Chapter 14
A Conceptual and Pragmatic Review of Regression Analysis for Predictive Analytics

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ABSTRACT

Regression analysis and modeling are powerful predictive analytical tools for knowledge discovery through examining and capturing the complex hidden relationships and patterns among the quantitative variables. Regression analysis is widely used to: (a) collect massive amounts of organizational performance data such as Web server logs and sales transactions. Such data is referred to as "Big Data"; and (b) improve transformation of massive data into intelligent information (knowledge) by discovering trends and patterns in unknown hidden relationships. The intelligent information can then be used to make informed data-based predictions of future organizational outcomes such as organizational productivity and performance using predictive analytics such as regression analysis methods. The main purpose of this chapter is to present a conceptual and practical overview of simple- and multiple- linear regression analyses.

INTRODUCTION

Regression analysis methods are powerful predictive analytics and modeling techniques that are used most often to develop predictive models and make future predictions of organizational productivity and performances (e.g., profits, sales) using past and current data in efforts to make informed and strategic organizational decisions. Their uses become more common and significant as predictive analytical tools due largely to:

1. Collecting massive amount of data such as internet traffic data (e.g., Web server logs, transaction data, and social media activities), which is referred to as "Big Data." It is called Big Data because the volume, velocity, and variety of the data exceed the processing, computing and/or storage capacities of the available computers, and
2. The increased need to transform the collected large volume of data into intelligent information (knowledge) and insights such as trends and patterns of hidden associations and relationships between variables (Hair, 2007; Kalaian & Kasim, 2015; Kuhns & Johnson, 2013; Siegel, 2014).

Consequently, the intelligent information can be used to create a holistic and a comprehensive view of a business enterprise to make smart and informed data-based competitive decisions, strategic planning, strategic organizational performance improvements, and predictions of future organizational performance to gain competitive advantage.

Methods of predictive analytics for quantitative data sets, including Big Data sets, are significant and relevant for executives and leaders across public (e.g., government, nonprofit organizations) and private sectors (e.g., companies, for-profit organizations) to improve organizational performance and increase the productivity of their organizations. Also, predictive analytics help firm leaders and executives to make informed data-based decisions and future predictions of organizational productivity and performance outcomes based on current and past data (Kuhns & Johnson, 2013; Maisel & Cokins, 2014).

Organizational Performance measurement is one of the most important and widely used constructs for evaluating organizational success. Organizational performance is an abstract construct that is presented by measurable indicators and factors that have direct and indirect effects on performance. Reviewing the literature of organizational performance reveals that studies defining organizational performance are divergent in how the organizational performance construct is conceptualized, measured, and defined as well as the factors that are included in the measurement model of organizational performance. Richard, et al. (2009) and Kasemsap (2014) defined organizational performance as an analysis of company's performance as compared to goals and objectives. Within corporate organizations, there are three primary outcomes analyzed: financial performance such as profits and return on investments (ROI), market performance such as sales and market share, and shareholder value performance such as total shareholder return.

In this chapter, organizational performance is defined as being a multidimensional construct that includes both financial and non-financial performance indicators to measure the organizational outcomes and quality of processes and practices within an organization to achieve the organizational strategic goals (e.g., increasing profits, reducing costs) and operational goals (e.g., optimizing operational efficiency, enhancing human capital). Organizational success, enhancement, improvement, and growth are the main objectives of any organization and it depends on its continuous performance. Examples of organizational performance indicators and factors are: productivity, profitability, leadership style, company

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