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Econometric Assessment of the Factors of Enterprise Receivables

Ekaterina Ivanovna Kadochnikova[1], Natalya Borisovna Semenikhina[2] and Alina Nailovna Garifullina[3]
[1]Associate Professor, Head University/Institute of Management, Economics and Finance/Department of Economic Theory and Econometrics, Kazan Federal University Russia.
[2]Associate Professor , Head University/Institute of Management, Economics and Finance/Department of Accounting, Analysis and Auditing, Kazan Federal University Russia.
[3]Institute of Management, Economics and Finance/Department of Economic Theory and Econometrics, Kazan Federal University Russia.

(Corresponding author: Ekaterina Ivanovna Kadochnikova)
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ABSTRACT: The authors built a linear model of accounts receivable multiple regression of agricultural enterprises depending on its financial performance. The authors used a sample of non-stationary time series with a deterministic trend from 2016 to 2018 quarterly. According to the Frisch–Waugh–Lovell theorem for regression construction, time series were reduced to a stationary form by including the trend component as an additional regressor. The study of the relationship of accounts receivable with financial indicators revealed that there is a close relationship between accounts receivable and sales revenue, accounts payable, and cash. The assumption about the relationship of receivables and cash assets of the company received a reasoned proof. The reliability of the results is confirmed by the "short" - "long" test, Durbin-Watson test, Wight test. The results of the empirical estimates confirmed the feasibility of practical use of this approach in the modeling of receivables of agricultural enterprises for the purpose of its forecast. Forecasting receivables will allow the company to stimulate sales by providing discounts or benefits in the form of deferred payment to optimize receivables. The authors note that the forecast will allow managing the amount of receivables by reducing the maturity of debt, reducing the share and amount of doubtful and overdue debts.

Keywords: accounts receivable, sales revenue, accounts payable, time series, false correlation.

I. INTRODUCTION

In a market economy, proper management of accounts receivable is one of the important tasks in the functioning of the enterprise. Accounts receivable is one of the potentially liquid items of the balance sheet; it can be classified as "future economic benefits". If there is a clear, well-established mechanism and proper work with receivables, the company can convert it into cash in a short time, which will improve the financial performance [1]. Accounts receivable management is the process of developing and implementing management decisions to agree on its size, composition and speed of movement in time, providing the necessary profit and the optimal amount of free cash. Therefore, receivables directly affect the financial condition of the enterprise and its solvency [2]. It is important for an enterprise to be able to determine the level of accounts receivable at which it will work effectively and to assess the factors affecting accounts receivable [3]. The aim of the study is to measure the relationship of accounts receivable with sales revenue, accounts payable, cash. The main hypothesis of the study - the increase in cash assets of the enterprise is associated with a decrease in accounts receivable. Analysis of economic phenomena is difficult to imagine without the use of econometric models. The most common of these are linear multiple regression models. Earlier studies have already analyzed the dependence of accounts receivable on long-term and short-term sources. The key role was played by factors such as equity, accounts payable, short-term loans and borrowings, long-term liabilities [4]. During the study, calculations were carried out using econometric models to prove the relationship between receivables and financial performance of the organization.

II. METHODS

The study used quarterly data from 2016 to 2018 of the agricultural enterprise. Descriptive statistics of the variables used are presented in Table 1.

Table 1: Descriptive statistics of the used variables.

Variable	Designation	Average	Standard deviation	Minimum	Maximum
Receivables, RUB, in thousands	Y	14896,67	4088,48	5843	20908
Receivable turn over factor	X1	2,591224	1,51	0,56	5,80
Sales proceeds, RUB, in thousands	X2	38670,75	17589,44	12473	60498
Accounts payable, RUB, in thousands	X3	92766,33	3915,06	87213	97372
Monetary assets and monetary equivalent, RUB, in thousands	X4	318,8333	234,02	90	860
Trend component	X5	6,5	3,605	1	12

The source: estimated by the authors according to the financial statement data.

In the case of modeling of multidimensional time series in the construction of regression of one variable to another slope may be significant, but there is no causal (qualitative) relationship. This effect is called false correlation and is considered in [5, 6]. The false correlation means a coincidence in space and time of some events, but this is exactly a coincidence, and not a causal relationship. Often a false correlation occurs due to the following variable relationship. We observe some variables Y and X, which have similar dynamics, and we may mistakenly conclude that there is a causal relationship between them, but in fact they may depend on the unobservable variable Z, which affects both of them. To get rid of the false correlation, you must go to the model, where all variables are stationary. False correlation occurs under the influence of the time factor, in other words, the trend component in the correlated time series. In order to obtain correlation coefficients characterizing the causal relationship between the studied series, one should get rid of the so-called false correlation caused by the presence of a tendency in each series. This is usually done using one of the methods of excluding trends. In regression analysis it is possible to eliminate the influence of the factor, if you fix the impact of this factor on the result and others are included in the model factors.

This technique is widely used for regression with time series in the presence of a deterministic trend in at least one series. A time series with a deterministic trend can be brought to a steady state by selecting a linear trend. To do this, the regression equation should be introduced trend component (select linear trend) as an additional regressor. This will clear the original variables of the trend according to the Frisch-Waugh-Lowell theorem. In the study for estimation of regression dependencies used ordinary least-squares method for the verification of the models applied the tests of "short" - "long", the test of Durbin-Watson, Wight test.

III. RESULTS AND DISCUSSION

As can be seen from the matrix of linear coefficients of pair correlation (Table 2), the greatest absolute value belongs to the linear pair correlation coefficient between accounts receivable and cash. Collinear regressors are not detected.

In the study (Table 3) the estimation of the linear pair regression model (1) and two linear multiple regression models [7, 8] with the trend component were performed by the usual least squares method: for the complete set of regressors (2) and after the elimination of insignificant regressors (3).

Table 2: Matrix of pair correlation linear coefficients.

	Y	X1	X2	X3	X4	X5
Y	1					
X1	0,096509	1				
X2	0,386867	0,427281	1			
X3	0,21516	0,480099	0,348306	1		
X4	-0,75844	-0,32743	-0,53765	-0,50717	1	
X5	0,60302	-0,18588	-0,29059	0,235143	-0,26547	1

The source: obtained by authors in MS Excel.

Table 3: Summary table of econometric modeling results.

	Dependent variable– Receivables		
Predicated variable	(1)	(2)	(3)
X1 – Receivable turn over factor	-	161,5937 (441,997)	
X2-Sales proceeds	-	0,094221* (0,044)	0,096118* (0,041)
X3-Accounts payable	-	-0,404* (0,181)	-0,37608** (0,153)
X4-Monetary assets	11,2461*** (3,027)	-9,372** (3,321)	- 9,4782** (3,097)
X5-Trend component	490,0109** (196,491)	771,6501*** (193,674)	752,7572*** (174,721)
Free factor	15297,23 *** (1909,197)	46284,68*** (16264,04)	44196*** (14254,21)
Determination factor	0,748807	0,89658	0,954276
Observed value of Fisher statistic	13,414		15,13527
P-value of Fisher statistic	0,001995	0,006432	0,001587
Number of observation	12	12	12

The source: obtained by authors in MS Excel

Note: *** - coefficient is significant with reliability of 99%, ** - coefficient is significant with reliability of 95%,* - coefficient is significant with reliability of 90%, standard errors of coefficients are specified in brackets.

Compare the quality of fitting models (3) and (1) with the “short – long” test

H_0: $R^2_{UR} = R^2_R$

H_1: $R^2_{UR} > R^2_R$

$$F = \frac{R^2_{ur} - R^2_r}{1 - R^2_{ur}} \cdot \frac{n-m-1}{k} = \frac{0.954276 - 0.748807}{1 - 0.954276} \cdot \frac{12-4-1}{3} = 4.513$$

$F_{0,1;3;7} = 3,074$

$F_{0,05;3;7} = 4,346$

$F_{0,01;3;7} = 8,451$

At the significance levels α = 0,1 and α=0,05, the observed value of Fisher's statistics exceeds the critical value, therefore, with the reliability of 90% and 95%, the null hypothesis about the insignificant difference in the coefficients of determination of the "long" and "short" models can be rejected, we choose the "long" model, thereby confirming the correlation between sales revenue, accounts payable and cash receivables. In particular, for variable X2 - sales revenue - with a

reliability of 90%, for variables X3 – accounts payable, X4 – cash – with a reliability of 95%. The presence of the trend component in the time series is confirmed with 99% reliability.

The observed value of the statistics of Durbin –Watson is equal to 2,600387 critical with d1 = 0.97 and d2 = 1.33 times less than 4-d2, then in the residuals regression is no autocorrelation. To check the regression residuals for heteroskedasticity, a simplified version of the white test was used in the study. Heteroskedasticity is the heterogeneity of the error variances of the regression equation, the reasons for which may be an error in the specification of the model or the nature of cross-sectional data. According to the test the estimation of regression of squared residuals was made on the original variables (Table 4).

Table 4: Results of squared residual regression for Wight test performance.

Regressionstatistics						
Multiple R					0,563374	
R-square					0,317391	
Normalized R-square					-0,07267	
Standarderror					3048356	
Observation					12	
Analysisofvariance						
	Df	SS	MS	F	Significance F	
Regression	4	3,02E+13	7,56E+12	0,813691	0,554707	
Residual	7	6,5E+13	9,29E+12			
Total	11	9,53E+13				
	Factors	Standarderror	t-statistics	P-value	Lower 95%	Upper 95%
Intercept	-1,5E+07	26074278	-0,55642	0,595256	-7,6E+07	47147649
X2	-63,2406	74,76771	-0,84583	0,425614	-240,038	113,5569
X3	208,0969	280,1095	0,742913	0,481717	-454,257	870,4506
X4	-4485,05	5664,975	-0,79172	0,454514	-17880,6	8910,488
X5	107594,2	319605,6	0,336647	0,74625	-648153	863341,4

From the obtained regression we are only interested in the value of the coefficient of determination R^2, equal to 0,317391, therefore, the statistics is the following:

$$\chi^2 = n \cdot R^2 = 12 \cdot 0{,}317391 = 3{,}8087$$

$$\chi^2_{0,1;11} = 11{,}3448$$

$$\chi^2_{0,05;11} = 7{,}8147$$

$$\chi^2_{0,01;11} = 6{,}251$$

At all possible levels of significance of the observed χ2 statistics is less than the critical value, then the null hypothesis of the white test on homoskedasticity residues cannot be rejected. From the Student's test for the coefficients for the residuals squares regressors, it is also seen that the squares of the residuals with the regressors are not interrelated. The second and third assumptions of the least squares method in the model (3) are met.

IV. SUMMARY

The obtained least squares approximates of the model coefficients (3) can be interpreted as follows: with an increase in revenue by one thousand rubles, accounts receivable, ceteris paribus, will grow by an average of 96 rubles, with an increase in accounts payable by 1 thousand rubles, accounts receivable will decrease by an average of 376 rubles, ceteris paribus. With an increase in cash by 1 thousand rubles, there will be a decrease in accounts receivable by an average of 9,4782 thousand rubles, ceteris paribus. The interpretation of regression coefficients is consistent with economic intuition. The determination coefficient R^2 shows that multiple regression explains 95% of the variation in accounts receivable.

V. CONCLUSIONS

Receivables are an integral part of monetary relations and occupy an important place in the activities of all organizations. The amount of debt directly affects the final indicators of economic activity.

Therefore, econometric assessment of the receivables formation factors is necessary for each enterprise [9]. Regression analysis is used when there is no functional relationship between the analyzed indicators. Due to the regression model it is possible to solve two problems: to study the closeness of the relationship between the studied indicators and to quantify the degree of influence of the analyzed factor on the studied indicator [10]. Identification of factors that directly affect the value of receivables, in turn, will affect the improvement of the process of receivables management. The constructed model can be used to predict the value of accounts receivable, depending on sales revenue, accounts payable and cash. This will allow the organization to plan the amount of receivables and maintain it at the optimum level.

The study of the relationship of receivables with financial indicators revealed the following: there is a close relationship between receivables and indicators such as sales revenue, accounts payable, cash. This is proved by the results of the construction of a linear model of multiple regression of receivables, estimates of which are obtained by the least squares method. Functioning features of the agricultural enterprise entail existence of the corresponding specifics in administrative decisions. Agricultural enterprises have a need to stimulate sales by providing discounts or benefits in the form of deferred payment, and, accordingly, with respect to receivables, they usually pursue goals aimed at both its optimization and reduction of its size, including: reducing the maturity of debt and timely repayment of receivables; reducing the share and amount of doubtful and overdue debts and others.

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