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IMPROVING MONEY SUPPLY REGULATION IN THE DIGITAL ECONOMY

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Abstract:

Improving the money supply regulation process is a necessary condition for preventing inflation in the country and ensuring the stability of macroeconomic growth. Therefore, the Central Bank of the Republic of Uzbekistan is obliged to control the monetary aggregate M2, and from 2020, a gradual transition to the inflation targeting regime began (1).
Currently, the inflation rate and money supply growth in the Republic of Uzbekistan is high. In 2019, the annual inflation rate in the country was 15.2%, while the growth rate of money supply (M2) was 13.8% (2). This highlights the need to improve the money supply regulation process.

Keywords: Money supply, money quantity ,inflation, exchange rate, credit, refinancing rate, state budget deficit.

INTRODUCTION

In 2017-2021, it is necessary to improve the monetary policy of the Republic of Uzbekistan with the use of tools used in international practice, as well as the gradual introduction of modern market mechanisms in the regulation of the currency and the stability of the national currency. (3, p. 32).

Solving the above-mentioned tasks highlights the need to ensure a stable growth rate of money supply. This, in turn, requires a scientific justification of ways to improve the regulation of money supply.

The Central Bank of Uzbekistan's money supply regulation has not improved. In particular, the Central Bank does not have a discount policy. Because there are no commercial bills in the country. In addition, there is a state budget deficit and it is expected to increase in the context of the coronavirus pandemic.

In accordance with the Decree of the President of the Republic of Uzbekistan dated March 19, 2020 PF-5969 "On priority measures to mitigate the negative impact of the coronavirus pandemic and the global crisis on the economy" the government will support strategic enterprises through the allocation of interest-free budget loans for the implementation of high-level expenditures (4).

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According to M. Friedman, the growth of money supply at the rate of 3-5% per year will increase economic activity in the economy. If the growth of money supply is higher than 3-5% per year, then inflation begins to grow, if the growth of money supply in the economy is less than 3-5%, the growth rate of gross national product begins to slow down (5, p.63).

According to Blanchard, the interest rate policy of the Central Bank and the fiscal policy of the government play an important role in the development of the economy. While the central bank's interest rate policy can prevent the economy from "overheating", the reduction of the budget deficit through the government's fiscal policy is important in ensuring the sustainability of economic growth (6, p. 108).

Although O. Blanchard based his conclusions on the example of the United States, these conclusions have found practical application in a number of other countries around the world. For example, due to the risk of "overheating" of the economy in China, the Central Bank of China raised the required reserve ratio on deposits of commercial banks in 2011 by 21.5% (7, p. 24).

According to R. Miller and D.Van Huz, monetary policy allows to ensure a high and stable level of production of goods and services, to achieve low and stable inflation (8, p. 545-646).

F. Mishkin said that the US Federal Reserve System (FRS) evaluates open market operations, mainly in the framework of FRS open market policy. It specifically recognizes that the U.S. Government does not trade or buy securities, nor does it trade in the securities of private companies in order to avoid conflicts of interest (9, p. 483).

According to T. Bobakulov, the lack of discount and pawn loans of the Central Bank of the Republic limited its ability to influence the liquidity of the banking system, the price of loans and money supply through its refinancing policy (10. p. 211-214).

MATERIALS AND METHODS

Models of partial adjustment of the demand for money are widely used in international banking operations. In these models, the demand for money in general can be described as follows:

$$m_t^* = b_0 + \sum_{i=1}^{n} b_i x_{it} + u_t^3,$$

Where:
mt * - real cash balances;
x_{it} – factors affecting the demand for money;
b_0, b_i, u_t^3 - are constant quantities.

The adjustment mechanism itself looks like this:

$$m_t - m_{t-1} = \delta(m_t^* - m_{t-1}) + \varepsilon_t,$$

Where: $m_t = M_t / P_t$ - the actual level of real cash balances;
ε_e – infinitely small amount.
It follows from the above,

$$m_t = \delta m_t^* - \delta m_{t-1} + m_{t-1} + \varepsilon_t = \delta m_t^* + (1-\delta) m_{t-1} + \varepsilon_t$$

Hence, the real level of demand for money is the acceptable level of money quantity in the previous period.
The model of demand for money proposed by F. Kagan is as follows:

$$m_t - P_t = \delta - \alpha pi_t + V_t$$

where:
m_t - is the logarithm of the money supply;

P_t - logarithmic evaluation of values;
δ – constant;
pi_t - expected inflation;
V_t – the degree of savings (11, pp. 25-117).

In its turn, prognosed inflation is defined as the average level of current and past inflation.
F. Kagan concludes that the higher the degree of devaluation of money, the more attractive the anti-monetary assets for agents and the lower the demand for money.
If the financial obligations of the banking system to the private sector constitute the bulk of total financial assets, the real interest rate can be used as a measure of the difference between financial assets and income from real assets. This is because an increase in the real interest rate has a positive effect on the change in the monetary aggregate.
If interest rates do not change over time, only changes in the inflation rate can be used to quantify such effects. The reason is that inflation has a negative effect on real money balances.
For this reason, the following formula is used in the financial program to empirically estimate the demand for the monetary unit:

$$\left(\frac{M}{P}\right) = a_0 + a_1\left(\frac{Y}{P}\right) + a_2(\pi),\ a_1 \geq 0;\ a_2 \neq 0$$

where:
M – money aggregate;
P – price level (inflation);

Y – nominal gross domestic product (GDP);
π – relative value of money savings;

a_0 – constant amount;

a_1 –elasticity of demand for money on income (if the quantities are given in logarithmic form);

a_2 – the degree of influence of the money supply on the relative value of the variable (depends on the chosen definition of the π) (12. P. 158).

Once the stable correlations in the above equation have been established, it is possible to forecast the demand for money for the next period based on the variables in the equation. As for the variables, it is necessary to take into account changes in real GDP, inflation and interest rates.

Money supply forecasting is a key element in forecasting the passive part of a monetary statement. The net foreign assets portion of the asset portfolio is calculated by forecasting the total balance of external payments. In general, the basis of the IMF's financial program is the main element of the monetary account structure - the balance of assets and financial liabilities, which is expressed through the consolidated account of the monetary sector. The basic model of money supply and demand is expressed by the following equations:

1) $\Delta M^s = \Delta D + E\Delta F$;
2) $\Delta M^s = \Delta M^d$;
3) $\Delta M^d = \frac{1}{V} PY$; (3.2.1)
4) $M = \left(\frac{\Delta P}{P_{-1}} + \frac{\Delta Y}{Y_{-1}} \right) M_{-1}$

where:
M - the money supply;
D – internal assets;
E – price of one national currency unit in foreign currency (exchange rate);
F – net foreign assets (reserves) denominated in foreign currency;
V – velocity of money;
P – the level of assessment within the country;
Y – the volume of real production in the country;

The symbol "Δ" - represents the difference operator, the money supply is represented by the symbol δ above the line, and the demand - by the symbol *d*.

DISCUSSION

The money supply is quantitatively measured by monetary aggregates.

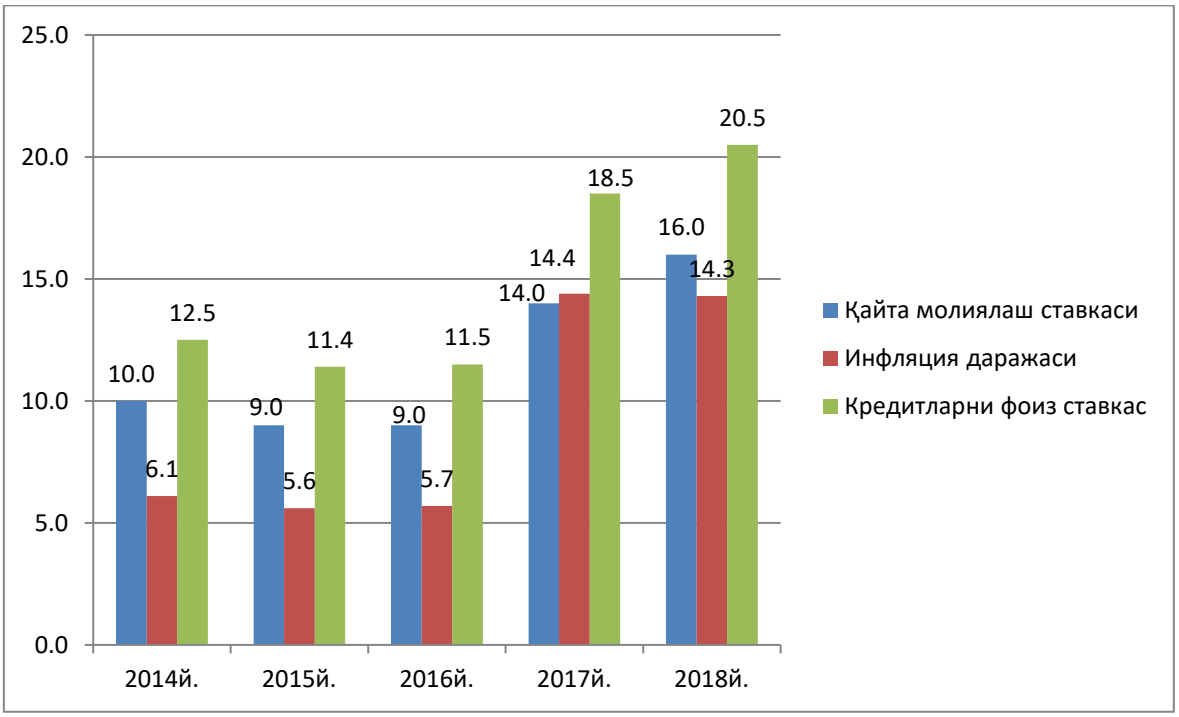
The use of monetary aggregates takes into account the specific features of each country's money market instruments and money circulation. For example, in the United States four monetary aggregates are used, five in the United Kingdom, and three in Switzerland (13, p. 112).

Table 1
Monetary aggregates M0 and M2 in the Republic of Uzbekistan (14)

Monetary aggregates	2016	2017	2018	2019
M0, billion sum	13209	19449	22164	18424
M2, billion sum	52226	73223	83734	91266
The weight of M0 in M2,%	25,3	26,6	26,5	20,2

According to Table 1, in 2015-2018, the growth trend in the number of monetary aggregates M0 and M2 in Uzbekistan was observed. In particular, in 2017 the growth rate of M0 and M2 monetary aggregates was higher than in 2016. This is explained by the fact that on September 5, 2017, in connection with the liberalization of foreign exchange policy, the sharp depreciation of the national currency against the US dollar led to an increase in the value of foreign currency deposits in June. As of January 1, 2017, the value of foreign currency deposits in soums amounted to 8758 billion soums. As of January 1, 2018, this value amounted to 25699 billion soums.

Table 1 shows that the weight of cash in the monetary aggregate M2 was relatively high during the analyzed period. This indicates that there are problems with the improvement of cashless payments.



Picture 1. The Central Bank refinancing rate in the Republic of Uzbekistan, the annual inflation rate and the average annual interest rate on loans of commercial banks in the national currency (15),%

As can be seen from Picture 1, the sharp rise in inflation in the country in 2017 led to a significant increase in the refinancing rate of the Central Bank. This, in turn, has led to an increase in interest rates on loans of commercial banks in the national currency.

As can be seen from Figure 1, inflation in 2018 was still high. Therefore, the refinancing rate of the Central Bank in 2018 was increased by 2 percentage points. This has led to a further increase in interest rates on loans issued by commercial banks in the national currency.

We analyze the impact of factors influencing changes in the money supply. The statistics are based on the quarterly data for 2007-2017. The statistics we analyze are data in the form of balanced time series. The quarterly data for analysis from the Committee's official website are calculated on the basis of current prices, including GDP, investment in fixed assets, foreign trade turnover, the official exchange rate and retail trade turnover. Also, since the variable we wanted to analyze was M2, we calculated M2's quarterly data based on the annual data of this indicator for the period under analyses and the quarterly data on the retail trade turnover. The reason for this is that the annual statistical correlation of these two variables is high, ie 0.99, and M2 has a high participation in the formation of retail turnover. We need an inflation rate to bring these nominal variables to exist. Unfortunately, the quarterly inflation rate was not announced by the committee during the period we are studying. To solve this problem, we use the official devaluation rate as a proxy for the inflation rate. Since our variables were between 2007-2017, we will get them at the growth rate after we bring them to reality in the third quarter of 2011 in order to normalize it. The following table describes the descriptive statistics and correlation matrix of variables.

Table 2
Descriptive statistics

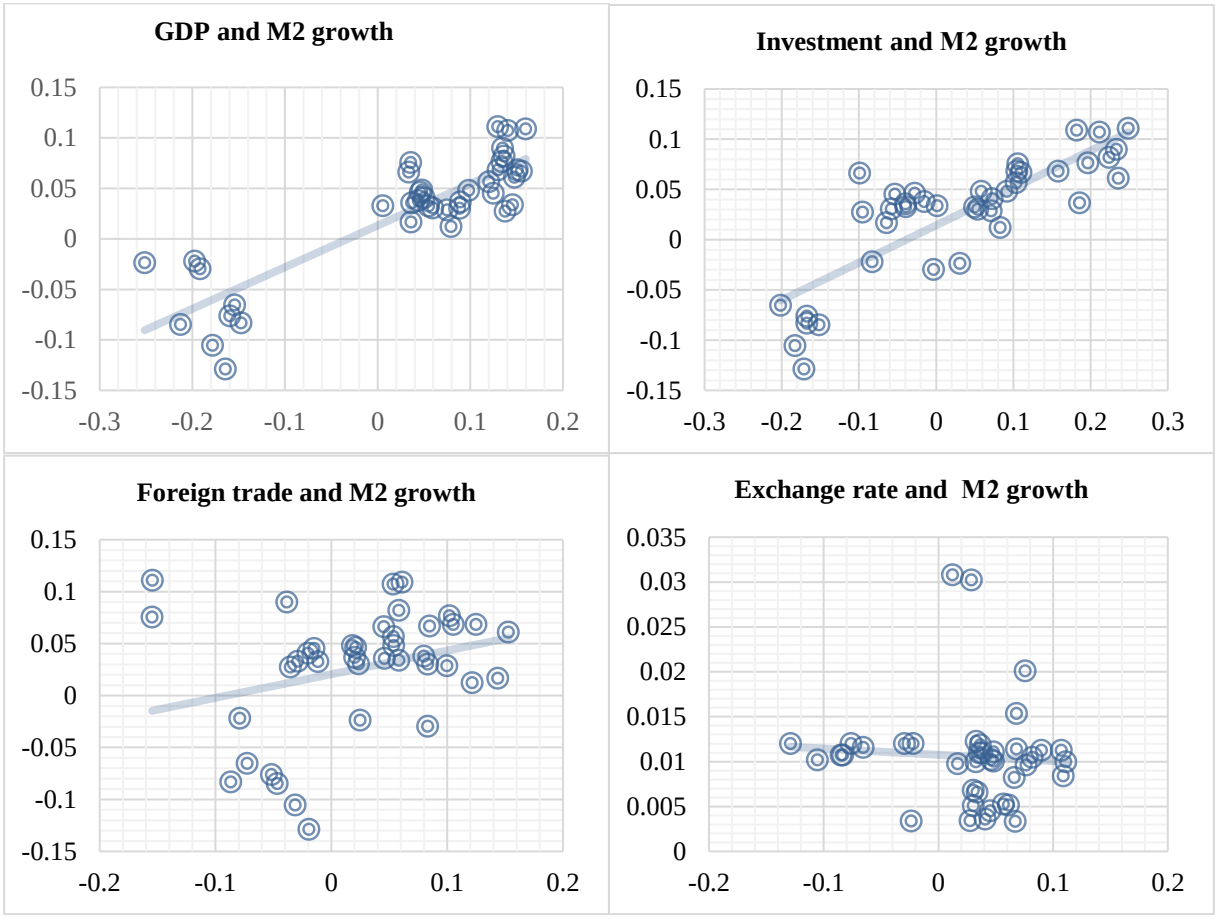
	symbol	quantity	average	Стд.ч	min.	max.
M2 growth	$\Delta M2_t$	39	0.03	0.06	-0.13	0.11
GDP growth	ΔY_t	39	0.03	0.13	-0.25	0.16
Investment growth	ΔI_t	39	0.03	0.13	-0.20	0.25
Foreign trade growth	ΔTO_t	39	0.02	0.08	-0.15	0.15
Exchange rate growth	ΔCR_t	39	0.01	0.01	0.00	0.03

From the table above, it can be seen that the $\Delta M2_t$, ΔY_t, and ΔI_t variables' average quarterly growth rate is 3%. The quarterly growth of foreign trade turnover averaged 2%, while the quarterly growth of the exchange rate averaged 1%. The standard deviation is high in GDP growth and investment in fixed assets, which is explained by the high seasonal level of the national economy. The low exchange rate fluctuations can be seen from the fact that the standard deviation of this indicator was 0.01. The biggest change in the growth rate was in fixed assets, which accounted for 45%. The smallest change is the change in the official exchange rate.

Table 3
Correlation matrix

	$\Delta M2_t$	ΔY_t	ΔI_t	ΔTO_t	ΔCR_t
$\Delta M2_t$	1.00				
ΔY_t	0.87	1.00			
ΔI_t	0.82	0.71	1.00		
ΔTO_t	0.29	0.41	0.32	1.00	
ΔCR_t	-0.17	-0.10	0.00	-0.03	1.00

The correlation matrix of the variables is given in the above matrix, which shows that the growth of the money supply has a positive and high correlation with the variables other than the growth of the exchange rate. Also, the fact that the correlation of independent variables with each other is not high means that there is no multicollinear problem in our model.



Picture 2. Scatter chart of variables in real growth rates with real M2 growth.

Looking at the scatter chart of the variables after the correlation matrix helps to get a better idea of their interdependence. As can be seen from the figure above, GDP also declined during periods of declining money supply. But we do not observe this situation with the other three variables. Especially the exchange rate

One of the problems with time series is that variables are not stationary. Because our variables are growing, they are unlikely to be non-stationary. As a graphic proof of this can be seen in the picture above

Table 4
Unified Dickey-Fuller test of unity.

Variables	Z(t) test statistic
$\Delta M2_t$	-9.36***
ΔY_t	-9.25***
ΔI_t	-17.88***
ΔCR_t	-3.98***
ΔTO_t	-8.06***

*** 1% statistik significance
** 5% statistik significance
* 10% statistik significance

In order to avoid doubts and for those who are skeptical about the graphic results, we have given the results of the extended Dickey-Fuller test in the table above. The test results show that all variables are stationary with a statistical significance of 1%.
Our basic model is as follows:

$$\Delta M2_t = \beta_0 + \beta_1 \Delta Y_t + \beta_2 \Delta I_t + \beta_3 \Delta TO_t + \beta_3 \Delta CR_t + \beta_4 \Delta M2_{t-1} + \varepsilon_{it}$$

Here, $\Delta M2_t$ – is the real growth of money supply in t quarter, $\Delta M2_{t-1}$ – real growth of money supply in t - 1 quarter. ΔY_t – represents the real growth of GDP in t quarter. We use other variables as control variables. The standard error indicator is – ε_{it}. The above model is an autoregressive model with one lag of the dependent variable, and the economic logic of including one lag of the dependent variable in the model is that the growth of the money supply in the previous period helps to decide how much money will be in the current period. It also helps us to solve the autocorrelation econometric problem associated with a standard error in a lag model of a dependent variable.

We evaluate the above model using several econometric evaluation methodologies. As can be seen from the table below, the positive impact of GDP growth on all specifications and real growth of investment in fixed assets on real growth of money supply is economically and statistically significant.

Table 5
Results of regression analysis

	Model [1]	*Model [2]*	*Model [3]*	*Model [4]*
β_0	0.02** [0.01]	0.02** [0.01]	0.02** [0.01]	0.02*** [0.01]
ΔY_t	0.27*** [0.04]	0.29*** [0.05]	0.24*** [0.04]	0.26*** [0.04]
ΔI_t	0.19*** [0.05]	0.19*** [0.05]	0.27*** [0.07]	0.28*** [0.08]
ΔCR_t	-1.16* [0.60]	-1.16 [0.50]	-1.36** [0.53]	-1.31*** [0.43]
ΔTO_t		-0.07 [0.05]		-0.08* [0.04]
$\Delta M2_{t-1}$			0.15 [0.11]	0.18 [0.13]
Breuch - Godfrey AR (1) test	0.80	0.22	5.32**	3.35*
Binoculars AR (1) test	0.71	0.19	5.23**	2.99*
Number of observations	39	39	38	38
R-squared	0.84	0.85	0.86	0.87

All standard errors are calculated in a way that is heteroskedastic
*** 1% statistic significance
** 5% statistic significance
* 10% statistic significance

To increase the reliability of the empirical results, we performed two autocorrelation tests. According to the results of both tests, there is no autocorrelation in the standard errors of the last two model specifications. Therefore, according to our last, model 4 specification, the coefficients of our model are expressed as follows:

$$\Delta M2_t = \underbrace{0.02}_{[0.01]} + \underbrace{0.18}_{[0.13]} \Delta M2_{t-1} + \underbrace{0.26}_{[0.04]} \Delta Y_t + \underbrace{0.28}_{[0.08]} \Delta I_t - \underbrace{1.31}_{[0.43]} \Delta CR_t - \underbrace{0.07}_{[0.06]} \Delta TO_t \quad (1)$$

Based on this regression model, we can conclude that investments in fixed assets have a high impact on the growth of money supply, that is, an increase in investment in the economy of our country by 1 unit leads to an increase in money supply by 0.28 units. The growth of GDP is also highly effective, ie the growth of GDP in our country by 1 unit leads to an increase in money supply by 0.26 units. This is completely and fundamentally consistent with the laws of economic theory. This is because the attraction of investment in the economy, whether foreign or domestic investment, leads to an increase in the money supply. In the second place, the increase in the balance of money in the previous period by 1 unit means an increase in the money supply in the current period by 0.18 units.

In other words, increasing the money supply by one unit leads to an increase in the money supply in the next period by 0.18 units, or an increase in the money supply by 0.18 units in the previous period. An increase in the exchange rate has an inversely proportional effect on the growth of the money supply. Although an increase in the exchange rate is considered to lead to an increase in the money supply, in fact, we can explain it by a decrease in the real value of money as a result of a decrease in its value. An example of this is the widespread use of sterilization operations in the central bank's operations to prevent inflationary pressures on the growth of the money supply at the expense of the exchange rate. Here, the growth of the foreign trade turnover is inversely proportional to the growth of the money supply, and the increase in the foreign trade turnover of 1 unit leads to a decrease in the money supply by 0.07 units. This can be explained by the fact that in the context of modernization of our economy, equipment and technological devices are purchased from foreign countries for fixed currency funds, and the amount of the positive balance in foreign trade is not large enough.

SUGGESTIONS

In our opinion, in order to improve the process of regulating the money supply, it is expedient to implement the following measures:

1. Firstly in order to improve the regulation of money supply, first of all, using government securities as open market objects, at the same time with high credit ratings of banks with international ratings (Standard & Poor's, Mood's, Fitch Ratings). and open market operations of the Central Bank at the expense of securities of enterprises (certificates of deposit, certificates of savings, bonds).

Secondly, the establishment of a centralized discount and pawnshop lending by the Central Bank, as well as the need for commercial banks to ensure the continuity of lending by the Central Bank (overdraft, dayly credits, long-term loans).

2. It is necessary to ensure price stability in the country by introducing inflation targeting, while maintaining the current procedure for controlling the growth rate of the monetary aggregate M2.

Initially, the inflation target should be taken as a definite level and set for a period of one year. Once the inflation target has been reached, the inflation target should be set for another three-year period.

The Central Bank of the Republic of Uzbekistan should announce the inflation target after obtaining the Government's help for supportment. This is due to the fact that the rise in prices for products and services of natural monopolies in the country plays an important role in inflation. The central bank does not have the authority to interfere in the pricing policy of natural monopolies. Their pricing policy will be regulated by the Government**.**

3. In order to increase the role of the central bank's refinancing policy in regulating the money supply, it is necessary to implement discount loans of the Central Bank by regulating the circulation of commercial bills.

In developed countries, discount loans from central banks, ie loans provided to commercial banks by the Central Bank by recalculating the drafts on their balance sheets, play an important role in solving the problem of unbalanced liquidity in banks.

In these countries, the Central Bank establishes a contingent for the recalculation of drafts, ie bills of exchange, in advance for each fiscal year. In determining the size of the re-enrollment contingent, the following factors are taken into account:

- growth rate of money supply;
- inflation rate;
- GDP growth rate.

The amount of the recalculation limit set for each bank is determined by dividing the contingent of the recalculation of drafts by the number of commercial banks in the country. This is a fair way to determine the limit. This is because in this way, all commercial banks, regardless of their size, are set the same limit. However, the disadvantage of this method is that it does not take into account the difference between the amount of assets of commercial banks as a result of the demand for liquid funds.

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