FOREX FORECASTING BY USING NGARCH MODEL

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To my beloved family, for your love and support.
To my friends, for your wits, intelligence and guidance in life.

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ABSTRACT

Foreign Exchange (Forex) is the market where a nation's currency trade with another. Flexible exchange rate started in 1973 since Bretton Woods Agreement was breakdown and it because the fluctuating exchange rate moves more drastically then before. Thus, forecasting exchange rates have become very important and challenge research issue for both academic and industrial. In this study used exchange rate selling prices of RM/USD. The daily data cover the period from 03/05/2007 to 29/05/2009 exchange rate from Bank Negara Malaysia and it was volatility and moves through the times. Thus, NGARCH model will be introduced in this study to forecast the selling prices for RM/USD exchange rate in future and GARCH(1,1) as a benchmark. All the data was analyzed by using Microsoft Office Excel 2007 software. The forecast performance value of RMSE of NGARCH (1, 1) is 0.022809308 smaller than RMSE of GARCH(1, 1) which value is 0.23439891. Therefore, the NGARCH model is more accuracy than GARCH model.

ABSTRAK

Pertukaran Wang Asing (FOREX) adalah pasaran di mana sebuah negara perdagangan mata wang dengan satu negara yang lain. Pada 1973, keruntuhan Bretton Woods Agreement menyebabkan keseluruhan dunia mula menerima kadar pertukaran yang fleksibel. Oleh itu, kadar naik turun pertukaran sering bergerak lebih drastik daripada dahulu. Oleh itu, kadar-kadar pertukaran peramalan telah menjadi amat penting dan mencabar dalam kedua-dua bidang akademik dan perindustrian. Dalam kajian ini, harga jualan kadar pertukaran RM/USD telah digunakan. Tempoh data yang digunakan daripada Bank Negara Malaysia dari 03/05/2007 hingga 29/05/2009 dimana kemeruapan dan bergerak melalui masa-masa itu. Oleh itu, model NGARCH akan diperkenalkan dalam kajian ini untuk meramalkan harga jualan untuk RM/ USD kemudian hari dan GARCH(1,1) seperti satu penanda aras. Semua data itu telah dianalisis dengan menggunakan perisian Microsoft Office Excel 2007. Prestasi ramalan NGARCH (1, 1) di mana nilai RMSE adalah 0.022809308 lebih kecil daripada GARCH (1, 1) di mana value sama dengan 0.23439891. Oleh itu, model NGARCH adalah lebih tepat daripada model GARCH.

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LIST OF SYMBOLS

P_{t+1}	-	Logarithm return for daily closing prices
C	-	The observed assets prices
σ^2_{t+1}	-	Conditional variance
ω, α, β	-	Coefficient parameter of GARCH model
ρ	-	the correlation between returns and variance
Z_t	-	iid standard normal random variable $N(0,1)$
r_d	-	the constant one period riskless domestic interest rate
r_s	-	the constant one period riskless foreign interest rate
λ	-	the constant risk premium (the reward for investing in the foreign currency)

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CHAPTER I

INTRODUCTION

1.0   Introduction

Foreign Exchange (Forex) is the market where a nation's currency trade with another. In 1973, Bretton Woods Agreement was breakdown and it makes most of countries in the world started to accept flexible exchange rate. Therefore, fluctuating of exchange rate often move more drastically than before. Thus, forecasting exchange rates have become very important and challenge research issue for both academic and industrial.

Due to the fact that Forex forecasting is of practical as well as theoretical importance, a large number of methods and techniques (including linear and nonlinear) were introduced to beat random walk model in Forex market. With increasing development of time series forecasting, researchers and investors are hoping that the mysteries of the Forex market can be solve. In last two decades, extensive research has been carried out on the returns of time series data Generalized Autoregressive Conditional Heteroscedastic (GARCH) models. Many previous studies have been discussed for FOREX forecasting.

In this study used exchange rate United State Dollar (USD) versus Ringgit Malaysia (RM). The daily data cover the period from 03/05/2007 to 29/05/2009

exchange rate from Bank Negara Malaysia and it was volatility and moves through the times. Thus, GARCH models will be introduced in this study to forecast the exchange rate in future.

A GARCH process is a form of stochastic process that is commonly used in finance and economics. These models are known as univariate time series models and is very useful in analyze and forecast the volatility. These models were developing in order to model and forecast the variance of financial and economic time series over time. GARCH models are simple and easy to handle, it take care of clustered errors, nonlinearities and changes in the econometrician's ability to forecast. GARCH is a time series modeling technique that used past variances and past variance forecasts to forecast future variances.

1.1   History of Foreign Exchange

At 1870s, Western Europe was acceptance with their countries currency set par value in term of gold which is the gold standard. Since governments agreed to buy or sell gold on demand with anyone at its own fixed parity rate, therefore the value of each currency in terms of gold are fixed.

Most central banks supported their currency with convertibility to gold before World War I (WWI). Although paper money could always be exchanged for gold, in reality this did not occur often, fostering the sometimes disastrous notion that there was not necessarily a need for full cover in the central reserves of the government.

Occasionally, inflation and political instability are causes by the ballooning supply of paper money without gold cover. Foreign exchange controls were introduced to prevent market forces from punishing monetary irresponsibility to protect local national interests.

In July 1994, the Bretton Woods agreement was reached on the initiative of the USA in the latter stages of World War II (WWII). The agreement established a US dollar based monetary system. Other international institutions such as the IMF, the World Bank and GATT (General Agreement on Tariffs and Trade) were created in the same period as the emerging victors of WWII searched for a way to avoid the destabilizing monetary crises which led to the war. The Bretton Woods agreement resulted in a system of fixed exchange rates that partly reinstated the gold standard, fixing the US dollar at USD35/oz and fixing the other main currencies to the dollar - and was intended to be permanent.

In 1973, Bretton Woods Agreement was breakdown and the dollar was no longer suitable as the sole international currency at a time when it was under severe pressure from increasing US budget and trade deficits. Foreign exchange trading was start develop in the following decades into all around the world. Restrictions on capital flows have been removed in most countries and most of countries in the world started to accept flexible exchange rate.

1.2   Problem Statement

GARCH models take care of the kurtosis of the frequency and the volatility clustering of the data. These two characteristics are very important in financial time series. It can provide the accuracy of the forecasts of variances and covariance in assets returns. It was ability to model time-varying conditional variances. The exchange rate will be forecast by GARCH in this research. In fact, GARCH model can also be apply in such field like risk management, portfolio management and asset allocation, option pricing, foreign exchange and the structure of interest rates.

In this research, we can easy found the highly significant of GARCH in the equity market, at present and for the future. GARCH models can use to examine the relationship between the long-term and short-term of the interest rates. Moreover, GARCH models can be using in analysis the time-varying risk premiums and the Forex market which consist the highly persistent periods of volatility and clustering.

1.3   Objectives of the Study

The objectives of this study are:

i.   To explore NGARCH and GARCH model of forecasting exchange rate by using Microsoft Excel 2007.

ii. To explore the NGARCH model in predict the Forex data.

iii. To predict the daily exchange rate for RM/ USD selling prices.

1.4   Scope of the Study

This research is focuses on examination of the Forex market by using NGARCH model. The GARCH models will be introduced as the benchmark to this study. There cover 2 years of exchange rate data will be forecast by using NGARCH model for more understanding for the reader. Hopefully this study will increase the understanding and further exploration about the GARCH model.

1.5   Organization of the Research

This research is organized into five chapters.

Chapter 1 gives the introduction of this study. It begins with the overview of FOREX market, GARCH models appoarch, the objectives and the scopes.

Chapter 2 and 3 describes the introduction of GARCH models with its specifications. The details and principles will also be focusing. It will present the GARCH family with their consistency and the appropriate model for the data will be selected.

Chapter 4 describes introduction of case study and analyze the data of Forex market which RM/USD. The data consists of daily observations of buying and selling price of exchange rate against RM (Ringgit Malaysia) over the periods 2007 – 2009. Between, this chapter will identify the variables that can influence the moving of Forex and its future. These variables will be included in the models so that the results in predict the exchange rate will more consistency and accurately.

Chapter 5 gives a summary of the whole study. Some conclusions are drawn and finally, some thoughts on possible directions in which future research in this area might be pursued are offered.