FORECASTING THE NESTLE SHARE MARKET USING ARIMA MODEL WITH THE APPLICATION OF EVIEWS

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THIS DISSERTATION IS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF BACHELOR OF SCIENCE WITH HONOURS

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DECLARATION

I hereby declare that this dissertation contains my original research work. Source of findings reviewed herein have been duly acknowledged.

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ABSTRAK

Tujuan kajian ini adalah untuk membentuk satu model ARIMA (p,d,q) yang paling sesuai dan meramal harga saham tutup bagi Nestle (M) Berhad dengan menggunakan kaedah Pengubahsuai Box-Jenkins selama 82 hari iaitu dari 3 September 2007 hingga 31 Disember 2007, dimana ia tidak termasuk hari-hari yang tidak diniagakan. Dengan itu, data analisis yang dijalankan adalah bermula dengan 3 Januari 2000 sehinnga 30 Ogos 2007 dimana analisi tersebut berupaya menjanakan ARIMA model yang bersesuaian dengan syarat $p+q \leq 10$. Analisis tersebut akan diulangi semula dengan menganggarkan harga saham yang tidak diniagakan. Harga bagi hari-hari yang tidak diniagakan dianggar dengan menggunakan kaedah pendekatan kubik splin. Model terbaik akan dipilih dengan menggunakan beberapa kriteria yang digunakan.

Kata Kunci: Peramalan, ARIMA, Pengubahsuai Box-Jenkins, kubik splin.

ABSTRACT

The purpose of this study is to build a suitable model ARIMA (p,d,q) and to forecast the closing price for Nestle (M) Berhad by using Modified Box-Jenkins procedures for 82 days from 3 September 2007 until 31 December 2007 which is excluding non-trading days. The data analysis is carried out from 3 January 2000 until 30 August 2007 where this analysis of data will enable of generating the suitable ARIMA model, due to the restricted in $p+q \leq 10$. This analysis will be repeated by estimating the non-trading price. The price of non-trading days is estimated by using the cubic splines approach. The best model will be chosen by using some of the criteria to determine it.

Keywords: Forecasting, ARIMA, Modified Box-Jenkins, cubic splines.

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INTRODUCTION

1.1 OVERVIEW OF DISSERTATION

A shares or securities market plays a very important role in an economics development of a country. Therefore, an effort is needed to research the fluctuations and behaviours of the share price in a particular department or company before closing in a daily. So, it should be taken a heavy emphasis onto the fluctuation of share prices and this will consider the effects of trend, seasonality and cycles which reflect the change of share prices. Here, it indicates that the main purpose of this dissertation is to find the best model in order to forecast the share prices in the future.

1.2 STATEMENT OF PROBLEM

Everyone will want their money to work for them and to achieve as high investment return as possible. An investor who buys share in a particular corporation will be considered as one of the investment to gain income but the risk is ever present. Due to this circumstance, the practice of forecasting is applied in our society where the benefit such as providing better strategic information can improve the outcome or result. Hence, this useful information has been provided to the investor can be treated them as a guideline on searching the quality share and others.

In this paper, a forecast model which is well-known as Autoregressive Integrated Moving Average (ARIMA) is used so as the task problem can be solved and improve the quality of the outcome. Besides that, this paper is proposed that the existence of unobserved values can be estimated by the computer C programming with the cubic splines approach. This will enhance the forecast result by finding the unobserved data particularly on Saturday, Sunday and public holidays. So, this will give a further insight to the investor in order to make any decisions rationally.

Therefore, the forecast results in which the data with the estimation of unobserved values and without the estimation of unobserved values are then to be compared. Overall, this model follows the Modified Box-Jenkins procedures where the stages such as model identification, parameter estimation, eight selection criteria, and forecasting will be discussed in detail on Chapter 3.

1.3 SHARES

Shares are defined as a company that is quoted on a stock exchange offers shares in its ownership to anyone who wants to buy them. Shares are also called as 'equities' or more often known as 'stocks'. In general, a large company or corporation will probably issue millions of shares so that it can attract money (Gough, 1995) and also offer many good benefits for the investors (Walden, 2004), such as capital appreciation, income and liquidity. According to Doggett (2001), a company wishes to attract money because it might lack of working capital which is structured under the restrictions of private ownerships, business expansion and related business growth. For example, a company will have insufficient working capital to buy the right equipments and hire the right people, in order to undergo or develop their business and the expansion of its ideas for the good of a company. Hence, it has been concluded that this issue can be overcome by offering the shares to the public and invite them to put up certain amount of money of their own capital in return for a certain number of shares in that particular company.

In the perception of investors, the shares have been offered by a company will beneficial them where the three reasons have been stated on above. Firstly, the benefit comes from capital appreciation (Walden, 2004) which means that the shares offer the best potential for the growth of any conventional form of investment. While liquidity, the shares can be sold or bought all day every business day. Apart from that, the investors will gain income or profits through a declared dividend (Doggett, 2001) which is done and decided by a company's board of director.

According to the description of Gough (1995), it says that if someone has bought the shares in a corporation, it will be referred as an investor or a shareholder. Here, they have the right to share in its profits, to attend board meetings and to vote on key issues and appointments. The shares are volatile, they go up and down all the time as people buy and sell them.

Basically, the quality of shares can be divided into four categories. The researcher, Gough (1995) has examined that the categories are comprised of blue chip, secondary issues, growth stocks, and penny shares. The blue chip is the share where its price will grow in the highest value while secondary issues are receiving slightly less confidence than the blue chip. On the other hand, growth stocks are the shares which are placed in a new company and it will expect to do well in the future. Finally, penny shares are the shares where its price is in the low value and it might increase due to certain reasons.

In addition, Gough (1995) illustrates that the companies can issue a few types of shares where it can be labeled as the alphabet of 'A', 'B', 'C', and others. Every class of shares will consist of different rules, market prices and dividends. Commonly, Saunders and Cornett (2004) identify that there are two different types of shares will be traded in a corporation or company, such as common share and preferred share.

1.4 SHARE MARKET

Share market is a market place where people will come together to buy and sell shares. Hence, Ong (1993) studies that the price of a share is determined by the buying and selling pressure. A share market is indicated as the 'invention of civilization' (Doggett, 2001) where it brings the companies to raise capital and it does also push toward the sector society to invest their surplus capital.

Besides that, Doggett (2001) stresses that the existence of share market is necessary in a society because both companies and the public require a centralized location which is used as a reference point for the share prices. According to the research of Abdalla and Murinde (1997), it is encouraged that the less developed countries to launch stock market or revitalize existing one. It is because the creation of emerging stock market will provide a vehicle for mobilizing savings for private sector investment. Thus, the funds which have been raised in the stock market will enable the firms to decrease their over reliance on debt finance, increase overall efficiency, competitiveness, and solvency.

According to Doggett (2001), a share market fulfills its primary and secondary functions. The primary function works when companies issue shares to the public as the purpose of raising capital to further fund their business ambitions whereas secondary function acts as a reference point for stock quotes and the exchange of share ownership in companies listed on it. In the share market, it is thus can be divided into two markets. There are known as primary market and secondary market.

According to Saunders and Cornett (2004), primary markets are markets in which the corporations raise funds through new issues of stocks. Practically, this market's transactions will go through investment bank. This bank will be served as an intermediate stage of issuing corporations and investors in a share market. Besides that, this investment bank will function as purchasing the shares from the issuer for a guaranteed price. Then, the next step is that they will resell the shares to the investors with a higher price.

In secondary market, Saunders and Cornett (2004) define as the market in which once the shares have been issued, then it will be traded. For example, the New York Stock Exchange (NYSE) and the National Association of Securities Dealers Automated Quotation (NASDAQ) are the well- known secondary markets in the worldwide. In this market, when the transaction occurs between the buyer and seller of the share, a securities broker or firm will become an intermediary among their trades. The original issuer of the share is not involving in transferring the shares or the funds.

In the share market, the performance of the share prices is measured by the stock market index. Index is a good barometer (Goh and Kok, 1995) in the business field because it is sensitive to the variation of business or investment activities and expectation. Besides that, it had been also proven that it is considerable of applying it to analyst in forecasting the price movements in future.

1.5 FACTORS OF INFLUENCING THE SHARE MARKET

There are quite a number of factors which affect the fluctuation of the share prices in the market. Here, there will be three reasons as suggested to discuss on this issue, such as inflation, government involved, the performance of its company and perception.

1.5.1 Inflation

Inflation is an economy-wide phenomenon (Mankiw, 2004) that concerns the value of the economy's medium exchange. It also simply refers to how many the prices of the goods and services that it will rise up every year. According to Sincere (2004), one of the reasons that people invest in the stock market is trying to beat the inflation. The further explanation is written by Faerber (2000) is that if the prices in the economy keep rising, the purchasing power of the investor is reduced. It is because the purchasing power risk has the strong effect on the investment that has fixed returns and no return. For example, common stocks will performance better during the period slight to moderate inflation.

Here, the illustration shows that most of the financial assets such as bonds, money market securities, and common stock have progressed or improved during the period of low to moderate inflation whereas during the high inflation, all financial assets are doing poorly. Hence, the investor should choose investment whose anticipated returns are higher than the anticipated rate of inflation.

Furthermore, the empirical finding of Caporale and Jung (1997) describes that the real stock returns are inversely related to the inflation rates has generated a significant debate in the finance literature. It argues that inflation lowers stock prices because non-neutralities in the tax treatment of inventory and depreciation charges cause inflation to lower real after- tax profits. On the other hand, it has been found that the negative inflation and stock return relationship is generated by a positive causal link between real output and stock returns coupled with an inverse correlation between real output and inflation.

1.5.2 Government and Political Risk

The government also plays a main influence on the fluctuation of the share price. For example, the speech given by government sector such as monetary policy, higher taxes, or new law will affect the share price in the market. According to Sincere (2004), the influence of the market is based on the perception and psychology than reality. Furthermore, the political risk refers to the political environment (Faerber, 2000) that affect companies' shares. For example, government intervention in the private sector, currency devaluations, and changes in government can affect a company's profits. Therefore, it is advisable of avoiding investing in the companies in troubled countries.

1.5.3 Company's Performance and its Perception

The prices of the shares which are traded on the stock exchanges are determined by the supply and demand (Mankiw, 2001) for the shares in the companies. Sincere (2004) evaluates that when a company makes money or might make money in future, there will probably more people to buy the shares in a particular company. This is the concept of supply and demand in the share market. It is because the demand of the shares will reflect people's perception of the corporation's future profit. For example, when people become optimistic about a company's future, the demand of shares will be raised up and this can directly bid up the shares prices of a market.

Apart from that, Sincere (2004) indicates that the shares go up and down is based on primarily people's perception where many corporations spend money on advertising in order to bring positive publicity for them. It also can be seen that there are some shareholders send emails or post message to public as this is one of the way to convince people to buy more shares. Besides that, the intertemporal asset pricing models (Loflund and Nummelin, 1997) suggest that ex ante real stock and bond returns should be related to investor's conditional forecasts of economic growth and uncertainty. For example, if an investor desires to smooth consumption over time, predictable change in forecasts of real activity will tend to generate predictability in asset returns through time varying expected returns.

REFERENCES

Abdalla, I.S.A. & Murinde, V.1997. Exchange rate and stock price interactions in emerging financial markets: evidence on India, Korea, Pakistan and Philippines. *Applied Finance Economics* **7**: 25-35.

Abdel-Aal, R.E & Mangoud, A.M. 1998. Modeling and Forecasting monthly patient volume at a primary health care clinic using univariate time-series analysis. *Computer Methods and Programs in Biomedicine* **56**: 235-247.

Akaike, H. 1970. Statistical Predictor Identification. *Annals Institute of Statistical Mathematic* **22**: 203-217.

Akaike, H. 1974. A New Look at Statistical Model Identification. *IEEE Trans Auto Control* **19**: 716-723.

Bowerman, B.L. & O'Connel, R.T. 1987. *Time Series Forecasting Unified Concepts and Computer Implementation*. 2nd Edition. Duxbury Press, Boston.

Bowerman, B.L., O'Connell, R.T. & Koehler, A.B. 2005. *Forecasting, Time Series, and Regression.* 4th Edition. Thomson Brooks/Cole, Belmont.

Caporale, T. & Jung, C. 1997. Inflation and real stock prices. *Applied Finance Economics* **7**: 265-266.

Chatfield, C. 1996. *The Analysis of Time Series*. 5th Edition. Chapman & Hall, London.

Chatfield, C. 2000. *Time-Series Forecasting*. Chapman & Hall, Boca Raton.

Craven, P. and Wahba, G. 1979. Smoothing Noisy Data with Spline Functions. *Numerical Mathematics* **13**: 377-403.

Cryer, J.D. 1986. *Time Series Analysis*. Duxbury Press, Boston.

De Gooijer, J.G. & Hyndman, R.J. 2006. 25 years of time series forecasting. *International Journal of Forecasting* **22**: 443-473.

DeLurgio, S.A. 1998. *Forecasting Principles and Applications.* McGraw-Hill, Boston.

Diebold, F.X. 1998. *Elements of Forecasting.* South-Western College Publishing, Ohio.

Doggett, P.R. 2001. *You, Your Stockbroker and Your Stocks*. McGraw-Hill, Sydney.

Faerber, E. 2000. *All About Stocks: The Easy Way To Get Started.* 2nd Edition. McGraw-Hill, New York.

Farnum, N.R. & Stanton, L.W. 1989. *Quantitative Forecasting Method.* Pws-Kent Publishing Company, Boston.

Giordano, F.R., Weir, M.D. & Fox, W.P. 2003. *Mathematical Modeling*. Thomson, South Melbourne.

Goh, K.L. & Kok, K.L. 1995. *Malaysian Securities Market*. Pelanduk Publications, Petaling Jaya.

Gough, L. 1995. *The Investor's Guide to How The Stock Market Really Works.* Pitman Publishing, London.

Hanke, J.E. & Wichern, D.W. 2005. *Business Forecasting*. 8th Edition. Pearson Prentice Hall, New Jersey.

Hannan, E. J. and Quinn, B. 1979. The Determination of the Order of an Autoregression. *Journal of Royal Stat. Society, Series* **B41**: 190-195.

Hoang, P. 2006. *Springer Handbook for Engineering Statistics*. Springer, London.

Hyndman, R.J., Koehler, A.B., Snyder, R.D. & Grose, S. 2002. A state space framework for automatic forecasting using exponential smoothing methods. *International Journal of Forecasting* **18**: 439-454.

Ismail, B.M., Ningsih, S.C. & Dasril, Y. 2007. Unimodality tests for Global Optimization of Single Variable Functions Using Statistical Method. *Malaysian journal of mathematical Sciences* **1**(2): 43-53.

Lim, C. & McAleer, M. 2001. Time series forecasts of international travel demand for Australia. *Tourism Management* **23**: 389-396.

Lind, D.A., Marchal, W.G. & Wathen, S.A. 2005. *Statistical Techiniques in Business and Economics*. 12th Edition. McGraw-Hill, Boston.

Loflund, A. & Nummelin, K. 1997. On stocks, bonds and business conditions. *Applied Finance Economics* **7**: 137-147.

Madden, G., Savage, S.J. & Coble-Neal, G. 2002. Forecasting United States-Asia International Message Telephone Service. *International Journal of Forecasting* **18**: 523-543.

Mankiw, N.G. 2001. *Principles of Macroeconomics.* 2nd Edition. Harcourt College Publisher, Fortworth.

Mankiw, N.G. 2004. *Principles of Economics.* 3rd Edition. Thomson South Western, Ohio.

Navorro-Esbri, J., Diamadopoulos, E. & Ginestar, D. 2001. Time series analysis and forecasting techniques for municipal solid waste management. *Resources, Conservation and Recycling*: 1-14.

Nestle, 2006. *Annual Report of 2006*. Petaling Jaya.

Nestle, 2006. *Financial Report of 2006*. Petaling Jaya.

Ong, Y. 1993. *Key To Singapore Stock Market Profits*. Heinemann Asia, Singapore.

Ramanathan, R. 2002. *Introductory Economatrics with Applications*. 5th Edition. South-Western, Ohio.

Rice, J. 1984. Bandwidth Choice for Nonparametric Kernel Regression. *Annals of Statistics* **12**: 1215-1230.

Saunders, A & Cornett, M.M. 2004. *Finacial Markets and Institutions*. McGraw-Hill, Boston.

Schwarz, G. 1978. Estimating the Dimension of a Model. *Annals of Statistics* **6**: 461-464.

Shibata, R. 1981. An Optimal Selection of Regression Variables. *Biometrika* **68**(1): 45-54.

Sincere, M. 2004. *Understanding Stocks*. McGraw-Hill, New York.

Su, V. 1996. *Fluctuation and Forecasting*. Hapercollins College Publishers, New York.

Vandaele, W. 2004. *Applied Time Series and Box-Jenkins Models*. Academic Press Limited, London.

Vogelvang, B. 2003. *Econometrics Theory and Applications with EViews*. Prentice Hall, London.

Walden, G. 2004. *If Not Stock, What?* McGraw-Hill, New York.

Wilson, J.H. & Keating, B. 1994. *Business Forecasting*. 2nd Edition. McGraw-Hill, Boston.

Zirilli, J.S. 1997. *Financial Prediction using Neural Networks*. Thomson, London.