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ABOUT METHODS OF USING VALUABLE INFORMATION IN RISK MODELING OF COMMERCIAL BANKS

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ABSTRACT

The article provides a comparative analysis of the shares of 2 commercial banks. To make this comparison, an analogical generalization of the 1st degree Chebishev interpolation polynomial was used. To do this, the results of the solution of the problem of approximation of a multivariate reflection of a level-fixed polynomial were used.

KEYWORDS: *Stock Price, Minimum, Maximum, Linear Polynomial, Risk, Risk Indicators, Price Amplitudes, Stock Trading, Interpolation Polynomial, Approximation.*

INTRODUCTION

Decree of the President of the Republic of Uzbekistan dated January 17, 2017 No. PF-4933 "On measures to accelerate the sale of state-owned property for business purposes and further simplify its procedures", Cabinet of Ministers of the Republic of Uzbekistan dated May 10, 2017 No. 268 In accordance with international practice, the procedure for public (IPO) and secondary (SPO) public offering of shares at the stock exchange is established in accordance with international practice. The price of a company's shares on stock exchanges varies according to market rules and requires participants in securities trading to take certain risks. This is why stock risk assessment is important when dealing with companies 'stock trading. We will explore one of the ways to identify such risks below.

Methodology

Suppose there is a set of non-negative numbers representing the starting moments - $T = \{t_0 < ... < t_N\}$ – that determine the start of the stock trade or the start of its observation. Let's get acquainted with the methodology of building a multi-valued reflection $\Phi(t_k) = \left[y_{1,k}; y_{2,k} \right]$ on the basis of data on stock trading prices.

Assume that the maximum share price in the period under study - $y_{2,k}-$; represent the minimum share price for the period under review - $y_{1,k}-$. So, $y_{2,k}\geq y_{1,k}$, $k=\overline{0,N}$.

We define a linear polynomial $p_n(A,t)=p_n\left((a_0,a_1),t\right)=a_0+a_1t$. We denote $\sigma^j=\left\{t_j<t_{j+1}<t_{j+2}\right\}\subset T$, $j=\overline{0,N-2}$, $N>1$ by the set of all Σ and the number of elements Σ of the set is equal to $|\Sigma|=N-1$.

We consider $\sigma^j\subset\Sigma$ for each collection

$$\rho^j(A)=\max\limits_{k=j,j+2}\max\left\{y_{2,k}-a_0-a_1t,a_0+a_1t-y_{1,k}\right\}\to\min\limits_{A\in R^2} \qquad (1)$$

the problem of finding a solution to the problem [1], [2].

Get $m^j=\max\limits_{k=j,j+2}\dfrac{y_{2,k}-y_{1,k}}{2}$, $\rho^j=\min\limits_{A\in R^2}\rho^j(A)$, $j=\overline{0,N-2}$

Inequality $\rho^j(A)\geq\rho^j\geq m^j$ is appropriate here. If the equation $A\in R^2$ is valid for the vector $\rho^j(A)=m^j$, then the vector $\rho^j(A)$ is the solution of the problem(1).

In each set $\sigma^j\subset\Sigma$, we define the amplitude functions $\phi_0\left(\sigma^j,\cdot\right)$, $\phi_1\left(\sigma^j,\cdot\right)$ and enter the following definitions:

$$\phi_{0,0}\left(\sigma^j\right)=\phi_0\left(\sigma^j,t_j\right)=y_{2,j},\ \phi_{1,0}\left(\sigma^j\right)=\phi_1\left(\sigma^j,t_j\right)=y_{1,j},$$
$$\phi_{0,1}\left(\sigma^j\right)=\phi_0\left(\sigma^j,t_{j+1}\right)=y_{2,j+1},\ \phi_{1,1}\left(\sigma^j\right)=\phi_1\left(\sigma^j,t_{j+1}\right)=y_{1,j+1},$$
$$\phi_{0,2}\left(\sigma^j\right)=\phi_0\left(\sigma^j,t_{j+2}\right)=y_{2,j+2},\ \phi_{1,2}\left(\sigma^j\right)=\phi_1\left(\sigma^j,t_{j+2}\right)=y_{1,j+2}.$$

We calculate $h_0(\sigma^j)$, $h_1(\sigma^j)$ and the coordinates of the vectors $A^0\left(\sigma^j\right)=\left(a_0^0\left(\sigma^j\right),a_1^0\left(\sigma^j\right)\right)$, $A^1\left(\sigma^j\right)=\left(a_0^1\left(\sigma^j\right),a_1^1\left(\sigma^j\right)\right)$ and the result as follows:

$$a_1^0\left(\sigma^j\right)=\frac{\phi_{0,2}\left(\sigma^j\right)-\phi_{0,0}\left(\sigma^j\right)}{t_{j+2}-t_j},$$
$$a_0^0\left(\sigma^j\right)=0,5\left(\phi_{0,0}\left(\sigma^j\right)+\phi_{0,1}\left(\sigma^j\right)-a_1^0\left(\sigma^j\right)\left(t_{j+2}-t_j\right)\right)$$
$$a_1^1\left(\sigma^j\right)=\frac{\phi_{1,2}\left(\sigma^j\right)-\phi_{1,0}\left(\sigma^j\right)}{t_{j+2}-t_j}, \qquad (2)$$
$$a_0^1\left(\sigma^j\right)=0,5\left(\phi_{1,0}\left(\sigma^j\right)+\phi_{1,1}\left(\sigma^j\right)-a_1^1\left(\sigma^j\right)\left(t_{j+2}-t_j\right)\right),$$
$$h_0\left(\sigma^j\right)=y_{2,j}-a_0^0\left(\sigma^j\right)-a_1^0\left(\sigma^j\right)t_j,\ h_1\left(\sigma^j\right)=a_0^1\left(\sigma^j\right)+a_1^1\left(\sigma^j\right)t_j-y_{1,j}.$$

Let's assume. $\beta^j\in\{0,1\}$ is for $h_{\beta^j}\left(\omega^j\right)=\max\left\{h_0\left(\omega^j\right),h_1\left(\omega^j\right)\right\}$

Here it is possible to form an inequality $\rho^j\left(A^{\beta^j}\left(\omega^j\right)\right)\geq h_{\beta^j}\left(\sigma^j\right)$ based on works [1] and [2].

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If $\rho^j\left(A^{\beta^j}\left(\omega^j\right)\right)=h_{\beta^j}\left(\sigma^j\right)$ so, then $j=\overline{0,N-2}\ \xi_j=0$; If $\rho^j\left(A^{\beta^j}\left(\omega^j\right)\right)>h_{\beta^j}\left(\sigma^j\right)$ so, then we can say that $j=\overline{0,N-2}\ \xi_j=1$. If we take $h^j{}_{\beta^j}\left(\sigma^j\right)=h^j$, it will be [2], [3].

$$\rho^j=\left(1-\xi_j\right)h^j+\xi_j m^j \qquad (3)$$

It is expedient to express the indicators in formula (3) as a percentage. Therefore, we write (3) in the following form:

$$\rho_0^j=\frac{\left(1-\xi_j\right)h^j+\xi_j m^j}{y_{1,j+2}+y_{2,j+2}},\quad j=\overline{0,N-2} \qquad (4)$$

Here (1) the price in the first of the three periods of the trade under consideration is used. In addition to the existing indicators, we recommend the use of the following risk indicators in the risk analysis:

$$V=\max_{j=0,N-2}\rho^{j+1} \qquad (5)$$

$$V(\%)=\max_{j=0,N-2}\rho_0^{j+1} \qquad (6)$$

The main part. Using the recommended indicators (V, $V(\%)$), we perform an analysis of 2 types of stock trading. If $V_1<V_2$ is the case, then the amplitude exchange trend in Type 2 stock prices is frequent. So, there is a need to change the trend. In carrying out the above analysis, we use the following statistics obtained from stock exchanges.

TABLE 1 DYNAMICS OF CHANGES IN THE MARKET PRICE OF SHARES OF COMMERCIAL BANKS

t times	From 01.09.2020 to 31.08.2021 the share price is max and min	
	"Agrobank"	"Microcredit bank"
1.	799	1068
2.	845	999,98
3.	522	999,98
4.	810	999,98
5.	424	999,98
6.	654	999,98
7.	550	999,98
8.	810	999,98
9.	550	999,98
10.	700	999,98
11.	500	999,98
12.	788	2300
13.	638	3651
14.	809,97	1990
15.	520	2300
16.	809,99	1900
17.	638	1999
18.	810	1000

19.	525	2340
20.	809,99	1100
21.	510	1899
22.	809,99	500
23.	600	1790
24.	804	1731

Based on the regression lines drawn on the basis of these data, there is a downward trend for shares of commercial banks (Figures 1 and 2). Here for Agro Bank $T=\{1<2<3<4<5<6<7<8\}$, $N=8$.

Based on the data in Table 1, we construct a multi-valued reflection. To do this, we divide the industry $T=\{1<2<3<4<5<6<7<8\}$, $N=8$ into the following sub-sectors:

$\sigma^0=\{1<2<3\}$, $\sigma^1=\{2<3<4\}$, $\sigma^2=\{3<4<5\}$,

$\sigma^3=\{4<5<6\}$, $\sigma^4=\{5<6<7\}$

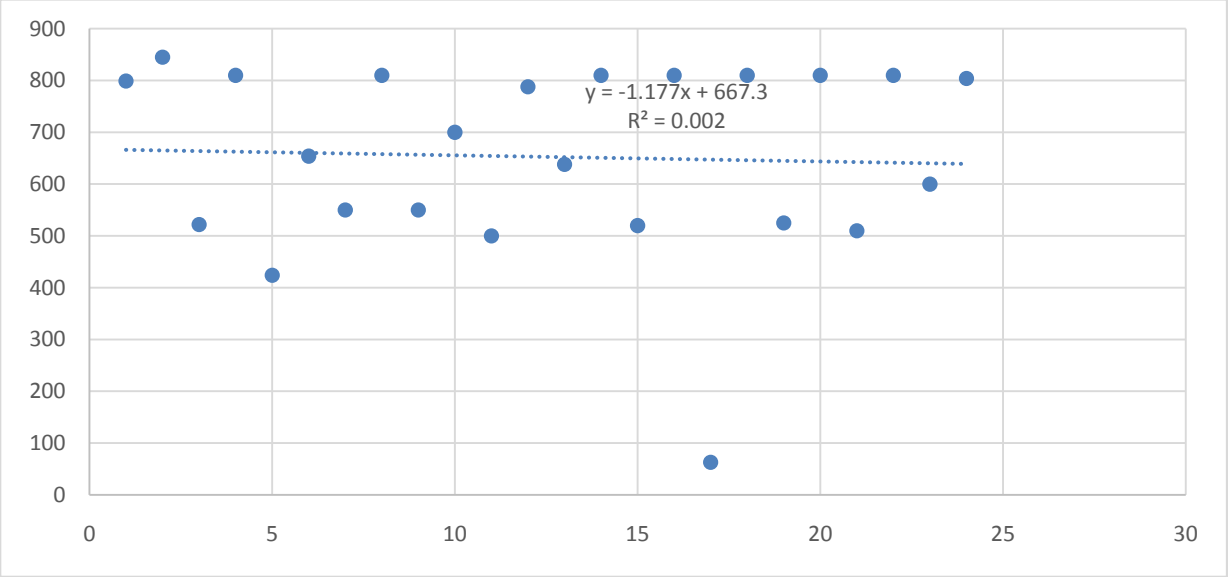

Figure 1. The regression line of change in the value of shares of Agrobank

The number of shares issued by Agrobank in 2003 amounted to 4,201,369,030, with a par value of 1,168 soums. The shares of the bank in subsequent years were sold at prices lower than the face value. In particular, the lowest figure was 424 soums on November 9, 2020, and the highest figure was 1150 soums on January 3, 2020.

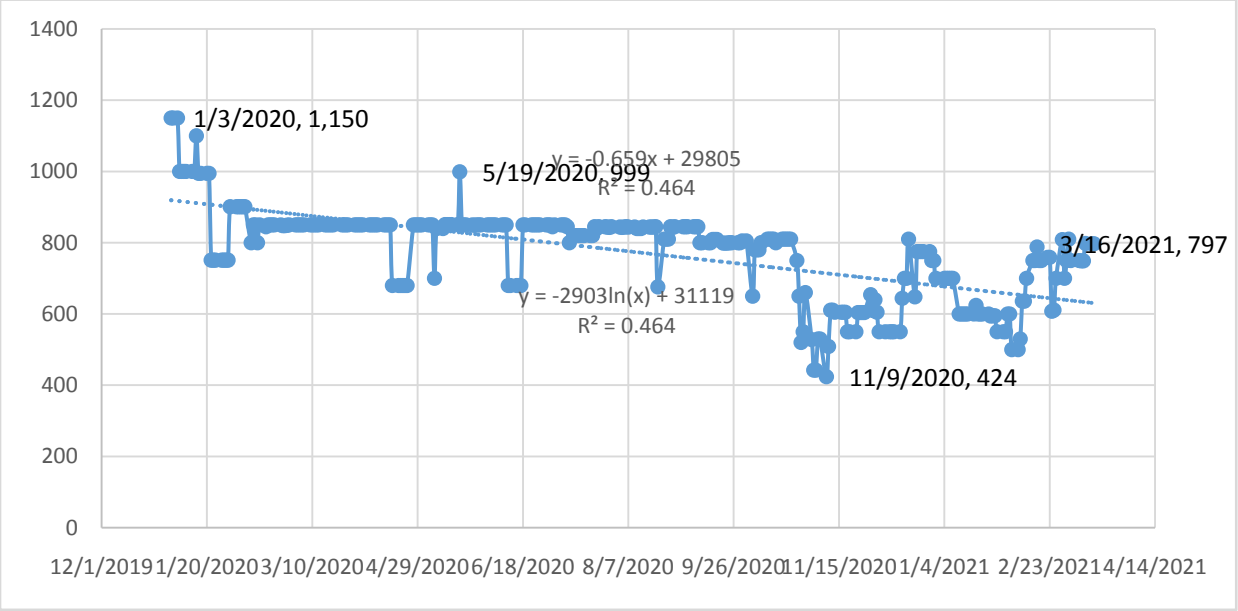

Figure 2. Diagram of changes in the share price of Agrobank[1]

The state-owned banks accounted for 8.5% of assets, 9.0% of loans, 9.2% of capital and 7.9% of deposits[2].

Despite the positive performance of the bank in the banking market, the stock price on the stock market was sold at a lower level than the nominal price.

As of August 1, 2021, the bank's loan portfolio amounted to 28929 billion soums. Problem loans amounted to 1,393 billion soums. The share of problem loans in total loans reached 4.8%[3]

Based on the same analysis, we can draw the regression lines of Microcredit Bank. Here we construct a multi-value reflection$T = \{1 < 2 < 3 < 4 < 5 < 6\}$ $N = 6$ for Microcredit Bank based on the data in Table 1. To do this, we divide the

[1]https://www.uzse.uz/isu_infos/STK?isu_cd=UZ7001560000&begin_date=01.01.2020&end_date=16.03.2021

[2]https://cbu.uz/oz/statistics/bankstats/548030/

[3]https://cbu.uz/oz/statistics/bankstats/548051/

industry$T = \{1 < 2 < 3 < 4 < 5 < 6\}$ $N = 6$ into the following sub-sectors:

$\sigma^0 = \{1 < 2 < 3\}$, $\sigma^1 = \{2 < 3 < 4\}$, $\sigma^2 = \{3 < 4 < 5\}$, $\sigma^3 = \{4 < 5 < 6\}$

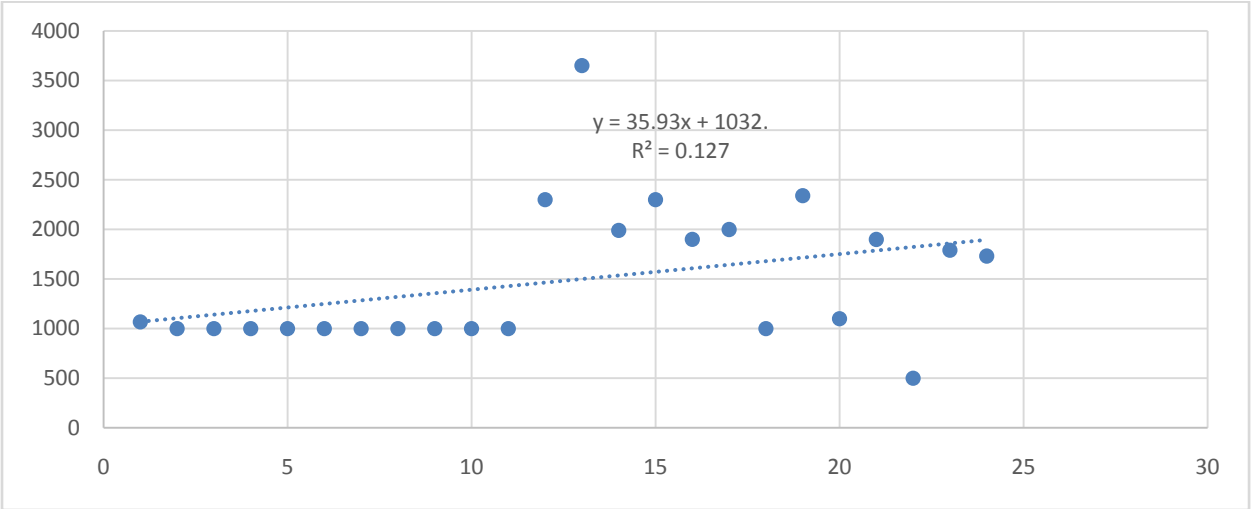

Figure 3. The regression line of change in the value of microcredit bank shares

Based on the above data (Table 1) and using formula (2), after certain calculations, we create the following tables for the above Commercial Banks, respectively:

TABLE 2 ANALYSIS OF INDICATORS BASED ON THE METHODOLOGY OF CONSTRUCTION OF MULTI-VALUE REFLECTION OF AGROBANK

	σ^j	m_j	$a_1^0(\sigma^j)$	$a_0^0(\sigma^j)$	$a_1^1(\sigma^j)$	$a_0^1(\sigma^j)$	$h_0(\sigma^j)$	$h_1(\sigma^j)$	$h_{\beta^j}(\sigma^j)$	ξ_j
799	1	161,5	-17,5	862,5	-138,5	799	0	-138,5	0	0
845	2	193	-17,5	845	-49	571	35	-49	35	0
522	3	193	-78	888	-49	522	156	-147	156	0
810	4	193	-78	810	63	361	312	189	312	0
424	5	130	78	576	63	424	-312	315	315	1
654	6	130	78	654	0	550	-468	0	0	1
550	7	130	-55	865	0	550	330	0	330	0
810	8	130	-55	810	-25	575	440	-175	440	0
550	9	144	44	656	-25	550	-352	-225	-225	1
700	10	144	44	700	69	431	-440	621	621	1
500	11	144	10,9	777,015	69	500	-109,85	759	759	1
788	12	144,9	10,9	788	-59	697	-131,82	-649	-131,82	0
638	13	144,9	0,01	809,96	-59	638	-0,12	-767	-0,12	0
809,97	14	373,4	0,01	809,97	-228,5	748,5	-0,14	-2970,5	-0,14	0
520	15	373,5	0,005	809,985	-228,5	520	-0,07	-3427,5	-0,07	0
809,99	16	373,5	0,005	809,99	231	-168	-0,08	3465	3465	1
63	17	373,5	-0,005	810,005	231	63	0,08	3927	3927	1
810	18	149,9	-0,005	810	-7,5	532,5	0,09	-127,5	0,09	0
525	19	149,9	0	809,99	-7,5	525	0	-142,5	0	0
809,99	20	149,9	0	809,99	45	465	0	855	855	1
510	21	149,9	-2,995	812,985	45	510	59,9	945	945	1
809,99	22									

600	23									
804	24									

Results. We perform the analysis in percentages. To do this, we use formula (4). In this case, we create the following for the bank:

V [j] = 0,4842300556586271

V [j] = 0.3220588235294118

V [j] = 0.5408

V [j] = 0.3687888198757764

V [j] = 0.466860501253479

V [j] = 0,5172971225347559

V [j] = 0.361302787744963

V [j] = 0.4919137971070945

V [j] = 0,006212168274002024

V [j] = 0.6036324786324786

V (0) = 0.6036324786324786

The number of shares issued by Microcredit Bank in 2003 was 2,060,155,089 and the nominal value was 1,068 soums. The bank's shares in subsequent years were sold at prices lower than their face value. In particular, the lowest figure was 800 soums on December 5, 2019, and the highest figure was 1068 soums on January 4, 2019.

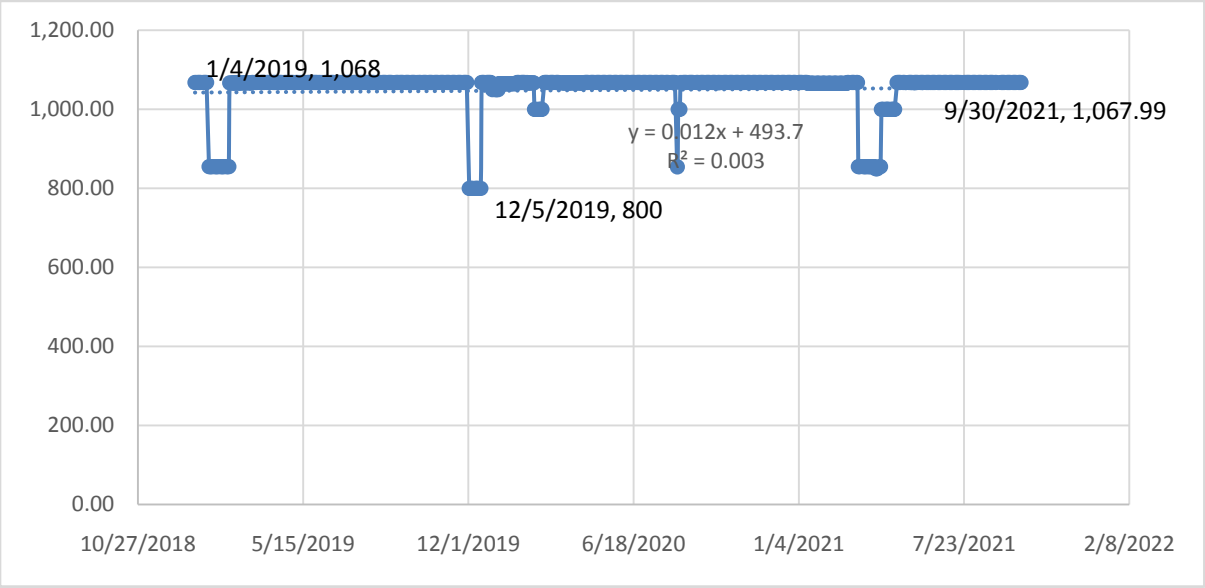

Figure 4. Diagram of changes in the share price of a microcredit bank[4]

The share of state-owned banks was 3.1% in assets, 3.5% in loans, 3.4% in capital and 2.3% in deposits[5].

Despite the positive performance of the bank in the banking market, the stock price on the stock market was sold at a lower level than the nominal price.

As of August 1, 2021, the bank's loan portfolio amounted to 10,458 billion soums. Problem loans amounted to 622 billion soums. The share of problem loans in total loans reached 5.9%[6].

[4]https://www.uzse.uz/isu_infos/STK?isu_cd=UZ7001560000&begin_date=01.01.2020&end_date=16.03.2021

[5]https://cbu.uz/oz/statistics/bankstats/548030/

[6]https://cbu.uz/oz/statistics/bankstats/548051/

TABLE 3 ANALYSIS OF INDICATORS BASED ON THE METHODOLOGY OF BUILDING A MULTI-VALUE REFLECTION OF A MICROCREDIT BANK

	σ^j	m_j	$a_1^0(\sigma^j)$	$a_0^0(\sigma^j)$	$a_1^1(\sigma^j)$	$a_0^1(\sigma^j)$	$h_0(\sigma^j)$	$h_1(\sigma^j)$	$h_{\beta^j}(\sigma^j)$	ξ_j
999,98	1	34,01	-34,01	1102,01	0	999,98	0	0	0	1
1068	2	34,01	-34,01	1068	0	999,98	68,02	0	68,02	0
999,98	3	0	0	999,98	0	999,98	0	0	0	1
999,98	4	0	0	999,98	0	999,98	0	0	0	1
999,98	5	0	0	999,98	0	999,98	0	0	0	1
999,98	6	0	0	999,98	0	999,98	0	0	0	1
999,98	7	0	0	999,98	0	999,98	0	0	0	1
999,98	8	0	0	999,98	0	999,98	0	0	0	1
999,98	9	0	0	999,98	0	999,98	0	0	0	1
999,98	10	650,01	650,01	349,97	0	999,98	-5850,09	0	0	1
999,98	11	675,5	1325,51	324,48	650,01	349,97	-13905,1	6500,1	6500,1	1
999,98	12	830,5	675,5	2300	495,01	1154,98	-8106	6095,12	6095,12	1
2300	13	830,5	-675,5	4326,5	-155	2300	8106	-2015	8106	0
3651	14	830,5	-675,5	3651	-45	2035	9457	-585	9457	0
1990	15	200	-150,5	2450,5	-45	1990	2107	-675	2107	0
2300	16	999	-150,5	2300	-949,5	2849,5	2408	-14242,5	2408	0
1900	17	1169,5	170,5	1828,5	-949,5	1900	-2728	-16141,5	-2728	0
1999	18	1169,5	170,5	1999	549,5	-548,5	-3069	9341,5	9341,5	1
1	19	1169,5	-220,5	2560,5	549,5	1	3969	10440,5	10440,5	1
2340	20	699,5	-220,5	2340	-300	1400	4410	-5700	4410	0
1100	21	699,5	-54,5	1953,5	-300	1100	1090	-6300	1090	0
1899	22									
500	23									
1790	24									

We perform the analysis in percentages. To do this, we use formula (4). In this case, we create the following for the bank:

V [j] = 0.5

V [j] = 0, .5

V [j] = 0.5

V [j] = 0.5

V [j] = 0.6049437069400101

V [j] = 1,1130652680652684

V [j] = 0.6812003077712234

V [j] = -0.9137120888509184

V [j] = -0.6468822940980327

V [j] = 1,4609170305676855

V (0) = 1,4609170305676855

As it is $V_1 < V_2$ here, it can be concluded that the risk in choosing the shares of Agrobank is low and the probability of a change in the trend of share prices in Microcredit Bank is high. This is also confirmed by the difference in the amplitude of the oscillations in Figures 3 and 4.

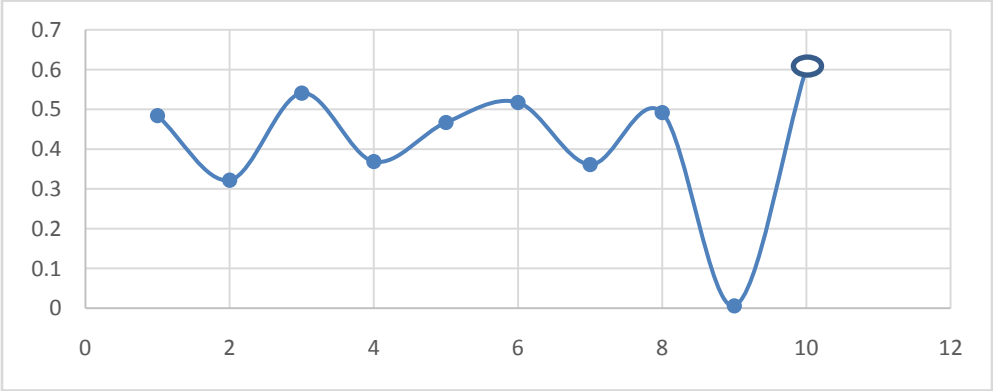

Figure 5. The level of risk affecting the share price of Agrobank

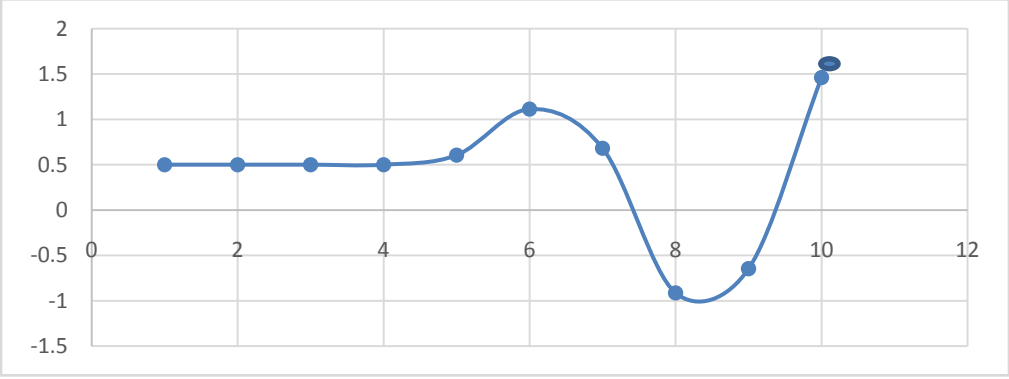

Figure 6. The level of risk that affects the share price of a microcredit bank

This means that the amplitude of changes in the market price of shares of Microcredit Bank in relation to Agrobank is high, and investors who want to invest money in order to invest, prefer to invest in shares of Agrobank in relation to Microcredit. The above method of risk assessment can also be used to assess the risks that may occur in the financial portfolio [4].

CONCLUSION

By analyzing the market prices of the shares of the above two commercial banks, the following conclusions were drawn as a result of assessing their level of risk:

First, although the position of commercial banks in the banking market was satisfactory, the amplitude of their stock prices in the secondary market generated sharp fluctuations. This led to a fall in the share price of banks.

Second, a comparative analysis of the shares of commercial banks using the analogous generalization of the 1st level Chebishev interpolation polynomial, the analysis of Agrobank's shares with low market risk, Microcredit Bank's shares with high risk. This highlights the need for Microcredit Bank to improve the quality of services, increase banking products and bring new banking services to the banking market using new information technologies.

Third, the weakening of demand for bank shares issued in 2003 as a result of the fact that the market price was not freely traded in the secondary market for many years has lowered the bank's image in the market.

Fourth, the amplitude of fluctuations in the stock price of banks in the market led to the opposite conclusion to the stock market rule. Despite the fact that the banks have a high share in the banking market on all indicators, its shares were sold at prices below par.

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