

РОЗДІЛ 2. МІЖНАРОДНІ ЕКОНОМІЧНІ ВІДНОСИНИ

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РЕАКЦІЯ ЕКОНОМІЧНОЇ ПОЛІТИКИ НА СИТУАЦІЮ З ПАНДЕМІЄЮ ТА ОЦІНКА ПОЛІТИКИ ЕКОНОМІЧНОГО РЕГУЛЮВАННЯ В АЗЕРБАЙДЖАНІ

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ECONOMIC POLICY RESPONSE TO THE PANDEMIC SITUATION AND ASSESSMENT OF ECONOMIC REGULATION POLICY IN AZERBAIJAN

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Анотація. Глобальна пандемія протягом цього періоду поширювала нові підходи та реалії, які не могли розрахувати надійні агенції кредитного рейтингу, що спеціалізуються на розрахунках ризиків, та організації, що спеціалізуються на економічному прогнозуванні. Азербайджанська Республіка, як країна, інтегрована у світовий світ, впоралася з попередженням гострих негативних наслідків пандемії коронавірусу (COVID-19), прийнявши своєчасне законодавче законодавство для зменшення негативних наслідків різких коливань в торгівлі енергією для сформованої економіки країни, макроекономічна сталість і стабільність, зайнятість та розвиток підприємництва. Ми є свідками глобальної кризи охорони здоров'я, на відміну від будь-якої кризи минулого століття, яка поширюється на людські страждання та впливає на повсякденне життя людей. Ми можемо відверто сказати, що це набагато більше, ніж помітна криза здоров'я. Це економічна, людська та тривала соціальна криза. Зазвичай пом'якшення умов фінансування стимулює попит, заохочуючи фірми позичати та інвестувати, а домогосподарства приносити майбутні доходи та споживати більше. У неспокійні часи втручання в грошово-кредитну політику також усуває надмірне ціноутворення ризику з ринку. Метою статті є дослідження реакції економічної політики на ситуацію з пандемією та оцінка політики економічного регулювання в азербайджані. Дослідження полягає у визначенні того, наскільки монетарне середовище сприяє прийняттю оптимальної стратегії, поряд з ефективністю заходів, що вживаються в країні. На першому етапі документ торкається загальних напрямків економічного регулювання в розвинених країнах та країнах CIS, одночасно особливо аналізує напрямки процесів регулювання в Азербайджані. В на другому етапі ми проаналізуємо встановлення оптимальних стратегій управління для системи грошово-кредитної політики на основі економетричного моделювання для повного розуміння обсягу регулювання. На основі фактичних показників грошово-економічних показників модель оцінить, чи буде успішною роль стійких рішень у регулюванні.

Ключові слова: глобальна рецесія, фінансова криза, макроекономічна стабільність, оцінка ризиків, грошово-кредитна політика, фіскальна політика, забезпечення ліквідності, оптимальна стратегія, залежності, інтервал надійності, економетричне моделювання, мультирегресійна модель.

Формули: 15; рис.: 5; табл.: 1, бібл.: 44

Annotation. The global pandemic throughout this period disseminated new approaches and realities that could not be reckoned by trustworthy credit rating agencies specializing in risk computation and organizations specializing in economic anticipating. Azerbaijan Republic as a country integrated into the global world, has coped to prevent the acute negative consequences of the Coronavirus (COVID-19) pandemic by accepting timely legislative enactment to lessen the negative outcomes of sharp fluctuations in energy trades, on the country's formed economy, macroeconomic permanency and stability, employment and developing entrepreneurship. We are witness of a globally extended health crisis unlike any crisis in the last century, spreading over human suffering, and affecting people's daily lives. We can frankly say this is much more than a noted health crisis. It is economic, human and extended social crisis. Normally, an easing of financing conditions boosts demand by encouraging firms to borrow and invest, and households to bring

forward future income and consume more. In turbulent times, monetary policy interventions also eliminate excess risk pricing from the market. The aim of the article is to study the reaction of economic policy to the situation with the pandemic and to assess the policy of economic regulation in Azerbaijan. The point of our research is to determine the extent to which the monetary environment is conducive to the adoption of an optimal strategy, along with the effectiveness of the measures taken in the country. In first phase, paper touches general directions of economic regulation in developed and CIS countries, at the same time particularly analyzes the directions of regulation processes in Azerbaijan. In the second phase, we will analyze the establishment of optimal management strategies for the monetary policy system on the basis of econometric modeling in order to fully understand the extent of regulation. Based on the actual indicators of monetary economic indicators, the model will assess whether the role of sustainable decisions in regulation will be successful.

Key words: *global recession, financial crisis, macroeconomic stability, risk assessment, monetary policy, fiscal policy, liquidity provision, optimal strategy, dependencies, reliability interval, econometric modelling, multi-regression model.*

Formulas: 15; fig.: 5; tabl.: 1; bibl.: 44

Introduction. The global pandemic throughout this period disseminated new approaches and realities that could not be reckoned by trustworthy credit rating agencies specializing in risk computation and organizations specializing in economic anticipating. Azerbaijan Republic as a country integrated into the global world, has coped to prevent the acute negative consequences of the Coronavirus (COVID-19) pandemic by accepting timely legislative enactment to lessen the negative outcomes of sharp fluctuations in energy trades, on the country's formed economy, macroeconomic permanency and stability, employment and developing entrepreneurship.

Literature review. Ensuring macroeconomic balance and sustainable development has been studied by such foreign scientists as S. Bailey, O. Blanchard, S. De Stefanis, G. Daley, R. Jones, J. Sachs, A. Harberger. In the works of Ukrainian scientists B. Burkinsky, V. Voloshin, P. Haidutsky, A. Galchinsky, B. Danylyshyn, N. Demchyshak, I. Kyrylenko, M. Krupka, O. Kovaliuk, I. Mikhasyuk, L. Melnyk, S. Panchyshyn, V. Priymak, I. Revak, Fr. Stefanyshyn, Y. Tunitsa, M. Khvesyka, L. Shvaika, S. Schultz and others.

Aims. The aim of the article is to study the reaction of economic policy to the situation with the pandemic and to assess the policy of economic regulation in Azerbaijan.

Results. In purpose to ensure the execution of Order No. 1950 dated March 19, 2020 President of Azerbaijan in partnership with Cabinet of Ministers "Action Plan" was arranged. The Action Plan involves arrangements to preserve the employment and

earnings of the community, as well as to ensure state support to entrepreneurs in diverse areas, including the arrangement of credit liabilities. Our republic plans to combat the pressure of the pandemic on economy in two stages. In the first phase, the crisis will be suppressed from deepening and stability will be preserved. In the second phase, the proceedings of economic evolution was expected to commence. Apparently, for economic restoration inexpensive finance, a light tax burden, transition to demand-creating markets is seen obviously.

It should be noted that State Oil Fund's 37.8% bonds and money market instrument's in that period replacement being not more than 1 year, unconditionally contributes to meet up with urgent liquidity requirements of economy in a short period of time. The planned intention of our state to combat the crisis at the expense of internal resources without recurrencing to external borrowing and devaluation, undoubtedly will have incomparable a positive effect on the process of economic restoration in post-pandemic period.

The mentioned above decree established working groups enveloping four main areas to exclude the possible impact of the global pandemic on economic stability, decrease the negative impact on employment and entrepreneurship in the country, preserve the social security and welfare of the citizens and ensure intended sustainable progressive economic development. A wide-ranging economic incentives program can be assorted as follows:

- allocating support to stricken economic activities and statutory entities operating in

related areas and individuals performing entrepreneurial activities without constituting a legal entity,

- community protection and comprehensive state support of employees operating in affected areas of economic activity;

- strengthening the social protection of the poor crowd of people;

- assist for the finance and banking sector, backing for the stability of the manat exchange rate and inflation targeting;

- accomplishment of additional measures to retain macroeconomic prosperity and stability.

World economies currently undergo an extraordinary and austere shock, as conducted public health measures to contain the spread of the coronavirus have suspended many economic activities across the worldwide globe economy. In accordance with preliminary glimpse estimates, in the first quarter of this year, the euro area economy dropped by 3.8 percent quarter on quarter: this ticks the first quarterly reversal in growth in the past seven years.

The modern circumstances is also marked by considerable uncertainty regarding the outlook for inflation. Oil prices, which plunged following the COVID-19 outburst, have strongly pushed aside headline inflation. The response of underlying inflation to the recession is projected to hold out comparatively muted in the short term. Nevertheless, in the near future, descending price pressures will be triggered by weaker economic and business activity and lower accumulated demand. The comprehensive net impact on medium-term inflation dynamics will depend on the balance between rising slack and lower cumulative demand on the one side and the possible long-term unfavorable pressure of the virus shock on cumulative supply extent on the other side.

Government and strategy

Before the COVID-19 outburst, the degree of international reserves and debt ratios were as widely sufficient and sustainable throughout the Central Asian area. The acute declines in commodity prices and transfers, additionally the expense of the fiscal

assistance packages launches by governments have expanded debt ratios, whereas expectancy of further impediment risks have put pressure on local currencies and sovereign scopes. The latest assessments insinuate an increase in debt-to-GDP ratios in 2020 by 3 percentage points in Kazakhstan (to 23.1% of GDP), 8pp in Uzbekistan (to 36.9%), 7pp in Tajikistan (to 51.8%) and 15pp in Kyrgyzstan (to 69.2%). Furthermore, as these statistics are based on hypothesis of recovery in 2021, they may rise further if other downside risks materialise. With higher debt service and refinancing costs, the impact of increased debt will likely be felt for several years, shrinking fiscal space at a time when governments look for ways to support economic recovery. It is noteworthy that the ratio of Azerbaijan's external debt to GDP at the end of 2019 is 17%. Azerbaijan has financial reserves enough to reduce debts (9,091 mln usd, 2019 december). Thus, joint resources of the Central Bank and SOFAR are approx. \$51 billion, from mathematical and formal point of view Azerbaijan has the ability to pay off debt overnight. In the latest reports of Azerbaijan, Current Account recorded a surplus of 646.3 USD mln in March 2020. Foreign Direct Investment (FDI) increased by 188.4 USD mln in Mar 2020. Azerbaijan's Direct Investment Abroad expanded by 336.6 USD mln in Mar 2020. Its Foreign Portfolio Investment fell by 50.2 USD mln in March 2020.

In addition, global financial circumstances have tightened obviously, with large portfolio outflows, a severe recession in equity markets, in particular for energy sectors, and a rise in global risk sentiment, which has led to an increase in 10-year government bond yields and sovereign spreads. This tightening could prove to be a serious challenge to the region's economic stability, notably for countries with high levels of dollarized debt financed foremost by export earnings. Nearly all of Tajikistan and Uzbekistan's debt, for instance, is dollarized (100% and 97% respectively), leaving them unsafe to exchange-rate depreciation, the more so that Tajikistan has remarkably degrade gold and international reserves than Uzbekistan.

Kazakhstan is some measure less exposed since only 35% of the country's debt is in USD and EUR. Finally, if portfolio outflows continue, there is a risk that the region could perish from a major downturn in investment.

Azerbaijan's GDP grew 2.3% in 2019 and is expected to drop to -2.2% in 2020 due to the outburst of the COVID-19 and growth to 0.7% in 2021, according to the updated IMF predictions from 14th April 2020. The region

has gained benefit from high oil prices and enlarged gas production, though its non-oil and gas sectors have also shown enhancement. Alternative strengths include a powerful sovereign fund, gas wealth in the Caspian Sea, an increase in exports to Turkey and Europe, serving as a geographic binding between China and Europe and a confident general business environment.

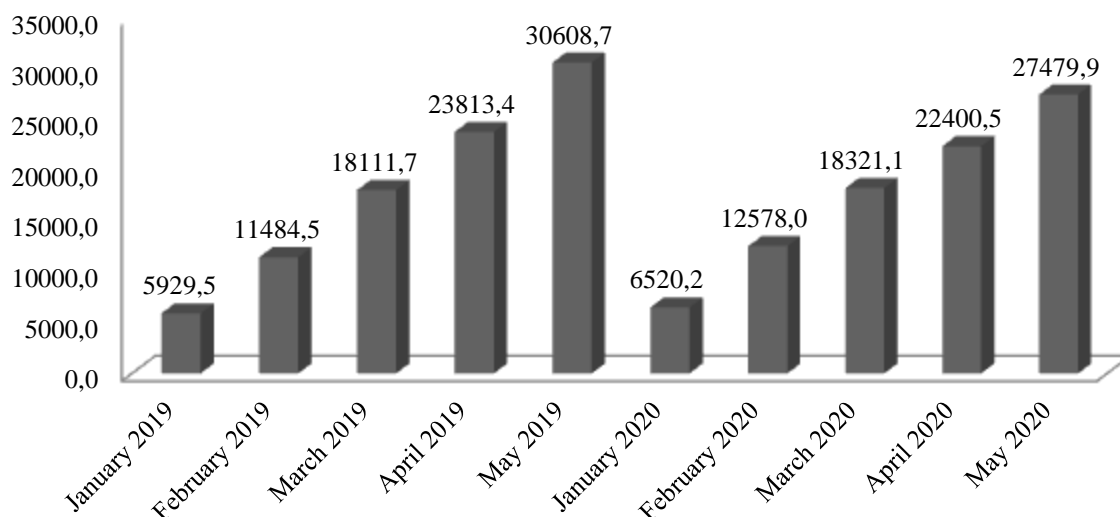


Figure 1. GDP indicators of Azerbaijan Republic, mln. Manat

Proper measures were initially focused in 9 programs, which included 20 areas of activity in 4 key sectors. Thus, the range of the program involves 44,000 businesses with 304,000 employees, and it is planned that the funds will be spent basically on salaries. One of the most significant features of the compatible anti-crisis programs is the financing program embracing 290,000 micro and individual manufacturer. Moreover, tax concession in various sectors will be granted, which will have a assertive effect on the mitigation of negative effects, especially on diminishing the financial burden on large taxpayers, and will give a new "natural breath" to the business sector.

It's noteworthy the performance taken by the European Central Bank to assist liquidity and financing conditions to households, businesses and banks, which will help to protect the smooth supply of credit to the economy. On 18 March, the ECB settled to initiate a EUR 750 billion Pandemic

Emergency Purchase Programme (PEPP), to extend the diapason of suitable assets under the corporate sector purchase programme (CSPP) and to facilitate regulation on collateral standards. These arrangements are aimed at providing that all sectors of the economy can derive benefit from protective financing conditions that permit them to swallow the Covid-19 impact.

It's noteworthy to note that the Fed on April 9 rolled out a wide, \$2.3 trillion effort to support local governments and small and mid-sized businesses, proposing four-year financial resources to companies of up to 10,000 employees and directly purchasing the bonds of states.

At the same time, Azerbaijan's anti-crisis package covers a wide range, ie takes into account almost all affected economic sectors, includes the principles of inclusion and sociality, the overall size of the aid package and its share in GDP, etc. differs significantly from similar programs in terms of features.

Extensive measures have been taken in connection with the pandemic in Azerbaijan in a short period of time, covering all spheres of life. It should be noted that the state implements the plan of effective measures to combat the pandemic only at the expense of its own resources, provides state support to all sectors of the economy.

The implementation of a new support program to protect against the consequences

of the pandemic, the allocation of 600 million manat for employment and social welfare covering 2.5 million citizens was a continuation of the steps taken to strengthen the social protection of citizens. Thanks to sustainable economy, our country is taking measures to cope with the material damage to the population in these difficult times, especially at a time of declining oil revenues.

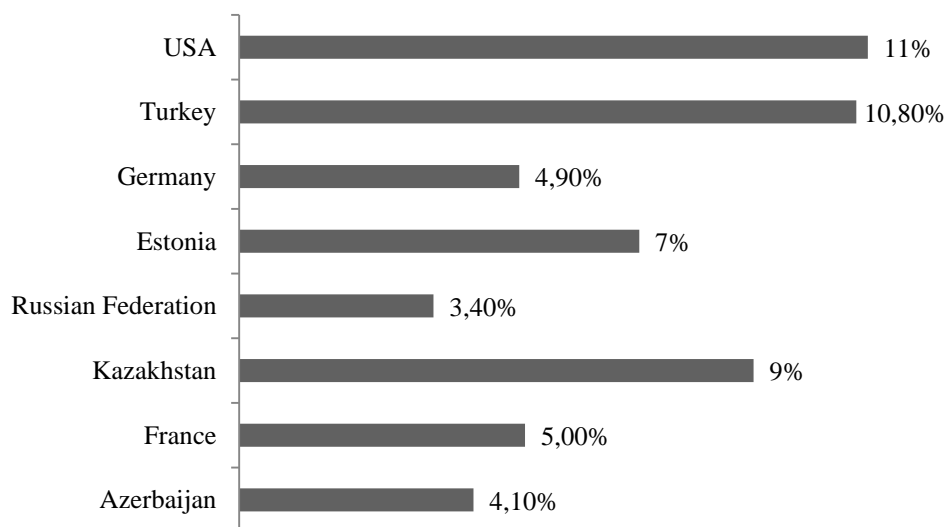


Figure 2. GDP share of countries, Stimulus package of to respond to the economic distress due to the COVID-19 pandemic

Moreover, more than 600,000 people who lost their jobs due to the pandemic have received financial assistance. In addition in the first quarter of 2020, 2.3 million citizens received 1.5 billion manat social benefits. During this period, the insurance part of all types of labor pensions was indexed by 16.6 percent.

Millions of people around the world are coping with job loss caused by the coronavirus disease COVID-19 pandemic.

Analyzing the global situation, we can say that global outlook is not so positive - the UN's International Labour Organization predicts 1.6 billion informal busy ones in economy could suffer "voluminous damage" to their subsistence. With this progress on the second quarter of 2020, COVID-19 may cost the equivalent of 305 million full-time jobs.

According to the latest figures from the International Labor Organization (ILO), more than one in six working-age people have

stopped working since the outbreak of the pandemic, while the working hours of those who continue to work have dropped by 23 percent. At the initial stage, the most negative impacted generally about 12 areas as tourism, hospitality, catering, entertainment, transport, trade, etc have been identified. In addition to the above-mentioned taxpayers who are engaged in catering and passenger transportation activities and which are payers of the simplified tax, besides property and land tax exemptions, they will be provided with a 50 percent discount on the simplified tax amount.

Besides this, private business establishments, including individuals concerned in entrepreneurship will be procured with the chance to restructure loans (of admissible quality, and with interests subsidized by the state) issued to them till March 1, 2020, without aggravating their quality.

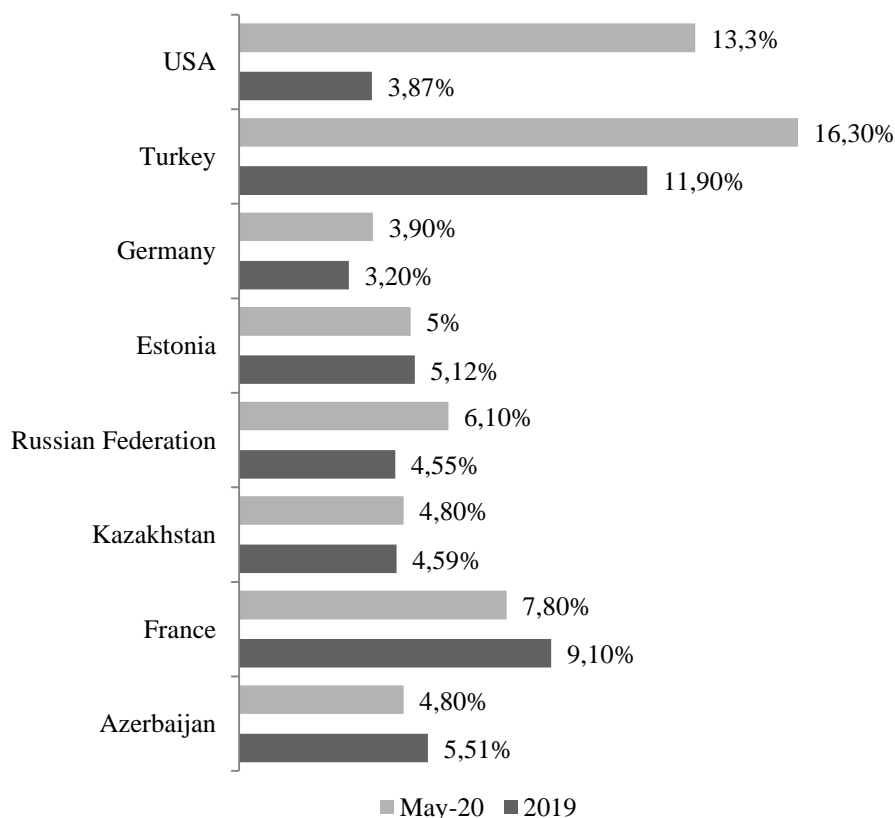


Figure 3. Unemployment rate of countries in 2019 and 2020 may

Moreover, it's envisioned to create opportunity for restructuring business and mortgage loans provided with the mechanisms of state funds and having satisfactory quality as of March 1, 2020.

Accelerating inflation is not an immediate threat, as the euro area will experience in 2020 its deepest recession ever recorded. Initially, the pandemic took the form of a supply shock, but second-round effects have now generated a massive aggregate demand shock. The overall impact on prices will depend on which of these two shocks dominates, but at this stage, it seems that deflationary forces are likely to dominate and bring headline inflation into negative territory in the near future.

Broad money supply (M3) in Azerbaijan decreased by 7.4% to 26 630 .2 mln manat as of end period. In comparison with January 2020 it is 6.7% low indication. No considerable change was observed in the level of dollarization of bank deposits. Foreign currency denominated savings and deposits account for 38.5% of M3 money aggregate by

the end of period. Foreign currency denominated savings and deposits account for 56.5% of total savings and deposits. Annual inflation rate has decreased since the last meeting dedicated to the monetary policy. According to official statistics 0.5% deflation was recorded in May, annual inflation was 2.9%. Over recent 12 months, inflation has been 5.7% on food products, 1.4% on non-food products and 0.4% on services. Shrunk aggregate demand, driven by decrease in consumption and investment expenses on the backdrop of pandemic triggered uncertainties, acts as the main disinflationary factor. Seasonal cheapening of agricultural products and ongoing drop in global food prices (10.5% over 5 months of 2020) also weigh on drop in food inflation. Findings of real sector monitoring indicate that inflation expectations decreased over the recent month. According to the findings of the May survey, inflation expectations decreased on the non-oil industry, construction, trade and services vs the previous month. The main external environment related risk is another slump in

oil prices, likely to be triggered by the second wave of the COVID-19 contagion, worsened economic-trade ties between the USA and China and socio-political tensions in particular countries. Under the condition of new economic normalities re-balancing of the national economy has been kicked-off.

Rebalancing should allow to smooth pass-through of changes in the external environment to the internal environment, and maintaining the balance between supporting economic activity and employment and financial stability.

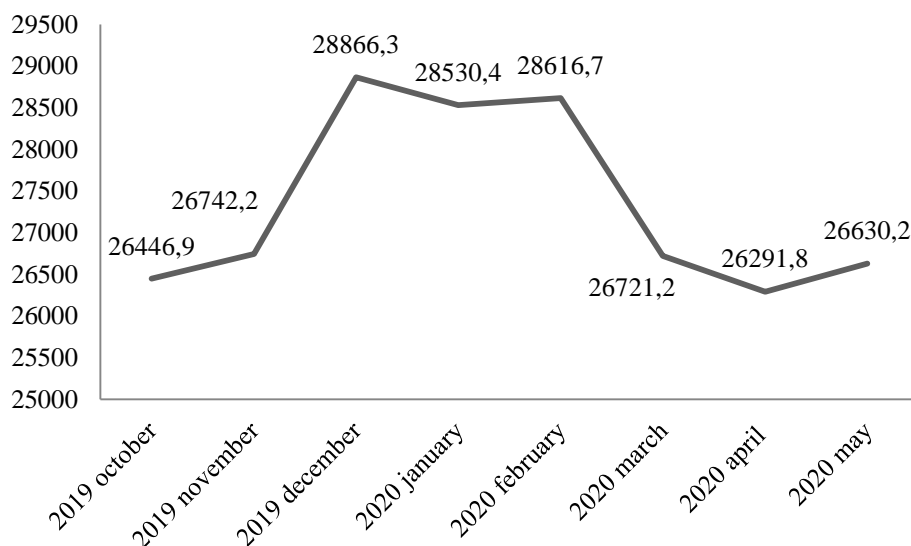


Figure 4. Broad money index (M3) of Azerbaijan Republic, mln. Manat

Optimal management strategy based on econometric modelling

Economic regulation is a set of elements of complex, dynamic and mainly stochastic nature, which are directly and inversely related to each other, considered as a single whole, can be studied as an economic-cybernetic system with these characteristics and its quantitative characteristics can be evaluated mathematically. In other words, it is necessary to clarify whether there are connections and dependencies between the indicators of the monetary policy system, the nature of the observed relationship, the choice of its theoretical expression. Answering these questions will allow us to determine the reliability intervals of the resulting regularities and to assess the suitability of their mathematical apparatus for the formation and forecasting of optimal strategies.

Studies show that the monetary policy system has all the characteristics of economic-cybernetic systems of special complexity. Examples of these characteristics are complexity, completeness, probability,

emergence, and etc. Therefore, the most effective way to analyze the state of the monetary policy system, which is perceived as an economic-cybernetic system, and to build strategies for its optimal management is mathematically modelling as a complex socio-economic system. These mathematical modeling methods include both linear and nonlinear optimization methods for the study of operations, as well as the method of econometric modeling, which is a method of mathematical and statistical research of dependencies. It should be noted that among the methods of econometric modeling, the method of correlation-regression analysis is very attractive in terms of its visibility and the adequacy results according to real economic conditions.

The following stages of econometric modeling can be distinguished in terms of improving the management of monetary policy:

1. Problems of establishing optimal management strategies for monetary policy and choosing the type of econometric model;

2. Obtaining data through the implementation of the established econometric model and analysis of their quality;

3. Model identification;

4. Model verification;

5. Economic interpretation of the model;

It should be noted that the first stage, reflected in this classification, is often called the specification stage and its purpose is to correctly select the composition of the factors that have a stronger impact on the results of the monetary policy system under study. The essence of the second and third stages is to evaluate the quantitative characteristics of the developed econometric model. This process is commonly referred to some literature as parameterization of the econometric model. In the verification process, which is considered the fourth stage, the quality of the concrete econometric model obtained at the end of the parameterization stage is checked and its adequacy to real economic processes, or rather its suitability for forecasting is assessed.

In the final stage of modeling, the economic meaning of the model, which has passed the verification stage and is considered adequate to the real economic conditions used to build optimal management strategies.

Official statistics are used as the main database for econometric studies of the monetary policy system. A number of observations are made in the information support of the study. During these observations, statistical data are collected on selected indicators of the studied socio-economic system. Note that this process can be carried out either in space or in time. One of the important points to consider in this process is to correctly determine whether the database obtained is stationary or non-stationary. Thus, if the purchased time series are non-stationary and have a trend and seasonal component, then such series must be adjusted and brought to a stationary state. This can be achieved by removing the trend and season component from the time series. It should be noted that many modern statistical software packages designed for computer

support automate the conversion of non-stationary time series into stationary series.

In Econometric modeling it's used a linear double regression model of correlation-regression analysis in the form $y = \alpha + \beta x + \varepsilon$, as well as a linear multi-regression model in the form $y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n + \varepsilon$.

In the linear double regression model, x plays the role of an explanatory variable of the studied economic system, y has the status of the explained variable and $(a + bx)$ acts as the sum of the non-random limit ε random limit, and a and b are the coefficients of the regression equation.

Although various algorithms are used to estimate the coefficients of the regression equation, all of them use the evaluation e_i residues, which reflect the deviation of the sample observations from the regression line $\hat{y} = a + bx + e$. The random variable e , which represents the difference between the actual value of \hat{y} and the calculated value of y_i of the outcome indicator of the economic system, actually represents the calculated part of the y_i dependent variable corresponding to x_i and certain coefficients a and b of the regression equation.

If the variation of the result indicator of the socio-economic system is formed under the combined influence of not one, but several influential indicators, then the double-regression analysis, which is generalized for this case, uses the generalized multi-regression analysis. As mentioned above, the multi-regression model is the object of study of this analysis is in the form:

$$y = a + b_1 x_1 + b_2 x_2 + \dots + b_n x_n + e \quad (1)$$

As in the case of double regression models of regression analysis, in multi-regression models to determine the values of the coefficients a and b_i ($i = 1, 2, \dots, n$) of the regression equation, the least squares method is used to minimize the sum of the squares of the deviations of the actual values of the dependent variable y from its forecast values:

$$\sum (y_{fakt} - y_{hes})^2 \rightarrow \min \quad (2)$$

If (1) $n = 2$ in the multi-regression equation, then as a result of the application of the least squares method, the evaluation of the

coefficients a, b1 and b2 of this regression equation leads to the solution of the following system called the system of normal equations:

$$\begin{aligned} \sum y &= na + b_1 \sum x_1 + b_2 \sum x_2 \\ \sum yx_1 &= a \sum x_1 + b_1 \sum x_1^2 + b_2 \sum x_1x_2 \quad (3) \\ \sum yx_2 &= a \sum x_2 + b_1 \sum x_1x_2 + b_2 \sum x_2^2 \end{aligned}$$

Hence, the following values are obtained for the coefficients of a linear multi-regression model with two explanatory variables (2):

$$a = \bar{y} - \bar{b}_1\bar{x}_1 - \bar{b}_2\bar{x}_2$$

$$b_1 = \frac{Cov(x_1; y)Var(x_2) - Cov(x_2; y)Cov(x_1; x_2)}{Var(x_1)Var(x_2) - (Cov(x_1; x_2))^2}$$

(4)

$$b_2 = \frac{Cov(x_2; y)Var(x_1) - Cov(x_1; y)Cov(x_1; x_2)}{Var(x_1)Var(x_2) - (Cov(x_1; x_2))^2}$$

It should be noted that as the number of explanatory variables involved in the multi-regression model increases, the formulas for determining the coefficients of this equation become significantly more complex.

Table 1

Economic indicators of analytical framework used in modelling

Year	Refinancing interest rate	Aggregate money, M2, mln manat	Aggregate money, M3, mln manat	Credit allocation in real sector, mln manat	The official average exchange rate of AZN against USD currency
2005	9%	796.7	1841.8	1441	0.9459
2006	9.50%	2135.5	3435	2362.7	0.8927
2007	13%	4401.6	5897.3	4681.8	0.8579
2008	8%	6081.24	8494.5	7191.3	0.8216
2009	2%	6169.41	8469.4	8407.5	0.8038
2010	3%	8297.57	10527.6	9163.4	0.8026
2011	5.30%	10997.43	13903.5	9850.3	0.7897
2012	5%	13806.58	16775.3	12243.7	0.7856
2013	4.75%	16434.8	19289.4	15422.9	0.7844
2014	3.5%	17435.8	21566.4	18542.6	0.7844
2015	3%	8678.3	21286.9	21730.4	1.0261
2016	15%	11546.3	20889.6	16444.6	1.5959
2017	15%	12466.4	22772.1	11757.8	1.7212
2018	9.75%	14643.6	24060.4	13020.3	1.70
2019	7.50%	18238.6	28866.3	15298.2	1.70

Source: Central Bank of Azerbaijan

As a subject of our econometric research, let us choose a quantitative assessment of the dependence of the monetary policy system on the real sector credit indicators. Let's make the following identification on the indicators forming this system:

- Dependent variable (result indicator)
y-real sector credit investments (million manat)

- Free variables (influencing factors):
x1 - M2 monetary aggregate (million manat)
x2 - M3 monetary aggregate (million manat)
x3 - discount rate
x4 - official average exchange rate of manat against foreign currency (USD)

Thus, the linear multi-regression model we will build on the monetary policy system has the following expression:

$$y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 \quad (5)$$

Let's evaluate the coefficients of the regression equation (5) using the Eviews software package. The results of the econometric modeling are presented in the following fig. 5.

Dependent Variable: Y
 Method: Least Squares
 Date: 12/22/20 Time: 18:30
 Sample: 2005 2019
 Included observations: 15

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9689.934	1613.982	6.003745	0.0001
X1	-0.942356	0.245719	-3.835091	0.0033
X2	1.542977	0.213477	7.227850	0.0000
X3	112.5374	170.1436	0.661426	0.5233
X4	-12434.31	2891.322	-4.300562	0.0016
R-squared	0.942883	Mean dependent var	11170.57	
Adjusted R-squared	0.920036	S.D. dependent var	5838.897	
S.E. of regression	1651.118	Akaike info criterion	17.91749	
Sum squared resid	27261913	Schwarz criterion	18.15351	
Log likelihood	-129.3812	Hannan-Quinn criter.	17.91498	
F-statistic	41.26968	Durbin-Watson stat	2.297820	
Prob(F-statistic)	0.000003			

According to the statistics of our econometric research, the multi-regression model of the dependence of the monetary policy of the Republic of Azerbaijan on the real sector credit investments in the economic-cybernetic system from monetary aggregates M2 and M3, the interest rate and the conversion rate of the manat is as follows:

$$Y = 9689.934 - 0.942x_1 + 1.543x_2 + 112.537x_3 - 12434.31x_4 \quad (6)$$

P (0.00) (0.00) (0.00) (0.52) (0.00)

Thus, according to the (6) econometric model, the amount of monetary aggregate M2 and the conversion rate of manat have a decreasing effect on lending to the real sector, while the amount of monetary aggregate M3 and the discount rate have an increasing effect. More precisely, one unit increase in the

amount of monetary aggregate M2 reduces the amount of credit investments in the real sector by 0.942 units and one unit increase in the exchange rate reduces credit investments by 12434.31 units.

Accordingly, one unit increase in the amount of monetary aggregate M3 increases the amount of credit investments in the real sector by 1,543 units and one unit increase in the discount rate increases the amount of credit investments by 112,537 units. It should be noted that as the econometric model (6) has not been verified, we will make this management decision as a preliminary decision.

Now let's move on to evaluating the quality of the econometric model (6). For this purpose, various coefficients, including t-statistics, determination and correlation coefficients, Fisher and Darbin-Watson statistics, etc. can be used. Among these

evaluation criteria the determination factor R^2 causes more interest.

The determination coefficient R^2 represents the proportion of variance of the dependent variable y explained by the regression equation. In other words, the effect of the factor x on the value of the resultant y is quantitative, the mathematical expression of the coefficient of determination R^2 is as follows:

$$R^2 = \frac{Var(\hat{y})}{Var(y)} = 1 - \frac{Var(e)}{Var(y)} \quad (7)$$

Or

$$R^2 = \frac{S_y^2 - S_{yx}^2}{S_y^2} = 1 - \frac{S_{yx}^2}{S_y^2} \quad (8)$$

The value of the coefficient of determination varies in the range $0 \leq R^2 \leq 1$. Rather, the maximum value of these coefficients is equal to $R^2 = 1$. The coefficient reaches its maximum value when the regression line is fully consistent with all observations. If there is no linear relationship between the explanatory regressor x and the resultant regressor y in the set, then the value of the coefficient of determination R^2 is very close to 0. Thus, the determination coefficient R^2 is an important diagnostic statistic that allows us to comment on the accuracy and quality of the approximation of the established econometric model.

The F-statistic or Fisher statistic is used to estimate the statistical significance of the R^2 determination coefficient of m factor linear regression model. The mathematical description of these statistics is as follows:

$$F = \frac{R^2/m}{(1 - R^2)/(n - m - 1)} \sim F(m, n - 1) \quad (9)$$

To evaluate the quality of the constructed econometric model, the value of the Fisher criterion is compared with the critical point $F_{krit} = F(\alpha; m; n - m - 1)$. Here F_{krit} is the value of the critical point of the Fisher distribution in the values of the level of significance and the degrees of freedom $v_1 = m, v_2 = n - m - 1$. If the hypothesis H_0 is accepted, then it means that the

coefficients of the exogenous variables x_1, x_2 and x_m are totally statistically insignificant, ie

$$\beta_1, \beta_2, \dots, \beta_m = 0$$

In this case, the established econometric model cannot be considered adequate to the real economic conditions and its further analysis and application is not expedient. Otherwise, ie when the H_1 hypothesis is true, the constructed model is statistically adequate and its overall quality can be directly characterized by the value of the determination coefficient R^2 .

Using the determination of the coefficient of determination, the statistics can be expressed in another way in order to test the hypothesis of equality of explained and unexplained variances. Then we get:

$$F = \frac{R^2/m}{(1 - R^2)/(n - m - 1)} = \frac{ESS/m}{RSS/(n - m - 1)} \quad (10)$$

For multi-regression models, the determination coefficient is a non-decreasing function of the number of exogenous regressors (free variables) present in the model. More precisely, if the number of exogenous parameters in the econometric model increases, ie if an additional explanatory variable is involved in the study, then the value of the determination coefficient will not decrease. Thus, in addition, the explanatory regressor involved in the study not only reduces, but also increases the information explaining the behavior of the dependent variable.

As can be seen from the statistics of the shock regression model we constructed for the monetary policy system (1), the value of the determination coefficient for this model is $R^2 = 0,94$ or 94%. Thus, 94% of the amount of credit investments in the real sector of the monetary policy economic-cybernetic system is formed under the influence of the explanatory regressors we have chosen. This means that the quality of the econometric model (6) is quite high. Given that v_1 and $v_2 = 15$ for this model, $F_{krit}(0,05; 4; 15) = 3,48$. $F_{müs} = 41,27 > F_{krit} = 3,48$ is obtained. Therefore, we can conclude that the quality of model (6) is confirmed by the Fisher coefficient. On the other hand, the

coefficient of the exogenous parameter x_3 of the model (6) (coefficient of the variable x_3 reflecting the accounting interest rate) is not statistically significant (since $P(3) = 0.52 \neq 0$). Therefore, in order to improve the quality of model (6), the variable x_3 (accounting interest rate) should be excluded from the study.

Thus, we can assume that only x_1 (monetary aggregate M2), x_2 (monetary aggregate M3) and x_4 (official average

exchange rate of manat against foreign currency) affect the endogenous parameter y , which reflects credit investments in the real sector, which we perceive as a dependent variable of the monetary policy system.

$$y = a + b_1x_1 + b_2x_2 + b_4x_4 + e \quad (11)$$

(11) the statistics for evaluating the econometric model using the Eviews software package are as follows:

Dependent Variable: Y
 Method: Least Squares
 Date: 12/23/20 Time: 18:59
 Sample: 2005 2019
 Included observations: 15

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9598.838	1566.438	6.127814	0.0001
X1	-0.909340	0.234363	-3.880044	0.0026
X2	1.481296	0.187057	7.918973	0.0000
X4	-10987.75	1842.210	-5.964441	0.0001
R-squared	0.940384	Mean dependent var	11170.57	
Adjusted R-squared	0.924125	S.D. dependent var	5838.897	
S.E. of regression	1608.347	Akaike info criterion	17.82698	
Sum squared resid	28454579	Schwarz criterion	18.01579	
Log likelihood	-129.7023	Hannan-Quinn criter.	17.82497	
F-statistic	57.83812	Durbin-Watson stat	2.183850	
Prob(F-statistic)	0.000001			

According to the studied statistics (11), the mathematical expression of the econometric model is as follows:

$$Y = 9598.838 - 0.909x_1 + 1.481x_2 - 10987.75x_4 \quad (12)$$

$$P(0.00) \quad (0.00) \quad (0.00) \quad (0.00)$$

According to model (12), the monetary aggregate M2 and the exchange rate have a reducing effect on lending to the real sector, while the monetary aggregate M3 has an increasing effect. More precisely, with a one-

unit increase in the monetary aggregate M3, the amount of credit investments increases by 1,484 units.

The value of the determination coefficient for model (12) is $R^2 = 0,94$ or 94%.

Therefore, model (12) is quite high quality. Given that $v_1 = 3$ and $v_2 = 15$ for this model,

$$F_{\text{krit}}(0,05; 3;15) = 3,19. \\ F_{\text{müs}}=57,84 > F_{\text{krit}}=3,39$$

and the hypothesis that the quality of model (12) is high is also confirmed by Fisher's criterion. The estimates $P(1) = P(2) = P(4) = 0.00$ are statistically significant for the coefficients of the explanatory regressors involved in the model.

According to the theoretical foundations of econometrics, 7 special conditions must be met in order to have the optimal characteristics of the values of the parameters of the regression model by the method of least

squares. The econometric model constructed according to these conditions, called Gauss-Markov conditions, must be linear in its parameters, there must be no systematic fields for all autonomous observations, and the conditions for independent deviations e_i and e_j must be satisfied $cov(\varepsilon_i, \varepsilon_j) = 0$, ε_j - random deviations, x_j should not depend on exogenous parameters (ie $cov(\varepsilon_j, x_j) = 0$), $x_j (j = \overline{1, m})$, there should be no serious linear relationship between exogenous variables and finally, ε_j - random deviations must have a normal distribution. Noteworthy, only if these conditions are fully met, then the values of the parameters of the linear regression model is accepted as effective values.

One of the important conditions for constructing a qualitative regression model by the least squares method is that the values of the random deviations ε_j do not depend on the values of $\varepsilon_i (i \neq j)$ obtained for other observations. Compliance with this condition prevents the correlation between any deviations (including neighboring deviations).

If no correlation is observed on the basis of time (time series) or spatial (intersecting series) indicators, then this condition is called autocorrelation or sequential correlation. I would note that this is more common when regression models are based on time series. Autocorrelation is unlikely to occur when using cross-sectional data to verify possible errors in the specification.

In the process of econometric modeling, different approaches are used to detect first-order autocorrelation. The most commonly used mechanism is the Darbin-Watson criterion. This criterion is sometimes called DW statistics.

The mathematical expression for the DW criterion is as follows:

$$DW = \frac{\sum(e_t - e_{t-1})^2}{\sum e_t^2} \quad (13)$$

The following relationship is observed between the DW criterion and the autocorrelation coefficient of the 1st order balances:

$$DW \approx 2(1 - \text{corr}(e_t; e_{t-1})) \quad (14)$$

The following hypotheses are used to test the absence of autocorrelation of random deviations of models using DW statistics:

H0: -autocorrelation of residues is not available

H1: - autocorrelation of residues is available

If we take into account the value of the correlation coefficient, then we can determine that the value of the Darbin-Watson criterion varies within the range $0 \leq DW \leq 4$. Then:

if $\text{corr}(e_t; e_{t-1}) = 0$, or $DW = 2$, then autocorrelation does not exist

if $\text{corr}(e_t; e_{t-1}) > 0$, or $DW < 2$, then there is a positive autocorrelation

if $\text{corr}(e_t; e_{t-1}) < -1$, or $DW > 4$, then there is a negative autocorrelation

DW statistics are characterized by the presence of uncertainty zones, or rather "dead" zones. These zones separate the acceptance area of the H_0 hypothesis from the critical areas. If the value of DW statistics falls into the "dead zone", then it is impossible to make a decision based on this criterion and other methods should be used to detect autocorrelation.

Autocorrelation of the remains of the econometric model based on the Darbin-Watson criterion is carried out by the following algorithm:

- After determining the value of DW statistics, the d_L (low) and d_U (upper) boundaries of the intervals of the "dead zone" are determined from the table of critical points according to the number of observations n , the number of independent variables m and the level of significance α .

Let's check the existence of autocorrelation of residues for the econometric model we have established (12). For this model, $n = 15$, $m = 3$, $\alpha = 0.05$. Then we determine the limits $d_L = 0.391$ and $d_U = 1.464$ for the boundaries of the "dead zone" from the table of critical points of DW statistics. Since $(4 - 1.464) = 2.536$ and $DW = 2.18$, we can conclude that there is no autocorrelation in model (12) because the value of $DW = 2.18$ of the Darbin-Watson criterion is within the range $2 < DW = 2.18 < 2.536$.

Now let us check the existence of autocorrelation of the econometric model expressed by the contact equation (12) by the

correlogram method. The results of this testing are shown below.

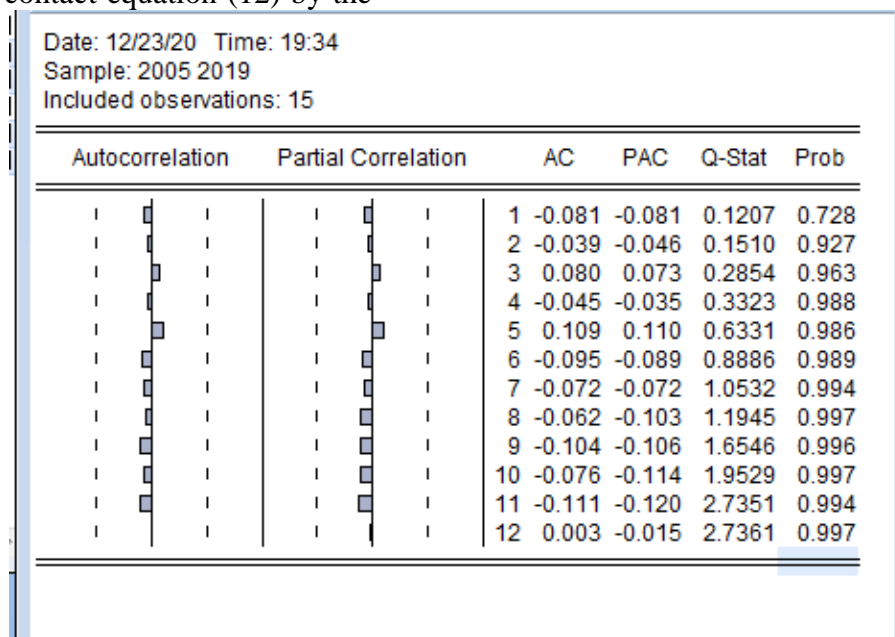


Figure 5. Correlogram of autocorrelation testing in model (12)

The analysis of the correlogram shown in Figure 06 shows that there is no first-order autocorrelation in the regression model (12) developed for the monetary policy system.

One of the main directions of quality control of econometric models built in the process of regression analysis is its testing for homoskedasticity. Homoskedasticity means the equality of the variances of the random remains of the regression model. Violation of this condition is called heteroskedasticity. One of the mechanisms used to test the regression model for homoskedasticity is the Vayt test.

To test the fulfillment of the hypothesis that there is no heteroskedasticity in the econometric model with the Vayt test, auxiliary regression regressing on all possible cross-sections of the regressors of the squares of the residuals is used as test statistics. For example, if the linear regression model $y_t = b_0 + b_1x_1 + b_2x_2 + e_t$ is evaluated, then the test statistics

$$e_t^2 = a_0 + a_1x_t + a_2z_t + a_3x_t^2 + a_4z_t^2 + u_t \quad (15)$$

will be based on auxiliary regression.

According to Vayt's test statistics, if $N \cdot R^2 < \chi^2$ then the model is homoskedastic, otherwise heteroskedasticity exists. (Here N is the number of observations in the set, R^2 is the determination coefficient of the test regression).

If the number of parameters in the regression model is large enough, then the Vayt test can be applied without cross strokes. This version of the application is called the "no cross" version of the White test. If the number of observations is not large, F_{stat} can be used instead of χ^2 for evaluation.

In this case, the test of the H_0 hypothesis on the existence of homoskedasticity in the model is in fact brought to the test of the hypothesis on the statistical significance of the coefficient of determination of the auxiliary model.

As the regression model (12), which reflects the quantitative characteristics of dependencies in the monetary policy system $m < 4$, the homoskedasticity of this model should be checked with the cross-model version of the Vayt test. The statistics of this testing are shown in the table below.

It is clear from this table that the Vayt test statistics for model (12) gave $P(F_{stat}) = 0.4970 > 0.05 = \alpha$. This means that the H_0

hypothesis about the existence of homoskedasticity in the (12) econometric model must be accepted.

Now let's apply the Jaka-Berra test to evaluate the law of distribution of the

residuals of the econometric model (12). The statics of the test were as follows

Heteroskedasticity Test: White

F-statistic	0.846110	Prob. F(3,11)	0.4970
Obs*R-squared	2.812382	Prob. Chi-Square(3)	0.4215
Scaled explained SS	2.999013	Prob. Chi-Square(3)	0.3918

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 12/23/20 Time: 20:06

Sample: 2005 2019

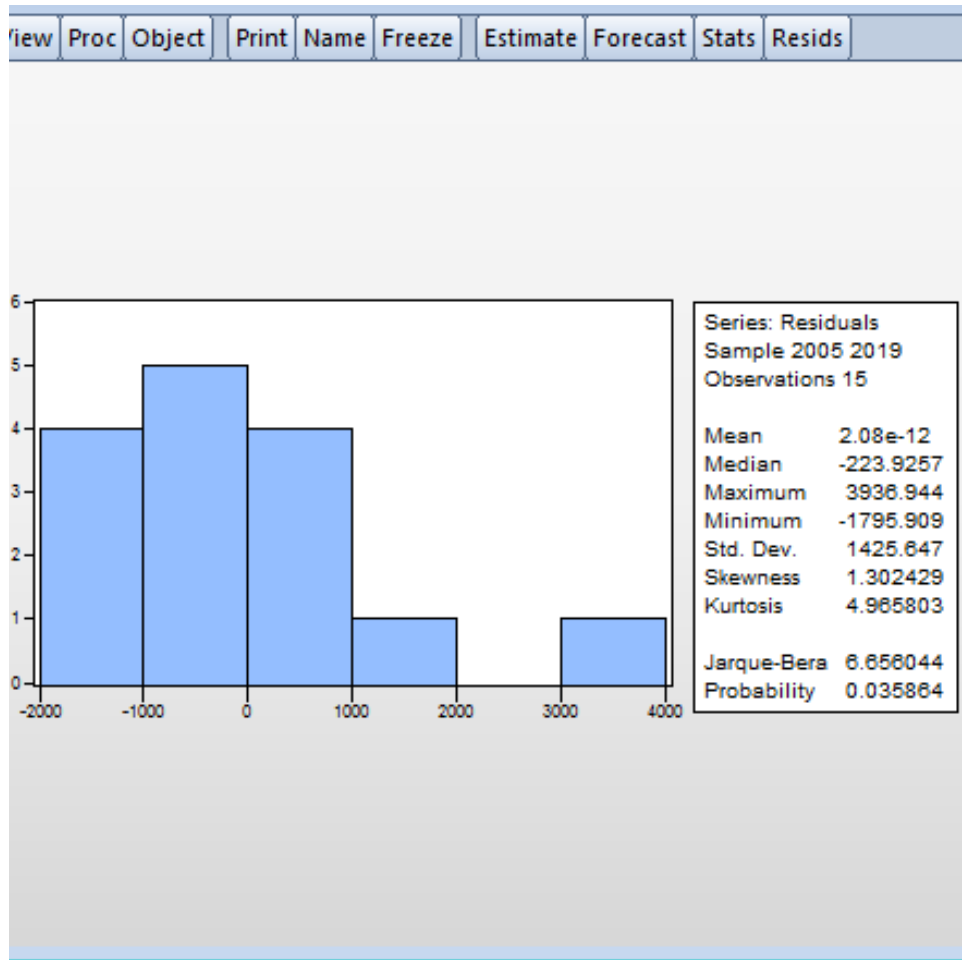
Included observations: 15

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-539134.8	2044419.	-0.263711	0.7969
X1^2	0.005899	0.022695	0.259936	0.7997
X2^2	-0.003682	0.013747	-0.267867	0.7938
X4^2	2149591.	2088083.	1.029457	0.3254
R-squared	0.187492	Mean dependent var		1896972.
Adjusted R-squared	-0.034101	S.D. dependent var		3910282.
S.E. of regression	3976395.	Akaike info criterion		33.45283
Sum squared resid	1.74E+14	Schwarz criterion		33.64164
Log likelihood	-246.8962	Hannan-Quinn criter.		33.45082
F-statistic	0.846110	Durbin-Watson stat		2.190057
Prob(F-statistic)	0.496958			

Analysis of the statistics of the Jaka-Berra test we used in the table above shows that the remainder of the model obeys the law of normal distribution. Thus, for the remainder of the model (mean = $2.08e-112 \approx 0$) and P (Jarque-Bera) = $6.656 > \alpha = 0.05$.

So the linear multi-regression model (12), which reflects the dependence of the monetary policy system on the amount of credit investments in the real sector of the monetary aggregates M2 and M3 and the

official average exchange rate of the manat against foreign currencies, is correctly specified. All the characteristics of this model fully meet the 7 known conditions of the Gauss-Markov theorem. So the (12) econometric model is adequate to the real economic situation and can be used as an effective mechanism for making and forecasting optimal management decisions on the monetary policy system.



Conclusion. We must be so careful on market signals across asset classifications, downturn and rehabilitation ornamentalations, as well as the bygone of epidemics and surprises, to derive conceptions into the path ahead. Importunate and courageous policy measures are required, not only to restrain the pandemic and save lives, but also to guard the most ill-protected in our societies from economic devastation and to maintain economic expansion and financial steadiness. International institutions must call for further rounds of —unconventional monetary policies coordinated with fiscal stimulus in developing countries, as discussed above, allowing them the policy space to decide how to do this. Foreign direct investment (FDI) has become a significant factor in bringing fund, as well as jobs, technology and administration skills to many developing countries. Several developing communities have seen primary benefits from these financing and investments in terms of

economic growth and uprising standards of living.

It should be noted that the arrangements are also aligned at taking measures to introduce a new model of economic growth in the post-pandemic period. Economic areas as construction, transport, trade, petrochemical industry, mining, digital economy, logistics, telecommunications, agriculture and processing industry and internal tourism will be the main preferences of the country's economic and business policy in this period. In order to reduce the social insurance burden, it is proposed to change the rates of mandatory social insurance contributions for persons deriving income from non-employment activities.

The purchasing power of the country's currency and the level of the broad money supply support the country's financial stability to ensure sustainable development.

The stability of the country's currency against the foreign currency which the main operations are carried out has led to the

conclusion that it will ensure price stability during the pandemic, keep current interest rates low, and support economic activity and lending.

It's becoming increasingly vital for economy to incorporate scenario-based planning into their regulation processes. Leveraging scenario-based planning can help to plan strategically wide variety of economic areas.

A robust scenario-based planning effort using econometric analysis can enhance sustainable developing and able to adapt contemplated ever-changing global processes.

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