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FORECASTING THE FINANCIAL RESULTS FROM ENTERPRISE ACTIVITY

Statistical equations of dependence have been used in this article to forecast the financial activity of an enterprise. The selection of 6 primary factors of production is grounded, as directly affecting the effectiveness of financial resources use by an enterprise: product sales income, cost of products sold, capital assets, cash resources, other current assets, bills payable. The results of the research show that the current financial situation of the enterprise is stable. According to the estimates the net profit will increase in the future. At the same time, of all these factors cash resources and other current assets had the maximum impact on net profit increase.

Keywords: *financial results; product sales income; capital assets; cash resources; current assets; net profit.*

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ПРОГНОЗУВАННЯ ФІНАНСОВИХ РЕЗУЛЬТАТІВ ДІЯЛЬНОСТІ ПІДПРИЄМСТВА

У статті використано метод побудови статистичних рівнянь залежності для прогнозування фінансової діяльності підприємств. Обґрунтовано вибір 6 основних факторів виробництва, що безпосередньо впливають на ефективність використання фінансових ресурсів підприємства: дохід від реалізації продукції, початкова вартість реалізованої продукції, основні засоби, грошові засоби, інші оборотні активи, кредиторська заборгованість. Результати дослідження виявили, що чинний фінансовий стан підприємства є стійким. Відтак прогнозується зростання чистого прибутку в майбутньому періоді. При цьому з усіх факторів найбільший вплив на зростання обсягів чистого прибутку мали грошові засоби та інші оборотні активи.

Ключові слова: *фінансові результати; дохід від реалізації продукції; основні засоби; грошові засоби; оборотні активи; чистий прибуток.*

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ПРОГНОЗИРОВАНИЕ ФИНАНСОВЫХ РЕЗУЛЬТАТОВ ДЕЯТЕЛЬНОСТИ ПРЕДПРИЯТИЯ

В статье использован метод построения статистических уравнений зависимости для прогнозирования финансовой деятельности предприятия. Обосновано выбор 6 основных факторов производства, которые непосредственно влияют на эффективность использования финансовых ресурсов предприятия: доход от реализации продукции, себестоимость реализованной продукции, основные средства, денежные средства, прочие оборотные активы, кредиторская задолженность. Результаты исследования показали, что текущее финансовое состояние предприятия устойчивое. Поэтому прогнозируется рост чистой прибыли в будущем периоде. При этом из всех факторов наибольшее влияние на рост объема чистой прибыли оказали денежные средства и прочие оборотные активы.

Ключевые слова: *финансовые результаты; доход от реализации продукции; основные средства; денежные средства; оборотные активы; чистая прибыль.*

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Problem statement. In the context of the Eurasian economic integration, and Kazakhstan's accession to the WTO, one of the crucial goals for domestic enterprises is not only production of competitive products and market expansion, but also the increase of enterprises solvency and financial stability.

However, today, the majority domestic enterprises do not have a clear plan of their activities, especially regarding the distribution of equity and attraction of required investment. Financial decisions are often made spontaneously, without considering the need for financial resources. As a result, most companies get little profit or don't get it at all. The use of most advanced methods of forecasting financial results taking into account the primary production factors will allow to use financial resources efficiently and to orient the enterprise to the desired results.

Recent research and publications analysis. One of the most effective methods of evaluating the financial condition of an enterprise is economic and mathematic modelling (Endovitskiy, 2006: 4; Soroka, 2012).

The methods of paired and multiple regression are often used in practice. Paired regression is the equation describing the relationship between two variables only: dependent variable Y and independent variable X (Nabendu and Wooi, 1998: 129; Shalabh, 1998: 237). The model of multiple regression is the method of identification of an analytical form of relation between the dependent (effective) indicator and several independent (factor) variables (Panik, 2009: 803; Revan, 2015: 531; Reinhold and Jorgen, 2008: 653; Toutenburg and Shalabh, 2003: 217; Zhanfeng and Yuanchin, 2013: 949).

According to Ya.R. Magnus et al. (2004), A.I. Orlova (2002), N.I. Shanchenko (2008), I.I. Eliseeva et al. (2005) the determination of quantitative relations in the form of regression and comparisons of actual (observed) values with the values obtained by substituting into the regression equation provides better insight into the nature of the phenomenon under analysis, and thus helps intervene into the economic process to obtain the planned results.

However, regression equations are not effective enough for qualitative assessment of the combined influence of several factors, for diagnosing the condition and justification of the development trends of a particular process (Novak and Popesko, 2014).

Methodology for studying the financial results of enterprise proposed by us is based on the construction of statistical equations of dependence, which allows forecasting the size of the effective index for the medium term, taking into account the impact of certain factors (Aivazyan et al., 1985; Kulichin, 2001).

The advantages of this method include:

- the initial term of statistical equation of dependencies has the real significance (e.g., economic), as is always either the minimum or the maximum value of the effective variable in the sample;
- parameter values for individual factors and signs for single- and multifactor equations are identical;
- the sum of linear deviations of theoretical values of the effective index from the actual values should be minimal (the comparison shows which type of equation is more appropriate to describe the studied phenomenon) (Ishkova, 2007).

Comparison coefficients of factor and effective indices are used for constructing statistical equations of dependence. Comparison coefficients show the rate of change

(increase or decrease) of the feature value in relation to the accepted comparison base. The comparison base was chosen for calculations, for which during the increase of the feature value, the comparison coefficients are calculated from the minimum level (y_i / y_{min}).

The basic parameters of this method are:

y_x – the symbol of equation of dependence of the single-factor relation;

y_{min}, y_{max} – minimum and maximum empirical values of the effective indices;

x_i, …, z_i – empirical values of the factor indices;

x_{min}, ..., z_{min} – minimum empirical values of the factor indices;

d – symbol of deviations from the unit of comparison coefficient of the effective and factor indices (d_y, d_x, …, d_z);

b_1, b_2, …, b_n – parameters of the equation of dependencies for individual factor indices (n – the number of factor indices);

B – aggregate parameter of the equation of multiple dependence;

r_{yx} – index of correlation of single-factor communication;

d_y, d_{xz} – the size of deviations from the unit of comparison coefficients of theoretical values of effective index (Ishkova, 2007).

In this regard, we consider it appropriate to use this method to predict the enterprise performance "N" operating in the road construction industry.

The research objective is forecasting the net profit value of the enterprise on the basis of constructing statistical equations of dependence, taking into account the impact of 6 production factors: product sales income, cost of products sold, capital assets, cash resources, other current assets, bills payable.

Key research findings. Carrying out a regression analysis is based on the mass observation of variables for a certain period of time. In this regard, we use the annual reports of the enterprise "N" for 5 years and form the original data file to analyze information (Table 1).

Table 1. **Financial indicators of the enterprise "N", 2010–2014,** *ths KZT*
(Annual Financial Reports of the Enterprise "N")

Period	Y	X1	X2	X3	X4	X5	X6
2010	6291	186185	155269	10733	2019	54725	33932
2011	5206	147850	124781	9239	1600	242303	214126
2012	3857	256611	238249	12128	22542	3839	25174
2013	5332	265502	237703	27443	3569	120027	98337
2014	6120	273305	240155	27443	3700	121212	99301

Net profit will be used as an effective indicator (Y), and as the indicators-factors that could potentially affect the value of profits we define: X1 – product sales income, X2 – cost of products sold, X3 – capital assets, X4 – cash resources, X5 – other current assets, X6 – bills payable. The study of the dependence (see formula (1)) shows the following results (Table 2).

$$y = \int(x1, x2, \ldots x10). \quad (1)$$

Table 2. **Matrix of paired correlation coefficient,** *authors'*

	Y (net profit)	X1 (sales revenue)	X2 (cost of products sold)	X3 (capital assets)	X4 (cash resources)	X5 (other current assets)	X6 (bills payable)
Y (net profit)	1						
X1 (sales revenue)	-0.168156	1					
X2 (cost of products sold)	-0.27288	0.994233	1				
X3 (capital assets)	0.28978	0.784350	0.7335541	1			
X4 (cash resources)	-0.85940	0.404766	0.4887658	-0.219692	1		
X5 (other current assets)	0.14195	-0.525320	-0.5294256	-0.040614	-0.564437	1	
X6 (bills payable)	0.11290	-0.515452	-0.5166561	-0.043124	-0.538974	0.99951	1

All the factors studied have correlation relationship with net profit, so the stability of net profit is determined for each factor. Correlation coefficient between net profit and product sales income amounted to $r_{yx} = 0.73$. This means there is close correlation between net profit and product sales income, and the value of stability coefficient $K = 0.809$ indicates its high level, thus we can to carry out accurate calculations:

$$\sum \hat{y}i = \sum yi = 26806.$$

The use of the equation of dependence shows that the effective index in theoretical value will increase if product sales income changes.

The obtained single-factor linear equation is equal to:

$$y = 3857 \times (1 + 0.74 \times dx). \quad (2)$$

The connection with other factors of net profit was calculated using to the above methodology. Having used the calculation results, we obtain a single-factor equation of net profit dependence on each of 6 factors (Table 3).

Table 3. **Single-factor equation of dependence and stability index,** *authors'*

Factor	Equation	Stability index
Product sales income	y = 3857 x (1 + 0.74 x dx1)	0.809
Cost of products sold	y = 3857 x (1 + 0.65 x dx2)	0.842
Capital assets	y = 3857 x (1 + 0.44 x dx3)	0.933
Cash resources	y = 3857 x (1 + 0.122 x dx4)	0.890
Other current assets	y = 3857 x (1 + 0.19 x dx5)	1.002
Bills payable	y = 3857 x (1 + 0.14 x dx6)	0.231

As it is clear from Table 3, the connection of X6 factor with the effective index Y is not stable, as far as $K < 0.7$. Consequently, multifactor equation of dependence includes X1, X2, X3, X4, X5 factors.

In order to create a multifactor equation, necessary calculations are presented in Table 4.

Table 4. **Parameters of multifactor equation of dependence,** *authors'*

Year	Y (net profit)	Deviation of comparison coefficient of factors						$\Sigma dx_{1\text{-}5}$	Theoretical value *y*, mln KZT
	y	*dy*	*dx1*	*dx2*	*dx3*	*dx4*	*dx5*		
2010	6291	0.63	0.26	0.24	0.16	0.26	0.43	1.35	4595.89
2011	5206	0.35	0.00	0.00	0.00	0.00	5.31	5.31	3857.00
2012	3857	0.00	0.74	0.91	0.31	13.09	0.00	15.05	5953.32
2013	5332	0.38	0.80	0.90	1.97	1.23	2.13	7.03	6124.69
2014	6120	0.59	0.85	0.92	1.97	1.31	2.16	7.21	6275.09
Total	26806	1.95	2.64	2.98	4.42	15.89	10.02	35.95	26806

In calculations of theoretical value and effective index, the amount of empirical and theoretical values coincides – $\sum \hat{y}i = \sum yi = 26806$. This means the calculations are correct.

Let's calculate the parameters of b for the deviations of comparison coefficients from the unit using the formula:

$$b = \frac{\sum dy}{\sum dx_1 + \sum dx_2 + \sum dx_3 + \ldots\ldots\ldots\ldots + \sum dx_n}$$

or

$$b = \frac{\sum\left(\frac{y_i}{y_{\min}} - 1\right)}{\sum\left(\frac{x_i}{x_{\min}} - 1\right)}. \quad (3)$$

Having used a statistical method we provide the multifactor equation of dependence:

$$y = 3857[1 + 0{,}74(dx1 + dx2 + dx3 + dx4 + dx5)]. \quad (4)$$

Parameter b in this equation shows that change in deviations of comparison coefficients of factor variable (x_i) per unit leads to change in deviation of comparison coefficients of the effective index by 0.74 times.

According to time series, forecast calculations in direct dependence shall be carried out by the following formula:

$$y_t = y_{\min}(1 + bdt), \quad (5)$$

where y_t – trend equation; $y_{\min}$ – minimum characteristic value.

Trend parameter b shows how much the time series changes per unit leads to the change in deviations of comparison coefficients of effective index:

$$b = \frac{\sum dy}{\sum dt}, \quad (6)$$

where dt – deviation of comparison coefficients.

The following trend stability coefficient is used as the confidence prediction criterion calculated by formula:

$$K = 1 - \frac{\sum |dx - bdt|}{\sum dx} \succ 0.7. \quad (7)$$

The value of stability coefficient (K) allows selection in forecasting according to the calculated parameters of trend equation. Earlier we have defined 5 factors in multifactor dependence on net profit. By each of these factors we will define the projected values, then assumptions on net profit. If factor x_1 increases, trend equation will be written as:

$$x1_t = x1_{\min}(1 + bdt). \quad (8)$$

The value t always begins from 1 and $t_{\min} = 1$.

The determined values of b parameter show how much the effective index will increase X1 in 2015 and 2016.

The trend equation is as follows:

$$x1 = 147850 \times (1 + 0.26 \times dt). \quad (9)$$

To establish the estimated figures of sales revenue we calculate the share of impact of factors and estimate the change in this indicator for 2015.

$$dt = 18/1 - 1 = 17; \quad (10)$$

$$b \times dt = 0.26 \times 6 = 1.32. \quad (11)$$

According to the formula (8) we calculate the predicted value of x_1 factor for 2015, 2016:

$$x2015 = 147850 \times (1 + 1.32) = 342951.5;$$

$$x2016 = 147850 \times (1 + 1.58) = 482781.$$

Thus, product sales income will increase up to 342951,5 ths KZT in 2015, and up to 482781 ths KZT in 2016.

Using this calculation methodology, we will calculate the predicted value of net profit for 2015 and 2016. Trend stability coefficient amounted to 0.81 that means high correlation of the effective index (net profit) with the time factor.

The value of b parameter is 0.195, i.e. net profit will increase by on average 0.195 as comparison coefficients of time factor increase on the unit from its mean level. Correlation coefficient R = 0.70 confirms the conclusion on the correctness of equation of the relationship between time factor and net profit.

Using the multifactor equation of dependence we will determine the predicted values of net profit for 2015–2016. This equation includes 5 factors as their stability level is sufficiently high:

$$y = f(x1 + x2 + x3 + x4 + x5). \quad (12)$$

According to the formula (12) we will define the value of b parameter.

Using the equation of multifactor dependence and the predicted value of factors, we will calculate the predicted value of net profit according to the formula:

$$y = y_{\min}\left\{1 + B\left[\left(\frac{x_1}{x_{1\min}} - 1\right) + \left(\frac{x_2}{x_{3\min}} - 1\right) + \left(\frac{x_3}{x_{5\min}} - 1\right) + \left(\frac{x_4}{x_{7\min}} - 1\right) + \left(\frac{x_5}{x_{8\min}} - 1\right)\right]\right\}, \quad (13)$$

where x_i – the predicted values of the considered factors.

Based on our calculations, the predicted value of net profit for 2015 will amount to 7601 ths KZT, for 2016 – 8350 ths KZT.

The calculated predicted values of net profit enable calculating the predicted values of factors that affected the value of the effective index. To determine the predictive levels of factors we will calculate the difference from comparison coefficient unit and the initial parameter of equation of multifactor dependence by the following formula:

$$d_{y_н} = \frac{y_н}{y_{min}} - 1 = \frac{7600.88}{3857} = 1.97. \quad (14)$$

Thus, using the data, we will calculate the values of the predicted levels of factors by the following formula:

$$x_н = \left(\frac{d_{y_н}}{b_x} + 1 \right) x_{min}. \quad (15)$$

The data obtained from trend equation and equation of multifactor dependence is correct, i.e. prediction values are reliable. The predicted values are presented in Table 5.

Table 5. **Financial indicators forecast for 2015–2016,** *ths KZT, authors'*

Indicator	2014	Forecast	
		2015	2016
Y (net profit)	6120	7600.88	8349.66
X1 (sales revenue)	273305	541584.84	580372.56
X2 (cost of products sold)	240155	503092.32	540360.64
X3 (capital assets)	27443	50618.62	54695.02
X4 (cash resources)	3700	27875.62	30464.09
X5 (other current assets)	121212	436614.85	475844.49

The predictive values of the considered indicators for 2015–2016 have a growth trend. Thus, for net profit to reach 8349.66 ths KZT in 2016, it is necessary to increase sales revenue to 307067.6 ths KZT, and cash resources – to 26764 ths KZT (Table 6).

Table 6. **Increase (decrease) in the level of factors,** *authors'*

Indicator	2014	2015	deviation 2015/2014 (+,-)		2016	deviation 2016 /2014 (+,-)	
			ths KZT	%		ths KZT	%
Y (net profit)	6120.0	7600.9	1480.9	124.2	8349.7	2229.7	136.4
X1 (sales revenue)	273305.0	541584.9	268279.8	198.2	580372.6	307067.6	112.4
X2 (cost of products sold)	240155.0	503092.3	262937.3	209.5	540360.6	300205.6	125.0
X3 (capital assets)	27443.0	50618.6	23175.6	184.4	54695.0	27252.0	99.3
X4 (cash resources)	3700.0	27875.6	24175.6	7.5 times	30464.1	26764.0	7.2 times
X5 (other current assets)	121212.0	436614.9	315402.9	3.6 times	475844.5	354632.5	2.9 times

The results show that the maximum impact on the effective index is made by such factors as cash resources – 41.93% and other current assets – 26.44%. The minimum impact have revenues from finished products sales and cost (Table 7).

Table 7. **The percentage of the impact of each factor on net profit of the enterprise "N",** *%, authors'*

Factor	Deviations of factors comparison coefficients	The percentage of the impact of factor on the effective index, %
Y (net profit)	1.95	5.15
X1 (sales revenue)	2.64	6.97
X2 (cost of products sold)	2.98	7.86
X3 (capital assets)	4.42	11.66
X4 (cash resources)	15.89	41.93
X5 (other current assets)	10.02	26.44
Total	37.90	100

From the above it may be **concluded** that:

1. 5 of 6 models had positive results, that is, all production factors, except for bills payable, had close relationship with net profit.

2. The maximum impact on net profit had been made by cash resources and other current assets. This confirms that the rate of current assets turnover is sufficiently high and has positive effect on the efficiency of the enterprise financial activity. Perhaps this is due to the fact that percentage of current assets in the enterprise studied is over 80%.

3. The forecast shows that in the current indicators of primary factors of production it is expected that net profit growth would be 36.4%, or 2229.66 ths KZT in 2016. It proves the solvency and financial stability of the enterprise studied.

4. With due regard for low percentage of capital assets in the enterprise assets, it is suggested to improve the investment activity of the enterprise. This will significantly affect the efficiency of the capital assets use and increase its market value.

5. It is recommended to use the automated program "Management of finance 2.1" for "1C: Accounting 8". Its functions include financial planning, accounting and management, which are in "Calendar of payments", "Budget of cash flow", "Documents Recording" programs. The proposed program is used for strategic and planning, analysis and control over financial operations, providing effective management of the enterprise cash flows (Programma "Upravlenie finansami 2.1" dlia 1S: Bukhgalterii 8, systecs.ru).

The price of this program today is 173880 KZT, or 500 USD. Taking into consideration the comparatively low price of the program and the planned amount of the enterprise profit, it could pay off quite fast, while the economic effect from its usage will significantly influence the effectiveness of the financial resources' management in future.

In general, the application of a multifactor model in forecasting of the key financial indicators of the enterprise activity will help use effectively the financial resources of enterprises.

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