Modeling the Effectiveness of Employee Compensation Based on Financial Resources

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Abstract

Modeling the effectiveness of employee compensation by evaluating the relationship with the factors of the labor intensity of products, work experience, and incentive payments based on a linear model of multiple regression on the main components. In this paper, several methods are utilized, including the classical least squares method, variation inflation factor, principal component method. It is expected with theoretical representations that the labor intensity of products reduces the efficiency of employee remuneration, the experience and incentive payments in the General Fund of remuneration positively contribute to the increase in the efficiency of employee remuneration. The expediency of applying linear regression to the main components for measuring internal corporate factors of the employee remuneration system is shown since the linear model of multiple regression can give incorrect estimates due to collinear regressors. A methodological way to modeling employee remuneration effectiveness based on a regression on individual determinants of the motivation and remuneration system has been developed. The developed methodological means to modeling employee remuneration effectiveness has been tested on a poultry enterprise's data for the period from January 2015 to March 2020. The article's main conclusions can be used in the scientific and practical activities of agricultural enterprises in measuring and evaluating the effectiveness of using financial resources to pay.

Keywords: pay, efficiency, salary return, economic analysis, linear regression model, principal component method

1. Introduction

Changing the model of economic development against the backdrop of the digitalization of economic processes poses challenges to the remuneration system, the solution of which is associated with an objective assessment of its effectiveness. It is important to solve the problems of consistency of the employee's remuneration system with the final results of the enterprise (Chingos, 2002). Addressing these issues requires improving approaches to modeling and evaluating the remuneration effectiveness, considering factors that affect both motivation and incentives for employees and their performance (Sungatullina et al., 2018). This approach will contribute to an objective assessment of the current remuneration system, considering the use of financial resources in the implementation of business goals (Sungatullina, Faizrahmanova, 2016). In this context, the main task of modeling is an integrated process that allows you to bring stable success to the enterprise. This process connects the goals of the enterprise and the experience and qualifications of employees. Besides, it connects different aspects of motivation with the development of the remuneration system to achieve a coordinated approach for solving economic problems. Furthermore, it permits to increase the level of competitiveness of the enterprise (Kulikova et al., 2016, Safiullin et al., 2018).

The main task of modeling and evaluating the effectiveness of remuneration is to achieve optimal performance of the enterprise and employees within a coherent system of business goals and objectives and requirements for the competence and productivity of employees (Boyd, Salamin, 2001). This approach is based on the principles of performance management, which allows one to align the tasks of the enterprise with the tasks of the employees, as well as measure the performance of the enterprise as a whole and each employee individually (Barrett, Mayson, 2007; Sheardwell, Claydon, 2010). Performance modeling is one of the management processes and is based on the "Plan –

Do – Check – Act" model (Deming, 1986). This cycle includes the following processes: agreeing on goals at the planning stage; performing the work necessary to achieve the goals at the action stage; checking progress towards the goals at the monitoring stage; and discussing progress at the verification stage. One of the problems of modeling and evaluating the effectiveness of employee compensation is to ensure quality checks that allow one to formulate fair conclusions. This requires a continuous process rather than a single annual assessment. Besides, it is necessary to correctly approach the definition of factors that affect the change in the effectiveness of remuneration. This process is strategic, since it is related to the broad problems facing an enterprise that intends to function effectively in a competitive environment and achieve long-term goals in a certain direction. Thus, modeling the effectiveness of employee remuneration is one of the key stages in achieving strategic business goals based on a comprehensive approach to managing the system of motivation and remuneration.

In order to find the most appropriate model for evaluating the effectiveness of employee remuneration, we propose the construction of a simple linear multiple regression model and its extension based on the main components. This approach allows one not only to identify but also to measure factors that contribute to improving the efficiency of remuneration. The models are based on six quarterly financial indicators of the poultry enterprise for the period from 2015 to 2020. In this case, the usual least-squares method is used to evaluate model parameters, and the traditional formal Student and Fisher tests are used to verify statistical significance.

The chief purpose of this work is to recognize the determinants that contribute to the increase of the poultry enterprise's salary return.

The following results were obtained. An increase in the labor intensity of poultry products, the average salary of an agricultural worker and the proportion of such workers lead to a decrease in salary, an increase in the average length of service of agricultural workers and the share of additional incentive payments in the general salary fund leads to an increase in salary.

According to the formulated research questions, the paper describes the economic and financial indicators used and presents the results of evaluating the linear multiple regression models used. The conclusion contains conclusions and recommendations for further research in the field of analytical econometric tools determinants of employee pay efficiency.

2. Research Question

The need to model the effectiveness of employee remuneration raises the problem of choosing a specific model for its evaluation, as well as the selection of factors that affect the effectiveness of remuneration (Berndt, 1996). Modern information technologies allow one to use different methods of economic and mathematical research, taking into account business objectives and strategies for building a pay system. The idea of the study was suggested by works of (Berndt, 1996; Chingis, 2002).

Based on the literature, three main research questions were formulated:

1). Is there a connection between the efficiency of remuneration and the product's labor intensity?

2). Do incentive payments related to production results increase the efficiency of remuneration?

3). Does the experience of employees and their numbers affect the efficiency of remuneration?

3. Research Methodology

We are testing the proposed approach to modeling the efficiency of labor remuneration based on one of the Russian Federationpoultry enterprises' materials. To measure labor remuneration efficiency, we use the salary return indicator as to the ratio of labor costs to revenue from the sale of manufactured products. The data sample consists of six quarterly economic and financial indicators of the enterprise from January 2016 to December 2019, obtained from the official SPARK corporate information disclosure network (table 1): Y-salary, RUB.; X1 – the share of workers employed in poultry production, the total headcount of the enterprise, %; X2 – the average salary per employee, RUB; X3 **-** average work experience per employee, years; X4 – the complexity of poultry production, hour/RUB; X5 **-** share of incentive payments related to production results in the total payroll, %.

Table 1. Descriptive statistics of variables

Variables	Average	Median	Standard deviation	Dispersion	Min	Max
Salary return, rub.	8,722	8,632	1,180	1,393	7,169	10,812
The share of employees engaged in poultry production in the total number of employees of the enterprise, %	66,966	66,6	1,125	1,266	65,240	68,740
Average earnings per worker of poultry production, rub.	29435,760	29478,1	1335,587	1783793,0	26482,400	31452,300
Average work experience of one employee of poultry production, years	21,861	21,7	0,844	0,712	20,500	23,200
Labor intensity of poultry products, hour / RUB.	0,116	0,121	0,157	0,025	0,095	0,141
Share of incentive payments related to production results in the total remuneration fund,%.	14,720	14,65	1,162	1,349	12,820	17,730

Using the classical method of least squares, we estimate the initial model of salary transfer. Let's determine the regression bloat criterion -VIF for each predictor. After that, implement the regression to the chief components to evaluate a multi-factor linear regression model's parameters. Comparing the original model quality estimates and regression on the central features is carried out utilizing student analyses and standard Fisher and for the standard model error. The simulation can be accomplished using the Gretl software package (Adkins, 2014).

In general, a linear multiple regression models can be represented as follows:

$$Y_t = \beta_0 + \beta_1 x_{t1} + \beta_2 x_{t2} + .\beta_m x_{t3} + \beta_m x_{t4} + \beta_m x_{t5} + \varepsilon_t \quad (1)$$

Where Yt – salary return, rub.,

Xt1 – the share of employees engaged in poultry production in the overall number of staff of the enterprise, %;

Xt2 – average earnings per worker of poultry production, rub.;

Xt3 – average work experience of one employee of poultry production, years;

Xt4 – Labor intensity of poultry products, hour / RUB.;

Xt5 – Share of incentive payments related to production results in the total remuneration fund, %.

The advantages of regression models (Wooldridge, 2009; Hill, 2012) are the ability to: evaluate the contribution of each of the considered model factors to the final result – the variation of the explained variable; predict changes in the found dependencies in the future; enter the necessary correction, knowing the accuracy with which the result was obtained and direct actions based on data obtained with known accuracy; apply modern computer technologies.

To test the factors of the linear model of multiple regression for multicollinearity (Chandrasekhar et al., 2016; García et al., 2016; Salmerón Gómez et al., 2016, Yakupova et al., 2017), that is, the linear relationship with each other, we use the VIF criterion (variation inflation factor):

$$VIF = \frac{1}{(1 - R^2_{xjx1...xj-1xj+1...xm})} \quad (2)$$

Where $R^2_{xjx1...xj-1xj+1...xm}$ - the determination coefficientfound for the equation of the dependent Xj variable from other variables X1...Xm included in the considered multiple regression model.

In order to preserve the collinear factors in the model, we estimate the regression on the chief components. The principal component method in multicollinearity conditions allows replacing highly related variables with new variables that do not correlate them. The new variables are linear compounds of the initial variables. The main intention of the principal component method is to replace the explanatory variables xj, j=1, 2, ... m with the principal components - the new variables PCj, j=1,2,..., k, k≤m, which are: first, free from the disadvantages caused by correlation dependence; second, they contain as much information as possible from the "old", original xj variables. The main components of the PCj are formed as linear compounds of the initial explanatory variables. The principal component method creates linear combinations of variables, decreasing the order of their impact on the first data's aggregate variance. That is to say; the first chief component is the linear combination of variables that owns the most considerable variance; the following element is the second-highest variance, etc. The maximum possible number of main components allocated is equal to the number of variables. The variances corresponding to the main components are called eigenvalues. According to the Kaiser criterion, the main components that have eigenvalues greater than 1 are allocated. In other words, if the component does not allocate a variance equivalent to the variance of a single variable, it is omitted. When selecting the main components, the main attention is paid to factor loads – correlations between standardized variables and selected components. To build a regression on the main components, z-standardization of the original XTi variables is performed, then the main components and their factor loads are determined using the newly obtained standardized ZTI variables. In the next step, the regression of the dependent variable Yt – payback on the main components are evaluated. Statistically insignificant main components are excluded from the regression equation, and the regression equation of the dependent variable with significant main components is obtained once again. Finally, the transition is made from the regression equation on the main components to the equation in the original XTi variables according to the transformation:

$$\hat{y}_t = \beta_0 + \beta_1 l_{11} Z_1 + \beta_1 l_{12} Z_2 + \beta_1 l_{13} Z_3 + \beta_1 l_{14} Z_4 + \beta_1 l_{15} Z_5 + \beta_3 l_{31} Z_1 + \beta_3 l_{32} Z_2 + \beta_3 l_{33} Z_3 + +\beta_3 l_{34} Z_4 + \beta_3 l_{35} Z_5 +$$

$$+\beta_5 l_{51} Z_1 + \beta_5 l_{52} Z_2 + \beta_5 l_{53} Z_3 + \beta_5 l_{54} Z_4 + \beta_5 l_{55} Z_5 = \beta_0 + \beta_1 l_{11} \frac{x_1 - \bar{x}_1}{\sigma_{x1}} + \beta_1 l_{12} \frac{x_2 - \bar{x}_2}{\sigma_{x2}} + \beta_1 l_{13} \frac{x_3 - \bar{x}_3}{\sigma_{x3}} +$$

$$+\beta_1 l_{14} \frac{x_4 - \bar{x}_4}{\sigma_{x4}} + \beta_1 l_{15} \frac{x_5 - \bar{x}_5}{\sigma_{x5}} + +\beta_3 l_{31} \frac{x_1 - \bar{x}_1}{\sigma_{x1}} + \beta_3 l_{32} \frac{x_2 - \bar{x}_2}{\sigma_{x2}} + \beta_3 l_{33} \frac{x_3 - \bar{x}_3}{\sigma_{x3}} + \beta_3 l_{34} \frac{x_4 - \bar{x}_4}{\sigma_{x4}} + \beta_3 l_{35} \frac{x_5 - \bar{x}_5}{\sigma_{x5}} +$$

$$+\beta_5 l_{51} \frac{x_1 - \bar{x}_1}{\sigma_{x1}} + \beta_5 l_{52} \frac{x_2 - \bar{x}_2}{\sigma_{x2}} + \beta_5 l_{53} \frac{x_3 - \bar{x}_3}{\sigma_{x3}} + \beta_5 l_{54} \frac{x_4 - \bar{x}_4}{\sigma_{x4}} + \beta_5 l_{55} \frac{x_5 - \bar{x}_5}{\sigma_{x5}} = \beta_0 - \beta_1 (\frac{l_{11}\bar{x}_1}{\sigma_{x1}} + \frac{l_{12}\bar{x}_2}{\sigma_{x2}} + \frac{l_{13}\bar{x}_3}{\sigma_{x3}} +$$

$$+\frac{l_{14}\bar{x}_4}{\sigma_{x4}} + \frac{l_{15}\bar{x}_5}{\sigma_{x5}}) - \beta_3 (\frac{l_{31}\bar{x}_1}{\sigma_{x1}} + \frac{l_{32}\bar{x}_2}{\sigma_{x2}} + \frac{l_{33}\bar{x}_3}{\sigma_{x3}} + \frac{l_{34}\bar{x}_4}{\sigma_{x4}} + \frac{l_{35}\bar{x}_5}{\sigma_{x5}}) - \beta_5 (\frac{l_{51}\bar{x}_1}{\sigma_{x1}} + \frac{l_{52}\bar{x}_2}{\sigma_{x2}} + \frac{l_{53}\bar{x}_3}{\sigma_{x3}} + \frac{l_{54}\bar{x}_4}{\sigma_{x4}} + \frac{l_{55}\bar{x}_5}{\sigma_{x5}}) +$$

$$+x_1 (\frac{\beta_1 l_{11}}{\sigma_{x1}} + \frac{\beta_3 l_{31}}{\sigma_{x1}} + \frac{\beta_5 l_{51}}{\sigma_{x1}}) + x_2 (\frac{\beta_1 l_{12}}{\sigma_{x2}} + \frac{\beta_3 l_{32}}{\sigma_{x2}} + \frac{\beta_5 l_{52}}{\sigma_{x2}}) + x_3 (\frac{\beta_1 l_{13}}{\sigma_{x3}} + \frac{\beta_3 l_{33}}{\sigma_{x3}} + \frac{\beta_5 l_{53}}{\sigma_{x3}}) + x_4 (\frac{\beta_1 l_{14}}{\sigma_{x4}} + \frac{\beta_3 l_{34}}{\sigma_{x4}} + \frac{\beta_5 l_{54}}{\sigma_{x4}}) +$$

$$+x_5 (\frac{\beta_1 l_{15}}{\sigma_{x5}} + \frac{\beta_3 l_{35}}{\sigma_{x5}} + \frac{\beta_5 l_{55}}{\sigma_{x5}})$$

$$b_0 * = \beta_0 - \beta_1 (\frac{l_{11}\bar{x}_1}{\sigma_{x1}} + \frac{l_{12}\bar{x}_2}{\sigma_{x2}} + \frac{l_{13}\bar{x}_3}{\sigma_{x3}} + \frac{l_{14}\bar{x}_4}{\sigma_{x4}} + \frac{l_{15}\bar{x}_5}{\sigma_{x5}}) - \beta_3 (\frac{l_{31}\bar{x}_1}{\sigma_{x1}} + \frac{l_{32}\bar{x}_2}{\sigma_{x2}} + \frac{l_{33}\bar{x}_3}{\sigma_{x3}} + \frac{l_{34}\bar{x}_4}{\sigma_{x4}} + \frac{l_{35}\bar{x}_5}{\sigma_{x5}}) -$$

$$\beta_5 (\frac{l_{51}\bar{x}_1}{\sigma_{x1}} + \frac{l_{52}\bar{x}_2}{\sigma_{x2}} + \frac{l_{53}\bar{x}_3}{\sigma_{x3}} + \frac{l_{54}\bar{x}_4}{\sigma_{x4}} + \frac{l_{55}\bar{x}_5}{\sigma_{x5}})$$

$$b_1 * = (\frac{\beta_1 l_{11}}{\sigma_{x1}} + \frac{\beta_3 l_{31}}{\sigma_{x1}} + \frac{\beta_5 l_{51}}{\sigma_{x1}})$$

$$\mathrm{b}_2 * = (\frac{\beta_1 l_{12}}{\sigma_{x2}} + \frac{\beta_3 l_{32}}{\sigma_{x2}} + \frac{\beta_5 l_{52}}{\sigma_{x2}})$$

$$\mathrm{b}_3 * = \frac{\beta_1 l_{13}}{\sigma_{x3}} + \frac{\beta_3 l_{33}}{\sigma_{x3}} + \frac{\beta_5 l_{53}}{\sigma_{x3}}$$

$$b_4 * = \frac{\beta_1 l_{14}}{\sigma_{x4}} + \frac{\beta_3 l_{34}}{\sigma_{x4}} + \frac{\beta_5 l_{54}}{\sigma_{x4}}$$

$$b_5 * = \frac{\beta_1 l_{15}}{\sigma_{x5}} + \frac{\beta_3 l_{35}}{\sigma_{x5}} + \frac{\beta_5 l_{55}}{\sigma_{x5}}$$

$$\hat{y}_t = a^* + b_1^* \cdot x_{t1} + b_2^* \cdot x_{t2} + b_3^* \cdot x_{t3} + b_4^* \cdot x_{t4} + b_5^* \cdot x_{t5}. \quad (3)$$

To check whether the final model matches the actual data, we will determine the average approximation error:

$$\bar{A} = \frac{1}{n}\sum\left|\frac{y_t - \hat{y}}{y_t}\right| \cdot 100\%. \tag{4}$$

4. Results & Discussion

The investigation of linear coefficients of regressors pair correlation with a dependent variable (Ryxj) - Table 2, revealed that salary return holds a solid connection with the average salary of one employee of poultry production (Ryx2 = 0.817), the average work experience of one employee of poultry production (Ryx3 = 0.829), a close inverse connection with the labor intensity of poultry production (Ryx4 = - 0.886). Regressor X5 - the share of incentive payments related to production results in the general fund of remuneration has a weak line (Ryx5 = 0.210), and regressor X1 - the share of employees engaged in poultry production in the total number of employees of the enterprise (Ryx1 = - 0.179) - a weak inverse connection to salary. However, the linear inter-factor correlation coefficients (Rxixj) in Table 1 show that there is a close connection (collinearity) between the predictors: Rx2x3 = 0,764; Rx2x4 = -0,899; Rx3x4 = -0,858.

Correlation coefficients, utilizing the observations 1 – 21

5% critical value (two-tailed) = 0.4329 for n = 21

Table 2. Matrix of correlation linear coefficients

Y	x1	x2	x3	x4	
1.0000	-0.1789	0.8173	0.8289	-0.8863	Y
	1.0000	0.1621	-0.2377	0.0993	x1
		1.0000	0.7641	-0.8987	x2
			1.0000	-0.8576	x3
				1.0000	x4
				x5	
				0.2101	Y
				0.0255	x1
				0.0482	x2
				-0.0866	x3
				0.1058	x4
				1.0000	x5

For the purpose of analytical reflection of the statistical connection of salary return to a full set of factors, we perform an estimation of multi-factor regression using the classical least squares method (Table 3).

Model 1: OLS, applying considerations 1-21

Dependent variable: Y

Table 3. OLS-estimates of multivariate payroll regression on a full range of factors

	Coefficient	Std. Error	t-ratio	p-value	
const	8.62292	10.179	0.8471	0.41023	
x1	−0.0492822	0.115262	-0.4276	0.67504	
x2	−5.13751e-05	0.000222709	-0.2307	0.82068	
x3	0.316682	0.23692	1.3367	0.20125	
x4	−58.1743	19.9251	-2.9197	0.01056	**
x5	0.320641	0.0908115	3.5308	0.00303	***

Table 4. The results of testing model 1 for multicollinearity by the variance inflation factor method

average dependent var	8.722095	S.D. dependent var	1.180477
Total squared resid	2.783688	S.E. of regression	0.430789
R-squared	0.900121	Adjusted R-squared	0.866828
F(5, 15)	27.03624	P-value(F)	5.31e-07
Log-likelihood	−8.579877	Akaike criterion	29.15975
Schwarz criterion	35.42689	Hannan-Quinn	30.51988

Let's write down the original model of salary return:

$$\boldsymbol{Y_t}=8.62-0.05\boldsymbol{X_{t1}}-0.0000514\boldsymbol{X_{t2}}+0.32\boldsymbol{X_{t3}}-58.17\boldsymbol{X_{t4}}+0.32\boldsymbol{X_{t5}}+\boldsymbol{E_t}. \quad (5)$$

As can be seen from Figure 2, the regression owns a determination coefficient – when R-square approaches 1, regression is important overall due to Fisher-test (P-value (F)<0,01) and with the coefficients of Student test regression when regressors X1 – the proportion of workers employed in poultry production, the total headcount of the enterprise, X2, – average salary per employee of poultry production, X3– average work experience per employee poultry of production, are not significant. This position occurred due to the multicollinearity of predictors. The adverse outcomes of multicollinearity are an inexact linear correlation of regressor's coefficients with a dependent variable-payback, a reduction in the precision of evaluations of regression coefficients, and mistaken operation of the Student's test while examining the importance of a particular coefficient in the regressor. To recognize multicollinearity, we apply the calculation of the regression bloat criterion (Table 3).

Variance Inflation Factors

Minimum possible value = 1.0

Values > 10.0 can demonstrate a collinearity problem

x1: 1.812

x2: 9.535

x3: 4.310

x4: 10.530

x5: 1.199

VIF (j) = 1/(1 - R(j)^2)

Where R(j) is the multiple correlation coefficient between variable j and the other independent variables

The presence of collinearity for the predictor X4 – labor intensity of poultry products was detected. It is possible to exclude correlating regressors in order to eliminate duplication of information. In Gretl, we perform a procedure for sequentially excluding redundant variables (X1, X2, X3) using a two-way p-value = 0.05 (Table 3).

Model 2: OLS, using observations 1-21

Dependent variable: Y

Table 5. OLS estimates of multivariate payroll regression after eliminating omit variables

	Coefficient	Std. Error	t-ratio	p-value	
const	12.1253	1.36318	8.8949	<0.00001	***
x4	−69.142	6.20432	-11.1442	<0.00001	***
x5	0.31232	0.0837898	3.7274	0.00154	***

Table 6. Principal component estimates

Mean dependent var	8.722095	S.D. dependent var	1.180477
Sum squared resid	3.372375	S.E. of regression	0.432844
R-squared	0.878998	Adjusted R-squared	0.865554
F(2, 18)	65.37919	P-value(F)	5.56e-09
Log-likelihood	−10.59421	Akaike criterion	27.18841
Schwarz criterion	30.32198	Hannan-Quinn	27.86848

Let us define the salary return model after eliminating redundant variables:

$$\boldsymbol{Y_t} = 12.13\text{-}69.14\boldsymbol{X_{t4}}+0.31\boldsymbol{X_{t5}}+\boldsymbol{E_t}. \quad (6)$$

As we can see from Figure 4, the regression has a coefficient of determination - R-square, close to 1, the regression is significant due to the Fisher test (P-value (F)<0.01), all regression coefficients are significant due to the Student's test.

In order to answer the research question, keep the factors in the model, as well as to obtain the best predictive characteristics and maintain the reliability and informativeness of the simulation, let us perform a regression on the main components. Z-standardization of variables and evaluate the main components was applied (Table 4).

Principal Component Analysis, n = 21

Eigenanalysis of the Correlation Matrix

Component	Eigenvalue	Proportion	Cumulative
1	2.4476	0.5194	0.5194
2	1.1055	0.2346	0.7540
3	0.9816	0.2083	0.9623
4	0.1245	0.0264	0.9887
5	0.0533	0.0113	1.0000

Eigenvectors (component loadings)

	PC1	PC2	PC3	PC4	PC5
Z1	0.045	0.833	-0.473	0.225	0.171
Z2	-0.601	0.262	-0.005	-0.357	-0.665
Z3	-0.492	-0.149	0.070	0.852	-0.072
Z4	0.626	0.037	0.012	0.307	-0.716
Z5	0.051	0.462	0.878	0.047	0.104

The initial and following chief elements own values higher than 1 and explain 51.9% and 23.5% of the dependent variable variance, in turn. The third, fourth, and fifth components have values less than 1 and explain together 24.6% of the dependent variable variance.

Factor loads on elements are the pair correlation coefficients, for the initial component - smaller than 0.7 for the entire variables, for the second component - more than 0.7 for the Z1 variable, for the third component - more than 0.7 for the Z5 variable, for the fourth component - more than 0.7 for the Z3 variable, for the fifth component - more than 0.7 (module) for the Z4 variable.

In the following procedures, we use the first, third, and fifth components defining regression equations using z-standardized variables:

$$\mathbf{PC_1}=0.045\,\mathbf{Z_1}-0.601\,\mathbf{Z_2}-0.492\,\mathbf{Z_3}+0.626\,\mathbf{Z_4}+0.051\,\mathbf{Z_5}. \quad (7)$$

$$\mathbf{PC_3}=-0.473\,\mathbf{Z_1}-0.005\,\mathbf{Z_2}+0.070\,\mathbf{Z_3}+0.012\,\mathbf{Z_4}-0.878\,\mathbf{Z_5}. \quad (8)$$

$$\mathbf{PC_5}=0.171\,\mathbf{Z_1}-0.665\,\mathbf{Z_2}-0.072\,\mathbf{Z_3}-0.716\,\mathbf{Z_4}+0.104\,\mathbf{Z_5}. \quad (9)$$

Let's perform a regression of the salary return on all the main components (Table 5):

$$Y=8.72-0.64\,\mathbf{PC_1}+0.03\,\mathbf{PC_2}+0.36\,\mathbf{PC_3}-0.02\,\mathbf{PC_4}+0.71\mathbf{PC_5}+E. \quad (10)$$

Model 3: OLS, utilizing measurements 1-21

Dependent variable: Y

Table 7. OLS estimates payroll regression results for principal components

	Coefficient	Std. Error	t-ratio	p-value	
const	8.7221	0.0940059	92.7825	<0.00001	***
PC1	−0.644957	0.0619291	-10.4145	<0.00001	***
PC2	0.0341101	0.0914616	0.3729	0.71441	
PC3	0.361479	0.097188	3.7194	0.00206	***
PC4	−0.0228877	0.2422	-0.0945	0.92596	
PC5	0.708912	0.416909	1.7004	0.10969	

average dependent var	8.722095	S.D. dependent var	1.180477
Total squared resid	2.783688	S.E. of regression	0.430789
R-squared	0.900121	Adjusted R-squared	0.866828
F(2. 18)	27.03624	P-value(F)	5.31e-07
Log-likelihood	−8.579877	Akaike criterion	29.15975
Schwarz criterion	35.42689	Hannan-Quinn	30.51988

As can be seen from Figure 6, the regression has a coefficient of determination-R-square, close to 1; the regression is important due to Fisher's test (P-value (F)<00.01), as well as for the Student's test, the regression coefficients for PC2 and PC4 are not significant.

We improved the model by performing a Gretl procedure for sequentially excluding redundant variables (PC2 PC4) utilizing a two-way p-value = 0.05 (Table 8):

$$Y=8.722-0.643\mathbf{PC_1}+0.361\mathbf{PC_3}+0.711\,\mathbf{PC_5}+E. \quad (11)$$

Model 4: OLS, utilizing observations 1-21

Dependent variable: Y

Table 8. OLS estimates payroll regression results for principal components after eliminating omit variables

	Coefficient	Std. Error	t-ratio	p-value	
const	8,7221	0,0887534	98,2733	<0,00001	***
PC1	−0,642545	0,0556957	-11,5367	<0,00001	***
PC3	0,361071	0,0917165	3,9368	0,00106	***
PC5	0,711244	0,393498	1,8075	0,08841	*

average dependent var	8,722095	S.D. dependent var	1,180477
Total squared resid	2,812150	S.E. of regression	0,406719
R-squared	0,899099	Adjusted R-squared	0,881293
F(2, 18)	50,49423	P-value(F)	1,12e-08
Log-likelihood	−8,686692	Akaike criterion	25,37338
Schwarz criterion	29,55147	Hannan-Quinn	26,28014

However, the description of the model in relation to the chief elements is difficult. Therefore, it is advisable to switch to a model containing initial factors that can be interpreted economically:

$$Y = 8.722 - 0.643 * (0.045\mathbf{Z_1} - 0.601\mathbf{Z_2} - 0.492\mathbf{Z_3} + 0.626\mathbf{Z_4} + 0.051\mathbf{Z_5}) + 0.361 * (-0.473\mathbf{Z_1} - 0.005\mathbf{Z_2} + 0.070\mathbf{Z_3} + 0.012\mathbf{Z_4} - 0.878\mathbf{Z_5}) + 0.711 * (0.171\mathbf{Z_1} - 0.665\mathbf{Z_2} - 0.072\mathbf{Z_3} - 0.716\mathbf{Z_4} + 0.104\mathbf{Z_5}) + E. \quad (12)$$

With

$\boldsymbol{\beta_0}$=8.72; $\boldsymbol{\beta_1}$=-0.642; $\boldsymbol{\beta_3}$=0.361; $\boldsymbol{\beta_5}$=0.711; $\mathbf{L_{11}}$=0.045; $\mathbf{L_{12}}$= -0.601; $\mathbf{L_{13}}$= -0.492; $\mathbf{L_{14}}$=0.626; $\mathbf{L_{15}}$=0.051; $\mathbf{L_{31}}$= -0.473; $\mathbf{L_{32}}$= -0.005; $\mathbf{L_{33}}$=0.070; $\mathbf{L_{34}}$=0.012; $\mathbf{L_{35}}$=0.878; $\mathbf{L_{51}}$=0.171; $\mathbf{L_{52}}$= -0.665; $\mathbf{L_{53}}$= -0.072; $\mathbf{L_{54}}$= -0.716; $\mathbf{L_{55}}$=0.104

We will get the final multi-factor regression model of salary return:

$$Y = 9.849 – 0.069\, x_1 – 0.0000665\, x_2 + 0.344\, x_3 – 5.667\, x_4 + 0.308\, x_5 + e. \quad (13)$$

According to the model (13), an increase in the share of employees engaged in poultry production in the total number of employees of the enterprise by 1% leads to a decrease in salary return by 0.069 rub. An increase in the average salary per employee of poultry production by 1 rub leads to a decrease in salary return by 0.0000665 rubs. An increase in the average work experience of one employee of poultry production for 1 year leads to an increase in salaries by 0.344 rubles. Increasing the labor intensity of poultry products by 1 hour / rub leads to a decrease in salary payments by 5.667 rubles, and an increase in the share of incentive payments related to production results in the general fund by 1% leads to an increase in salary payments by 0.308 rubles.

The average approximation error for checking whether the model (13) matches the actual data was 3.272%. An approximation error of 5-7% shows a good agreement of the model to the source data. The resulting value does not exceed 12-15%, which indicates that the average deviation of the calculated data from the actual data used in the econometric model is insignificant and that the acceptable quality of the model selection is not significant.

5. Conclusions and Future Research

This survey is aimed at the methodological features of modeling the employee remuneration effectiveness in the enterprise management system, given a linear model of multiple regressions. The research is built on empirically verified theoretical arguments concerning increasing the remuneration efficiency to implement strategic business objectives (Armstrong, Murlis, 2004; Beardwell, Claydon, 2010; White, 2005). The findings are based on practical recommendations (Sungatullina et al., 2010; Berrocal et al., 2018; Bush, 2003; Sum, 2010), on methodological approaches of evaluating employee remuneration effectiveness, a motivating factor in the company's activities. The study's approach to modeling the salary efficiency has several benefits because of the ability to trace the factors connections representing employees' incentive system and experience. In particular, achieve a better selection of the remuneration system's predictive factors for an essential interpretation of the consequences of modeling in making management decisions. Hence, the study reinforces the standard assumptions about a statistically meaningful connection between individual factors (labor intensity, work experience, average salary, number of employees, incentive payments related to production results) that influence the system of motivation and incentives for employees' effectiveness of remuneration. All this serves to optimize the remuneration system and promote the efficiency of applying the company's resources. Advancing this study in the direction of studying a more extensive set of circumstances that affect the level of efficiency of employee remuneration permits one to develop the rational use of financial resources that relate to the business strategy.

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