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# РЕГРЕССИОННАЯ ОЦЕНКА АКЦИЙ БАНКА

***Аннотация:*** *оценка акций важна как для эмитента, так и для инвестора. Акции – это ценные бумаги, на которые больше всего влияют различные факторы. На рыночную стоимость акций влияют многие факторы, как внешние, так и внутренние. Специфика развития фондового рынка Республики Казахстан показывает, что многие аспекты слабо отражаются на формировании стоимости акций. Это относится и к акциям банков, в частности. В результате возникают вопросы относительно того, какие факторы и насколько сильно влияют на изменение стоимости акций. В статье приведен корреляционно-регрессионный анализ влияния факторов на рыночную стоимость акций ОАО «ФортеБанк». На основе применения регрессионной модели сделаны выводы о степени влияния эндогенных и экзогенных факторов на формирование рыночной стоимости банковских акций.*

***Ключевые слова****: регрессионная модель, банковские акции, стоимость акций, анализ влияния факторов.*

***Abstract****: valuation of shares is important for both the issuer and the investor. Shares are the securities that are most affected by various factors. The market value of shares is influenced by many factors, both external and internal. The specifics of the development of the stock market of the Republic of Kazakhstan shows that many aspects are slightly reflected in the formation of the value of shares. This also applies to shares of banks in particular. As a result, questions arise as to what factors and how much influence the change in the value of shares. The article contains a correlation-regression analysis of the influence of factors on the market value of shares of JSCForteBank. Based on the application of the regression model, conclusions are*



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*drawn about the degree of influence of endogenous and exogenous factors on the formation of the market value of bank shares.*

***Keywords**: bank shares, regression model, stock value, analysis of the influence of factors.*

As it is known, stocks are those securities of the capital market that are most susceptible to various kinds of factors: from the situation in the world market, the changes observed in the issuing bank itself, and ending with rumors, expectations and purely technical market moments. A share is a share security characterizing the contribution to the issuer's capital [1]. The global dynamics of the stock market is influenced, as a rule, by global and long-term processes [2]. First of all, these are processes in the economy itself, both in the country and in the world economy as a whole, as well as the financial policy of the state. The long-term dynamics of the stock market is influenced by the level of GDP growth, the growth of company profits and the growth of real disposable incomes of the population.

The existence of a hypothesis about the dependence of the value of bank shares on market factors, as well as the policy of the bank itself, makes it possible to apply a regression analysis model to identify the degree of the existing relationship.

All factors affecting the value of shares can be divided into two categories: external and internal (Figure 1).

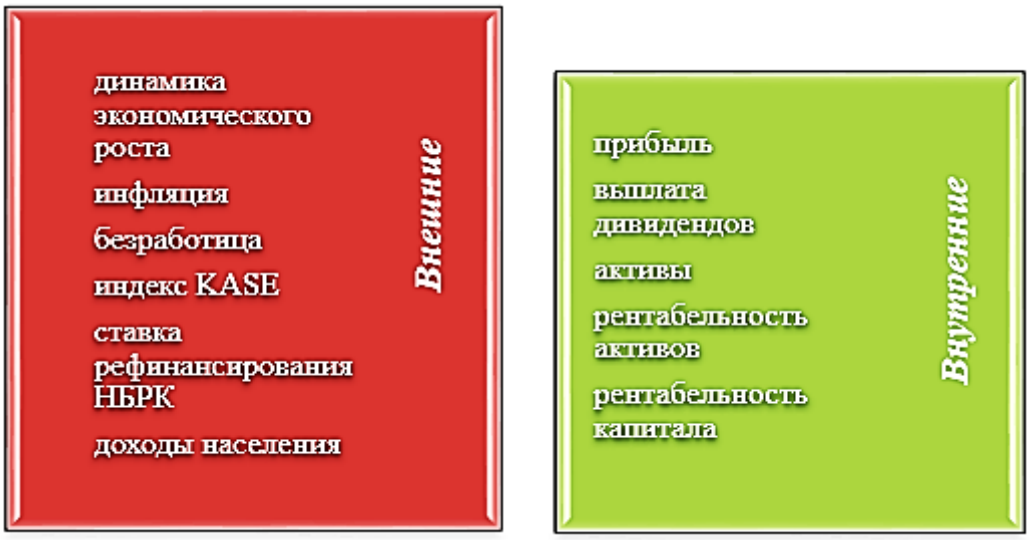


Figure 1. Factors affecting the market value of shares of JSCForteBank


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For the purpose of analyzing the value of the shares of ForteBank, it makes sense to apply the multiple regression model.

The multiple regression equation has the following form:

$$Y = f(\beta, x) + \varepsilon$$

$x = x(x1, x2,..., xm)$ – vector of independent (explanatory) variables;

$\beta$ – parameter vector (to be determined);

$\varepsilon$ – random error (deviation);

$Y$ – dependent (explained) variable [3].

Data for assessing the dependence of the value of the bank's shares on the indicated factors is presented in Table 1.

The resulting regression equation is as follows:

$$Y = -7640{,}85 + 28{,}55x1 + 1579{,}33x2 - 0{,}065x3 + 105{,}78x4 + 372{,}39x5 - 21{,}28x6 + 0{,}064x7 + 0{,}04x8 - 1337{,}37x9 + 302{,}49x10$$

Table 1

Data for constructing a regression model of shares of JSCForteBank

| stockvalue | RealMoneyIncomeIndex% | Unemployment rate, % | GDP percapita, KZT | consumerprice index | refinancingrate, % | IndexKASE | assets, millionKZT | profit, millionKZT | ROA | ROE |
|---|---|---|---|---|---|---|---|---|---|---|
| 3500,01 | 111,8 | 6,6 | 1024175,0 | 109,5 | 10,5 | 903,6 | 1011879,2 | 1562,4 | 1,29 | 2,03 |
| 800 | 96,9 | 6,6 | 1056854,7 | 106,2 | 9,5 | 1768,3 | 419094,0 | – 298440,0 | 1,30 | 3,08 |
| 800 | 106,3 | 5,8 | 1336605,6 | 107,8 | 7,0 | 1718,1 | 427584,0 | 334434,0 | 0,98 | 4,21 |
| 800 | 108,7 | 5,4 | 1705848,6 | 107,4 | 7,5 | 1105,6 | 529888,0 | 39887,0 | 0,76 | 1,10 |
| 800 | 107,5 | 5,3 | 1847084,8 | 106,0 | 6,0 | 969,7 | 590009 | 640 | 0,54 | 1,57 |
| 800 | 102,9 | 5,2 | 2113204,8 | 104,8 | 5,5 | 918,0 | 475768 | –84848 | 0,29 | 1,81 |
| 800 | 103,4 | 5,0 | 2294830,2 | 107,4 | 5,5 | 941,9 | 616911 | 171531 | 0,30 | 1,73 |
| 800 | 101,4 | 5,1 | 2330360,2 | 113,6 | 5,5 | 858,8 | 1067091 | 6348 | 0,75 | 4,62 |
| 1 | 99,3 | 5,0 | 2639710,3 | 108,5 | 5,5 | 1357,9 | 1 215 177 | 11 654 | 1,00 | 6,80 |
| 1 | 101,0 | 4,9 | 2943893,0 | 107,1 | 10,25 | 2304,9 | 1 444 640 | 19 751 | 1,50 | 10,60 |
| 2,5 | 104,4 | 4,8 | 2179520,1 | 105,3 | 9,25 | 2329,6 | 1 600 575 | 22 702 | 2,00 | 15,60 |

According to the calculations made in Excel, the matrix of paired correlation coefficients R is represented by the following values (Table 2).



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Table 2

Matrix of paired correlation coefficients

| – | $y$ | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $x_5$ | $x_6$ | $x_7$ | $x_8$ | $x_9$ |
|---|---|---|---|---|---|---|---|---|---|---|
| $y$ | 1 | 0,6429 | 0,7204 | –0,672 | 0,2867 | 0,311 | –0,512 | –0,225 | –0,030 | –0,080 |
| $x_1$ | 0,6429 | 1 | 0,2027 | –0,414 | 0,0249 | 0,1478 | –0,349 | –0,121 | 0,443 | –0,083 |
| $x_2$ | 0,7204 | 0,2027 | 1 | –0,898 | 0,0683 | 0,4681 | –0,145 | –0,451 | –0,317 | 0,1217 |
| $x_3$ | –0,672 | –0,414 | –0,898 | 1 | 0,0618 | –0,321 | 0,197 | 0,5781 | 0,1358 | –0,043 |
| $x_4$ | 0,2867 | 0,0249 | 0,0683 | 0,0618 | 1 | –0,161 | –0,373 | 0,1931 | 0,1801 | –0,079 |
| $x_5$ | 0,311 | 0,1478 | 0,4681 | –0,321 | –0,161 | 1 | 0,596 | 0,3653 | –0,274 | 0,8005 |
| $x_6$ | –0,512 | –0,349 | –0,145 | 0,197 | –0,373 | 0,596 | 1 | 0,505 | –0,016 | 0,815 |
| $x_7$ | –0,225 | –0,121 | –0,451 | 0,5781 | 0,1931 | 0,3653 | 0,505 | 1 | –0,000 | 0,6861 |
| $x_8$ | –0,030 | 0,443 | –0,317 | 0,1358 | 0,1801 | –0,274 | –0,016 | –0,0001 | 1 | –0,159 |
| $x_9$ | –0,080 | –0,083 | 0,1217 | –0,043 | –0,079 | 0,8005 | 0,815 | 0,6861 | –0,159 | 1 |
| $x_{10}$ | –0,511 | –0,283 | –0,464 | 0,481 | –0,137 | 0,3928 | 0,8256 | 0,8486 | 0,0377 | 0,7998 |

To estimate the β-coefficients, we apply the least squares method. In this case, the system of normal equations will have the form [4]:

$$\begin{cases} r_{x1y}=\beta_1+r_{x1x2}\beta_2 +... + r_{x1xm}\beta_m \\ r_{x2y}=r_{x2x1}\beta_1 + \beta_2 +... + r_{x2xm}\beta_m \\ ... \\ r_{xmy}=r_{xmx1}\beta_1 + r_{xmx2}\beta_2 +... + \beta_m \end{cases}$$

This system of linear equations is solved by the Gauss method, with the result that we obtain the following results:

$\beta_1 = 0,127$
$\beta_2 = 1,05$
$\beta_3 = 0,145$
$\beta_4 = -0,0738$
$\beta_5 = 0,742$
$\beta_6 = -1,212$
$\beta_7 = 0,0189$
$\beta_8 = 0,259$
$\beta_9 = -0,745$
$\beta_{10} = 1,212$

The standardized regression partial coefficients – *β*-coefficients ($\beta_i$) show which part of its standard deviation *S (y)* the sign-result *y* changes with a change in the corresponding factor $x_i$by the value of its standard deviation ($S_{xi}$) with the constant influence of other factors (incoming into the equation).

The coefficient $\beta_i$can also be interpreted as an indicator of the direct (direct) influence of the i-th factor ($x_i$) on the result ($y$). In multiple regression, the i-th factor has


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not only a direct, but also an indirect (indirect) effect on the result (i.e., through other factors of the model).

Indirect influence is measured by: $\beta_{irxi}$, $x_i$, where *m* is the number of factors in the model. The total effect of the i-thfactor on the result, equal to the sum of direct and indirect effects, measures the linear pair correlation coefficient of the given factor and the result – $r_{xi}$, *y*.

So for our equation, the direct influence of the factor $x_1$ on the result *Y* in the regression equation is measured by $\beta_i$ and is 0,127; indirect (indirect) effect of this factor on the result is defined as: $r_{x1x2}\beta_2$ = 0,203 x 1,05 = 0,2129.

In order to clarify and rank the factors according to the strength of the impact on the resulting indicator, we calculate the elasticity coefficients, which are determined by the formula:

$$E_i = b_i \frac{\overline{x}_i}{\overline{y}}$$

$b_i$ – regression coefficient for factor xi in the multiple regression equation;

$x_i$ – average value of the i-th factor;

*y* – average result.

The partial coefficient of elasticity shows how much percent the sign-result y changes on average with an increase in the sign-factor $x_i$ by 1% of its average level with a fixed position of other factors of the model.

$E_1 = 28{,}546 \frac{103{,}964}{827{,}68} = 3{,}586 > 1$significantly affects the value of bank shares.

$E_2 = 1579{,}33 \frac{5{,}432}{827{,}68} = 10{,}364 > 1$significantly affects the value of shares.

$E_3 = -0{,}0655 \frac{1952007{,}94}{827{,}68} = -154{,}56$|$E_3$| > 1, significantly affects the value of bank shares.

$E_4 = 105{,}777 \frac{107{,}6}{827{,}68} = 13{,}751 > 1$significantly affects the value of shares.

$E_5 = 372{,}39 \frac{7{,}455}{827{,}68} = 3{,}354 > 1$significantly affects the value of bank shares.

$E_6 = -21{,}286 \frac{1379{,}673}{827{,}68} = -35{,}482$|$E_6$| > 1, significantly affects the value of bank shares.



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$E_7 = 0{,}0642\frac{854419{,}66}{827{,}68} = 66{,}268 > 1$significantly affects the value of shares.

$E_8 = 0{,}0405\frac{20474{,}673}{827{,}68} = 1{,}001 > 1$ significantly affects the value of shares.

$E_9 = -1337{,}369\frac{0{,}974}{827{,}68} = -1{,}573|E_9| > 1$,significantly affects the value of bank shares.

$E_{10} = 302{,}499\frac{4{,}832}{827{,}68} = 1{,}766 > 1$significantly affects the value of shares.

The assessment of the significance of the multiple regression equation is carried out by testing the hypothesis of zero equality coefficient of determination calculated according to the general population: $R^2$ or $b_1 = b_2 = ... = b_m = 0$ (the hypothesis of in-significance of the regression equation calculated according to the general population). To test it, use Fisher's F-test. At the same time, the actual (observable) value of the F-criterion is calculated through the coefficient of determination $R^2$, calculated from the data of a specific observation. The Fisher-Snedecor distribution tables find the critical value of the F-criterion ($F_{cr}$) [5]. To do this, set the level of significance α (usually it is taken equal to 0,05) and two numbers of degrees of freedom $k_1 = m$ and $k_2 = n\text{-}m\text{-}1$.

$$R^2 = 1 - \frac{89091516812{,}51}{9194432{,}58} = -9688{,}72$$

Lets test the hypothesis of general significance – the hypothesis of simultaneous equality to zero of all regression coefficients with explanatory variables: $H_0$: $R^2 = 0$; $\beta_1 = \beta_2 = ... = \beta_m = 0$. $H_1$: $R^2 \neq 0$.

Testing of this hypothesis is carried out using F-statistics of Fisher distribution. If $F < F_{cr} = F_{\alpha}$; n-m-1, then there are no grounds for rejecting the hypothesis H0.

$$F = \frac{-9688{,}72}{1-(-9688{,}72)} x \frac{11-10-1}{10} = 0$$

Tabular value with degrees of freedom $k_1 = 10$ и $k_2 = n\text{-}m\text{-}1 = 11 - 10 - 1 = 0$, $F_{cr}(10;0) = 0$

Since the actual value of $F > F_{cr}$, the coefficient of determination is statistically significant and the regression equation is statistically reliable (i.e., the coefficients bi are jointly significant).


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So, the results of the analysis allow us to draw the following conclusions. Regarding external factors, it can be noted their strong correlation with the value of the shares of ForteBank. In particular, the increase in the index of real incomes of the population by 1 KZT leads to an increase in the value of shares of ForteBank by 28,546 KZT. The increase in GDP per capita in the country by 1 KZT contributes to an increase in the rate of 15,79KZT. The growth of unemployment by 1% in the country leads to a decline in the bank's stock price by 0,066%. A 1% increase in the CPI contributes to a 1,058% decline in the bank's share price. With the growth of the refinancing rate by 1%, the value of the bank's shares decreases by 0,21%. Growth index of Kazakhstan Stock Exchange by 1 unit leads to an increase in the value of the bank's shares by 3,72 units.

Internal factors also have a strong influence on the value of bank shares. However, assets and profits lead to minor changes. In particular, the growth of the bank's assets by 1 KZT leads to an increase in the value of the share by 0.0642 KZT, profit – by 0,0405KZT. Increase in return on assets by 1 unit reduces the stock value of the bank by an average of 1337,37 units. The increase in profitability of capital for 1 unit increases the value of bank shares by 302,5 units.

Thus, all of the indicated factors influence the formation of the value of ForteBank, shares. However, it should be noted that due to the lack of demand for these stocks, some errors in the regression model are possible.

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