Multiple Regression for Forecasting

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Introduction

Forecasting is an integral part of any business and the strategic planning of big and small entities. Forecasting is looking at possible future values of parameters that are based on historical data and events. Without forecasting, it would be nearly impossible to prepare budgets, and make plans in the future. One of the most common methods used for forecasting is discussed in this paper: multiple regression.

Multiple Regression

Multiple regression is one of the most powerful forecasting tools and is used to determine the relationship between a dependent variable and several independent variables (Statistics Solutions). The term “multiple” means there are two or more independent variables. Multiple regression is, and can be used, for forecasting sales, demand for electricity, consumption, population, gross domestic product, air quality, the number of insurance claims in a given period, the number of customer complaints based on waiting times, the number of patients in a health care facility, and many other variables. Almost all aspects of human activities can be applied with multiple regression, which will aid in objective decision-making.

In order to apply multiple regression, researchers and interested users must determine what variables influence the object of interest. For example, this year, a manager would want to forecast sales in the next ten years. He would look at factors that may influence the demand for sales such as population, product quality in terms of customer satisfaction rates, number of competitors, and average personal disposable income. Sales demand is the dependent variable or the object of interest to forecast, while the other variables are the independent variables whose values are assumed to affect the dependent variable. Independent variables are also called

predictor variables. Historical data should be gathered for the dependent and independent variables—the period of which would depend on the researcher's assumption. As a rule of thumb, the period chosen should at least have some assurance of normality or stability observed —that is, there are no adverse events that would affect the data. For example, the global financial crisis in 2008-2010 affected most stock markets. Therefore in multiple regression, data from these periods are excluded. Multiple regression follows the form:

$$\text{Predicted } Y_t = \text{Intercept} + \beta_1 X_1 + \beta_1 X_1 + \ldots\ldots \beta_n X_n$$

Where Predicted Yt is the dependent variable to be predicted at time period t, β_1 to β_n are the coefficients corresponding to each independent variable X_1 to X_n and n refers to the number of independent variables used. Data is processed in statistical softwares such as SPSS and Microsoft Excel's Analysis Toolpak to produce the multiple regression equation, which is also the forecasting equation. To illustrate, let the following regression equation be the output of a multiple regression:

Predicted Sales = 10,298 + 0.223*Population + 0.255*Customer satisfaction rating + 0.126*Number of competitors + 0.289*Average personal disposable income

If population = 9,876; Customer satisfaction rating = 4; Number of competitors = 5; Average personal disposable income = 2,500

Predicted Sales = 10,298 + 0.223*9,876 + 0.255*5 + 0.126*5 + 0.289*2,500 = 13,224

Regression analysis assists in finding relationships between variables and uncovering important patterns (Newgenapps, 2017). For example, data analyzed from the point of sales (POS) may highlight patterns in the market like seasonality at certain periods to which a business may plan to stock at optimal levels and additional personnel be hired before the anticipated spikes in demand happens (Newgenapps, 2017). As a statement of caution, statistical calculation

determines the relative importance of predictor variables. However, it is not an assurance that the variables are also important in the practical sense (Minitab Blog Editor, 2016). Use subject area expertise well.

References

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