PARAMETER ESTIMATION IN DOUBLE EXPONENTIAL SMOOTHING USING GENETIC ALGORITHM

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5. Report

5.1 Proposed Executive Summary

In last decade, there has been increasing interest in simulating the natural evolutionary process in solving hard optimization problems. Genetic Algorithm (GA) is numerical optimization algorithm inspired by both natural selection and natural genetics. The method is general and capable of being applied to an extremely wide range of problems. Exponential smoothing is a simple extrapolative method that seeks to identify pattern of past data. Double Exponential Smoothing is one of the smoothing method which handle time series data with trend. The determination of parameter in Double Exponental Smoothing is difficult and crucial. Trial and error often serves as the best method to determine the parameter. Therefore, a good optimization technique is required for identify the best parameter in minimizing the forecast errors. The objective of this research is to estimate the Double Exponential Smoothing by using Genetic Algorithm Mechanism. The expected result of this research is Genetic Algorithm to able search for the best parameter in Double Exponential Smoothing.

5.3 Introduction

Double Exponential Smoothing was introduced by Operation Research analyst, Robert G. Brown, in late '50s and early '60s after World War II. The equation was first applied in forecasting the spare parts demand in Navy Inventory System. Nowadays, it is utilized by business firms and military due to its simplicity.

The Double Exponential Smoothing equation contains a parameter in interval range of (0, 1) and the choices of parameter were infinitely many. The choice of the parameter will greatly affects the accuracy of forecasting simulation. Nevertheless, the policy of parameter selection is nebulous. Most of the business firms and military sector forecasters define the parameter either based on past experience or trial and error basis. Past experience or trial and error should not serves as a good method in selecting the parameter value. Both of them may lead to a deviation from optimum parameter value.

Hence, an artificial intelligence called genetic algorithm was introduced. The Genetic Algorithm was integrated into the exponential equation such that the flaw of exponential equation will be reduced. Genetic Algorithm was pioneered by John Holland in 1975. The algorithm itself is capable in solving hard optimization problems in various field such as business, engineering and sciences. Now, the algorithm is one of the famous research topics among scientists.

In this research, Genetic Algorithm was hybrid with double exponential smoothing equation. The algorithms will perform the iterative search by adopting the natural evolution mechanism. Through the imitated evolution process, the parameter will evolve intelligently to an optimum parameter value in forecasting simulation. Research experiments of integrating three different approaches of genetic algorithm were tried in this research. Then, the most effective algorithm in minimizing forecast errors was select as the best suit of algorithm for integration.