FORECASTING MALAYSIA AIRLINES SHARE PRICES
USING MARKOV CHAIN

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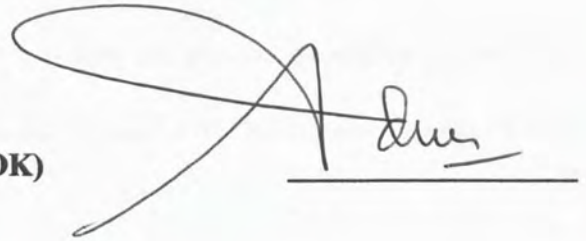
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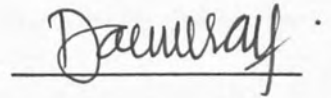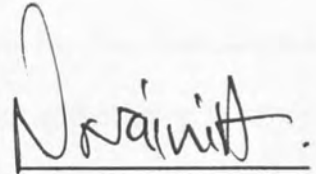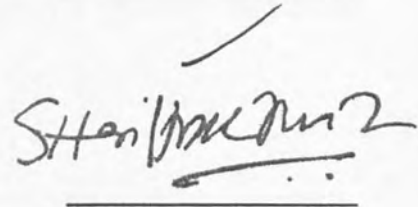
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ABSTRAK

Kaedah peramalan harga saham masih diutamakan dan menarik di kalangan aktiviti peramalan yang lain. Peramalan harga saham ditumpukan kepada Malaysia Airlines System Bhd. atau singkatan MAS. Kaedah ramalan yang digunakan ialah kaedah rantai Markov yang merupakan sejenis proses stokastik. Data yang digunakan untuk membuat peramalan adalah dari 3 Januari 2000 sehingga 31 Oktober 2007. Selain rantai Markov, anggaran nilai bagi data hilang juga dilakukan dengan menggunakan splin kubik yang merupakan salah satu jenis interpolasi. Tujuannya adalah untuk melihatkan kesan data hilang ke atas peramalan. Walaubagaimanapun, hasil kajian ini tidak begitu berjaya di mana ramalan dengan menggunakan kaedah rantai Markov tidak tepat. Selain itu, anggaran nilai data hilang tidak memainkan peranan yang penting dalam ramalan iaitu hasil kajian tidak menunjukkan perbezaan sama ada nilai anggaran diambil kira atau tidak.

ABSTRACT

Forecasting share prices remains the most demanding and exhilarating research among other forecasting activities. The particular stock of interest in this study is the national carrier, Malaysia Airlines or famously abbreviated as MAS. Rather than the usual way of time-series forecasting, this study uses Markov chain, a special kind of stochastic process. The historical data used to make forecast is from the period of 3 January 2000 until 31 October 2007. Besides forecasting, an interpolation method known as cubic spline is used to estimate missing values in the share prices. The purpose of estimating missing values is to look at the effect in forecasting. At the end of this study, however, the forecast by Markov chain has yet to be proven accurate. Moreover, the role of missing values does not contribute to the forecast significantly.

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LIST OF SYMBOLS

∈	element of
APE	absolute percent error
CLOB	Central Limit Order Book
KLCI	Kuala Lumpur Composite Index
KLSE	Kuala Lumpur Stock Exchange
MAPE	mean absolute percent error
MAS	Malaysia Airlines
MAR	missing at random
MCAR	missing completely at random
MNAR	missing not at random
OTC	over-the-counter
SAS	statistical analysis of software
SES	Stock Exchange of Singapore

CHAPTER 1

INTRODUCTION

1.1   STOCK MARKET

Wong (1993) commented that people buy stocks because they 'hope' to make money. Similarly people sell stocks as they 'fear' that their stock prices will tumble. It is often said that to make money in the stock market is not easy. However, people want to buy stock for capital gain and not just for the sake of dividends. The rise and fall of stock market is dependent to a large extend on the country's economic cycle and environment. During economic expansion, stock market will rise and during economic recession stock market will fall. Stock market comprises of various sectors of the economy such as consumer products, industrial products, construction, trading or services, infrastructure and so on. More sectors can be found in any newspaper under business or economics section.

Stocks also exist to enable companies in need of long-term financing to 'sell' pieces of the business that is stocks or equity securities, in exchange for cash. This is

written by Dalton (1993) of raising business capital other than by issuing bonds. In other words, when the stocks of these corporations are owned by the public at large, which includes both private investors and institutions, they are said to be publicly held. These publicly held shares can be sold to other investors in the stock market, and thus said to be liquid, or readily converted to cash.

1.2 INTRODUCTION TO FORECASTING

In all aspects of lives, people seek to anticipate or forecast events. For example, when driving, people anticipate the movements of other vehicles. The need for such forecasts explained by Hall (1994) arises because people are taking responsibilities into commitments about the future, and therefore need to form a view about the possible future consequences. Forecasting methods may be formal or intuitive. As future is unknown, all forecasting rests ultimately on learning from the past.

There are a lot of forecasting tools to forecast stock market. Sherman and Kolk (1996) divide them into two big groups that are qualitative and quantitative forecasting models. Qualitative forecasting models are like judgement methods and counting methods such as Delphi method and market research method. They are good in short term of the familiarity of experts with ongoing changes in their field. It works best when the forecasting scope is limited. The latter one consists of causal methods such as correlation models, regression models and leading indicators. Causal is a mathematical relationship between a dependent variable with one or more independent variables. Time series models such as moving averages, exponential smoothing, and Box-Jenkins are also quantitative forecasting models.

Other than statistical methods, there are also theories regarding the movements in the stock price. One of them which are accepted by most academians is the efficient market hypothesis. The stock price behaviour of Malaysia studied by Othman (1994) is to conform to the weak form of the efficient market hypothesis. Stock prices are assumed to reflect all information which may be contained in the past history of the stock itself. Since the information itself is random, the stock price movements should therefore be random. This gives rise to the random walk theory which is that series of price changes has no memory; the past cannot be used to predict the future in any meaningful way.

Other theories like Chartist theories on the other hand assume past behaviour of a stock's price is rich in information concerning its future behaviour. Through careful analysis of price chart, one can predict the future behaviour of prices. In Othman (1995) research and observation, it was found that any group can be right or wrong at any one specific time. There is no consistency in the results of the tests e.g. the use of monthly data opposed to weekly data produced different results.

1.2.1 Misuse of Forecasts

Forecasts can be incorrect sometimes. It can occur for a numerous reasons. According to Sherman and Kolk (1996), among the reasons is a tendency of forecasters to be momentum followers where they forecast the same thing because they are concerned about the validity of their forecasts. If the forecast are almost similar, then people will believe more. Sometimes, error in forecast happens because of the data itself. If the data is not true, then the forecast will be bias. Next, a forecast has no value if there is

no accuracy in the forecast. Accuracy can be improved by choosing an appropriate forecasting technique. Besides, lack of knowledge to interpret the forecast will make a forecast meaningless.

1.3   PROBLEM

The purpose of this study is to apply forecasting in stock market. Unlike the common theories or methods mentioned above, another way to forecast stock market is by using Markov chain. It is often unheard and rarely being used to forecast stock market. So, it will be proven that it can make good forecast.

The problem lies in each individual and investor when trading shares is in deciding when is the best time to buy or sell the share. They do not know how much the price is likely to change. According to White (1994), statistics show that over long periods, an investment in shares outperforms all other investments, including property. However, shares are a risky form of investment. The greater the reward, the greater is the risk. There is always risk in whichever decision being made. The investor must be prepared for the fact that part of his total investment is certain to be lost. Therefore, investor should only buy shares with money which he, or she, can afford to lose. So it follows that only the rich can afford to own shares. However, this is not always true. If the person knows the following movement of a share prices, then he or she has a high probability to maximize earning and minimize losing. By using Markov chain, the problem can be solved. Results are believed to be liable and it will be a perfect guidance to investors for investment purposes in the future.

1.4   BRIEF HISTORY OF MALAYSIA AIRLINES

In this study, the stock market that will be studied is trading or services particularly in airlines industry. This industry explained in Othman (1995) is characterised by high financial and operating leverage. A marginal passenger makes a difference between a profitable flight and an unprofitable one. Labour and fuel expenses account for big percentages of total expenses. Also, most airline revenues are generated from overseas operation. Thus Malaysia Airlines is the subject of this study. Following is a brief history of Malaysia Airlines.

Malaysia Airlines or MAS as short is the national carrier of Malaysia. It is recognised as Asia's largest, and receives numerous awards for lengthy record of services and best practices excellence. In Cheong (1995), MAS traces its origin to the registration in 1937 of Malayan Airways Limited. When Federation of Malaysia was formed in 1963, the airline was renamed Malaysian Airways Limited. In 1966, the government of Malaysia and Singapore acquired joint control of Malaysian Airways and renamed the airline Malaysia-Singapore Airlines Limited (MSA). However, differences in the objective and philosophy between the two partners led to adjoin governmental decision to restructure MSA into two separate carriers. Hence, Malaysian Airline Limited was incorporated on 3 April 1971. By 1 October 1972, the name of the national carrier was changed to Malaysian Airline System Berhad and officially launched. MAS was listed on the Main Board of the KLSE (Kuala Lumpur Stock Exchange) on 16 December 1985 which now has been renamed as Bursa Malaysia.

1.5   RELATIONSHIP BETWEEN MAS WITH KLSE AND SES

MAS was listed as new shares solely on the KLSE and Singapore Airlines on SES (Stock Exchange of Singapore) after the Malaysian government made the decision to terminate the interchangeability of currencies between Malaysia and Singapore which resulted in the dissolution of the joint stock exchange and the respective formation of the KLSE and SES. This fact was noted in Sun *et al*. (2002). Despite the separation, cross-listings continued and the regulatory and legal frameworks of both exchanges were similar.

On 27 October 1989, Malaysian finance minister at that time, Tun Daim Zainuddin and not Mr Zairuddin as mentioned in the paper announced the decision to end the mutual listings of stocks (delisting). The SES made two responses which were to set up an over-the-counter (OTC) market to trade Malaysian stocks and announced similar delisting of Singaporean stocks from KLSE. CLOB (Central Limit Order Book) International, the OTC market, initially consisted of one hundred and thirty three Malaysian stocks and six Hong Kong stocks. Of the one hundred and thirty three counters, some twenty five were not listed previously on the SES which included heavyweight MAS (major shares listed). However, CLOB International was officially closed on 15 September 1998 after the Malaysian government announced that all dealings in shares listed on the exchange must only be done through KLSE or a stock exchange recognized by the KLSE.

1.6   PURPOSES OF STOCK INDEX

The performance of an individual stock in any trading day is easily measured by calculating the percentage change in price at the end of the trading day over the closing price at the end of the previous day. According to Kok and Goh (1995), index is used to measure the performance of the whole stock market. In fact, it serves other several purposes. Rates of return on the stock index itself can be a valuable benchmark for judging the performance of actual portfolios of shares. Index is proved to be considerable use to analysts in forecasting the price movement in the future. The index is also regarded to be fairly good barometer for business conditions since the stock market is sensitive to changes in business activity and expectation. Finally, a stock market index may be used for stock index futures trading.

1.6.1   Kuala Lumpur Composite Index

Kuala Lumpur Composite Index (KLCI) is the main indexes used in Bursa Malaysia. The other index is FTSE Group. KLCI is constructed based on sample stocks inclusive of MAS. The objectives of Kuala Lumpur Stock Exchange Composite Index that was constructed in 1986 according to Kok and Goh (1995) are:

    (a) to reflect the performance of the companies listed on the stock exchange;

    (b) to be generally sensitive to the investors' expectation;

    (c) to be generally indicative of the impact of government policy changes, and

    (d) to be responsive to the underlying structural changes in the different sectors of the economy.

1.7 RELATIONSHIP BETWEEN KLCI AND MAS

In the findings by Kok and Goh (1995), the Single-Index Model was used to relate the return on a stock to the return on KLCI. Data on weekly closing returns on the stock and the week closing returns on the KLCI over the eight-year period 1983-1990 was used. The interpretation for MAS was that the stock is less volatile than the Composite Index. It was also quite reliable in tracking the Composite Index.

1.8 MISSING VALUES

Missing values in this context means the share prices which are unavailable. However they are not missing in the middle or at random but only during weekends and pubic holidays. This is because Bursa Malaysia does not operate and therefore no shares are traded. Hence they are considered as 'missing'. Missing values are a concern in this study because it may affect the daily stock return. The reasons are explained by Bell and Levin (1998) which are first, there is absence of brokers' advice over the weekend and second, there may be a high incidence of unfavourable news arriving at the weekend.

1.9 OBJECTIVES

The purpose of this study is to use forecasting in real-life application where it is to forecast the share prices of MAS by using a method called Markov chain. The objectives are shown below:

i. To forecast MAS share prices for data with and without estimating missing values.

ii. To examine the effectiveness of different dimension of matrices used Markov chain in forecasting MAS share prices.

iii. To estimate missing values for weekends and public holidays.

iv. To compare the performance between data with and without estimating missing values.

v. To examine the suitability of Markov chain as a forecasting tool.

1.10   SCOPE OF RESEARCH

The range of daily data of MAS share prices collected is from 3 January 2000 until 31 October 2007. All the historical prices are secondary taken from Yahoo! Finance website which MAS's stock code is 3786 in Bursa Malaysia (http://finance.yahoo.com/q/hp?s=3786.KL). The method used here is cubic spline and Markov chain.

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