

Fiscal and Monetary Policy Coordination Strategies: The Case of Armenia

Received: 02.08.2025

Available online: 30.09.2026

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Abstract

The aim of the article is to study the strategies for coordinating fiscal and monetary policy on the example of the Republic of Armenia based on a game model. In order to describe the behavior of the government and the Central Bank in the game model, the indicators of high-tech output and core inflation were selected as objective functions, respectively. As a desirable Pareto optimal solution to the considered game, such a behavioral combination of the playing parties was chosen, in which case the minimum core inflation combined with the maximum output of high-tech output would be ensured, from the possible scenarios of growth in government spending and normal inflation. The study showed that one of the essential combinations of the game matrix of profitability characterizing the policy of the playing pair, which describes the true established Nash equilibrium, is in fact not Pareto optimal at the same time.

Keywords: coordination; fiscal policy; monetary policy; Nash equilibrium; Pareto optimal.

JEL: E31; C40; K40; O11.

1. Introduction

Current trends in the development of high-technological sphere indicate new and more far-reaching technological and economic-political changing developments. First of all, it refers to the global economy, which is preparing to accept the challenges of the new period related to artificial intelligence, biological, nano, digital technologies, but it is greatly hindered by the gaps in innovative processes between countries.

In order to enter a cutting edge of economic period, emerging markets should be able to absorb innovative approaches, especially when implementing economic policies. Those states that will quickly adapt the various branches of the economic policy conducted in their country, will come out of the mentioned shocks in the most advantageous condition. Therefore, at different stages of economic policy implementation, it is extremely important to study the existing issues from different viewpoints.

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Of course, this issue is particularly acute in middle-income and emerging market countries, where a mix of economic policy instruments is combined with institutional reforms and improvements. In this context, achieving the best combination of monetary and fiscal policy coordination aimed at economic development and technological modernization becomes a difficult task. The Republic of Armenia (RA) is a typical country from that perspective.

Research shows that inflation in emerging market economies is not just a monetary phenomenon, but is largely driven by fiscal policy. In particular, fiscal deficits are a factor that exerts some inflationary pressures, which implies a certain level of fiscal dominance (Bucacos, 2022). Fiscal-monetary policy coordination plays a critical role in achieving macroeconomic stability and avoiding conflicting objectives. When fiscal and monetary policies are coordinated, they can work in harmony to achieve common goals, such as promoting economic growth, controlling inflation, and maintaining financial stability (Yeboah, 2022).

From the above-mentioned point of view, one of the main problems facing the design of effective economic policy in the Republic of Armenia is the ineffective cooperation between the policies of the Central Bank (CB) and the central government. It should be noted that since 2006, the Central Bank of the Republic of Armenia has introduced the inflation targeting strategy as the main model of monetary policy, the application of which has not always ensured the achievement of inflation stability indicators within the targeted ranges. The analysis reveals that prices in Armenia change more frequently than in advanced economies, with an average price spell of 2.4 months. However, the frequency of

price changes varies notably across product categories (Matinyan & Nurbekyan, 2025).

In this study, in the above-mentioned context, the authors addressed the fiscal and monetary policy of the Republic of Armenia, its individual parts and the possibilities of their coordination based on current realities. In the next step, the focus was on the monetary sector of the economy of the Republic of Armenia and the Central Bank policy. The framework of the corresponding inflation index and the possible factors affecting it were determined with the maximum involvement of the main assumptions of the monetary policy conducted in the Republic of Armenia. With the active introduction of econometric modeling and the use of game theory, the mutual relationships of monetary and fiscal instruments and the selected target indicators were obtained.

The selected equations or models served as the basis for formulating the game situation and obtaining the game payoff matrix. Based on the results obtained, the options for solving the game situation were discussed, as well as the Nash equilibrium. As a result of the analysis, strategies were obtained, which, as a result of a certain application of fiscal and monetary instruments, can provide partial solutions to the set goals.

The novelty of our research primarily concerns the quantitative analysis and comparison of equilibrium situations formed by monetary and fiscal policies. It mainly focuses on the analysis of possible situations of coordination of monetary and fiscal policies from the point of view of efficiency, in particular, the formation of Pareto and Nash equilibria and the possible connections, coincidences and divergences between them. The main result obtained is that the Nash equilibrium situation obtained on the basis of

game simulations of targeted indicators within the framework of monetary and fiscal policies is not at the same time a Pareto optimal solution.

2. Literature review

The interplay 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 those policies (Lozano-Espitia & Arias-Rodríguez, 2022). That is why the coordination of monetary and fiscal policies has always been the focus of attention of economists, scientists and analysts. This issue has been addressed by Central Banks and Governments of different countries, in addition, various researchers have made many analyses, the center of which was the various aspects of monetary and fiscal policy coordination.

Some theoreticians look at this problem mainly from the point of view of macroeconomic stability (Bonam & Lukkezen, 2019). Nevertheless, the coordination of monetary and fiscal policies is important from the point of view of maximizing the general welfare of the society. This problem a number of authors (Saulo et al., 2013) consider the behavioral priorities of the Brazilian government and the Central bank in the context of different regimes of their coordination. These authors argue that the behavioral effects of the government and the central bank on the general welfare of society can have three manifestations. In the first case, when the central bank and the government conduct their policies completely independently of each other, guided by their corporate interests, then such a situation can have a disastrous effect on the general well-being of society. In the case of the second version, the interactions between the two sides of the game develop according to the

Stackelberg equilibrium scheme, when one side makes its decisions while being aware of the other. Finally, the third version of the interaction between the participants of the game is the behavioral combination of the parties, when the behavior of each of them is the best response to the decisions of the other.

According to the authors' calculations, the least loss in terms of public welfare for Brazil occurs in the case of the second option. Some researchers' (Chibi et al., 2024) analysis shows that, in the case of Algeria, the cooperative Pareto equilibrium between fiscal and monetary policies minimizes welfare losses by offering optimal responses to economic shocks, especially in terms of output stabilization, debt sustainability, and inflation control. Another researcher came to a similar conclusion (Phebe Padolo, 2024) considering the problems of coordination of monetary and fiscal policies in the conditions of the Liberian economy. According to that author, the optimal coordination of fiscal and monetary policy and the establishment of the Nash equilibrium in that context becomes possible under the conditions of ensuring a moderate level of inflation, as well as the dominance of monetary policy. Another group of researchers based on the example of Croatia (Bošnjak & Tunjo, 2017) in the work done, the payoffs of each player, the Central Bank and the Government, in the case of applying different strategies, were obtained on the basis of the econometric models that effectively describe the monetary and fiscal policies and the matrix of winning pairs developed on their basis. When formulating the objectives of the fiscal policy, they note that these results may differ from country to country and may relate to different socio-economic indicators. A group of authors (Aguilar et al., 2023) argue

that monetary policy should change its policy rule in response to changes in the stock of government debt. According to this position, the long-term real interest rate is sensitive to the stock of government debt.

Zhang (2024) considers that the game between monetary and fiscal policies in the stage of normal development or economic recovery is based on cooperation, that game is essentially a cooperative game. In these circumstances, the balance or effective coordination between these policy pillars implies the implementation of expansionary policies by both. Meanwhile, in the crisis stage, the relations between these two institutions of macroeconomic regulation become non-cooperative, that is, the game between them becomes non-cooperative. This implies a restraining policy on both sides, under which only a Nash equilibrium can be established. Another study (Kumar et al., 2024) examines the use of fiscal and monetary policy coordination as a successful tactic to achieve balance of payments equilibrium. The results show that the synergistic relationship between fiscal and monetary policies can significantly contribute to a sustainable balance of payments adjustment.

In this context, a VAR model with Markov transitions is proposed, where in the context of the "Government-Central Bank" interaction, the leading dominant behavior is attributed to the government, which starts the game first, as the anti-inflationary policy pursued by the central bank adapts to that situation (Chibi et al., 2021). Voskanyan and Paronyan (2020) address another version of the game situation of monetary and fiscal policy coordination. The authors approach the game situation of policy coordination in three main directions, which mainly refer to the mutual dependence of monetary and fiscal policy implementers.

Depending on it, different types of games are obtained, which require different approaches to solving. The paper mentions the need to minimize the budget deficit as one of the objectives of the fiscal policy.

Stawska et al., (2019) consider the coordination of fiscal and monetary policies in the member states of the European Union from the point of view of ensuring Nash equilibrium, while arguing that the two pillars of coordination, the basis of effective matching of public budget deficits and interest rates, are institutional decisions made by Central bank boards and Governments based on external stimuli. At the same time, another group of researchers (Stawska et al., 2023), developing this point of view, claims that the active side of the non-cooperative game "Central Bank-Government" is the Central Bank, whose decisions depend on the establishment of the Nash equilibrium between the main regulators.

Another group of researchers in the context of the study of the issue (Caramp & Silva, 2021) in their analysis emphasize the need to take into account the response of the fiscal policy in the monetary policy transmission mechanism based on the effects of the wealth effect. Moreover, the authors conclude that a restrictive monetary policy reduces inflation only if it is followed by a restrictive fiscal policy. Hamand and Hussain (2020), using game theory in the context of emerging market realities, consider the implementation of expansionary policies by both the government and the central bank to be the best combination of monetary and fiscal policy coordination. According to Chang (2025), in the context of growing global economic uncertainty, strengthening the coordination between fiscal and monetary policies not only helps resolve short-term economic fluctuations, but also provides

crucial support for achieving long-term high-quality economic development.

The complete description of the monetary policy implementation process presented by the Central Bank of the Republic of Armenia (2006) greatly helped in the selection of the factors of the econometric model of the monetary sector. First of all, the Central Bank is quite thorough in revising the CPI and core inflation indicators. In particular, it is said that the approaches of Poland and the Czech Republic are acceptable in the difficult matter of choosing one of the two indicators. The Central Bank also refers to the transmission mechanism, noting that the change in short-term interest rates, which occurs through the use of the Central Bank's monetary policy instruments, short-term repo operations, over a period of time reflects the behavior of other interest rates, which in turn have an impact on aggregate demand.

3. Data and Methodology

The results recorded by the Republic of Armenia in the period of 2010-2021 in terms of innovative processes were of starting importance for the conducted research. During the research, special attention is paid to the indicators that are included in the report of the Global Innovation Index for the Republic of Armenia. In this study, the volume of the gross output of high-tech sectors of RA was adopted as a target indicator of the fiscal policy. In order to ensure the consistency of long-term trends and the reliability of modeling, the data of 2022 and 2023 were excluded from the sample, taking into account the enormous inflow of Russian capital into Armenia's high-tech sector, after the start of the Russian-Ukrainian war, which, in our opinion, will not have a permanent nature and

the risk of outflow after the end of the war is quite high.

On the other hand, the indicator of the core inflation was chosen as the target indicator of the monetary policy, which should tend to decrease to minimum level. For this purpose, one of the policy instruments of the Central Bank of Armenia, the lombard repo interest rates, was singled out from the factors affecting core inflation. The indicators of both the monetary sector and the fiscal sector described above were included in the model at the quarterly levels of 2010-2021.

Our research is based on the theory of equilibrium developed by John Nash for non-cooperative games, according to which no player participating in the game can improve his outcome by unilaterally changing his strategy, taking into account the strategies chosen by other players (Alderborn, 2018). Econometric models describing the relationships mentioned above were presented as functions of the payoffs of the corresponding policies in the game model (Bošnjak & Tunjo, 2017). In accordance with the objectives set within the framework of the game: minimum inflation and maximum output volumes of the high-tech sector, a partial solution was considered, and Nash equilibria (Kremlev, 2016) were given in pure and mixed strategies. All this was attempted to be ensured within the appropriate levels of fiscal and monetary policy tools, such as government spending and lombard repo interest rates.

4. Analysis and modeling

4.1. Branch-structural analysis

We can see the dynamics of the gross output of high-tech sectors of the RA economy in the quarters of 2010-2021 below (Figure 1). The high-tech industry of RA is most prominently represented by the releases

of pharmaceutical, computer, electronic and optical equipment productions.

According to chart 1, in the fourth quarter of 2021, the gross production volumes of the high-tech sector of RA amounted to 7,568.1 million drams. The latter increased by 4% compared to the fourth quarter of the previous year, and

by 63% compared to the third quarter of 2021. As of the fourth quarter of 2021, the share of RA high-tech gross output in the gross output of the manufacturing industry was only 1.4%. The high-tech sector includes two high-tech industries: the production of pharmaceutical products and the production of computers,

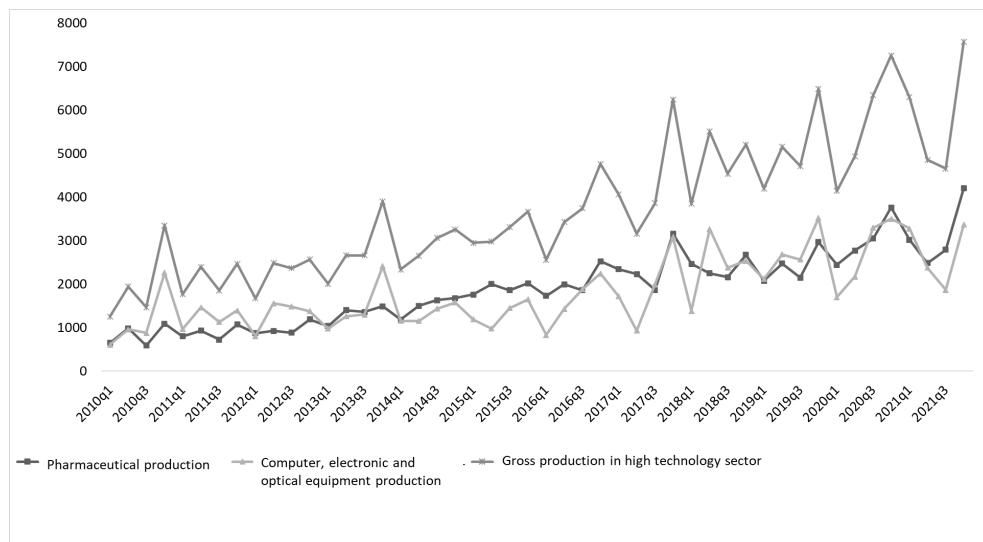


Figure 1. The Dynamics of the Production Volumes of the Gross Output of the High-Tech Sector in the Quarters of 2010-2021 (in bln drams)

Source: RA Statistical Committee: <https://armstat.am/en/?nid=157>.

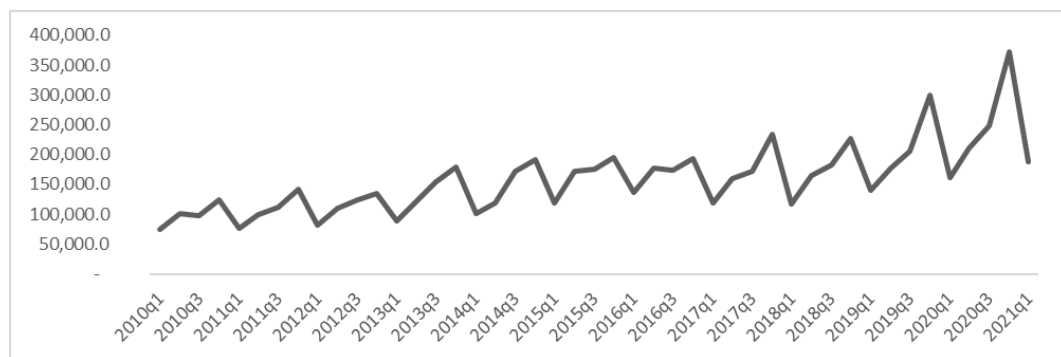


Figure 2. The Dynamics of the Volumes of Government Expenditures on a Quarterly Basis for 2010-2021 (in bln drams).

Source: Central Bank of RA: <https://www.cba.am/am/SitePages/statrealsector.aspx>

electronic and optical equipment. In the fourth quarter of 2021, the share of pharmaceutical production volumes in the gross production volumes of the high-tech sector is 56%, and the share of computer, electronic and optical equipment production volumes is 44%. In the fourth quarter of 2021, compared to the fourth quarter of 2020, the production volumes of pharmaceutical products increased by 12%, and compared to the previous quarter, by 51%. Production volumes of computers, electronic and optical equipment in the fourth quarter of 2021 decreased by 4% compared to the fourth quarter of 2020, and increased by 81% compared to the previous quarter. It has been mentioned many times that the Government of RA supports the high-tech sector. First of all, it is expressed by the implementation of state expenditures, which is one of the key tools of the fiscal policy.

In the first quarter of 2021, the volumes of Government expenses decreased by about 49% compared to the previous quarter, and increased by 17% compared to the first quarter of 2020 (Figure 2). There are connections between government spending and high-tech

sector spending that can be described with the help of an econometric model.

When conducting an analysis of the objectives and implementation of the monetary policy of the Republic of Armenia, we mostly relied on the set of possibilities and ways of implementing the monetary policy presented by the Central Bank of the Republic of Armenia. In policy framework, actually the consumer price index (CPI) is considered as the main indicator of inflation. In our case, the preference was given to the core inflation index, because the consumer price index, as shown by the calculations, is more sensitive to a number of monetary policy instruments. The dynamics of CPI and normal inflation on a quarterly basis is given in Figure 3.

Statistical data prove that the difference between CPI and core inflation is not big. In particular, in the fourth quarter of 2021, the CPI was 8.8%, and the normal inflation was 7.3%. A significant and serious difference between the CPI and normal inflation during the considered period was observed in the first quarter of 2012, when CPI was -6% and core inflation was 5.6%. Within the

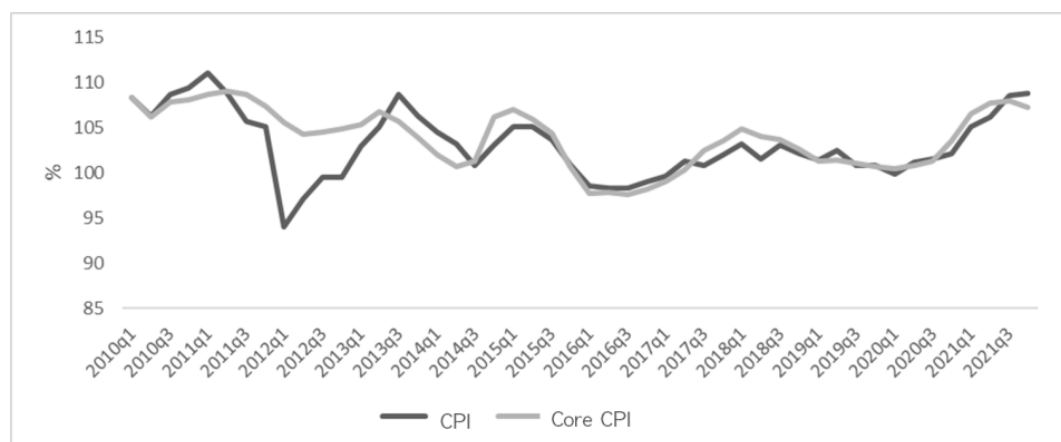


Figure 3. The Dynamics of RA CPI and Core Inflation Indicators on a Quarterly Basis for 2010-2021

Source: Central Bank of RA: <https://www.cba.am/en/statistics/price-statistics/27>

framework of the research, many monetary policy instruments with possible impacts on these two indicators were considered. These include the level of money supply M0, repo rates - repo agreements, leveraged funds and lombard repo. The CPI reacts quite harshly to changes in each of these instruments. In the case of natural inflation, the lombard repo interest rate is affected, whose quarterly levels had the following dynamics (Figure 4).

Let's note that according to the data of the Central Bank of the Republic of Armenia, the interest rate of pawn repo transactions in the Republic of Armenia in the 4th quarter of 2021 was 9.25%. The latter increased by 0.5 percentage points compared to the previous quarter, and by 3.5 percentage points compared to the same quarter of the previous year. As part of the research, it was found that there was no deviation from the stated objectives of the monetary policy of the Central Bank of Armenia. Let's note that currently inflation is aimed at the level of $4\% \pm 1.5\%$. Therefore, if the RA Central Bank is a participant in the game situation considered within the framework of the research, then its

main goal is to maintain the above-mentioned limits (interval) of inflation.

4.2. Modeling

4.2.1. The econometric model describing the fiscal sector

As mentioned above, strong connections between the gross output of the high-tech sector and the volume of government spending have been revealed. This is evidenced by the results of the correlation analysis, according to which the observed correlation was 0.87. Therefore, the following econometric model (1) was presented using the quarterly data of government expenditures and gross output of the high-tech sector for 2010-2021:

$$HT_t = \beta_0 + \beta_1 \cdot G_t + \mu_t \quad (1)$$

Where:

HT_t - the level of gross output volumes of the RA high-tech sector in the t-th quarter,

G_t - the volume of government spending in the t-th quarter,

β_0, β_1 - the unknown parameters of the model

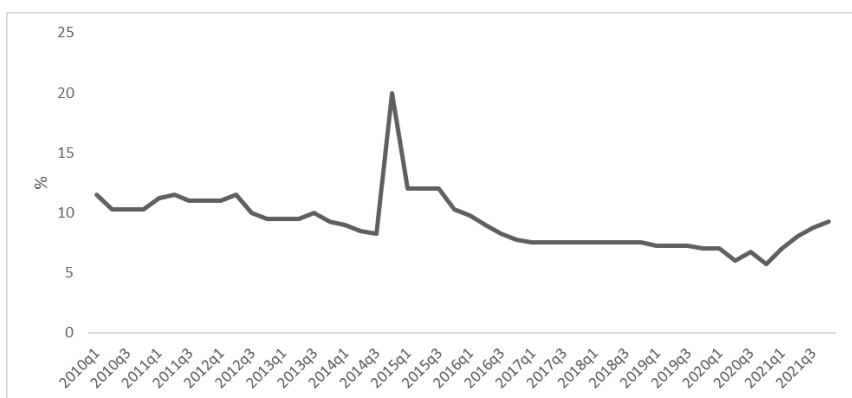


Figure 4. The Dynamics of the Interest Rate of Lombard Repo Transactions on a Quarterly Basis for 2010-2021 in RA.

Source: Central Bank of RA: <https://www.cba.am/en/statistics/interest-rates-of-the-cba-operations-in-financial-markets/219>

μ_t - the random error of the model in the t -th quarter,

$$t = 2010:q1, 2021:q1$$

In the model, we are particularly interested in β_1 coefficients, which represent the impact of changes in one of the instruments of fiscal policy, the volume of government spending, on the volume of gross output of the high-tech sector. Before proceeding to the estimation of the model, the stationarity of the variable series was checked. As a result, it became clear that the series which are non stationary were made stationary with differences of the first and second order. Also, the lagged variable of the gross output of the high-tech sector was added to the model, which increased the quality of the model. To account for seasonality issues in quarterly data, dummy variables describing the quarters were also introduced. Model variables were also logarithmized. Based on all the requirements formulated above, model (2) was estimated with the following specification:

$$D(\log(HT_t)) = \gamma_0 + \gamma_1 \cdot D(D(\log(G_t))) + \gamma_2 \cdot D(\log(HT_{t-1})) + \gamma_3 \cdot q_{t2} + \varepsilon_t \quad (2)$$

Where:

$D(\log(HT_t))$, $D(D(\log(G_t)))$ – are the logarithms of the gross output and government expenditure indicators of the high-tech sector with differences of the first and second order, respectively,

$D(\log(HT_{t-1}))$ – is the lagged magnitude of the gross output of the high-tech sector with logarithmic and first-order differences,

q_{t2} – if t is the second quarter, then $q_{t2}=1$, in case of other quarters: 0,

$\gamma_0, \gamma_1, \gamma_2, \gamma_3$ – the unknown parameters of the model,

ε_t – the random error of the model in the t -th quarter,

We are interested in this model coefficient γ_1 that semantically matches the original model coefficient β_1 . As a result of the evaluation of the model, all the coefficients and the general model were found to be significant, the R-squared is close to 1, 0.74. In the estimated model, the estimate of the γ_1 coefficient was 0.5. The latter means that, other things being equal, a 1% increase in government spending leads to an average 0.5% increase in the gross output of the high-tech sector.

4.2.2. The econometric model describing the monetary sector

As mentioned above, one of the instruments of monetary policy affecting normal inflation is the interest rate of the lombard repo. Other instruments were also considered, but the strongest correlations were observed in the case of the lombard repo rate. In addition, it is assumed that a certain time is required for the reaction after the interest rate change. In this situation, it is appropriate to consider the following autoregression econometric model (3):

$$INF_t = \alpha_0 + \sum_{q=1}^n \alpha_q \cdot R_{t-q} + \sum_{s=1}^n \beta_s INF_{t-s} + \varepsilon_t \quad (3)$$

Where:

INF_t – t -is the core inflation rate in the t -th quarter,

R_{t-q} – is the lombard rate level in the $t-q$ quarter,

INF_{t-s} – is the level of the dependent variable in $t-q$ quarter,

$\alpha_0, \alpha_1, \dots, \alpha_n, \beta_1, \dots, \beta_n$ – the unknown parameters of the model,

ε_t – is the random error of the model in the t -th quarter.

Here, also, the variables of the model will be considered in a logarithmic state. In addition, the series of all variables were

non-stationary and were made stationary, as a result of which they will be considered in the model with first-order differences. In this case, we will have the following econometric model (4) necessary for evaluation:

$$d(\log(INF_t)) = \alpha_0 + \sum_{q=1}^n \alpha_q \cdot d(\log(R_{t-q})) + \sum_{s=1}^n \beta_s d(\log(INF_{t-s})) + \varepsilon_t \quad (4)$$

where:

$d(\log(INF_t)), d(\log(R_{t-q}), d(\log(INF_{t-s}))$ – are the logarithms of the dependent and independent variables of the model with differences of the first order.

As a result of model estimation, the following model (5) will be obtained:

$$\begin{aligned} D(\log(INF_t)) = & \underbrace{-0,003}_{(0.1482)} \underbrace{-0,36}_{(0.0025)} d(\log(R_{t-1})) \\ & \underbrace{-0,34}_{(0.0015)} d(\log(R_{t-2})) \underbrace{-0,27}_{(0.0068)} d(\log(R_{t-7})) \\ & \underbrace{-0,35}_{(0.0032)} d(\log(R_{t-8})) \underbrace{-0,25}_{(0.0150)} d(\log(R_{t-9})) \\ & + \underbrace{0,78}_{(0.0000)} d(\log(INF_{t-1})) \underbrace{-0,45}_{(0.0101)} d(\log(INF_{t-3})) \\ & \underbrace{-0,37}_{(0.0339)} d(\log(INF_{t-4})) \end{aligned} \quad (5)$$

Where:

$D(\log(INF_t)) - n$ is the predicted value of the dependent variable at the t -th observation.

The model is of high quality, R-squared is close to 1, coefficients and the overall model are significant. In this model (5),

the coefficients that show the effect of the change of the interest rate in the previous quarters on the level of core inflation in the given quarter are of clear importance to us. In this regard, let us note that there is an inverse dependence on all of them. In particular, the increase in the interest rate one quarter ago, other things being equal, leads to a decrease in core inflation by 0.4% on average.

5. Simulation of game situation

On the basis of the performed analysis, it is possible to formulate a game situation, on one side of which is the Government implementing fiscal policy, and on the other side, the Central bank implementing monetary policy. Using the econometric models obtained above, it is possible to obtain the gains of both parties in the case of changes in the relevant instruments of fiscal and monetary policy considered in the analysis. Here, the main task of the Central Bank is to ensure the minimum level of inflation within the target inflation regime, and the goal of the government is to ensure the maximum level of high-tech gross product volumes. To break down this game situation, let's first look at each side's payoff matrix (Bošnjak & Tunjo, 2017).

From the above matrix (Table 1), we notice that the minimum core inflation and the maximum levels of the gross output of the high-tech sector (7.23; 7738) are ensured in

Table 1. The Game Matrix of Coordination of Monetary and Fiscal Policies on the Example of RA

Policy directions (%) 1.0%		Fiscal Policy (%)			
		2.5%	3.5%	4.5%	
Monetary Policy (%)	1.0%	(7.27;7606)	(7.27;7663)	(7.27;7701)	(7.27;7738)
	1.5%	(7.26;7606)	(7.26;7663)	(7.26;7701)	(7.26;7738)
	2.0%	(7.24;7606)	(7.24;7663)	(7.24;7701)	(7.24;7738)
	2.5%	(7.23;7606)	(7.23;7663)	(7.23;7701)	(7.23;7738)

Source: Research Finding.

the case when the government expenditures increase by 4.5%, and the Lombard repo rate is 2.5 in %. This is, in fact, the **Pareto optimal** situation. In this binary game, the **Nash equilibrium** is established when the government implements the 4.5% spending strategy and the Central Bank implements the 1% repo policy. In this case, CB and government winnings are confirmed by winning combination of (7.27; 7738). Let's note, however, that in the case of combining such strategies, the Nash equilibrium does not guarantee the minimum level of inflation, that is, the condition of ensuring the Pareto optimal situation at the same time.

6. Results and Discussion

Our studies show that effective coordination of monetary and fiscal policies, which should be close to the Pareto efficient situation, is, in fact, a rather difficult situation to achieve in an economy with emerging markets. In the case of the Republic of Armenia in particular, if we look at the components of the efficient profit combination estimated by the calculated model, we will notice that the actual indicators characterizing the Nash equilibrium situation in the economy are quite far from the equilibrium situation. In essence, the game observed in the case of our models is non-cooperative in nature, which is very typical of economies with emerging markets that have not yet been institutionally established.

This situation is very typical for developing economies with an institutionally imperfect system. In particular, similar studies conducted on the example of the Hungarian economy show that in the long run, fiscal policy is always more expansionary than the requirements implied by the Nash equilibrium, while monetary policy, while maintaining low interest rates in the long run, forces the

Central Bank to implement sharp increases in interest rates in a shock situation (Salimi et al., 2025). Analysis of the experience of a number of similar countries shows (Chibi et al., 2024) that policies between the government and the central bank are coordinated in the context of Pareto optimality if the game between them is cooperative, that is, there is effective cooperation between the players (Blueschke et al., 2020, Woroniecka-Leciejewicz, 2015).

Let us note that in our study, the problem of strategic interaction between monetary and fiscal policies was considered in the case of different game regimes, including mixed strategies. In the case of the Republic of Armenia, the restrictive or expansionary options of the mentioned policies were actually combined and combined during the observed period, depending on the internal and external factors affecting these vectors. Therefore, the winning combinations representing the Pareto equilibrium situation are significantly different from the Nash equilibrium situation. In this case, mixed game strategies were considered.

It is noteworthy that there are studies that have yielded opposite results, depending on the fact that the observed situations were described based on a combination of pure strategies of the players: the government and the central bank. Moreover, it was found that Pareto optimal strategies are a subset of Nash equilibrium strategies, and the former provide the maximum profit to all agents. The calculation of Pareto optimal solutions implies less computational costs than for Nash equilibrium solutions (Das et al., 2019).

Some recent research argues that effective cooperation between governments and central banks is quite possible from the perspective of maximizing social welfare when the adaptive game model is used as the basis for coordination. (Herrera-Medina & Riera

Font, 2023). We believe that in a game-like “dialogue” with the government, central banks are typically reluctant to maintain the status quo and respond optimally to disruptions caused by pro-cyclical fiscal policy. However, such a response may crowd out domestic investment, slow down the economy, and lead to financial instability. This suggests that focusing solely on the credibility of the monetary policy status quo is not enough, and monitoring the behavior of fiscal policy becomes a crucial prerequisite (Izzulhaq & Kurnia, 2022).

7. Conclusions and questions for further analysis

In this analysis, the extent and direction of dependence on fiscal policy instruments on a quarterly basis between 2010-2021 is revealed between public expenditures and the gross output of the high-tech sector. As a result of the conducted assessment, it became clear that, other things being equal, a 1% increase in the volume of government spending in a given quarter leads to an average increase of 0.5% in the gross output of the high-tech sector. In other words, the growth of government spending in the considered period contributes to the growth of the gross output of the high-tech sector.

On the other side is the monetary policy, in terms of which it became clear that the CPI reacts quite non significantly to the changes in money aggregates, interest rates and short-term interest rates. For this purpose, taking as a basis a number of provisions of the monetary policy of the Central Bank of Armenia, in our case, a core inflation index describing inflation was taken into analysis, which is influenced by the lombard repo rate of the Central Bank of Armenia. It is assumed that the change in interest rates takes effect with a certain

delay. Taking this circumstance into account, as a result of the evaluation of the estimated econometric model, it was found that in the previous quarter, other things being equal, a 1% increase in the lombard repo interest rate leads to a decrease in the core inflation rate by 0.4% on average.

In the next step, a game situation was formulated, one side of which is the monetary policy (CB), and the other side Government implementing fiscal policy. To describe the game, the above mentioned econometric models were used to determine the winnings of each player. As a result, a game matrix was obtained. Note that it is assumed that the sides implementing monetary and fiscal policy act independently of each other. Under these conditions, the goal of the Central Bank is to ensure the minimum level of core inflation, and the goal of the fiscal policy is to ensure the maximum level of gross output of the high-tech sector.

Note that in this game situation there is one Nash equilibrium state, in which core inflation is established at 7.27%, and the result of high-tech gross product is at the level of 7.738 million drams. Moreover, these gains are confirmed when the government increases public spending by 4.5%, and the Central Bank increases the Lombard repo rate by 1%. The Pareto optimal solution of the game situation is established when the level of normal inflation is 7.23%, and the volume of high-tech gross product is 7.738 million drams. In this case, the Central Bank increases the pawn repo interest rate by 2.5%, and the government increases public spending by 4.5%.

According to the established logic of the game and the actual results obtained, the strategies of the policies of the government of the Republic of Armenia and the central

bank register highly biased results, which can be seen from the fact that the situation describing the Nash equilibrium of the winning pairs of the game matrix is not Pareto optimal. This indicates the weak and ineffective coordination of the policies of the government and the central bank.

In our opinion, the questions made on the basis of the chosen methodology within the framework of this topic and the subsequent analyses should be related to the application of new approaches to the coordination of fiscal and monetary policies. In particular, it refers to the possible application of the elements of the evolutionary-sustainable strategy within the framework of the game of the government-central bank pair and the clarification of their results.

In our opinion, such a setting for modeling the game situation between the central bank and the government can significantly improve the efficiency of coordination of monetary and fiscal policies according to the rules of the repeated game, which, in general, can reduce the losses of public welfare. For *economies* with emerging markets, such as the economy of the Republic of Armenia, such a coordination strategy can save significant resources for the development of the high-tech segment and the creation of new jobs.

Acknowledgements

The work was supported by the Higher Education and Science Committee of RA, in the frames of the research project № 23AA-5B025

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