential policies for risk management purposes (Poloz 2021, 12). Monetary and fiscal policies are implemented by different government agencies, which may have different objectives and focus on different aspects of ensuring macroeconomic stability. Although monetary policy is primarily responsible for price stability, fiscal policy is primarily aimed at stabilizing debt and output. As fiscal and monetary authorities implement their policies according to their own objectives, these policies sometimes lead to backlash depending on the state of the economy and their priorities. Thus, the interplay between monetary and fiscal policy is vital in understanding and managing macroeconomic policy. Therefore, the study of this interaction has attracted a lot of interest among both government agencies and scientists. This type of policy analysis is important not only for developed economies, but also for emerging markets (Büyükbaşaran, Çebi, and Yılmaz 2020, 1). In the context of COVID-19, both in developed countries and in countries with emerging markets, an unprecedented fiscal expansion took place, which resulted in an inflationary jump around the world in 2021–2022. Under these conditions, the central banks of many countries were forced to restrain further price growth through high interest rates and by consolidating inflation expectations. However, according to many theorists, while such steps may have a short-term effect, in the future they will lead to a new spiral of higher inflation. To solve this problem, some – in particular, Princeton University Professor John Cochrane – recommend the more effective coordination of monetary and fiscal policy. Cochrane observed that: "To reduce inflation, fiscal and monetary policy must be coordinated. Without fiscal contraction, an unpleasant arithmetic holds: The Fed [Federal Reserve] can reduce inflation now, but only by increasing inflation later. If the Fed wishes to lower inflation durably via interest rate rises, those must come with fiscal support to pay higher costs on the debt and a windfall to bondholders" (Cochrane 2022, 1). The same point of view was expressed by Fernando Bianchi and Leonardo Melossi (2022, 31), who argued that stable, low inflation can be achieved only in combination with a consistent and appropriate fiscal policy.

Modern theoretical models which take into account the interaction between fiscal and monetary policy lead their authors to the conclusion that to stabilize the rate of inflation and the dynamics of public debt, an active policy regime on the part of the Central Bank/Government is needed, and a passive one on the part of the opposing institution, respectively. In this study, empirical works were considered, which, using the Markov

transition model, distinguish the periods of active and passive modes of state economic policy (Belova and Perevyshin 2017).

Analysis

This research was based on the following questions:
- What was the nature of the monetary policy of the Central Bank of Armenia in 2000–2021?
- What was the nature of the government's fiscal policy in 2000–2021?
- What was the relationship between the budget deficit and inflation during the transition to an inflation-targeting strategy?

In order to study the relationship between the budget deficit and inflation, the 2000–2021 period was considered, which was divided into two parts: the period of inflation targeting, 2006–2021; and the period of no inflation targeting, 2000–2005. The dynamics of the budget deficit/GDP and inflation indicators were observed for these two periods, and are presented below.
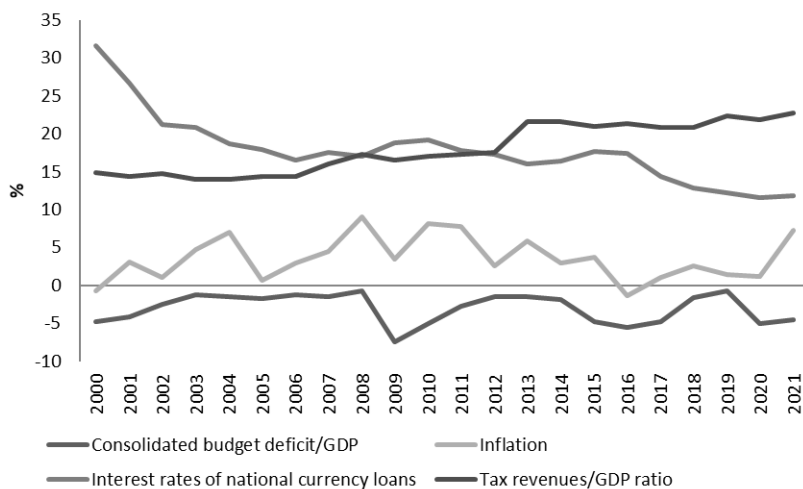

Figure 1. *The dynamics of the consolidated budget deficit/GDP ratio, inflation, interest rates of national currency loans, and tax revenues to GDP ratio indicators in 2000–2021*
Source: *RA Statistical Committee and Central Bank*

In Figure 1, the separate periods are clearly visible. As a result of the analysis of statistical data, it becomes clear that when there was no inflation targeting, in 2000–2005, the maximum deficit was 4.8% (2000); from the point of view of prices, deflation at the level of 0.8% was observed (2000). On the other hand, it can be seen that during the period of

inflation-targeting policy, the minimum deficit was 1.5% (2004). In this case, maximum inflation was recorded at 7% (2004). During the implementation of inflation-targeting policy, it is observed that there was a minimum deficit of 0.7% (2008) and a maximum inflation of 9% (2008). On the other hand, a maximum deficit of 7.5% (2009) was also observed, at which inflation was 3.4% (2009). When conducting a correlation analysis in the observed period, it becomes clear that the correlation between the consolidated budget deficit and inflation is quite weak. In addition, the analysis conducted shows that the average budget deficit increased by 0.5 percentage points when switching to an inflation-targeting strategy.

In the next stage, the nature of the monetary policy conducted by the Central Bank in 2000–2021 was studied from the perspective of the implementation of the Taylor rule. In this particular context, it is imperative to examine the dynamism of interest rates on AMD loans during the 2000–2021 period.

Armenia's economy continues to be under the influence of loans. The volumes of the latter play a significant role in the processes taking place in various sectors of the economy. Therefore, fluctuations in the price of loans, the interest rate, can lead to changes in attitudes or behavior towards loans. As can be seen in Figure 1, the interest rate of AMD loans shows a decreasing trend. In 2000, before the inflation-targeting strategy was implemented, the interest rate on loans was around 32%. In the 2000–2005 period, the average interest rate was 23%. After 2005, when the inflation-targeting strategy was in place, a continuous decline in loan interest rates can be observed. In particular, by 2021, the interest rate on loans had reached around 12%. The interest rate on loans in the 2006–2021 period was 16% on average. As a result, we can state that the interest rate on loans decreased by 6.9 percentage points, or around 30%, after switching to the inflation-targeting strategy.

In the context of Taylor's rule, the gaps in GDP, the real effective exchange rate, and inflation were considered as factors influencing the interest rate of loans. In order to study the nature of the monetary policy of the Central Bank, the following econometric model with Markov transitions was put forward.

$$i_t = \alpha_0(s_t) + \alpha_1(s_t)\pi_t + \alpha_2(s_t)y_t + \alpha_3(s_t)ex_t + \varepsilon_t \qquad (1)$$

Where:

π_t — is the inflation rate in year t;

y_t — is the GDP gap in year t;

ex_t — is the real effective exchange rate gap in year t;

$\alpha_0(s_t)$, $\alpha_1(s_t)$, $\alpha_2(s_t)$, and $\alpha_3(s_t)$ are the unknown parameters of the model;

s_t — is an unobserved state variable that can exist in 2 modes;

ε_t — is the random error of the model in the year t;

t — is the index of the year.

Before evaluating the presented model, all variable series were tested for stationarity. According to the results of the latter, all series in the model are non-stationary, and were included in the model with first- or second-order differences. The models were evaluated with different specifications, from which the model with the most significant statistical properties was selected. As a result, we observed the following results.

Table 1. *Estimated econometric model results in both regimes*

Variables	Mode 1: 2009–2010, 2012–2015, 2017–2019, 2021	Mode 2: 2011, 2016, 2020
D(D(EXCHG))	−0.03***	0.12**
D(GDPG(-8))	0.00000000000321***	0.0000000000037*
D(PRICE(-1))	0.26***	−0.21**

Source: *author's own calculations*

As can be seen from the obtained results, the inflation index is affected with a lag of 1; in the case of both regimes, this index is significant. In the case of the first regime, we have a positive dependence, and in the case of the second regime, we have a negative dependence. In the case of the first regime, the effect of split GDP is also significant, the coefficient of which is extremely small and has a positive direction. The indicator of the effective real exchange rate gap is significant in both regimes. In the case of the first mode, there is a negative effect, and in the case of the second mode, there is a positive effect. In the case of both regimes, the coefficient in front of inflation was less than 1, which implies that the policy is passive in this regime. The probability of the situation remaining in the second mode is small. The probability of staying in the first mode is 68%. The probability of switching from mode 1 to mode 2 is 31%, and the probability of switching from mode 2 to mode 1 is 97%. The length of stay in mode 1 is around 3 years, and the length of stay in mode 2 is around 1 year.

When describing the behavior of the government, a key indicator is considered: the ratio of budget tax revenues to GDP, the dynamics of which are shown in Figure 1 for 2000–2021. Statistical data prove that the ratio of tax revenues to GDP showed a growing trend during the considered period. In particular, in 2000, the tax revenue to GDP ratio was 14.8%, and by 2021 it reached 22.7%. During the period of the inflation-targeting strategy, the level of the tax revenue to GDP ratio was, on average, 19.4%. In 2000–2005, when an inflation-targeting strategy was not in force, the tax revenue to GDP ratio was 14.4%. In other words, when switching to the inflation-targeting strategy, there was an increase in the budget tax revenues to GDP ratio by 5 percentage points, or 35%. In order to describe the nature of the fiscal policy in this period, a model was considered. The tax revenue to GDP ratio is influenced by the external public debt to GDP ratio, the GDP gap, and the government expenditure to GDP ratio. In order to identify these connections, we will consider the following econometric model with Markov transitions.

$$\tau_t = \beta_0(s_t) + \beta_1(s_t)b_t + \beta_2(s_t)y_t + \beta_3(s_t)g_t + \varepsilon_t \qquad (2)$$

Where:

b_t — is the external debt/GDP ratio in year t;

y_t — is the GDP gap in year t;

g_t — is the ratio of state budget expenditures/GDP in year t;

$\beta_0(s_t), \beta_1(s_t), \beta_2(s_t),$ and $\beta_3(s_t)$ — are the unknown parameters of the model;

s_t — is an unobserved state variable that can exist in 2 modes;

ε_t — is the random error of the model in year t.

Before evaluating the presented model, all variable series were tested for stationarity

According to the results of the latter, all series in the model are non-stationary, and were included in the model with first- or second-order differences. The models were evaluated with different specifications, from which the model with the most significant statistical properties was selected.

Table 2: *Estimated econometric model results in both regimes*

Variables	Mode 1: 2006, 2008, 2010, 2012, 2015, 2017 , 2020	Mode 2: 2005, 2007, 2009, 2011, 2013–2014, 2016, 2018–2019, 2021
D(D(DEBTGDP(-1)))	0.16***	0.12***
D(D(DEBTGDP(-3)))	−0.1*	−0.24***
D(GDPGAP(-3))	−0.00000000000419*	−0.0000000000168***
D(EXPGDP(-2))	0.29*	1.92***

Source: *author's own calculations*

As can be seen from the obtained results, the external public debt/GDP indicator is affected by a lag of 1. In the case of both regimes, this indicator is significant and has a positive direction of influence. In both cases, the obtained coefficient is positive, which means that the government's policy is characterized as passive. In the case of the first regime, only the external debt/GDP indicator is significant. As with the second regime, the increase in the GDP gap reduces the tax revenues to GDP ratio, but the coefficient is quite small. The public expenditure/GDP indicator has a positive effect, but with a lag of two.

The probability of the situation remaining in the same regime is small. The probability of switching from mode 1 to mode 2 is extremely high, and the probability of switching from mode 2 to mode 1 is 75%. The period of stay in both mode 1 and mode 2 is around 1 year.

Conclusion

1. Within the framework of this study, the long-term behavior of the government and the Central Bank was considered from the point of view of the probability of it being in two modes: active and passive. As a methodological starting point, a statement was adopted, according to which, from the point of view of economic development, the behavior of the government and the Central Bank in combination is considered effective when their policies are simultaneously in different regimes. For example: if the budget policy of the Government of the Republic of Armenia is in active mode, then in this case the policy of the Central Bank should be in passive mode, and vice versa. Meanwhile, when both institutions utilize the same regime (whether active or passive), economic policy is considered ineffective .

2. The article discussed the mutual actions of monetary and fiscal policy in the context of the transition to inflation targeting in the Republic of Armenia, from which it transpired that the relationship between the deficit of the consolidated budget and inflation is rather weak. In addition, this analysis shows that during the transition to an inflation-

targeting strategy, the average annual budget deficit increased by 0.5 percentage points. The main reason for this appears to be that the government, in turn, when implementing programs to attract public debt and spending policy, sometimes violated the standards of financial stability and was guided by aspirations of political expediency.

3. To assess the behavior of the Central Bank, the Taylor rule was adopted in the framework of the study, which considered the impact on interest rates on loans of factors such as the inflation rate, the real effective exchange rate and the GDP gap. To evaluate the proposed dependencies, econometric models of Markov transitions were used, as a result of which two modes covering different time intervals were obtained. The results show that the Central Bank's policy is characterized as a passive policy. In addition, the following results were obtained for the two modes: the probability that the situation will remain in the second mode is small, while the probability of staying in the first mode is 68%; the time spent in mode 1 is around 3 years, and the time spent in mode 2 is around 1 year.

4. The nature of fiscal policy for 2000–2021 was considered. To this end, the impact of the budget deficit/GDP, the gap between real GDP, and external public debt/GDP on the budget revenue to GDP ratio was described. The dynamics of the budget revenues to GDP indicator in 2000–2021 were studied, where the impact of the transition to inflation-targeting policy was also assessed. A model with econometric Markov transitions was considered, as a result of which two modes were obtained; in each of them, different results regarding the relationship of the variables described above were obtained. It turned out that from the point of view of fiscal policy, both regimes also have a passive policy. In addition, the following results were obtained: the probability that the situation will remain in the same modes is small, the probability of transition from mode 1 to mode 2 is extremely high, and the probability of transition from mode 2 to 1 is 75%.

5. Thus, based on the results of the analysis, it can be concluded that during the period under review, both the central bank implementing monetary policy and the government implementing fiscal policy implemented a passive policy, which from the point of view of the effectiveness of economic policy is considered ineffective and undesirable. In these conditions, the level of risks and policy uncertainty increases, which, particularly in conditions of external shocks, can increase the level of instability of the financial system, and in some cases lead to serious financial shocks and crises.

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