UNIVERSITI TEKNOLOGI MARA

ENHANCED VARIANCE TARGETING ESTIMATOR FOR PARAMETER ESTIMATION IN GARCH MODEL

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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.

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ABSTRACT

The aims of this study is to investigate two issues that affect the estimator’s performance which are a well specified conditional variance and the existence of the finite fourth order moment to retain the estimator’s performance. This study focuses on variance targeting estimator (VTE) as it proved to be robust to model misspecification and reduce the complexity of the estimation process compared to the standard quasi maximum likelihood estimator (QMLE). Nevertheless, common characteristics of financial time series data is heavy tailed and therefore the finite fourth order moment does not exist. This situation cannot be handled by the standard VTE. Two enhanced estimators, trimmed and winsorized unconditional variance are proposed to counter this problem. By proposing this, the issue of non-existence of finite fourth order moment can be solved while maintaining the VTE robustness toward model misspecification. The estimators are tested in two environments, in-sample and out-of sample using simulated and real datasets. The in-sample performance is measured by Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC) while the out-of sample performance is measured by Mean Square Error (MSE) and Mean Absolute Deviation (MAD). The simulated datasets are generated with three different error distributions (normal, Student’s-t and skewed Student-t distributions) and three sample sizes (n=500, 1000 and 2500). Meanwhile, Financial Times Stock Exchange (FTSE) Bursa Malaysia Kuala Lumpur (FBMKLCI) closing price index is used and is divided into three periods (pre-crisis, crisis and post-crisis) based on Asia Financial Crisis 1997. These datasets are implemented under three misspecification and in the presence of outliers. The three misspecifications are error distribution assumption, initial parameters assignment and model selection. In order to examine the robustness of the estimators, two types of outliers, single and consecutive occurrence are considered. Results show that winsorized VTE is better compare to the other estimators for n=500 and n=1000 while trimmed VTE is best when n=2500. For real datasets, it appears that the trimmed VTE is best to be used for post-crisis period while winsorized VTE gives competitive results for pre-crisis period. Hence, the proposed estimator can be of practical use in forecasting volatility of financial time series data.
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