The Study of GM (1,1| α) on The Verhulst Model

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ABSTRACT

In the GM (1,1) study, generally speaking, the original data are non-smoothing type. But, actually, many types of data are smoothing and nonlinear. Such as population model, that is shown the saturation behavior in where. Hence, Deng and Wen proposed Verhulst model in GM (1,1) model to analyze this type of original data. However, the formula has some missing. Therefore, in this paper, we not only present the novel application for GM(1,1|α) to solve the problem, but also suggest the 4-points rolling in GM(1,1|α) is the better method in this field.

Key word—GM(1,1), smoothing and nonlinear type, population model, Verlhust GM (1, 1) mode, GM(1,1| α), 4-points rolling.

1. Introduction

Many research results based on the methodology of the GM (1,1) has been published in different area in the past two decades, since Deng developed the grey prediction model GM (1,1)[1]. Some applications of GM (1,1) were proposed to the problem of social science. in this field of the stock market GM (1, 1) has been used as a tool to analysis the market behavior, Hsiao and Hu,...el., forecasted Taiwanese stock index prices in 2005 [2]; Lin and Hung...el., in 2005, submit an application of GM (1,1) for forecasting the One–period–ahead Volatility of the International Stock Indices[3]; in 2004, Chang and Wen...el., apply it to forecast NASDAQ Index[4] and another application of GM (1,1) can be used to predict the grain, the same as that Zhang and Luo are valid the GM(1,1) to grain prediction in 1985 [5]; Long and Li...el., have been propose that analysis and envelope for GM (1,1) based prediction in Fruits and Forest Yields in 1993[6]. Also, there have some applications of GM (1,1) for hospital infections forecasting in this area. For exempla, Zhang and

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Wang...el., are proposed that using the GM (1,1) to forecast trends in hospital infections in 1999[7]; in 2006, Hsu and Hsu are Using the GM (1,1) to forecast the supply and demand for healthcare professionals in Taiwan[8].

The GM (1,1) also can be applied to forecast and regression for behavioral analysis for business market, in 1999, Lin and Chen are pertain GM(1,1) to analyses the Required Reserve Ratio of bank Re-decreasing[9]. Lin and Hsu are affect GM (1,1) to Forecast Advertising Revenue for five largest media internet in Taiwan[10] and forecast of Non-alcoholic aeverage sales in Taiwan in 2002 [11]; Kung and Chuang,...el., pertain GM(1,1) to forecast the computer game in Taiwan market in 2003[12]; In 2004, Kung and Chang are concern GM(1,1) to predict the China automobile industry [13]. By the traffic safety, the result of GM (1,1) based on prediction can be used to improve the safety, Lu and Wevers...el., apply GM (1,1) to model and forecast traffic safety improvement in 2005[14].

Since the GM (1,1) is developed to solve the problem of forecasting states of engineering. GM (1,1) has more width area for which application in the engineering. Huang and Wen are using GM (1,1) construct secure network communication system in 2004[15]; Fu and Zhang are valid GM (1,1) to optimization the data mapping in 2004[16]; Hsieh is appropriate GM (1,1) to process the speech enhancement in 2003[17], Wang is relevant GM (1,1) to process the thermal error compensation in a CNC lathe[18], Cheng and Chang are submit an application of GM (1,1) to forecast earthquake in 2001[19].

Overview those studies on the application of the GM (1,1) model, the GM(1,1) is used to predicting the original data that is the non-smoothing types. For the smoothing original data, "dose the GM can be applied?" this is further studies to the GM model to process this type. As so, Deng had proposed the method of the GM is using to the grow on the population on a location[20]. This is called "Verhulst GM(1,1) model, VGM(1,1)". Since, the population model has the behavior that wills saturation in the number of natural population grow. Thus, the original data of the population in a location is a smoothing type. Therefore, the processing to predict for the population just could using the VGM.

Whoever, to analysis the procedure of VGM that proposed by Deng and Wen [21,22], there is some