UNIVERSITI TEKNOLOGI MARA

GARCH PARAMETER ESTIMATION USING LEAST ABSOLUTE MEDIAN

HANAFI A.RAHIM

PhD

September 2012

UNIVERSITI TEKNOLOGI MARA

GARCH PARAMETER ESTIMATION USING LEAST ABSOLUTE MEDIAN

HANAFI A.RAHIM

Thesis submitted in fulfillment
of the requirement for the degree of
Doctor of Philosophy

Faculty of Computer and Mathematical Sciences

September 2012

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any academic institution or non-academic institution for any degree or qualification.

I hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my student and research.

Name of Student	:	Hanafi A.Rahim
Student I.D. No.	:	2008426564
Programme	:	Doctor of Philosophy
Faculty	:	Computer and Mathematical Sciences
Thesis Title	:	GARCH Parameter Estimation using Least Absolute Median
Signature of Student	:	
Date	:	September 2012

ABSTRACT

The general autoregressive conditional heteroscedasticity, (GARCH) family has become more efficient in fitting financial data as it consists of the second order moment that measures the time-variant of the volatility data. However, GARCH may fail to fit some high frequency financial data with large jumps called outliers. In this research, GARCH parameters were estimated using least absolute median (LAM). The LAM estimator was developed using Bahadur representation and Taylor expansion to speed up i ts iteration process. This research managed to obtain the asymptotic normal distribution for LAM-ARCH and LAM-GARCH. This asymptotic distribution was used to develop test statistics to test the performance of estimated parameters. This asymptotic distribution is an extension of the special case of quantile regression to the GARCH model. Iteration processes are needed to obtain the parameters. T his was performed using the modified idea of least median square regression. Simple tests like the box plot and average absolute error, (AAE) were also used to test its performance. T he model developed was then validated through simulation analysis and hypothesis testing. Based on t he simulation analysis, the LAM estimator produced stable parameters in terms of less variability compared to other estimators considered in this research. Hypothesis testing showed that the parameters are well estimated. Throughout the research, estimation method in the form of a LAM-ARCH model with asymptotic normal distribution is developed. The LAM-GARCH model, an extension from LAM-ARCH with asymptotic normal distribution together with its procedure to assess the performance of the estimated parameters is achieved. An autocorrelation test to access the behaviour of the model based on its residuals and test statistics for assessing the performance of the methods developed. Applications to real data provide insights on the usability of the method developed using three data series. LAM can estimate good parameters of all the real series.