Multiple Regressions for the Financial Analysis of Alabanian Economy

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Abstract

> *Fulfillment of strategic, managerial and operational decisions is the ultimate aim of any company. Economic performance is to be evaluated on the basis of effectiveness and efficiency of use of resources. The aim of this paper is to study economical phenomena through a statistical point of view. Our motivation is to emphasize the validity of the regression analysis in economic performance. Multiple regression analysis will be applied to demonstrate the trend of economic trend of transitory economy of Albania. The whole paper will be as a case study on a limited liability company in the production industry. There are a few processes from raw material to final product. Regression analysis, correlation analysis, ANOVA are used to represent a mathematic-statistical model to analyse the economic progress of the company depending of the used indicators. The main goal of statistical analysis used in the paper, is to demonstrate the kind of relationship between the variables, presented by a equation of multiple linear regression (in our case one dependent and two independent variables). SPSS 17.5 will be used to evaluate the statistical results.*

Keywords: *Multiple regression, economic performance, financial analysis*

1. Introduction

In the continuous progress of an enterprise strategic, managerial and operational management is very important. In order to evaluate the extant at which the enterprise goals are achieved it is imperative to define an integrated system of indicators that can tell us at any time if our business is going in right direction or not.

Our main reason for compelling the financial statements is to provide a better decision taking, diagnosis of the current situation of a business and future perspective.

Plain cost and profit are not the main aim of the enterprise, we want to study how qualitative the earning is, what is the sale revenue, which one of the indicators best reflects the economic progress of the enterprise.

For this purpose the multiple regression analysis will be used to demonstrate the trend of economic trend of transitory economy of Albania.

To have a better understanding we will apply the regression model in a case study. Our case will be a company with foreign capital in the construction and trade industry.

2. Research Method

Three types of analysis will be used: regression analysis, correlation analysis, ANOVA. The objective of analysis is control of the relationship between dependent and independent variables exists and if so , does it aims to use the existing information for dependent and independent variables, in order to improve the correctness of prediction of the values of dependent variable.

In our study we have used multiple regression analysis and through this analysis we aim to achieve:
- the valuation of the connection between the variables; two independent and one dependent variable.

- to prove the correlation of the relationship that exist between this two variables.

Analysis of multiple regression is used to valuate a variable (dependent) in dependence to the values of independent variable, in order to express the amount of explanation of dependent variable in dependence of independent variable, finding all the units that help in ensuring a better explanation of dependent variable.

Let make the mathematical explanation of this problem of multiple linear regression:

Suppose that our variable **y** depends from n variables " non statistically independent" , x_1, x_2, ….x_n, that are called independent variables. The problem of multiple regression is considered to be a model where is showed the function of these variables in the following form:

$y = f(x_1, x_2, ,..., x_n) + \varepsilon$, in which :

ε – random variable error or residue, and the ε has the normal distribution $N(0, \sigma^2)$ and expresses the deviations of expected observed values of y calculated through the regression equation.

Dependent variable y is also a casual unit normally distributed .

In the model of multiple linear regression:

- all the independent variables take part in the same time in the model
- the value of R and R^2 determine the strongnees of the correlations between independent variables and dependent variable
- Fisher test is used to show if this connection determined by the election, may or no generalize for whole the population.
- t- test is used to evaluated the individual the link between every independent variable and the dependent variable.

One of major problems that appears during the creation of multiple regression model is the definition of the correlation of relationship in between variables:

For this purpose in multiple regression is defined a unit that is called the coefficient of multiple correlation (R) that defines the amount of linear correlation in between the dependent variable y and the independent variables $(x_1, x_2,…x_n)$.

This coefficient takes defined values. If the distribution values are near the medium, the linear dependency is perfect so Y can be expressed exactly as a linear combination of $x_1, x_2,….x_n$ and in this case the model of linar regression is too strong.

Beside the values of R in consideration should be taken also the value of R^2 that defines the part of variance of Y that is "explained "from the connection of relation $x_1, x_2,….x_n$.

This coefficient is dependent from the degree of measurement of random variables that are part of the model. Bigger is the number of variables, bigger will be the value of R^2, because the expected error of prediction will be smaller.

Even if we are using reliable data, a big R^2 does not necessarily means that there is a strong causal relationship, follows that, on the basis of regression, it is not possible to determine causation. [1]

3. The Analyses of Fenomena Using Multiple Linear Regression-Case Study

Method of multiple linear regression analysis is used to show the connection that exists among variables and to make concrete this relation.

For this purpose all the data is used in following table, gathered from opendata.al and gives the income in dependence of number of employees and the price of the product.

In this regard the following financial ratios derived from the organization studied during years 2005-2015: incomes, number of employees, and product price, as described in the below table will be taken into consideration.

Years	Incomes (/000000 ALL)	Nr. of employees	Product Price
2015	56	50	500
2014	79	71	500
2013	99	109	500
2012	350	188	470
2011	242	211	470
2010	155	176	470
2009	103	100	400
2008	78	86	400
2006	48	62	400
2005	37	57	350

Thus, it was established as a dependent variable the financial indicator total revenue, and as independent variables: number of employees and product price.

The shown equation gives the statistical model of multiple linear regression between a dependent variable (in our case income) and dependent variable (in our case number of employees and the price of product.)

To explain the variation of the dependent variable - total revenue - by its covariance with independent variables: number of employees and price we use a multiple linear regression statistical model defined by:

$y = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \varepsilon$

In the above equation:

Y = the explained variable - the financial indicator total revenue.

x_1 = the explanatory variable 1 - number of employees.

x_2 = the explanatory variable 2 - product price.

α_1, α_2 = model parameters.

ε = specification error, unknown (the difference between the true and the specified model);

n = total number of observations - 10 fiscal years.

The model parameters give the change value of y that corresponds with one unit change of x.

The tables below are taken from the SPSS and give the links between variables.

Regression

Notes

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Comments		
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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	10
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.
Syntax		REGRESSION /DESCRIPTIVES MEAN STDDEV CORR SIG N /MISSING LISTWISE /STATISTICS COEFF OUTS R ANOVA CHANGE /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT Income /METHOD=ENTER Nrofemploy Prodprice.
Resources	Processor Time	00:00:00.03
	Elapsed Time	00:00:00.06
	Memory Required	1756 bytes
	Additional Memory Required for Residual Plots	0 bytes

Descriptive Statistics

	Mean	Std. Deviation	N
Income	124.70	99.517	10
Nrofemploy	111.00	59.200	10
Prodprice	446.00	53.790	10

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Correlations

		Income	Nrofemploy	Prodprice
Pearson Correlation	Income	1.000	.887	.342
	Nrofemploy	.887	1.000	.326
	Prodprice	.342	.326	1.000
Sig. (1-tailed)	Income	.	.000	.167
	Nrofemploy	.000	.	.179
	Prodprice	.167	.179	.
N	Income	10	10	10
	Nrofemploy	10	10	10
	Prodprice	10	10	10

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Prodprice, Nrofemploy[b]	.	Enter

a. Dependent Variable: Income
b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.889[a]	.789	.729	51.775	.789	13.125	2	7	.004

a. Predictors: (Constant), Prodprice, Nrofemploy

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	70367.819	2	35183.909	13.125	.004[b]
	Residual	18764.281	7	2680.612		
	Total	89132.100	9			

a. Dependent Variable: Income
b. Predictors: (Constant), Prodprice, Nrofemploy

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-86.121	144.820		-.595	.571
	Nrofemploy	1.458	.308	.867	4.729	.002
	Prodprice	.110	.339	.059	.324	.756

a. Dependent Variable: Income

From the table of coefficients, the multiple linear regression model describing the relationship between this indicators of the economy subject of this research may be given in the following equation:

$$Y = -86.121 + 1.458 \, x_1 + 0.110 \, x_2$$

As it can be observed, the number of employer and the product price are the factors that significantly influence in the economy trends.

In the previous tables of statistical tests we see that the value of R and adjusted R^2 is in the allowed limits to define the correctness of the created econometric model.

The negative value of the constant of 86.121 represents the fixed costs of a business. The correlation between number of employees and price of product is positive with the dependent variable. They are both significant for the model. Their significance can be valued from statistical tests that show a significance value smaller than 0.05.

4. Conclusion

Companies operate in a dynamic environment that changes in cooperation and compliance with the influence of other factors or not. Because of this dynamism it is mandatory to have a good strategy in disposal, especially during financial crisis.

Results (outputs of the tasks) and the behaviors (work process entries) are important in the process of assessing and measuring of performance.

The complexity of decision taking rises the need for statistical correlation method to explain the relationship between the environment of variables. In this situation, the income on the product is the result of conjugation many influencing variables, but not all the determined ratios have the same importance, the action of some of them compensating each other.

The case study model that was chosen is a representative one. Number of employees and price of product have a big impact on the level of sales revenue.

References

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