

POSSIBILITY OF COORDINATION OF MONETARY AND FISCAL POLICIES IN EEU: KYRGYZSTAN CASE

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Introduction. The issue of monetary and fiscal policy coordination is not only important for Armenia, but other member states of the Eurasian Economic Union are also in the center of their attention. The need for such coordination is more than urgent, because the West has imposed quite painful economic sanctions on two member states of the Union. The latter indirectly attack other EU member states. Sanctions imposed on high-tech industries are particularly disturbing. As a result of them, the entry of the newest technologies to Russia and Belarus is prohibited, which will certainly deal a tangible blow to the common innovative agenda of the Eurasian Economic Union. Under these conditions, other member economies should be able to bypass the sanctions and weaken their impact on the innovation system of the Union. Within the framework of the conducted research, it was shown for Kyrgyzstan (based on a similar study conducted for RA) that as a result of the implementation of certain instruments of fiscal and monetary policy, when the task was to ensure the minimum level of inflation and the maximum level of gross output of the high-tech industry, it is possible to obtain policies coordination indicators. Why was the economy of Kyrgyzstan chosen? Let's note that the economy of other EEU member states and RA are not very comparable. In particular, the Russian Federation and Kazakhstan have access to the sea and a fairly high level of population. Both countries have tangible fuel and energy reserves. There are many sanctions against Russia and Belarus. All these factors significantly deviate the main parameters of monetary and fiscal policy coordination. Armenia and Kyrgyzstan are landlocked, both are high mountain countries. There are no sanctions on the two economies. Both Armenia and Kyrgyzstan are not at peace with their neighbors. In this case, to a certain extent, the economies of our countries can be compared with greater probability than others. First of all, in Kyrgyzstan, the dynamics of such indicators as the gross output of the high-tech sector, inflation, money supply M_0 , government expenditures and the dollar/som exchange rate were studied. The analysis of the latter is based on the quarters of 2017-2022. In the next step, econometric models describing monetary and fiscal policies were considered. With their help, the game model of coordination of fiscal and monetary policies was created. As a result of the partial

solution of the latter, tactics were singled out, which led to certain optimal levels of performance indicators. The obtained results are summarized in the conclusion.

Methodology. Two main goals have been set for the Kyrgyz economy: to maximize the volume of high-tech gross output, as well as to ensure the lowest level of inflation as much as possible. Certain factors affect the achievement of each of the set goals. In particular, the level of public expenditure and the level of inflation were selected as factors influencing the high-tech gross product. On the other hand, factors affecting inflation in the country were considered the mass of money M0 and the level of the dollar/SOM exchange rate. All the above indicators of both the monetary sector and the fiscal sector were included at the quarterly levels of 2017-2022. The dynamics of all indicators were analyzed using graphs. Comparisons were made. Econometric models describing the proposed relationships were presented as payoff functions of the corresponding policies of the game model [Krešimir, 2017, 77-82]. In accordance with the goals set within the framework of the presented game: minimum inflation and maximum gross output volumes of the high-tech sector, a partial solution was considered, and Nash equilibria were given in pure and mixed strategies [Kremlev, 2016, 111-115]. All this was attempted to provide appropriate fiscal and monetary policy instruments within certain levels of government spending and money M0.

Literature review. Economists, analysts and experts have paid great attention to the problems of coordination of monetary and fiscal policies in neighboring countries. In order to describe and highlight them, the researchers made many analyses, in the center of which were the various aspects of monetary and fiscal policy coordination. Bosniak K. was of great importance for the conducted analysis and Tunio P. "Game theory in the analysis of Monetary and Fiscal policy on the example of Republic of Croatia", where the game situation of coordination of fiscal and monetary policies is given on the example of Croatia. In addition, in the work, the gains of each player, the Central Bank and the government, in the case of applying different strategies, are obtained from econometric models describing monetary and fiscal policies. In this research, one more important circumstance should be paid attention to. While formulating the goals of the fiscal policy, it is noted that they may differ from country to country and they may refer to different socio-economic indicators [Krešimir, 2017, 77-82]. Researchers M. Voskanyan and L. Paronyan in their "Coordination of fiscal and monetary regulation in Armenia. Finance: The analysis entitled "Theory and Practice". In the latter, the game situation of policy coordination is approached in three main directions, which mainly refer to the mutual dependence of monetary and fiscal policy implementers. As a result, different types of games are obtained, which require different approaches to solving. In the analysis, one of the goals of the fiscal policy is the need to minimize the budget deficit [Voskanyan, 2020, 105-118]. The basis for the selection of factors in the

monetary policy model of the conducted research was the joint "Monetary policy of EAEU member states" of the Eurasian Bank and the Eurasian Economic Commission. the current situation and opportunities for coordination" report [Joint report of the Eurasian Economic Commission and the Eurasian Development Bank, 2017, 73-74], where it is noted that the most influencing factors on inflation in Kyrgyzstan are the exchange rate and changes in the dram base. At the same time, it is noted that the effectiveness of the agreed monetary policy of the EEU member states significantly depends on the implemented fiscal policy [EEC & EUDB, 2017, 129-131].

Scientific novelty. One of the most important tasks of this research is to study the experience of countries comparable to the RA economy from the point of view of monetary and fiscal policy coordination. Of particular interest are the EEU member states, one of which is Kyrgyzstan. Regarding the latter, econometric models describing monetary and fiscal policies were obtained, which at the same time are profit functions of the game matrix. Thanks to performed calculations, results were obtained that testify to the possibility of certain local solutions for the coordination of monetary and fiscal policy.

Analysis. Suppose the goal of the Kyrgyz government is to maximize the gross output of the high-tech industry, and the Central Bank of the country has decided to ensure minimum inflation. These two goals are influenced by various factors of fiscal policy. In particular, the money supply M_0 and government spending. Before moving on to the econometric models corresponding to the main goals, let's consider the dynamics of the volume of gross output of the High-tech industry .

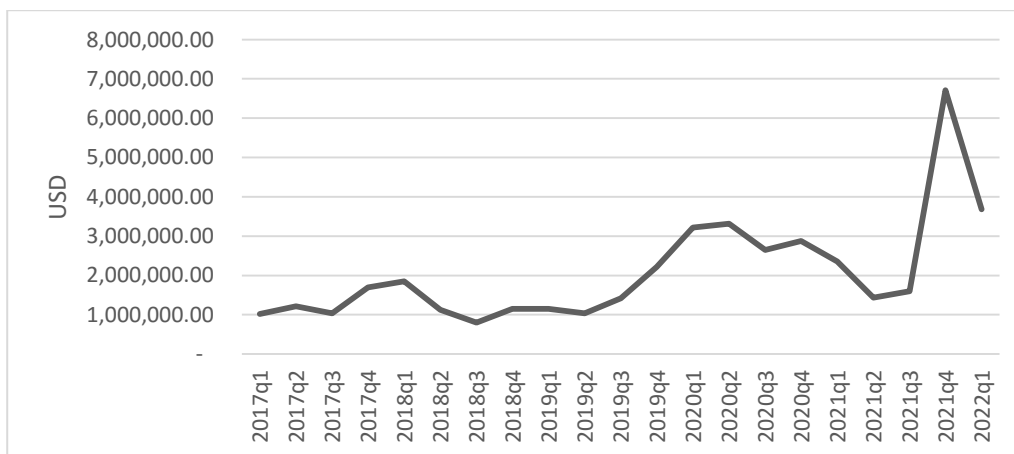


Figure 1 . The dynamics of the gross output of the high-tech industry in Kyrgyzstan in the quarters of 2017-2022 (Source: own calculations)

Below the threshold of 3 million US dollars until the 4th quarter of 2019 . In the second quarter of 2020, the volume of high-tech gross output was established at the level

of 3.3 million US dollars. Then a sharp decline is observed. In the 4th quarter of 2021, the gross output of the high-tech industry reaches its maximum level of 6.7 million USD. In the first quarter of 2022, the volume of the gross output of the high-tech industry was 3.7 million USD. The components of the high-tech industry of Kyrgyzstan are the pharmaceutical industry and the production of computers, electronic and optical products [Industry, eurasiacommission.org]. The dynamics of inflation in Kyrgyzstan in the quarters of 2017-2022 was as follows :

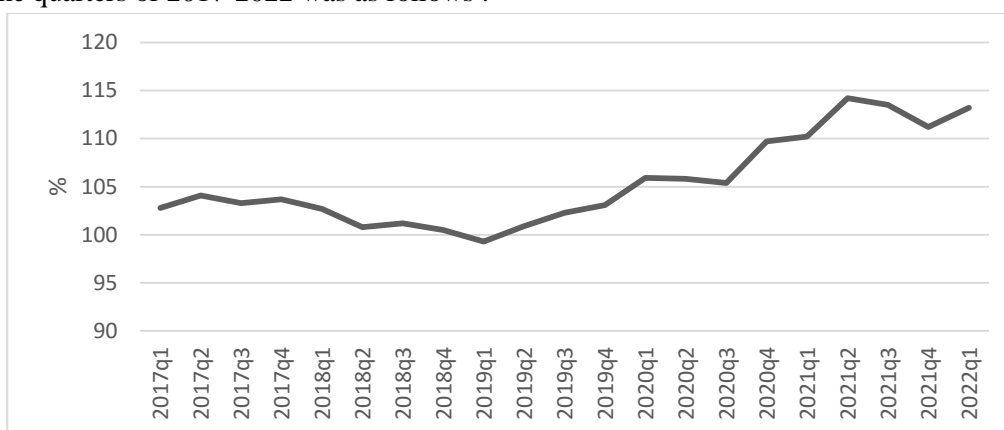


Figure 2. Inflation dynamics in Kyrgyzstan in the quarters of 2017-2022 (Source: Prices (eurasiacommission.org))

In the observed period until the 4th quarter of 2019, inflation in Kyrgyzstan was below 3% . Then, an acceleration of inflation is observed . In the Ist quarter of 2020, it was 5.9%, in the first quarter of 2021, exceeded 10%, and in the first quarter of 2022, the inflation rate was recorded at the level of 13.2%. One of the instruments of monetary policy is the mass of money M0, the dynamics of which in Kyrgyzstan was as follows :

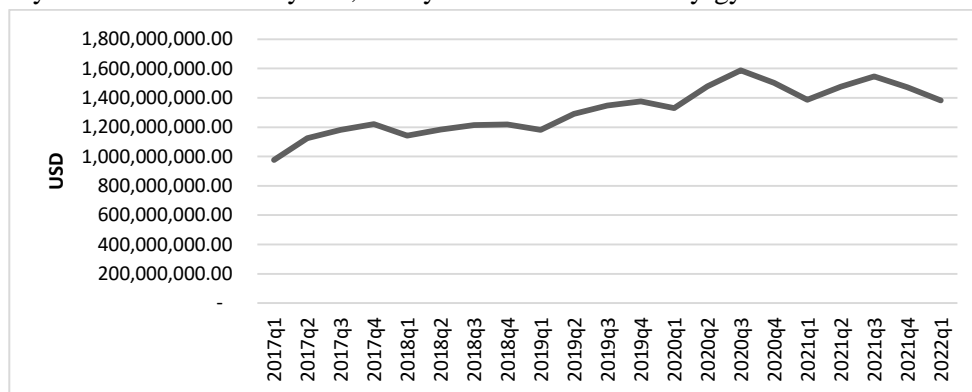


Figure 3 : The dynamics of the mass of money M0 in Kyrgyzstan in the quarters of 2017-2022 (Source: Monetary Statistics (eurasiacommission.org))

The minimum level of the mass of money M0 was observed in the first quarter of 2017: 977.2 million US dollars, and the maximum level was recorded in the third quarter of 2020: 1.6 billion US dollars. In the first quarter of 2022, the level of the M0 mass of money reached the level of 1.4 billion US dollars. One of the key instruments of the fiscal policy are state expenditures, the dynamics of which volumes were as follows :

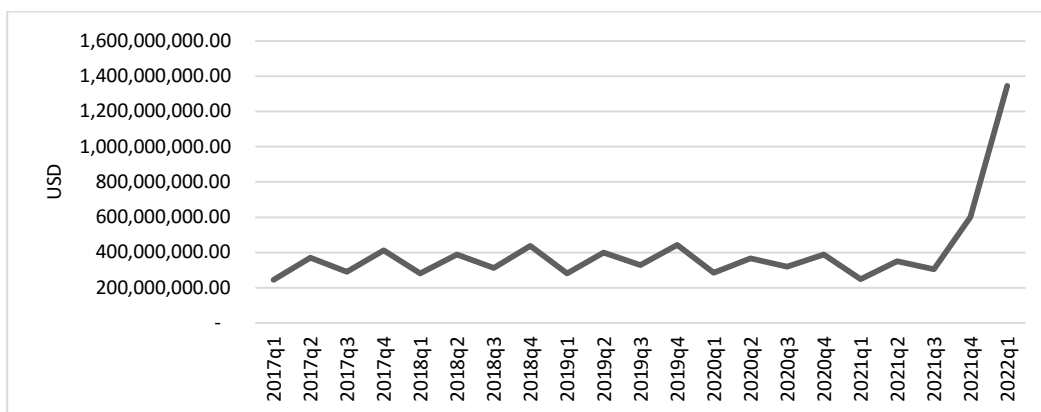


Figure 4 . The dynamics of public expenditure volumes in Kyrgyzstan in the quarters of 2017-2022 (Source: National Accounts (eurasiancommission.org))

According to statistical data, the level of public spending until the third quarter of 2021 was below 450 million US dollars, and already from the first quarter of 2021, the volume of public spending exceeded 600 million US dollars. In the first quarter of 2022, the volumes of state expenditures amounted to 1.3 billion US dollars. Kyrgyzstan is a largely importing country, whose economy is dependent on exchange rate fluctuations. In particular, let's consider the dynamics of the som/US dollar exchange rate .

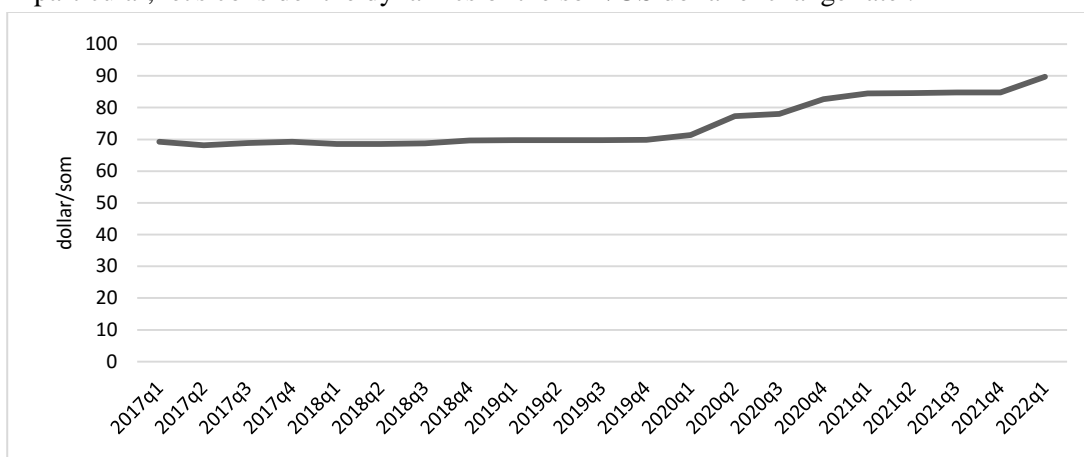


Figure 5 . The dynamics of the dollar/som exchange rate in Kyrgyzstan in the quarters of 2017-2022 (Source : Monetary Statistics (eurasiancommission.org))

Statistics show that until the 4th quarter of 2019, the value of 1 dollar in Kyrgyzstan fluctuated around 69 soms. However, already in the first quarter of 2020, 1 US dollar was already worth 71.4 soms. Then there is a further increase in the value of the dollar. In particular, in the first quarter of 2022, they give 89.7 soms for 1 US dollar.

Modeling. Next, let's examine a game situation in which monetary and fiscal policies are combined. On the basis of the goals described above, the game's winning functions-econometric models can be formed. In particular, suppose that the following econometric models represent the profit functions of monetary and fiscal policy implementation [Eliseeva,2021, 36-38]:

$$INF_t = \alpha_0 + \alpha_1 \cdot MO_t + \alpha_2 \cdot EXR_t + \varepsilon_t$$

and:

$$HT_t = \beta_0 + \beta_1 \cdot INF_t + \beta_2 \cdot G_t + \mu_t$$

where

INF_t – is the inflation rate in the t quarter,

HT_t – is the level of gross output of the high-tech sector in the t-th quarter,

EXR_t – is the exchange rate (dollar/som) in the t quarter,

MO_t – is the level of the volume of money mass M0 in the t-th quarter,

G_t – is the volume of government spending in the t-th year,

$\alpha_0, \alpha_1, \alpha_2$ \wedge $\beta_0, \beta_1, \beta_2$ – are the unknown parameters of the model,

ε_t and μ_t – are the random errors of the corresponding models in the t-th quarter,

t – is the index of the quarter. Moreover $t = \overline{2017:1,2022:1}$.

We are particularly interested in the model α_1 and β_2 the coefficients representing, respectively, the effect of one of the monetary policy instruments, the change in the volume of the money supply M0, on inflation, and the effect of one of the fiscal policy instruments, government spending, on the change in the volume of the gross output of the high-tech sector, respectively.

Before estimating the above two econometric models, the variables were logarithmized. The problems of stationarity [Magnus, 2004, 276-285] and multicollinearity of the series [Verbek, 2008, 146-148] were considered. The serieses were not stationary. Non-stationary series were made stationary with the help of second and even third order differences. In order to take into account the seasonality in the model, dummy variables describing the 4 quarters were also introduced [Eliseeva, 2021, 91-103]. In order to choose the optimal model, the models were evaluated with different specifications [Babeshko, 2006, 246-249]. As the main evaluated models, those that have the highest possible quality and meet a number of statistical criteria were selected. The models were estimated using the least squares method. The final estimated models are given with the following specification :

$$d(d(\widehat{\ln INF}_t)) = \frac{0,003}{(0.5084)} + \frac{0,14}{(0,0214)} \cdot d(d(\ln M0_{t-3})) - \frac{0,69}{(0.0003)} \cdot$$

$d(d(\ln EXR_{t-1}))$ and:

$$d(d(\widehat{\ln HT}_t)) = \frac{0.41}{(0.0418)} - \frac{29.01}{(0.0245)} \cdot d(d(\ln INF_{t-5})) - \frac{0.48}{(0.0062)} \cdot d(d(d(\ln G_{t-2}))) \\ + \frac{1.4}{(0.0080)} \cdot q3$$

where

$d(d(\widehat{\ln INF}_t))$ –is the predicted level of inflation in the t observation case in the logarithmic state and the second order difference, $d(d(\widehat{\ln HT}_t))$ –is the predicted level of the high-tech sector gross output volume in the t observation case in the logarithmic state and the second order difference.

$d(d(\ln M0_{t-3}))$ – is the level of the money supply M0 in t-3 in the logarithmic state and with double differences,

$d(d(\ln EXR_{t-1}))$ –is the level of the exchange rate in t-1 in the logarithmic state and with double differences,

$q3$ –is the dummy variable describing the third quarter,

$d(d(\ln INF_{t-5}))$ –is the logarithmic and double difference index of inflation in t-5, in the logarithmic state and with double differences,

$d(d(d(\ln G_{t-2})))$ –is the government expenditure volume in t-2 in the logarithmic state with a triple difference.

As a result of the evaluation of the profit function-econometric model for monetary and fiscal policies, high-quality models were obtained, and the estimated coefficients of the models are significant. Turning to the coefficients that interest us, we should note that a 1% increase in the volume of money mass M0 three quarters ago, other things being equal, leads to an average increase in inflation by 0.14% in a given year . On the other hand, a 1% increase in government spending two quarters ago, other things being equal, leads to a 0.48% increase in the level of high-tech manufacturing gross output in a given year. Using the obtained results, we will get the game matrix [Krešimir, 2017, 77-82] if, as a result of fiscal and monetary policy, the government expenditures and the volume of money mass M0 increase by 1%, 3%, 6% and 9% .

Table 1 . The game matrix of coordination of monetary and fiscal policies

		Fiscal:			
		1%	3%	6%	9%
Currency:	1%	(111.4 , 6.73)	(111.4 , 6.80)	(111.4 , 6.90)	(111.4 , 6.99)
	3%	(111.7,6.73)	(111.7,6.80)	(111.7,6.90)	(111.7,6.99)
	6%	(112.13,6.73)	(112.13, 6.80)	(112.13, 6.90)	(112.13, 6.99)
	9%	(112.6,6.73)	(112.6,6.80)	(112.6,6.90)	(112.6 , 6.99)

From the matrix, we can see that minimum inflation and maximum levels of gross output of high-tech production are ensured only when the volume of money mass M0 increases by 1%, and government expenditures by 9%. With this strategy, inflation is 111.4%, and the volume of gross output of high-tech production is 6.99 million USD.

Conclusion. Based on the research done on certain coordination of monetary and fiscal policies for Armenia and China, the same methodology was applied to explore possible options for coordination of the above policies in Kyrgyzstan. In the analysis, the goals of the government and the monetary authority were set, respectively, ensuring the maximum volume of high-tech gross output and the minimum levels of inflation. In accordance with these goals, a range of factors were considered: government spending and the mass of money M0, which affect the set goals. Regarding all presented indicators, a dynamic analysis was carried out on a quarterly basis for 2017-2022, within the framework of which the maximum and minimum levels of each indicator during the considered period, as well as the directions of changes in the indicators, became clear. Based on the results of the analysis, the econometric models corresponding to the monetary and fiscal policies were built, which describe the effects of various monetary and fiscal policy instruments on the indicators corresponding to the main goals. Before evaluating the econometric models, consider a number of issues related to the stationarity of the indicators included in the models, possible seasonality issues, etc. The models were evaluated with different specifications, but in the end, the version was chosen, in which case the qualitative features of the models are higher. The models were estimated by the method of least squares and the following results were obtained :

1. money supply M0 three quarters ago, other things being equal, leads to an average 0.14% increase in inflation in a given year.

2. A 1% increase in government spending two quarters ago, ceteris paribus, leads to a 0.48% increase in the level of high-tech manufacturing gross output in a given year.

Based on the obtained models, the game matrix of coordination of fiscal and monetary policies was obtained. As a result of observing the latter, it became clear that under the conditions of the mentioned partial situation, it is possible to reach minimum inflation and maximum levels of high-tech product volumes, when the volume of money mass M0 increases by 1%, and state expenditures by 9%. With this strategy, inflation is 111.4%, and the volume of gross output of high-tech production is 6.99 million USD.

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Integration processes continue in the EEU. They move in different directions, increasing the rate of circulation of goods, people and capital within the Union. In the developments taking place in the Union, special attention should be paid to innovative processes, which are influenced by many factors of internal and external politics. In general, the modernization of the EEU economy as a result of the use of advanced technologies of the time is a very important agenda that should be pursued in all member states. In this context, this study refers to the Kyrgyz economy, within the framework of which the possibilities of coordinating monetary and fiscal policies in the country were studied in terms of achieving two main goals: the maximum gross output of the high-tech industry and the minimum levels of inflation. Based on the above objectives, the dynamics of fiscal and monetary policy instruments and a number of other economic indicators were considered in the research. Based on it, two econometric models were proposed, which were the winning functions of the proposed game model. After estimating the above models, the components of the game matrix were calculated. As a result of the observation of the matrix game, the partial possibilities of coordination of fiscal and monetary policies were shown.