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VALUE-AT-RISK MODELLING FOR THE MALAYSIAN STOCK EXCHANGE BASED ON MONTE CARLO SIMULATION

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Candidate'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 other academic institution or non-academic institution for any other degree or qualification.

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ABSTRACT

This study puts forward Value-at-Risk (VaR) models based on Monte Carlo Simulation (MCS) that are integrated with several volatility representations to estimate the market risk for seven non-financial sectors traded on the first board of the Malaysian stock exchange which is now known as Bursa Malaysia. In a sample over the years from 1993 until 2004 for construction, consumer product, industrial product, plantation, property, trade and services and mining sectors, the expected maximum losses were quantified for 1-day, 10-days and 25-days at 95% and 99% confidence levels. While the mining sector gave the highest expected value of VaR in all parameter settings, the plantation sector delivered the minimum value of VaR in most circumstances. Next, in a two-year out-of-sample group covering 2005 to 2006, the performance of the RiskMetrics EWMA and GARCH-based models was assessed from three different perspectives; conservatism, accuracy and efficiency. Although mixed results were observed, the study provides some indications of the applicability of some VaR models for the sectors involved besides confirming that data and computational choices affect risk measurement qualities. Under conservatism tests, the GARCH-based models were the most conservative model at both the 95% and 99% levels of confidence of Mean Relative Bias and Root Mean Squared Relative Bias in the single variable cases, while the t-distributed EGARCH delivered good results in multiple variables circumstances. For accuracy performances, tests conducted using Kupiec's and Christoffersen's provided evidence that almost every model was found to be accurate for all sets of occurrence. However, using Lopez test, which takes into consideration the magnitude of the impact of exceptions, models with the highest accuracy rate for multiple variables and most of the sectors studied under single variable were the $MCS_2+EGARCH_N$ and $MCS_1+GARCH_t$ respectively. In measuring efficiency, restricted to the confidence levels, the t-distributed models were identified as the best representative to track movements in true risk exposure for single variable while $MCS_2+EGARCH_N$ for multiple variables conditions. As such, this study indicates that a consideration of fat-tails and asymmetries are crucial issues when deciding to estimate VaR in managing financial risk.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Since the 1970s, world business transactions have experienced and contributed to diverse sources of financial uncertainty or risk (see, Dowd, 2005; Holton, 2003; Jorion, 2006; Tardivo, 2002a). Financial risk or risk created through financial transactions can be associated with value reduction. This reduction is due to market factors disequilibrium such as equity prices devaluation, interest or exchange rate fluctuations. Lately, in the competitive business environment, it has been discovered that firms have to face several financial risks namely market, credit, liquidity, operational and legal risks.

The uncertainty scenario undoubtedly has had an impact on the volatility level of the financial market, thus influencing the return of an investment. Reflected in various dimensions such as the stock market, exchange rate, interest rate and commodity market, a volatile environment exposes firms to greater financial risk levels. Volatility that creates new dimension of business and systematic risk then forces firms to amend congruently their operational structure to accommodate changes in the environment. These conditions motivate firms to find new and better ways to manage risk, specifically in the case reported by Dowd (1999a) where investors were exposed to multiple problems of market risk. Although risk cannot be totally eliminated, Fong and Vasicek (1997) stress that its effect, particularly on investment losses, can be minimized thoroughly when one understands and manages it according to an effective risk measurement methodology.

Ironically, the tremendous evolution in risk management practices coupled with innovation of financial engineering instruments have several distinctive effects,

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