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THE INFLUENCE OF THE CAPITAL MARKET (FINANCIAL INSTRUMENTS) ON ECONOMIC GROWTH IN KAZAKHSTAN AND CIS COUNTRIES

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ABSTRACT

Econometrics is a branch of economics that uses mathematical and statistical methods to study quantitative and qualitative relationships within economic phenomena. The purpose of this article is to study the impact of the capital market (financial instruments) on economic growth in Kazakhstan and the CIS countries through an understanding of the concept of "econometrics". The task of the study is to determine the dependence of gross domestic product as a resultant factor over the past 20 years. Methods. The article determines the assessment of the impact of financial factors on economic growth in the short term. An econometric model was used for this purpose. The resulting factor was the gross domestic product over the past 20 years. Results. The results indicate that the capital market influences economic growth in Kazakhstan and the CIS countries. This paper presents a model of the GDP function for the economy of Kazakhstan. In the course of the study, coefficients and variables of the model were estimated to predict the level and future changes in the country's GDP. Thus, the size of the capital market (Y1) depends on the following variables tested in the model: the number of securities issuance transactions; the volume of securities issuance transactions; the number of transactions of non-residents with shares at the secondary auction of KASE; the rate of change of shares of leading issuers on KASE

Keywords: *econometrics, methods, models, Gross domestic product, capital markets, securities market*

1. INTRODUCTION

The role of finance in economic activity is a topic that has long been of interest to economists and government agencies. Indeed, in the twentieth century, prominent authors talked about the benefits of financial development for economic development.

However, the role of finance in economic growth models has long been ignored. Indeed, Keynesian theorists (Easterly & Levine,2002), for whom monetary and financial phenomena are crucial to explain the level of activity, are traditionally interested not in growth (a long-term phenomenon), but in developing short-term models (Narziev, O., 2021; Eswar et al., 2007). More recent work carried out within the framework of endogenous growth models will aim to highlight the direct positive relationship between financial development (the development of financial intermediaries and capital markets) and economic growth. This affects economic growth by increasing productivity and capital efficiency.

The purpose of this paper will be explored through understanding the concept of "econometrics". Econometrics is a branch of economics that utilizes mathematical and statistical techniques to study the quantitative and qualitative relationships within economic phenomena (Greenwood & Jovanovic, 1990). This field's contemporary scope was outlined by the Econometric Society, which emphasized the integration of statistics and mathematics to advance economic theory as its primary objective. Econometrics is divided into two main areas: theoretical econometrics, which examines the statistical characteristics of estimators and testing methods, and applied econometrics, which applies these methods to evaluate economic theories. It offers tools for economic measurement and methodologies for estimating model parameters at both microeconomic and macroeconomic levels. Additionally, econometrics is widely employed in forecasting economic trends, applicable across the broader economy and within individual businesses, positioning it as a crucial component of economic theory, alongside macroeconomics and microeconomics (Caporale et al.,2005).

An assessment of influence of financial factors on economic growth in the short-term period should be carried out. For this purpose, the econometric model will be made.

Gross domestic product acts as a resultant factor for the last 20 years (Y). As the variables having impact on a resultant factor, the following variables act: size of the market of the capital, billion tenge, Y1; size of the market of securities, billion tenge, Y2. Size of the market of the capital, billion tenge (Y1) depends on the following variables tested in the model: number of operations on issue of securities; the volume of operations on issue of securities; number of operations of nonresidents with actions at the secondary auction of the KASE; rates of change of actions of leading issuers at the KASE. Size of the market of securities, billion tenge (Y2) depends on the following variables: primary placement at the KASE; volume of the credit market, billion tenge; volume of the insurance market, billion tenge; size of the market of derivative financial instruments, billion tenge.

2. LITERATURE REVIEW

A literature review on the influence of the capital market and financial instruments on economic growth in Kazakhstan and CIS countries entails an examination of scholarly articles, reports, and studies exploring various aspects of this relationship (Review of the financial market,2021; Review of the financial market, 2022). The review highlights theoretical foundations, empirical findings, and key discussions within the context of emerging market economies such as those in the CIS region. Here's a summary based on existing literature:

Theoretical Framework:

1. Modigliani-Miller Theorem on Capital Structure: Originally devised to comprehend the effects of debt and equity on a firm's value, this theorem establishes fundamental principles for understanding the functioning of financial markets in efficiently allocating resources (Ahmeti, F. & Prenaj, B.,2015).

2. McKinnon-Shaw Hypothesis: This hypothesis proposes that financial liberalization, leading to the development of financial markets, contributes to economic growth by improving savings rates, investment decisions, and technological advancements (Koshkina et al.,2015).

Empirical Findings:

1. Role of Financial Markets in Resource Allocation: Studies focusing on Kazakhstan and CIS countries highlight the capital market's role in facilitating efficient resource allocation, emphasizing the significant impact of stock markets and bond markets in mobilizing savings for investment in productive assets (Shakeyev, S. et al.,2023).

2. Impact of Financial Instruments on Economic Growth: Research indicates that a wide range of financial instruments, including derivatives, equity, and debt securities, play a vital role in hedging risks, diversifying investment portfolios, and enhancing liquidity, thereby supporting economic growth (Bencivenga, V.& Smith, B.,1991).

3. Regulatory Environment and Market Development: The literature underscores the importance of a robust regulatory framework in fostering market confidence, protecting investors, and ensuring market stability, which are crucial for the development of capital markets and their contribution to economic growth (Beck, T.& Levine, R.,2004; Chubrik, A.,2002; Aziakpono, M.,2011).

3. METHODS

3. 1. DATA SOURCES

An econometric model is a statistical or mathematical model that represents the relationship between two or more variables. Its use allows you to evaluate the influence of one variable on another and/or make predictions about the future value of variables.

Table 1. Econometric model

Year	Gross domestic product, billion tenge, Y	Size of the market of the capital, billion tenge, Y1	Number of operations on issue of securities	The volume of operations on issue of securities, billion tenge	Number of operations of nonresidents with actions at the secondary auction of the KASE	Rates of change of actions of leading issuers at the KASE	Size of the market of securities, billion tenge, Y2	Primary placement at the KASE	Volume of the credit market, billion tenge	Volume of the insurance market, billion tenge	Size of the market of derivative financial instruments
	Y	Y1	Variables for Y1				Y2	Variables for Y2			
2006	162	49878	10172	110	98000	19	10580	9	7141	471	21980
2007	611	50420	11450	98	87000	18	11045	8	7420	470	22090
2008	1429	51770	12390	125	101000	12	11520	9	7880	488	23101
2009	2019	52888	13570	101	89000	12	11960	35	8370	496	22450
2010	2343	52890	14400	112	87900	8	12111	9	8452	530	23780
2011	2630	52880	15000	87	88700	16	12880	36	9540	590	24110
2012	4823	53897	13800	102	112013	1	12780	4	9880	598	24890
2013	7306	53961	12100	89	115000	7	13110	19	10470	670	25120
2012	7944	53290	11200	95	110000	2	13520	16	10450	660	25870
2013	10831	54870	13500	103	80900	5	14199	17	11945	695	26111
2014	13208	54930	14800	115	95600	9	14660	8	11094	710	26489
2015	17027	55987	12300	118	95400	6	14321	48	12110	732	27550
2016	21610	56482	14500	121	87890	2	14980	12	12870	754	28450
2017	26917	56890	12800	126	98700	3	14870	8	13154	798	29740
2018	32248	57420	14780	124	87400	4	15110	9	13298	801	29880
2019	41277	57880	12357	131	88900	3	15420	8	14170	821	30120
2020	38877	58370	12450	145	87980	10	15780	19	14381	870	30332
2021	46322	59072	16880	118	84750	4	16761	8	15267	991	30937
2022	55329	61234	15900	98	89570	5	19609	28	20121	1267	32484
2023	62357	66061	15400	92	88740	11	11567	23	24483	1479	35492

Source: Review of the financial market, 2022

In this case, two groups of variables Y1 and Y2 will be studied, which will allow us to estimate the dynamics of GDP in a chronological framework from 2006 to 2023. Table 1 represents the econometric model.

3. 2. MODEL SPECIFICATION

Building a model based on regression analysis of the selected parameters allows to establish and formalize the relationship between different indicators in the form of an equation:

$$\hat{Y}_i = b_0 + b_1 X_{1i} + b_2 X_{1i}^2 \quad (1)$$

Running a regression analysis, Excel provides standard output that is important for interpreting the results of model. These results are presented in tabular form and are often referred to as Table 2 in academic papers and publications. The content of this message includes, but is not limited to, the following key metrics:

1. Multiple R – correlation coefficient of R;
2. R2 - determination coefficient R2;
3. Adjusted R2
4. Standard error;
5. Observations.

Table 2. Correlation

	Column 1	Column 2	Column 3	Column 4	Column 5
Column 1	1				
Column 2	0,595791	1			
Column 3	0,129059	-0,08987	1		
Column 4	-0,31015	-0,44792	-0,24857	1	
Column 5	-0,40246	-0,29092	-0,24236	-0,18373	1

Source: by authors

At the next stage of the correlation analysis, multiple correlation coefficients were studied and checked for significance (Table 3).

Table 3. Co-variation

	Column 1	Column 2	Column 3	Column 4	Column 5
Column 1	14010298				
Column 2	3744041,2	2818684,1			
Column 3	7339,7	-2292,375	230,85		
Column 4	-10696555	-6929030,2	-34799,25	84898313	
Column 5	-7946,625	-2576,5325	-19,425	-8930,275	27,8275

Source: by authors

Since the analysis of the correlation coefficient matrix revealed the presence of multicollinearity, it makes sense to use an algorithm for step-by-step inclusion of variables to obtain the optimal regression equation. To do this, the explanatory variable with the highest correlation coefficient with the dependent variable (0.66) was included in the model (Table 4).

Table 4. Regression Statistics

Multiple R	0,661146
R Square	0,437115
Adjusted R Square	0,287012
Standard Error	3242,673
Observations	20

Source: by authors

Table 5 contains the results of the dispersion analysis which is used for the control of R2 significance:

df column – the number of degrees of freedom. For Regression row, the number of the degrees of freedom is equal to the number of factor indications of the regression equation; for Residuals row, this number equals the number of observations minus the number of variables in the regression equation (m+1).

SS column – the sum of squared errors. For the Regression row this is the sum of squared deviations of theoretical data from the average - RSS; for the Residuals row this is the sum of squared deviations of empirical data from the theoretical – ESS.

MS column is calculated as SS/df.

F column is the calculated value of Fisher's criterion.

F significance is the value of significance corresponding to the calculated value of F.

Table 5. F significance

	df	SS	MS	F	Significance F
Regression	4	122482092	30620523	2,912101	0,0574682
Residual	15	157723875	10514925		
Total	19	280205967			

Source: by authors

Table 6 contains the values of regression coefficients bi and their statistical estimations. The columns have the following interpretation:

Coefficients – the values of bi coefficients;

Standard error - Sbi standard errors of the coefficients bi;

t-statistics – the values of t-criterion calculated as bi/Sbi;

P-value – the levels of significance corresponding to the calculated value of t-statistics;

Lower 95% and upper 95% - lower and upper bounds of confidence intervals for the regression coefficients bi.

Table 6. Coefficients of the model for Y1

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	46697,24	21040,73	2,219374	0,0423	1849,988	91544,49	1849,988	91544,49
X Variable 1	1,023668	0,587354	1,742847	0,101817	-0,22825	2,275583	-0,22825	2,275583
X Variable 2	16,90115	56,90352	0,297014	0,770529	-104,386	138,1881	-104,386	138,1881
X Variable 3	-0,05624	0,107818	-0,52165	0,60953	-0,28605	0,173566	-0,28605	0,173566
X Variable 4	-197,038	173,5029	-1,13565	0,273925	-566,851	172,7746	-566,851	172,7746

Source: by authors

4. RESULTS

A T-test is a statistical tool that checks if there is any difference or correlation between two different datasets. The t-test formula verifies this by comparing the average values of both data sets presented in Table 7. In order to check whether our model is appropriate, good or bad, we must make some tests.

R^2

R Square is almost 1 => as the value of R square lies between 0 and 1 and is closer to 1, then our model is well explained and our regressors are chosen correctly and they explain regressants well enough.

F-test

Femp > Fcrit => R square formed not under the influence of random factors. Significance F < 0.05 => Model has a good explanatory ability.

Table 7.T-Test

	Coefficients	Standard Error	t Stat
Intercept	46697,24	21040,73	2,219374
X Variable 1	1,023668	0,587354	1,742847
X Variable 2	16,90115	56,90352	0,297014
X Variable 3	-0,05624	0,107818	-0,52165
X Variable 4	-197,038	173,5029	-1,13565

Source: by authors

Tcrit is equal to 2,13145. Absolute values of t Stat of $\beta 1$ and βn > tcrit, then our coefficients are significant.

In addition, the Goldfeld-Quandt test was performed to determine whether heteroskedasticity is present (Table 8) using the following equation:

$$Y(t) = 46697{,}24 + 1023668 * X1(t) + 16{,}90115 * X2(t) - 0{,}05624 * X3(t) - -197{,}038 * X4(t) + u(t) \quad (2)$$

GQ test checks if model is the homoscedastic or heteroschedastic according to the Gauss-Markov theorem's condition. Model is homoschedastic if:

$$\begin{cases} GQ \leq Fcrit \\ 1/GQ \leq Fcrit \end{cases} \quad (3)$$

Table 8. Goldfeld-Quandt test

GQ	0,1046
1/GQ	9,56
Fcrit	5,05

Source: by authors

Fcrit > GQ and < 1/GQ ==> the variance isn't constant in different time periods. Then our model is heteroschedastic. Then we must reestimate our model and should divide data by the variance of the disturbance term.

The test assumes that d lies between 4 and 0, presented in Table 9. The critical value of d at any significance level depends on the number of explanatory variables in the regression equation and the number of observations in the sample. Our estimations show that d critical is 0,927 and it lies between 0 and dl (1.244). It means that there is no information about autocorrelation of residuals.

Table 9. Durbin-Watson test

			d			
		DW	0,9271928			
	d_L	d_U		$4\text{-}d_L$	$4\text{-}d_U$	
0	1,244	1,65	2	2,35	3,756	4
	DW lies between 0 and dL => there is a positive autocorrelation (nearest residuals).					
	So, the third null hypothesis is rejected => $E(\varepsilon_i,\varepsilon_j)\neq 0$					

Source: by authors

Coefficients of the model for Y2 are represented in Table 10.

Table 10. Coefficients of the model for Y2

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-9554,31	6017,447	-1,58777	0,133191	-22380,2	3271,578
X Variable 1	40,04568	32,50332	1,232049	0,236896	-29,2335	109,3249
X Variable 2	-2,03974	0,906172	-2,25094	0,039816	-3,9712	-0,10828
X Variable 3	21,97329	13,1992	1,664745	0,116707	-6,16013	50,10671
X Variable 4	1,149263	0,341636	3,364001	0,004261	0,421084	1,877442

Source: by authors

Tcrit is equal to 2,13145. Absolute values of t Stat of β1 and βn > tcrit, then our coefficients are significant.

$$Y(t) = -9554{,}31 + 40{,}04568 * X1(t) - 2{,}03974 * X2(t) + 21{,}97329 * X3(t) + + 1{,}1492363 * X4(t) + u(t) \quad (4)$$

GQ test checks if model is the homoscedastic or heteroschedastic according to the Gauss-Markov theorem's condition (Table 11). Model is homoschedastic if:

$$\begin{cases} GQ \leq Fcrit \\ 1/GQ \leq Fcrit \end{cases} \quad (5)$$

Table 11. GQ test for Y2 model

GQ	0,00246
1/GQ	406,44
Fcrit	5,05

Source: by authors

Fcrit > GQ and < 1/GQ ==> the variance isn't constant in different time periods. Then our model is heteroschedastic.

The test assumes that d lies between 4 and 0, presented in Table12. The critical value of d at any significance level depends on the number of explanatory variables in the regression equation and the number of observations in the sample. Our estimations show that d critical is 0,927 and it lies between 0 and dl (1.244). It means that there is no information about autocorrelation of residuals.

Table 12. Durbin-Watson test

			d			
		DW	2.52143			
	d_L	d_U		$4-d_L$	$4-d_U$	
0	1,244	1,65	2	2,35	3,756	4
	DW lies between $4-d_L$ and $4-d_U$ => there is a negative autocorrelation.					

Source: by authors

Coefficients of the model for Y are represented in Table 13.

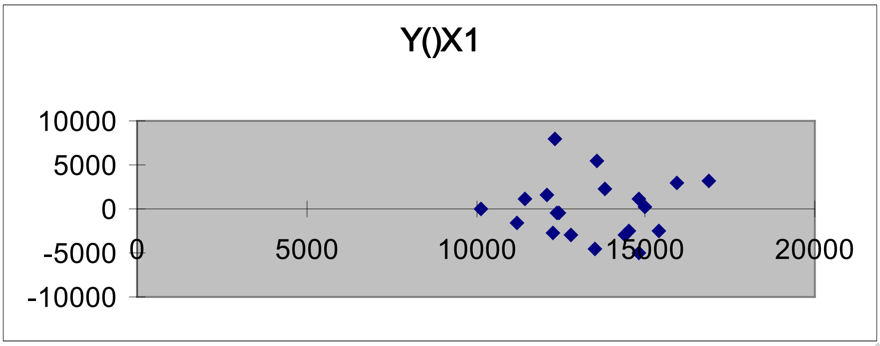
Table 13. Coefficients of the model for Y

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-58360,4	41149,21634	-1,418263545	0,183817	-148929,2	32208,38
X Variable 1	-0,72575	0,948867647	-0,764856924	0,460451	-2,814192	1,362696
X Variable 2	154,74	124,3467772	1,244423452	0,239206	-118,9454	428,4255
X Variable 3	-0,25282	0,169092891	-1,495152499	0,163	-0,624991	0,119351
X Variable 4	9,071495	331,7107118	0,02734761	0,978672	-721,0189	739,1618
X Variable 5	-50,6915	94,98219417	-0,533694641	0,60417	-259,7459	158,3629
X Variable 6	-3,27932	2,921006838	-1,122669033	0,285485	-9,708417	3,149769
X Variable 7	93,05088	47,89247002	1,942912629	0,078054	-12,35973	198,4615
X Variable 8	2,430478	1,896936842	1,28126468	0,226452	-1,744652	6,605608

Source: by authors

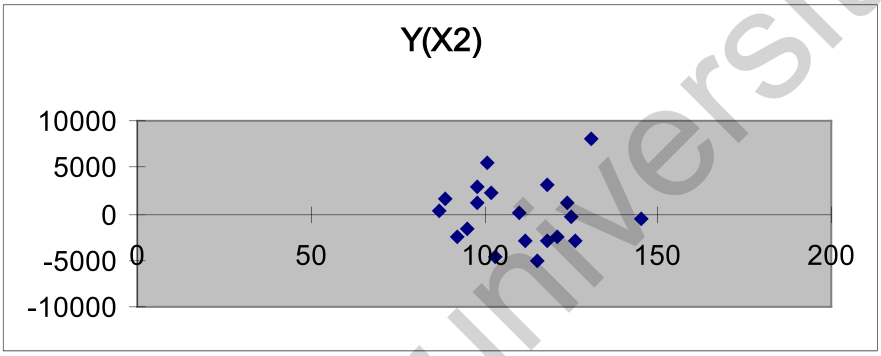
Dispersion charts for X1-X8 variables are submitted in figures 1-8.

Figure 1. Dispersion charts for X1



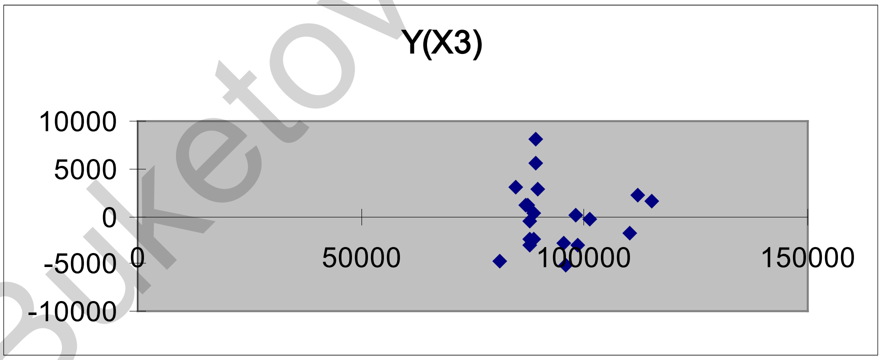
Source: by authors

Figure 2. Dispersion charts for X2



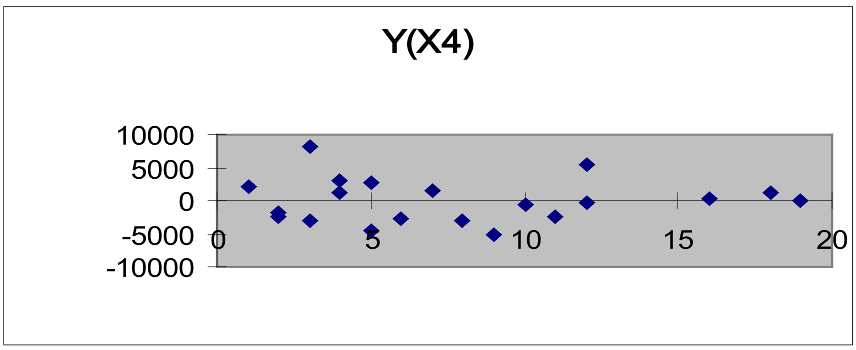
Source: by authors

Figure 3. Dispersion charts for X3



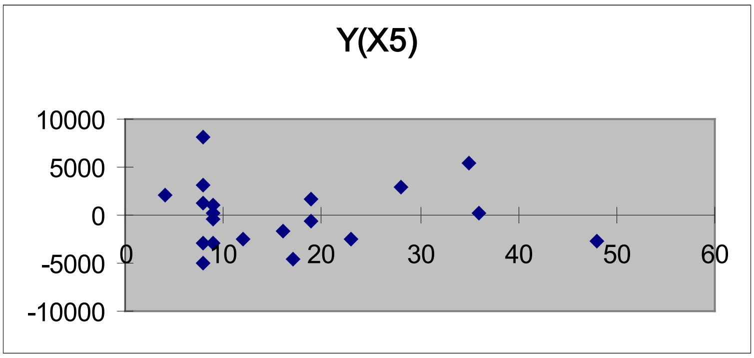
Source: by authors

Figure 4. Dispersion charts for X4



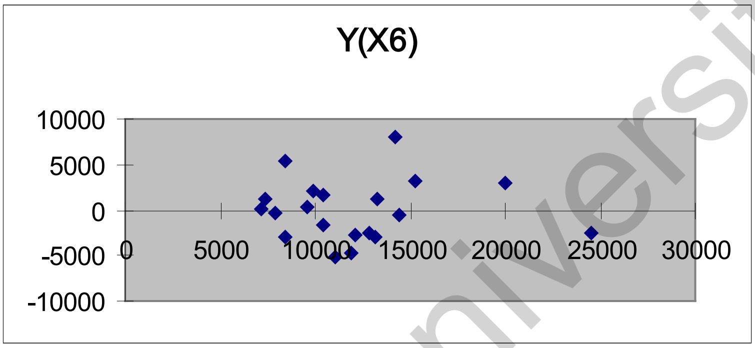
Source: by authors

Figure 5. Dispersion charts for X5



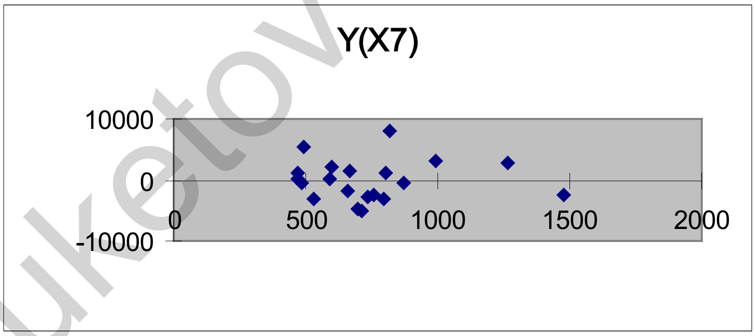
Source: by authors

Figure 6. Dispersion charts for X6



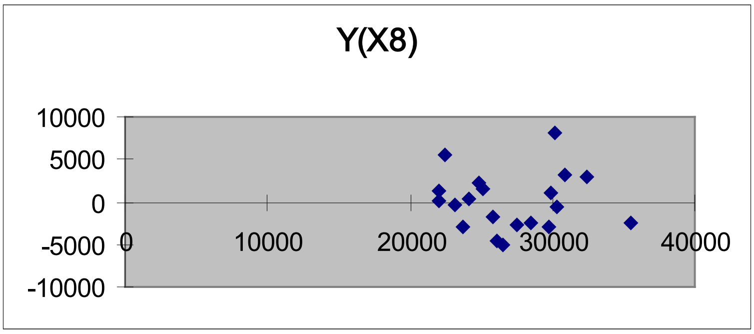
Source: by authors

Figure 7. Dispersion charts for X7



Source: by authors

Figure 8. Dispersion charts for X8



Source: by authors

T-Test for Y-model is represented in Table 14.

Table 14. T-Test for Y-model

	Coefficients	Standard Error	t Stat
Intercept	-58360,4	41149,21634	-1,418263545
X Variable 1	-0,72575	0,948867647	-0,764856924
X Variable 2	154,74	124,3467772	1,244423452
X Variable 3	-0,25282	0,169092891	-1,495152499
X Variable 4	9,071495	331,7107118	0,02734761
X Variable 5	-50,6915	94,98219417	-0,533694641
X Variable 6	-3,27932	2,921006838	-1,122669033
X Variable 7	93,05088	47,89247002	1,942912629
X Variable 8	2,430478	1,896936842	1,28126468

Source: by authors

Tcrit is equal to 2,202085. Absolute values of t Stat of β1 and βn > tcrit, then our coefficients are significant.

$$Y = - 58360{,}4 - 0{,}72575 * X1 + 154{,}74 * X2 - 0{,}25282 * X3 + 9{,}071495 * X4 - 50{,}6915 * X5 - 3{,}27932 * X6 + 93{,}05088 * X7 + 2{,}430478 * X8 + u(t) \quad (6)$$

5. DISCUSSION

GQ test checks if model is the homoscedastic or heteroschedastic according to the Gauss-Markov theorem's condition, presented in Table 15. Model is homoschedastic if:

$$\begin{cases} GQ \leq Fcrit \\ 1/GQ \leq Fcrit \end{cases} \quad (7)$$

Table 15. Goldfeld-Quandt test

GQ	0,095587
1/GQ	10,46
Fcrit	3,79

Source: Beck & Levine, 2004

Fcrit > GQ and < 1/GQ ==> the variance isn't constant in different time periods. Then our model is heteroschedastic.

The Durbin—Watson test is based on a simple idea: if the correlation of regression errors is not zero, then it is also present in the regression residualse (resulting from the application of the usual least squares method. The Durbin—Watson test uses statistics of the form to assess correlation. Simple calculations allow us to verify that the Durbin—Watson statistics are related to the sample correlation coefficient between neighboring observations in the following way (Table 16).

Table 16. Durbin-Watson test

			d			
		DW	0,46371			
	dL	dU		4-dL	4-dU	
0	1,244	1,65	2	2,35	3,756	4
	DW lies between 0 and dL => there is a positive autocorrelation (nearest residuals).					
	So, the third null hypothesis is rejected => E(εi,εj)≠0					

Source: by authors

The test assumes that d lies between 4 and 0. The critical value of d at any significance level depends on the number of explanatory variables in the regression equation and the number of observations in the sample. Our estimations show that d critical is 0,927 and it lies between 0 and dl (1.244). It means that there is no information about autocorrelation of residuals.

6. CONCLUSION

In this work the model of GDP function to the economy of Kazakhstan is represented. The coefficients of the model for forecasting the level and future changes of GDP of the country are estimated. As the variables having impact on a resultant factor, the following variables act: size of the market of the capital, billion tenge, Y1; size of the market of securities, billion tenge, Y2.

These variables depend on the other variables. Thus, size of the market of the capital (Y1) depends on the following variables tested in the model:

- number of operations on issue of securities;
- the volume of operations on issue of securities;
- number of operations of nonresidents with actions at the secondary auction of the KASE;
- rates of change of actions of leading issuers at the KASE.

Size of the market of securities (Y2) depends on the following variables:

- primary placement at the KASE;
- Volume of the credit market, billion tenge;
- Volume of the insurance market, billion tenge;

As the result we got model of this general form:

$$Y = -58360{,}4 - 0{,}72575 * X1 + 154{,}74 * X2 - 0{,}25282 * X3 + 9{,}071495 * X4$$
$$- 50{,}6915 * X5 - 3{,}27932 * X6 + 93{,}05088 * X7 + 2{,}430478 * X8 + u(t)$$

The model is good for application in case of adequacy, then it is possible and reasonable to use it for forecasting.

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