FORECASTING DOMESTIC TOURISM:
APPLICATION TO JOHOR TOURISM DATA

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To my beloved Abah, Mak, Yaya and Ail

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ABSTRACT

Serious tourism forecasting spans over three decades. A number of tourism forecasters have noted that complex forecasting models are seldom more accurate in predicting the future than simple ones. Hence, in this study, it shows through a Johor tourism forecasting comparison using the naïve model, moving average and exponential smoothing. An approach to selecting the method appropriate to Johor tourism data is based on criteria which are Mean Absolute Percentage Error (MAPE) and Mean Square Error (MSE). The naïve model, moving average and exponential smoothing are relatively simple to apply, requiring no more than a data series and a computer spreadsheet program. This study also explores the need of Tabu Search method in implying forecast. Tabu Search will be used to ensure the pattern of the studied data by searching the value of weighted constants α, β and γ. The confirmation is performed by Automated Computerized Forecasting (ACF) System.

ABSTRAK

Ramalan dalam industri pelancongan telah dijalankan secara serius menjangkau lebih daripada tiga puluh tahun. Beberapa peramal menyedari bahawa model ramalan yang kompleks tidak selalunya memberi keputusan yang lebih tepat daripada model yang ringkas dalam meramal masa depan. Oleh itu, kajian ini menunjukkan perbandingan ramalan industri pelancongan negeri Johor menggunakan model naif, Purata Bergerak dan Pelancar Eksponen. Pendekatan untuk memilih kaedah yang sesuai bagi data pelancongan Johor dengan berpandukan kepada kriteria yang mana ianya adalah Min Peratusan Ralat Mutlak (MAPE) dan Min Kuasa Dua Ralat (MSE). Model naif, Purata Bergerak dan Pelancar Eksponen agak mudah diaplikasi, memerlukan hanya siri data dan boleh menggunakan program komputer berlembaran. Kajian ini juga meneroka perlunya kaedah Carian Tabu dalam pelaksanaan ramalan. Carian Tabu akan digunakan sebagai pengesahan kepada corak data yang dikaji dengan mencari nilai pemberat bagi pemalar α, β dan γ. Pengesahan ini dilakukan melalui sistem Pengkomputeran Automatik Ramalan (ACF).

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LIST OF SYMBOLS

MAPE	-	Mean Absolute Percentage Error
MSE	-	Mean Square Error
α	-	Weighted Constant (between 0 and 1)
β	-	Weighted Constant (between 0 and 1)
γ	-	Weighted Constant (between 0 and 1)
AFC	-	Automated Computerized Forecasting
ADLM	-	Autoregressive Distributed Lag Model
ECM	-	Error Correction Model
VAR	-	Vector Autoregressive
TVP	-	Time Varying Parameter
AIDS	-	Almost Ideal Demand System
BSM	-	Basic Structural Model
SES	-	Single Exponential Smoothing
ARIMA	-	Autoregressive Moving Average
$N(s)$	-	Neighbourhood
S_T	-	Smoothed Estimate or Smoothed Statistic
ε	-	Random Component

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CHAPTER 1

INTRODUCTION

1.1   Introduction

Predictions of future events and conditions are called forecasts and the act of making such predictions is called forecasting. Forecasting can be broadly considered as a method or a technique for estimating many future aspects of a business or other operation. Planning for the future is a critical aspect of managing any organization and small business enterprise are no exception.   Indeed, their typically modest capital resources make such planning particularly important. In fact, the long-term success of both small and large organizations is closely tied to how well the management of the organization is able to foresee its future and to develop appropriate strategies to deal with likely future scenarios. Intuition, good judgment and an awareness of how well the industry and national economy is going may give the manager of a firm a sense of future market and economic trends.

Nevertheless, it is not easy to convert a feeling about the future into a precise and useful number. Perfect accuracy (in forecasting) is not obtainable (Brealy and Myers, 1988). If it were, the need for planning would be much less. Still the firm must

do the best it can. Forecasting cannot be reduced to a mechanical exercise. Naïve extrapolation or fitting trends to past data is off limited value. It is because the future is not likely to resemble the past that planning is needed. Forecasters rely on a variety of data sources and forecasting methods. In other cases, the forecasters may employ statistical techniques for analyzing and projecting time series. A time series is simply a set of observations measured at successive points in time or over successive periods of time.

As far as forecasting method are concerned, they can generally be classified into quantitative and qualitative (Archer, 1980; Uysal & Crompton, 1985). The quantitative approach gives more accurate forecasts than judgment forecasts. These methods are further divided into causal models and time series approaches. Their main distinction is that causal models attempt to identify and measure both economic and non-economic variables affecting other variables such as price and quantity while time series approaches identify stochastic components in each time series. All forecasting methods can be divided into two broad categories: qualitative and quantitative. Division of forecasting methods into qualitative and quantitative categories is based on the availability of historical time series data.

Clearly, forecasting is very important in many type of organizations since predictions of the future must be incorporated into decision-making process. In particular, any organizations must be able to make forecasts in order to make intelligent decisions.

1.2   Background of the Problem

Some say that travel and tourism is the 'world's largest industry and generator of quality jobs' (World Travel and Tourism Council, 1995: 1). They estimate that

tourism directly and indirectly contributes nearly 11 percent of the gross world product, the most comprehensive measure of the total value of the goods and services in the world's economies produce. The World Travel and Tourism Council estimated that in 2008, gross world product both directly and indirectly related to travel and tourism would total about US$944 billion, up from US$ 857 billion in 2007. This activity is buttressed by more than US$8 trillion invested in world plan, equipment and infrastructure related to travel and tourism. While these estimates may be controversial, there is no doubt that tourism activities, encompassing travel away from home for business or pleasure, comprise a substantial part of lifestyles of the world's residents, or that a very large industry has grown up to serve these travellers.

Futurist John Naisbitt (1944), in his bestselling book *Global Paradox*, subscribes to the concept that tourism will be one of three industries that will drive the world of economy into twenty-first century. However, the rate of growth has varied immensely from year to year, and while most countries have enjoyed steady increase in their tourist arrivals, some experienced declines in numbers at certain times. Planning under these circumstances is exceptionally difficult and important. But in attempt to plan successfully, accurate forecasts of tourism is required. This point has been noted by several authors in tourism field. For example, Wandner and Van Erden (1980, p. 381) point out that since governments and private industry must plan for expected tourism demand and provide tourism investment goods and infrastructure, the availability of accurate estimates of international tourism demand has important economic consequences. Archer (1987, p. 77) emphasizes the particular necessity for accuracy in tourism forecasting.

The tourism industries and those interested in their success in contributing into to the social and economic welfare of citizenry, need to reduce the risk of decisions which is reduce the chances that a decision will fail to achieve desired objectives. Future events important to tourism operations are somewhat predictable and somewhat changeable. Future time, on the other hand, includes time that has passed for which we

do not yet have reasonably complete and accurate data, as well as time not yet encountered. Some time series of interest to tourism forecasters may run three or six months behind actual time, so that we may not know what happened to tourism industry in two or three years ahead.

Planners and others in public agencies use tourism forecasts to predict the economic, social/ cultural or environmental consequences of visitors. In short, sound tourism forecasts can reduce the risks of decisions and the costs of attracting and serving the travelling public. It is difficult to imagine the tourism industry without forecasting to deal with the risks inherent in saving and investing.

1.3   Statement of the Problem

In this research, the tourism forecasting will be done by using basic extrapolative models (naïve and simple moving average). These are seldom used on their own to produce forecasts of tourism, but rather are the foundation for developing and applying more sophisticated models. The naïve models are especially useful as benchmarks for evaluating more complex forecasting techniques.

Then, we can test a number of alternative quantitative forecasting models, including extrapolative methods. We look for the model that best simulates the data, using criterion of error magnitude such as Mean Square Error (MSE) and Mean Absolute Percentage Error (MAPE). This should be the best candidate for forecasting future periods. Once we have determined this model, we can produce the forecasts we need.

We will also examine intermediate extrapolative forecasting methods, specifically single exponential smoothing, double exponential smoothing and triple

exponential smoothing. These methods are intermediate in their complexity among time series forecasting methods. Single exponential smoothing can be used to forecast from stationary time series while double exponential smoothing is designed for series showing a linear trend or a trend with seasonality removed. Triple exponential smoothing can be used for series including both trend and seasonal components. Intermediate time series methods are somewhat more complex than their basic brethren, but can still be handled in modern computer spreadsheets. However, as complexity arises, more data are required in time series models to obtain satisfactory results.

Finally, the use of Tabu Search will be applied to verify the pattern of the data by searching the value of α, β and γ. This is because Tabu Search technique is a meta-heuristic that guides a local heuristic search procedure to the solution space beyond optimality. It uses adaptive memory (memory-based strategies) and takes advantage of historical information of past solutions to form memories which are useful to help the search to explore other regions via diversification and intensification whenever necessary.

1.4   Objectives of the Study

Objectives of this study are:

i.   to forecast tourism using basic and intermediate extrapolative methods in Microsoft Excel spreadsheets.

ii.   to use Tabu Search for the confirmation of data pattern based on the value of α, β and γ found.

iii.   to compare the obtained results from those methods and select the best model in forecasting Johor tourism..

1.5   Scope of the Study

In this study, the basic and intermediate extrapolative methods will be used in determining the best model to forecast tourism. The naïve method will be introduced as the basic of this research, followed by the moving average and exponential smoothing method. At the mean time, the Tabu Search technique will be used to ensure the data pattern based on the value of α, β and γ found using ACF system. This study concentrates only on univariate model where the time series forecasting based on the past value. Measurement of error used is the MSE and MAPE. The data that will be used in this study is the Johor tourism data which is taken from *Majlis Tindakan Pelancongan Negeri Johor* (MTPNJ). The data covers the period for ten years from January 1999 to December 2008. The data are listed in the Appendix A.

1.6   Significance of the Study

The need for quick, reliable and simple forecasts of various time series is often encountered in economic and business environments. This study is an introduction of scientific approach in making decision. The result from this study is practical for other forecasters as a guide in forecasting especially in using extrapolative methods. A tourist forecaster or policy maker can at least make a good estimate of visitor arrivals in the absence of structural data by just using the available time series data. Relatively simple methodologies can be used on a spreadsheet and can give reasonable estimates albeit a short period time into the future. Moreover, these models are such that can be easily updated as time goes on; hence a constant track can be kept of the expected number of visitor arrivals. These models also can be extended to cover more regions or even predict the total expected number of visitor arrivals. Further works need to be done to generalize the findings to other tourist receiving destinations. That is, future studies can employ the same forecasting models but with different data series, for forecasting

accuracy testing. Moreover, additional forecasting techniques can be incorporated into future studies.

1.7   Dissertation Organization

Chapter 1 is the framework of the study that includes brief introduction, problem background, problem statement, objectives of the study, scope of the study, significance of the study and research outline.

Chapter 2 looks at the literature review involving tourism forecasting, history of Johor, time series forecasting, the types of forecasting methods, the naïve methods, the moving average methods, the single exponential smoothing method, the double exponential smoothing method, the triple exponential smoothing method, the Tabu Search technique and the Automated Computerized Forecasting (ACF) system.

Chapter 3 explores more about those methods mentioned above. The forecast errors which are MSE and MAPE will be discussed in forecast accuracy. This chapter will elaborate about the approach of the Tabu Search.

Chapter 4 presents the implementation of forecasting methods. Here, it shows the calculation using each basic and intermediate extrapolative method on Johor tourism data.

Chapter 5 discusses the comparison of each forecasting method. The best model among these methods will be selected in order to forecast.

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