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Estimating the Cobb-Douglas Production Function

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ABSTRACT

Cobb-Douglas Production functions is a functional relationship between input and out put.we has estimated the function employing the data of D G Cement. We have taken the classical production function having two inputs, capital and labour. The time series data collecting from 1990 to 2010.Results show that there is a constant return to scale in the said industry. Moreover the empirical evidences show that capital contributes less than the labour during the production process of D G Cement.

Keywords: Production function, cement industry, time series, labour intensive, return to scale.

INTRODUCTION

Main objective of the study is to investigate the relationship put and between the production of cement and inputs labour and capital. The econometric model consists of Cobb-Douglas Production function .The general form of Cobb-Douglas Production function is:

$$X= f (K, L) \quad (1)$$

$$X= \beta_0 Lb^{K1-b} \quad (2)$$

X is output and appeared as a dependent variable, while capital (K) and labour (L) are independent variables. In our regression analysis, we will find out the effect of factors of production on output. The data for labour and capital are taken from D G Cement. The time series data collected from 1990 to 2010. Labour is measured as the total number of employees in the factory during the said period. While the capital is measured as the total fixed assets during the same years. Whereas the output is taken as the value added.

ECONOMETRIC TECHNIQUES

B is the intercept term which is constant. Because we are analyzing the relationship between input and output, so we are not discussing in detail the intercept term.

We assume that E (ei) =0, as Wooldridge (2009) explained.

The regression is run on the following model:

$$Ln X = Ln \beta_0 + \beta_1 Ln L + (1-\beta_1) Ln K \quad (3)$$

The value of β_1 is .81 and $1-\beta_1$ is .19

To find out the significant difference between these two estimates and absolute 1, we apply the Chi-Square test. The results show that these values are close to one, implying that there is a constant return to scale. To test the homoscedasticity, we used the Breusch-Pagan test. The null hypothesis is that the residuals are homoscedasticity in our regression model. The test will help us to find out the accurate results. One problem often faced when we estimate the Cobb-Douglas Production function, which is multicollinearity,it will also be dealt in this model. Derivation of the equation:

$$Ln X = Ln \beta_0 + Ln K - \beta Ln K + \beta Ln L \quad (4)$$

$$Ln X = Ln \beta_0 + Ln K + \beta (Ln L - Ln K) \quad (5)$$

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$LnX-Ln\ K = Ln\beta_0 + \beta\ (Ln\ L - Ln\ K)$ (6)

Taking Ln β_0 equal to one, we get the following equation:

$1(Log\ (X) - Log\ (K)) \sim 1\ (Log\ (L) - Log\ (K))$ (7)

B_0	1 (Log (L) – Log (K))	R^2	R^{-2}	F-Stat
1.89	.66	.8	.7	3.8
(15.72)*	(35.27)**			

S.E .085 .039

Note: Values in parenthesis are t-ratios.

* Significant at 1 percent

** Significant at 5 percent

Exp (1.89) = .156

β = .66, 1- β = .34

The estimated equation then is:

$X = .156\ L^{.66}\ K.34$

EMPIRICAL FINDINGS

Results of the above estimates show that the capital contributes relatively less than the share of labour. Justification for the statement is that in the far-flung areas of Pakistan like D G Khan, labour input is cheaper than the capital. Therefore the rational industrialist prefers the labour intensive techniques. Moreover, the labour factor is abundant in these areas. The value of R shows that there is a strong relationship between the dependent and independent variables. And this value also confirms the validity of the model.

The reasonably high value of F-Statistics and significant T-ratios indicate the model is best fit.

CONCLUSION

Empirical results show the strong relationship between the input and output variables. The relationship shows that if we increase the amount of capital and labour, output can be increased. Moreover, the labour input is relatively cheaper .So the labour intensive technique is more useful tool than the capital intensive technique in the production process of D G Cement.

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