ECONOMETRIC ANALYSIS OF SMALL BUSINESS DEVELOPMENT IN THE DIGITAL ECONOMY

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Abstract: In this article the factors that affect the development of small business entities in the region's economy and determination the relationship between them through correlation-regression analysis as well as directions of development of social and labor relations in the enterprises of the industry are identified.

Key Words: small business, private entrepreneurship, socio-labor relations, labor resources, correlation-regression analysis, multidimensional model, coefficient of determinism, econometric model, Fisher criterion..

Introduction

Encouragement of the small business and private entrepreneurship in our republic is one of the essential, strategic factors of socio-economic development of the country. The small business creates conditions for the expansion of employment and the increasing of the income of the population, eliminates the possible conflicts between the social groups and forms a favorable social environment. In this context, the special attention to the development of small business and private entrepreneurship is being paid in our republic. The issue of development of small business and private entrepreneurship is considered as a strategic task of the economic policy of our state.

Econometric analysis of the development of economic entities in the sphere of small business allows determining the strength of complex relation socio-economic phenomena by means of economic and mathematical methods, identifying existing laws and conducting experimental research on them.

Literature Review

 1. Ivanova M.A. Economic statistics. Textbook. - M., INFRA, 2000. P.210

This textbook highlights the methods of constructing econometric models, correlation and regression analysis methods. In addition, periodic rows of research, dispersion, correlation and factorial analysis methods and various aspects have been characterized and the methods of constructing the system of econometric equations used in the interpretation of the results of

econometric research, dynamic econometric models, and expert assessment methods have been studied.

2. Andrew F., Siegel. Statistics - practical business. 4th edition, Moscow: Williams Publishing House, 2002. P.389-450

In this work peculiarities of economic systems which are considered in econometric models, using the least squares method in the processing of economic information, correlation, dispersion, factor analysis methods and the system of econometric equations are investigated.

3. Abdullaev A.M., Djamalov M.S. Econometrics-2. Textbook for Higher education - T.: 2011. P. 612

In this textbook has been expressed the factors on the construction of econometric models and the calculation link of multicollinearity, issues on econometric modeling, and correlation and regression analysis methods.

In addition, periodic rows of research, dispersion, correlation and factorial analysis methods and various aspects have been characterized and the methods of constructing the system of econometric equations used in the interpretation of the results of econometric research, dynamic econometric models, and expert assessment methods have been studied.

4. Magnus Ya.R., Katyshev P.K., Peresetskiy A.A. Econometrics. Textbook. - M., 2005. – P.499.

This work investigated methods of constructing econometric models, connection between factors, correlation and regression analysis. Moreover, it has been studied the techniques of periodic rows, dispersion, correlation and factor analysis and various aspects of dynamic econometric models and expert assessment methods.

Research Methodology

In the course of the investigation, dialectical and systemic approach, comparative and contrastive analysis methods, statistical and dynamic approach, and regression and correlation analysis were used in the study the economic systems and rates of economic development economic entities in the sphere of small businesses.

In the present day, a large number of software products have been created in order to accelerate the process of implementing these methods and to select an essential model of analysis. We carried out the following analysis using SPSS software package.

Analysis and results

While conducting research we studied the scientific works of scientists like Abdullayev A.M., Djamalov M.S. [3], Ya.R.Magnus [3], M.Ivanova [2], Andrew F. Siegel [5] while evaluating the development of small business entities activities and working out a model of forecasting. They have worked out prospective methods based on developed econometric analysis, i.e., methods of correlation-regression analysis and they worked on their improvement.

As a result of the analysis of the development of small business entities by correlation-regression analysis methods, it is determined to determine the strength of the connection amongst the factors, and to develop social-labor relations in the industries of the field, and finally will be determined the directions for achieving labor productivity. The most important step in the strategy of the model is to

select the econometric expression describing the dependence of the predicted indicator on selected factors.

At the moment identifying key factors that influence the development of small business entities by using correlation-regression methods, predicting their development prospects by creating multi-factor regression models is an urgent problem.

The research begins with the identification of all the factors affecting the development of the subjects of small business and choosing the most important of them using correlation-regression methods.

In order to create econometric model of development of subjects of small business in Samarkand region the following factors were selected:

Table 1

Factors influencing the volume of gross product created in the small business sectors in Samarkand region[1]

Result: the volume of gross product created in the small business sector, UZS billion. UZ - Y	
Factors	**Character**
share of small business and private entrepreneurship in GRP,%	X_1
average tax load on small businesses,%	X_2
Refinancing rate set by the Central Bank,%	X_3
Investments into fixed capital in the sectors of the economy (UZS bn.)	X_4
Number of operating small businesses, units;	X_5
The volume of small business in fixed capital investments, UZS billion	X_6
those employed in small entrepreneurship, (thousand people)	X_7
labor productivity in small business, (thousand soums)	X_8
Price index (inflation), (%)	X_9
Export volumes of small businesses sectors, (million. USD)	X_{10}

The factors influencing the development of the econometric model of small business sectors developments in the Samarkand Region were selected (Table 1). Correlation-regression analysis methods can be used to determine the effect of these factors on the resulted factor. This is determined by calculating the pair correlation coefficients. This method gives us opportunity not to add factors that are duplicating and weakly linked to the resultant factor into the constructed econometric model.

Table 2

Values of factors included in the correlation-regression analysis[2]

	Y(t)	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
2005	577,3	49,9	22,6	16,0	203,5	9666	73,3	738,6	781,6	7,8	34,4
2006	996,9	64,2	22,4	16,0	233,4	10495	95,4	797,7	1249,7	6,8	73,9
2007	1336,2	66,4	22,4	14,0	305,5	11605	119,1	864,2	1546,2	6,8	128,9

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[1] Worked out by the author.

[2] Worked out by the author.

2008	1718,1	68,8	22,1	14,0	403,7	10288	152,2	921,6	1864,3	7,8	90,8
2009	2138,3	71,2	22,0	14,0	551,4	10626	177,0	961,9	2223,0	7,4	110,8
2010	2925,1	73,6	21,9	14,0	934,2	10689	362,8	1009,0	2899,0	7,3	66,6
2011	3771,1	76,2	21,8	12,0	1145,2	12517	568,8	1045,5	3607,0	7,2	97,8
2012	4795,3	75,9	21,6	12,0	1383,3	11117	702,7	1075,1	4460,3	7,0	96,2
2013	6153,9	77,1	21,6	12,0	1914,9	12648	923,1	1129,2	5449,8	6,8	215,5
2014	7119,3	77,4	21,6	10,0	2247,8	12860	1293,0	1174,3	6062,6	6,1	213,7
2015	8762,8	77,9	21,5	9,0	2854,0	13840	1297,1	1213,9	7218,7	5,6	272,5
2016	11737,0	78,0	21,4	9,0	3321,4	13981	1315,5	1254,6	9355,2	5,7	278,2
2017	14325,8	78,2	21,3	14,0	3307,1	16005	1356,2	1298,7	11030,9	14,4	295,4
2018	18546,4	78,3	21,2	14,0	5746,9	20669	3102,0	1347,4	13248,3	14,5	257,4
2019	29135,3	77,5	21,3	16,0	6106,3	25643	3246,3	1345,8	14826,4	16,0	298,5

Then a multi-factor econometric model will be formed by using correlation-regression methods. Multi-factor correlation-regression analysis is used in order to determine the econometric model of factor dependence. The following econometric model (multi-factor regression equation) was used to analyze the development of small business sector in the Samarkand region:

$$1)\ y = \beta_0 + \sum_{i=1}^{m} \beta_i x_i, \qquad (1)$$

Linear model;

Here,

β_0 – free limit;

y - employment level of graduates;

x_i - Factors influencing the employment level of graduates;

β_i - multi - factor model parameters; (i= 1,2,3....m);

m - Number of selected factors.

The given $y = f(x_1, x_2, ..., x_n)$ must be found. We use the method small squares to determine this connection.

Table 3

№	Name	Expression
1.	Constant, free limit	$\beta 0$
2.	Multi-factor correlation coefficient	R^2
3.	Uncertain parameters of multiple factor regressions	$\beta 1, \beta 2,... \beta k$
4.	The standard error of the evaluation	the model becomes so important if the value is small
5.	Determination coefficient	If the value is about 1, the model considered adequate
6.	F-Fischer's coefficient	If $F_{xaқ} > F_{maбл}$ the coefficient of determining is significant

7.	P-Value	(Criterion indicating the importance of "zero" hypothesis) model less than 0.05 is considered as a significant model

The peculiarity of multi-factor correlation connections is that, in its regression equation, several important and substantial factors are involved. Right choice of the most significant among these factors and their introduction into the regression equation has a great importance. It is based on the choice of factors and the qualitative theoretical analysis and it will be conducted in three stages. At the first stage (in the initial analysis) factors are selected without any terms. In the second step, they are analyzed using the pair correlation coefficients. In order to this, the matrix of the pair correlation coefficients between the symbols y_1, x_1,x_2,...,x_n is formed. In the third stage of the factor analysis, the regression equation is determined and whether its parameters are characteristic or not, are evaluated by special measure.

Correlation analysis methods can be used to determine the effect of these factors on the resultant character. Here, the pair correlation coefficient is defined as follows:

$$r_{ij} = \frac{\left(\sum x_i x_j - \sum x_i \times \sum x_j / n\right)}{\sqrt{\left(\sum x_i^2 - \left(\sum x_i\right)^2 / n\right)\left(\sum x_j^2 - \left(\sum x_j\right)^2 / n\right)}} \quad (2)$$

In order to determine which factors should be included in the regression equation, we construct pair correlation coefficients between the factors (Table 4).

Table 4
Matrix of mutual pair correlation coefficients of the affecting factors

	Y(t)	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
Y(t)	1,00										
X1	0,69	1,00									
X2	-0,88	-0,91	1,00								
X3	-0,62	-0,74	0,76	1,00							
X4	0,98	0,73	-0,91	-0,75	1,00						
X5	0,94	0,70	-0,82	-0,59	0,92	1,00					
X6	0,93	0,75	-0,91	-0,80	0,98	0,89	1,00				
X7	0,93	0,89	-0,98	-0,78	0,95	0,89	0,95	1,00			
X8	1,00	0,72	-0,90	-0,65	0,98	0,94	0,94	0,95	1,00		
X9	0,40	0,04	-0,19	0,41	0,21	0,41	0,14	0,21	0,37	1,00	
X10	0,92	0,68	-0,80	-0,70	0,93	0,93	0,91	0,88	0,92	0,20	1,00

$r_{ij}$$x_i$ and x_j in the table are the pair correlation coefficient between the factors. It is known that, in the multi-factor regression equation, strongly correlated correlation factors should not be interconnected simultaneously[3]. As can be seen in Table 4, some factors' mutual (z_i and z_j) pair

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[3] Abdullayev Yo. General Theory of Statistics. - T. Fan, 1993.P.240

correlation coefficient (r_{ij}) is less than its critical value for absolute value, i.e. $|r_{ij}| < r_{kr.}$. Therefore, four from all factors were planned to be included in the econometric model, here as a critical value of correlation coefficient is taken as $r_{kr} = 0,91$.

If we analyze the above table, we will see that there are strong interconnected factors that are larger r_{kr} than critical values. Therefore, we found to deduce factors from the regression equation the factors x_2, x_4, x_7, x_8ва x_{10}, and x_9 factors from $|r_{Yx_i}| \geq 0,5$ weakly connected to Y.

The most important stage in the analysis of socio-economic development by using correlation-regression analysis is the choice of the econometric expression describing the dependence of the resultant indicator on selected factors. Quality, significance and reliability of the formed econometric expression are assessed on the basis of the following criteria:

1) The overall quality of the econometric model is evaluated by the multi-factor correlation coefficient and the coefficient of determinism;

2) The importance of econometric models will be assessed using the Fisher criterion and the error of approximation;

3) The importance of the econometric model parameters is evaluated using the St'yudent criterion.

In determining the general quality of the defined regression equation, the coefficient of determinability (R^2) is calculated using the following formula:

$$R^2 = 1 - \frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{\sum_{i=1}^{n}(y_i - \bar{y})^2} \quad , (3)$$

y_i - The observed number of the resultant indicator;

$\bar{y}$ - average arithmetic value of the resultant indicator;

$\hat{y}$ - Detected, forecasted, leveled number of the resultant indicator;

n - Number of observations.

The model which is determined the determinant coefficient i.e. shows the share of the resultant variable dispersion that is explained by the influence of the factors being considered. This value includes values between "0" and "1". The closer it is to the value of "1," the factors that are included in the regression equation justify the action of the resulting indicator.

An analysis of the significance of the identified model is carried out by checking as "the hypothesis of equal to zero ". "The hypothesis of equal to zero" is expressed as $H_0 : \beta_1' = \beta_2' = ... = \beta_k' = 0$ refers to the general value of the regression coefficient. If the results of the analysis do not deny the "The hypothesis of equal to zero", in that case it can be concluded as: factors $x_1, x_2, ..., x_k$ affect to the resultant indicator "y" is not significant and the overall quality of the regression equation is low", The "hypothesis of equal to zero " is checked by using a dispersion analysis, and the "hypothesis of equal to zero " $H_0 : D_{fact} = D_{residue}$ is alternative hypothesis expresses as H_1: $D_{fact} = D_{residue}$. The F-Fisher criterion is used to check these hypotheses.

The real value of the criterion is determined by the following formula:

$$F = \frac{\sum_{i=1}^{n}(\hat{y}_i - \bar{y})^2 / k}{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2 /(n-k-1)} = \frac{R^2}{1-R^2} * \frac{(n-k-1)}{k} \quad , (4)$$

Here:

$\sum_{i=1}^{n}(\hat{y}_i - \bar{y})^2 / k$ – Factor dispersion corresponding to one level of liberty (number of degrees of liberty $\gamma 1 = k$);

$\sum_{i=1}^{n}(y_i - \hat{y}_i)^2 /(n-k-1)$ – residual dispersion corresponding to one degree of liberty (number of degrees of freedom $\gamma 1 = n-k-1$);

n - number of observations;

k - number of factors (parameters) in multi-factor regression equation.

The actual value of the F-Fisher criterion (F_{real}) will be compared with the value of the criterion (F_{table} (α; k; n-k-1)). If $F_{real} > F_{table}$ in that case determined model is defined as significant.

Conclusion and Recommendations

Thus, according to the final reflections the effects of factors as "the volume of gross product created in the small business sector" is "share of small business and private entrepreneurship in GRP,%", "refinancing rate set by the Central Bank,%", "number of operating small businesses, units", "the volume of small business in fixed capital investments, UZS billion" are significant. The effect of these factors on the resulted indication can be explained by the following:

1. Increase in the share of small business and private entrepreneurship in GRP (X_1) by 1.0% will result in increase of gross output in small business by 6.535%;

2. Increase in the refinancing rate (X_3) established by the Central Bank by one percent will result in a decrease in the volume of gross output created in the small business sector to 402.135 million soums;

3. The increase in the number of operating small business subjects (X_5) by one percent will lead to a 1,020% increase in the volume of gross domestic product created by small businesses;

4. Increase in the volume of small business (X_6) in fixed capital investments by one percent will result in an increase in the volume of gross product created in the small business sector by 5,897%.

With the help of the econometric model described above (2 ...), we have compiled the list of perspective models for the X_1, X_3, X_5, and **X_6** factors influencing the volume of gross domestic product created by the use of statistical data in Samarkand region for 2005-2017.

References
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