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ASSESSMENT OF THE EFFECT OF INFLATION EXPECTATIONS ON THE DEVELOPMENT OF THE FUND MARKET OF UZBEKISTAN ON THE BASIS OF ECONOMETRIC ANALYSIS

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Abstract. In the econometric analysis carried out during the study, it is important to assess the impact of inflation on the stock market, as one of the important trends in the context of financial globalization in the world, which was considered in the previous paragraphs. In this regard, it is possible to analyze the relationship between the trading volume and inflation expectations on the organized stock market in our country - the "Tashkent" Republican Stock Exchange. Proposals and recommendations have been developed based on the results.

Keywords: securities market, macroeconomic policy, stock market, financial instruments, financial resources, corporate structure, privatization, stock exchange, commercial banks, OLS, regression, inflation expectations, "Gauss-Markov" conditions, White test Breusch Ragan test, business entities, investment activity, target indicator

Introduction. Uzbekistan is implementing economic reforms aimed at attracting financial resources in the capital market based on the development of the securities market. In this regard, the country's macroeconomic policy and the development programs implemented and in force on its basis, including the "Strategy of Actions on Five Priority Development Areas for 2017-2021" [1], "Development Strategies of New Uzbekistan for 2022-2026" [2], are important in increasing the role and significance of the securities market in the economy and financial relations in our republic.

In Uzbekistan, ensuring the transparent operation of stock market issuers and their financial stability, increasing the level of capitalization of freely traded securities in the stock market, increasing the supply of highly liquid securities in the national stock market, improving the activities of the regulator regulating this market, further expanding the diversification of financial instruments, assessing the impact of dynamic changes in macroeconomic indicators on the stock market, and integrating and implementing international best practices into the national stock market system are among the urgent issues. The task of "increasing financial resources in the economy to increase stock market turnover from 200 million US dollars to 7 billion US dollars in the next 5 years" [3] has been set.

In order to achieve this goal, it is important to further gradually liberalize the movement of financial capital, improve the mechanism for privatization of large corporate structures with state shares through the stock market, support the practice of placing Eurobonds by commercial banks on international stock exchanges, and increase the share of the private sector by reducing the state share in the capital structure of commercial banks.

Methods. Based on the objectives of this study, we used the OLS ("ordinary least squares" [4]) model to estimate the impact of the selected dependent and independent variables, namely the inflation expectations of the population and the inflation expectations of business entities in the surveys conducted by the Central Bank of the Republic of Uzbekistan in the months of 2022 and 2023, on the trading volume of the Tashkent Republican Stock Exchange in the months of 2022 and 2023.

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The general formula of the OLS econometric model is as follows:

$$y_{t+1} = a * x + b \quad (1)$$

where: "t + 1 - forecast period; yt+1 – forecasted indicator; a and b are coefficients, x is the conditional value of time" [5].

We use the following formula to calculate the coefficients a and b in the general formula:

$$a = \frac{\sum_{i=1}^{n}(Y_i * X) - (\sum_{i=1}^{n} X * \sum_{i=1}^{n} Y_i)/n}{\sum_{i=1}^{n} X^2 - (\sum_{i=1}^{n} X)^2 / n} \quad (2)$$

$$b = \frac{\sum_{i=1}^{n}(Y_i)}{n} - \frac{a * (\sum_{i=1}^{n} X)}{n} \quad (3)$$

where: “Yi is the true value of the dynamic series, n is the number of degrees of the time series” [5].

The main reasons and advantages of using the OLS model in the econometric analysis in our study can be explained as follows. That is, linear regression is convenient for use in analysis and forecasting, and is one of the simplest and most widely used methods for determining the impact of variables in interpretable analyses. This method is also considered an effective method for linear relationships, and if it is determined in the analysis that there is a linear relationship between the independent and dependent variables, then through linear regression, it is possible to achieve high-precision forecasting of the future values of the dependent variable. Importantly, in the constructed linear regression equation, each regression coefficient is used to determine the impact of each selected independent variable on the dependent variable.

Results. The aggregated indicators of the results of the surveys conducted by the Central Bank of the Republic of Uzbekistan on inflation expectations of the population and business entities in the months of 2022 and 2023 were used in the econometric analysis during the study.

Based on the results of the analysis, we econometrically assess the extent to which a 1 percent increase or decrease in the selected independent variables

will affect the trading volume of the Tashkent Republican Stock Exchange. As a result, the appropriate conclusions are drawn based on the analysis. Information on the descriptive statistics of the variables selected for econometric analysis is presented in the following table:

Table 1

Selected variables in econometric analysis descriptive statistics [10]

Variables	Number of observations	Average	Standard limitation	Minimum	Maximum
Stock exchange	26	555.4554	1146.702	12.92	4816.22
$I_{population}$	26	14.7875	1.328465	13	18.9
$I_{business}$	26	14.59423	1.212836	13.1	18.7

According to it, the trading volume of the “Tashkent” Republican Stock Exchange in 2022 and 2023, selected as the dependent variable, is Y (Stock exchange), the independent variables are x_1 (Ipopulation) - the inflation expectations of the population in 2022 and 2023, in the surveys conducted by the Central Bank of the Republic of Uzbekistan, and x_2 (Ibusiness) - the inflation expectations of business entities.

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The average value of the trading volume of the "Tashkent" Republican Stock Exchange in 2022 and 2023, in monthly terms, was 555.4554 billion soums. The smallest indicator of the trading volume was 12.92 billion soums, and the largest trading volume was 4816.22 billion soums. Also, according to the results of surveys conducted by the Central Bank of the Republic of Uzbekistan, the average inflation expectations of the population for the months of 2022 and 2023 were 14.7 percent, the minimum inflation expectation was 13 percent, and the maximum inflation expectation was 18.9 percent. The average inflation expectations of business entities were 14.5 percent, the minimum inflation expectation was 13.1 percent, and the maximum inflation expectation was 18.7 percent. It should be noted that, according to the responses provided by the population and business entities, there are no significant differences between the maximum inflation expectations.

The results of the correlation analysis of the dependent and independent variables selected for the study are as follows:

Table 2

Results of correlation analysis on selected variables in econometric analysis [10]

Variables	Stock exchange	$I_{population}$	$I_{business}$
Stock exchange	1.0000		
$I_{population}$	0.8355	1.0000	
$I_{business}$	0.9393	0.8993	1.0000

According to the theoretical aspects of conducting econometric analyses, the closer the correlation coefficient is to 1, the stronger the level of correlation between the selected variables. Based on the results of the above analysis, it can be said that, according to the results of the correlation analysis, the correlation coefficient of the dependence of the independent variables on the dependent variable is in the range of 0.83-0.93. The results show that, according to econometric laws, the independent variables, inflation expectations of the population and business entities, are significantly more strongly related to the dependent variable, that is, the trading volume of the Tashkent Republican Stock Exchange.Амалга оширган регрессия таҳлили натижалари қуйидаги жадвалда ифодаланган:

Table 3

Results of regression analysis of selected variables in econometric analysis [10]

Number of observations		26				
F (2, 23) value		0,23				
Probability value		0.0000				
Coefficient of determination		0.9677				
Corrected coefficient of determination		0.9958				
Variables	**Coefficient**	**Standard limitation**	**t value**	**P > | t |**	**Coefficient (95%)**	**The interval**
$I_{population}$	46.10749	407.4784	0.01	0.911	-796.8258	889.0408
$I_{business}$	86.30822	446.3263	0.04	0.848	-836.9882	1009.605
_cons	-1385.961	2862.667	-0.48	0.633	-7307.839	4535.916

According to the results of the regression analysis of the variables selected in the econometric analysis, the coefficient of determination is 0.96.

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It was determined that this coefficient is 96 percent when the impact of inflation expectations of the population and inflation expectations of business entities, which are considered independent variables, on the trading volume of the Tashkent Republican Stock Exchange is considered constant. Based on the results of the analysis, we construct the following regression equation:

$$Y_{\text{stock exchange}} = 46.107\ I_{\text{population}} + 86.30822\ I_{\text{business}} - 1385.961$$

We will check the reliability of the above econometric model constructed according to the regression equation through a series of tests:

- When we checked the reliability of the econometric model constructed according to the regression equation above using the "f" test, we found that the true value of the "F" of the model was 0.23. Also, the probability value was 0.0000. According to the conditions of this test, the probability coefficient Prob□0.05 means the reliability of the constructed econometric model according to the conditions of the "f" test.

- When assessing the reliability of the above econometric model constructed based on regression analysis by parameters, it is also appropriate to use the "t" test. According to the results of the regression analysis performed, the "t" parameter value is -0.48 and 0.04, respectively. The probability values are reflected in the results of the above analysis, respectively. According to the general property of econometric models, the probability Prob is less than 0.05, which means that the model is reliable according to the "t" test. Therefore, when we checked the parameters of the constructed model, it was found that our model is reliable.

In addition to testing each constructed econometric model by parameters, conducting a number of generally accepted tests further increases the reliability of the model. Therefore, we will test the results of the econometric regression analysis using "Gauss-Markov" conditions. The conditions and results of testing under these "Gauss-Markov" conditions are described in the following order:

- The results of the analysis according to the first condition of the "Gauss-Markov" test: the number of observations of the analysis results is greater than the number of parameters, that is, the number of observations is 26. The number of parameters is
3. According to the rules of this condition, the number of variables should be 6 times less than the number of observations. This means that the model reliability test meets the first condition of the Gauss-Markov test;

- According to the second condition of the "Gauss-Markov" test, the empirical data set should be equal to the model data set:

Table 4

Results of the second condition of the Gauss-Markov test [10]

Variables	Number of observations	Average	Standard limitation	Minimum	Maximum
модел	26	555.4554	161.9931	366.5369	1099.434
GDP	26	555.4554	1146.702	12.92	4816.22

In the case under consideration, the empirical data set is equal to Y=555.4554 and the model values, that is, the model we have constructed under this condition is considered reliable;

- "According to the third condition of the Gauss-Markov test, the residuals are required to be uncorrelated with the independent variables. If the residuals and the independent variables are correlated, it is recognized as a heteroscedasticity condition. If the residuals and the independent variables are not correlated, it is called a homoscedasticity condition or is evaluated as homogeneity.

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It is possible to verify this condition of this test using a graph, correlation table or tests. The requirements set out in this condition of this test can be verified using one of the most common tests - the White test Breusch-Pagan test. The results of the analysis and the reliability of the constructed model can be verified using the Breusch-Pagan (White test) test under the Gauss-Markov conditions, the results of the verification are as follows:

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of Stockexchange

         chi2(1)      =     1.32
         Prob > chi2  =   0.2506
```

Figure 5. Results of the third condition for the Gauss-Markov test [10]

According to the test results, we can see that p>0.05 is greater than 0.05. As a result, the alternative hypothesis (H1) is rejected, and the main hypothesis (H0) is accepted. This indicates that the requirements of this condition of the Gauss-Markov test are also met;

- According to the fourth condition of the "Gauss-Markov" test, the residuals must be uncorrelated. In this process, it is required that they be in a free state. In this case, the autocorrelation between the residuals is checked. It is determined in three ways: graphically, by autocorrelation methods and by the "Durbin Watson" test.

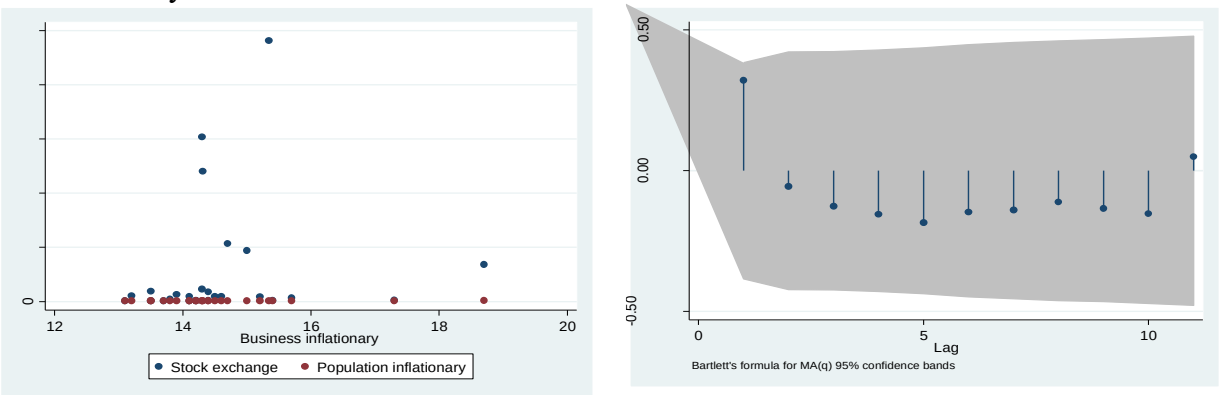

Figure 6. Check the reliability of the econometric model
Results of the fourth condition for the Gauss-Markov test [10]

"According to the fourth condition of the Gauss-Markov test, the residuals are relatively scattered in the graph. Thus, the fact that the residuals are located in the confidence interval indicates that there is relatively little autocorrelation between the residuals. We use the Durbin Watson and Breusch-Godfrey LM tests to test the relationship between the residuals. That is:

Durbin-Watson d-statistic (3, 26) = 1.238995

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Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	2.809	1	0.0937

H0: no serial correlation

Figure 7. Durbin Watson test results [10]

According to the results of the conducted test, r□0.01, we reject the H0 hypothesis and accept the H1 hypothesis. That is, according to the results of this test, there is no correlation between the residuals. The requirements of the Gauss-Markov conditions are met in the model built according to the test results;

- According to the fifth condition of the Gauss-Markov test, the factors must be uncorrelated. The VIF test can be used to perform tests according to the provisions of this condition.

Table 5.

VIF test results [10]

Ўзгарувчилар	**VIF**	**1/VIF**
$I_{population}$	5.23	0.191209
$I_{business}$	5.23	0.191209
Mean VIF	5.23	

Variable	VIF	1/VIF
Businessin~y	5.23	0.191209
Population~y	5.23	0.191209
Mean VIF	5.23	

When we check the 5th condition through the VIF test, it is necessary to check the correlation of the factors. According to the results, the factors are not strongly correlated, that is, there is no multicollinearity between the factors. That is, the requirements of the Gauss-Markov test for the center condition are also fully met.

- "According to the sixth condition of the Gauss-Markov test, we determine that the residuals are normally distributed. In this analysis, it is recommended to use the Shapiro-Wilk W and Skewness/Kurtosis tests. In this condition of the Gauss-Markov test, based on the results of the Shapiro-Wilk W and Skewness/Kurtosis tests, it is determined to reject the hypothesis H0 and accept the hypothesis H1. In this case, it is checked whether the residuals are normally distributed. In the constructed model, the probability p must be greater than 0.05 to check this condition. When checking the residuals for normal distribution using the graphical method, Swilk test, Sktest, it was found that p>0.05:

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Table 6.

Results of Shariro-Wilk W and Skewness/Kurtosis tests [10]

Shapiro-Wilk W тести					
Ўзгарувчи	Кузатувчилар	W	V	z	p>z
r	10	0.54653	12.109	5.111	0.1578
Skewness/Kurtosis тести					
Ўзгарувчи	Кузатувчилар	PR (Skewness)	PR (Kurtosis)	adj ch2(2)	p> ch2
r	10	0.5254	0.2357	23.56	0.7273

$$Y_{\text{stock exchange}} = 46.107\ \text{I}_{\text{population}} + 86.30822\ \text{I}_{\text{business}} - 1385.961$$

Discussion. According to the results of the analysis, it can be said that the inflation expectations of the population and business entities cannot but affect the volume of stock exchange trading. In particular, a 1 percent increase in the population's inflation expectations leads to an increase in the trading volume of the Tashkent Republican Stock Exchange by 46,107 units, and a 1 percent increase in inflation expectations expressed by business entities leads to an increase in the trading volume by 86,308 units. This can be said to be due to the fact that inflation expectations cause an increase in concerns about inflation losses among individuals and legal entities, which artificially stimulates investment activity on the stock exchange. Therefore, the trading volume in stock exchange trading at the beginning and end of the year increases significantly compared to the remaining months. This is due to the fact that at the beginning of the year, the population and business entities are more active in trading as a result of their optimistic attitude to inflation expectations for the coming year. This will be repeated at the end of the year. In this case, it is impossible to ensure the stability of stock exchange trading. When real inflation indicators approach the established target indicators, a relative decrease in inflation expectations is observed.

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