

The 5th IMT - GT International Conference on Mathematics, Statistics and Their Applications **ICMSA 2009**

Editors :
**I Made Arnawa, Muhafzan,
Maiyastri, Susila Bahri**



**June 9-11, 2009
The Hills Hotel
Bukittinggi, Indonesia**

Organized by :



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PROCEEDING



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**Department of Mathematics
Faculty of Mathematics and Natural Sciences,
Andalas University, Indonesia**

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Preface

First of all, I would like to say welcome to Bukittinggi, Indonesia to all of you. It is an honour for us to host this conference. We are very happy and proud because the participants of this conference come from many countries; we have participants from Libya, Japan, Qatar, India, Malaysia, Singapore, Thailand, Iran, and many more.

Ladies and gentlemen, according to constructivism theory, mathematics comes out as a result of social construction; that's why, the outcomes of our researches in mathematics, like theorem or formula of mathematics, should be communicated in a scientific forum such as seminar or conference. Through this kind of seminar or conference, we could refine the existing theorems or we could get new ideas to produce a new one. Seminar or conference which is held annually enables us to continually develop the science of mathematics until the end of the time.

That's way, in this two-day conference, we are going to discuss around 250 papers coming from diverse aspects of mathematics ranging from analysis, applied mathematics, statistics, algebra, Computational Mathematics, mathematics education, and other related topics.

For all of us here, I would like to convey my endless appreciation and gratitude for your participation in this conference.

Thank you very much



Dr. I Made Arnawa
Chairman of the Conference

Message from Rector Andalas University

It gives me great pleasure to extend my sincere and warm welcome to the participants of the 5th International Conference on Mathematics Statistics and Application (The IMT GT's 5th ICMSA 2009) - A Joint Scientific Program organized by Universities over Indonesia, Malaysia and Thailand Growth Triangle Region. On behalf of Andalas University, let me welcome all of you to the conference in Bukittinggi, West Sumatra Province, the land of Minang kabau.

We believe that from this scientific meeting, all of participants will have time to discuss and exchange ideas, findings, creating new networking as well as strengthen the existing collaboration in the respective fields of expertise. In the century in which the information is spreading in a tremendous speed and globalization is a trend, Andalas University must prepare for the tough competition that lay a head. One way to succeed is by initiating and developing collaborative work with many partners from all over the world. Through the collaboration in this conference we can improve the quality of our researches as well as teaching and learning process in mathematics and to achieve standards and requirements applied in many developed countries. I strongly believe that this conference is and extraordinary testimony to our capacity building at international, regional and local level.

I would like to express my deep gratitude to International Scientific Committee of who has honored the Mathematics Department, Faculty of Mathematics and Natural Sciences, Andalas University to host this prestigious conference. This is a very special opportunity for us to be involved in a regional community of knowledgeable scientist in the field of mathematics, statistics and their applications. I would also like to extend my gratitude to keynote speakers, participants, and organizer of this conference for their contribution to this event. My special thank is also rendered to the local government of West Sumatra for various supports and facilities.

Finally I wish all participants a fruitful deliberation at the conference. I also wish all participants and accompanying spouses a pleasant and enjoyable stay in Bukittinggi City, West Sumatra.



Prof. Dr. Ir. Musliar Kasim, MS
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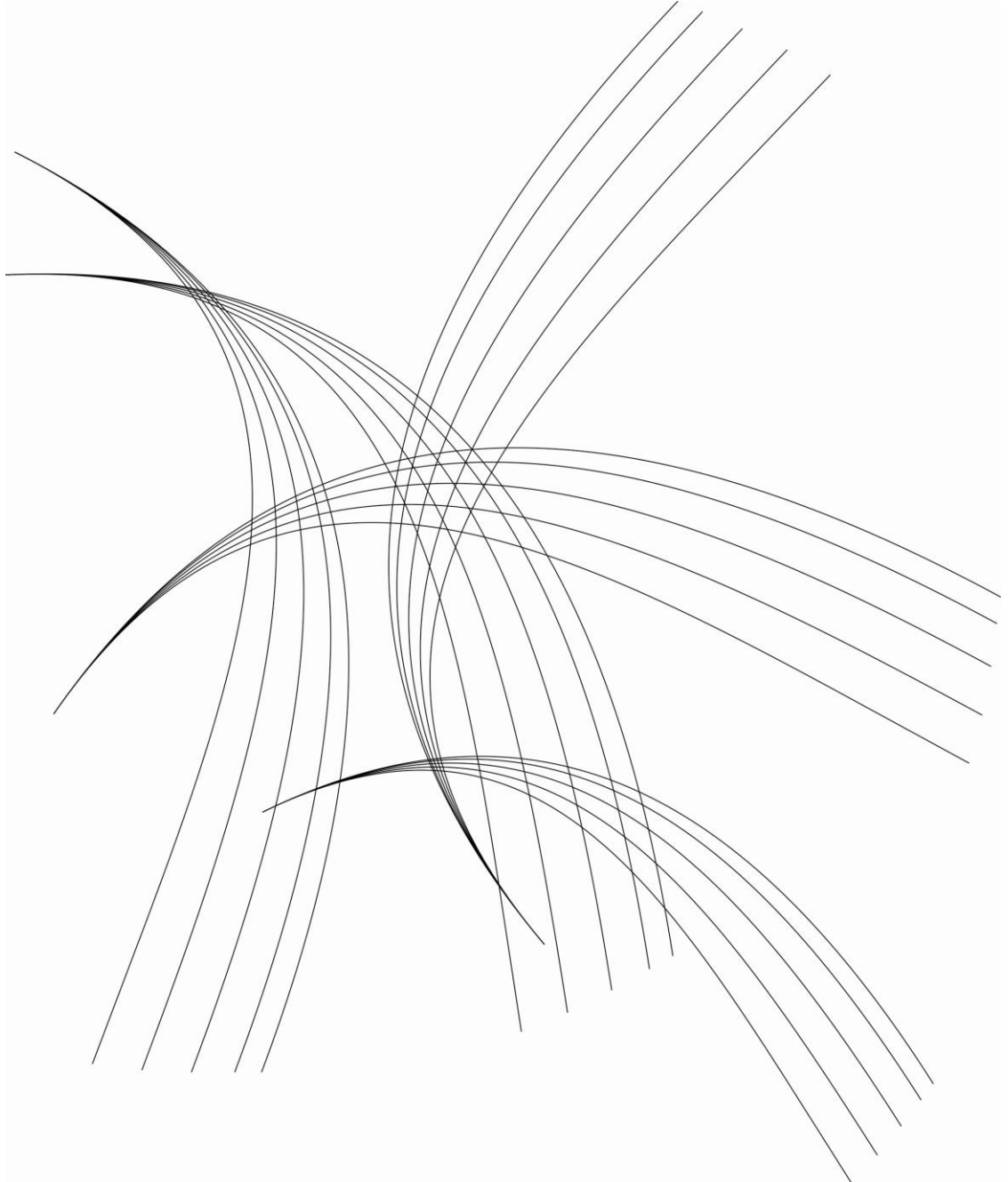
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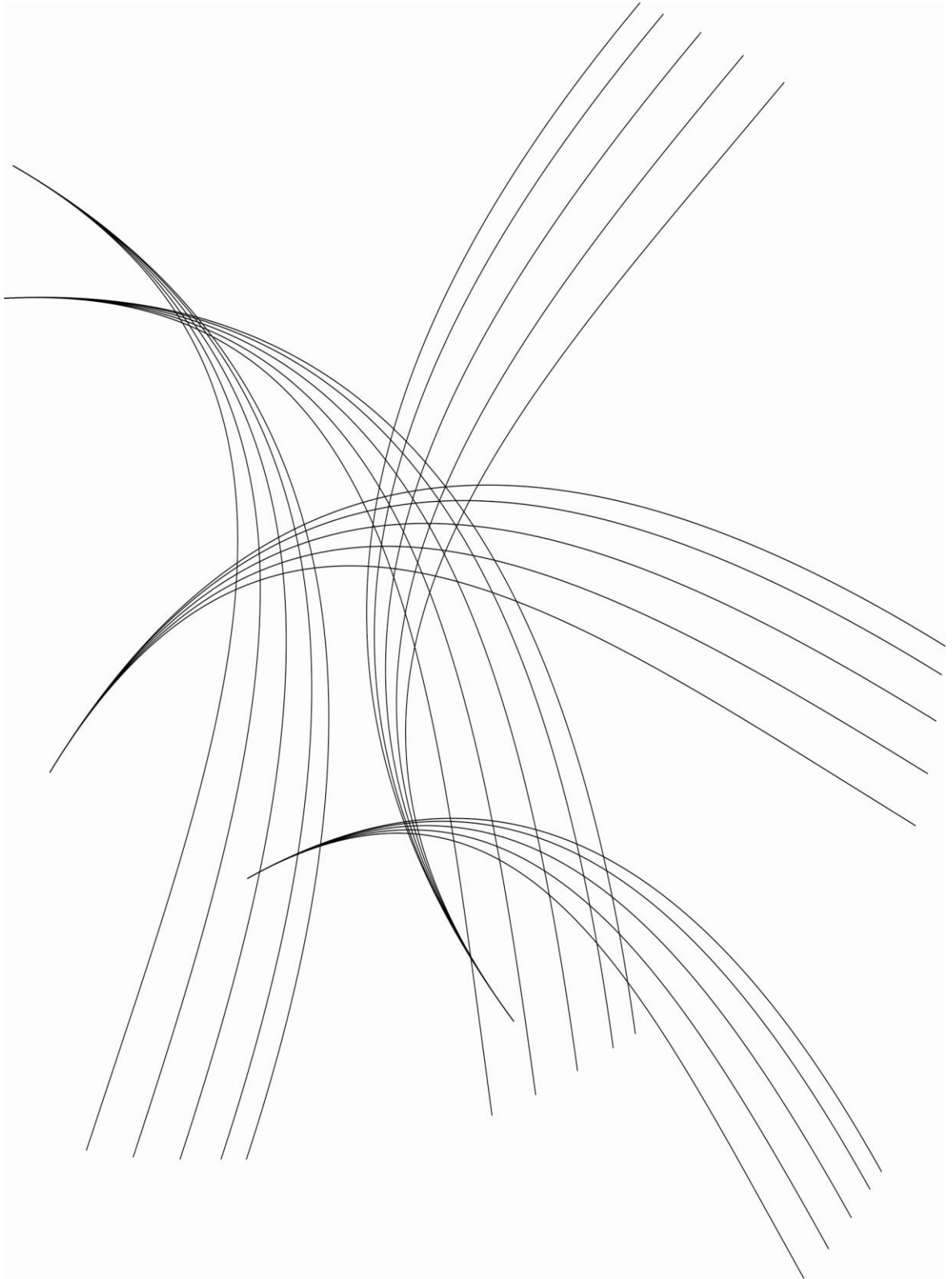
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Statistics



Mean-VaR Portfolio Optimization Under CAPM by Non Constant Volatility in Return Market

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Abstract

Problems in this paper is the optimization of investment portfolios based on the mean and the Value-at-Risk (VaR) under the Capital Asset Pricing Model (CAPM) with non constant volatility. In CAPM, the return individual stock (or portfolio) assumed it is influenced by the market return and risk-free return. Here, the market return is assumed has non constant volatility, which will be estimated using GARCH models. The size of the risk of VaR is calculated based on quantile standard normal distribution with a confidence level δ . Mean and VaR will be used for formulation of portfolio optimization problems. Portfolio optimization techniques performed using the Lagrangean multiplier, and the settlement with the Kuhn-Tucker theorems. Furthermore, these methods will be used to analyze a few stocks that are in the Indonesian capital market.

Keywords: CAPM, GARCH models, VaR, Lagrangean Multiplier, Kuhn-Tucker theorem.

1 Introduction

Investment in security in the capital market, investors will face problems in the assessment and measurement of stock return risk. Because they can not be separated between the one with the other. Generally, the higher the return will be accompanied by a high level of risk also [1]. To reduce the level of risk the investor will usually make diversification of investment portfolios, the amount of capital invested in some stocks. In this case, the required estimate of the allocation of capital invested proportionally to the respective stocks as a portfolio [3]. In this paper return stock assessment will be done by using the CAPM approach. In the CAPM, the return individual stock (or portfolio) is influenced by the assumed market return and risk-free return [1]. Usually assumed that the market return has a certain distribution (usually normal distribution), so that its volatility assumed constant. In this paper will be analyze the market return with the time series model, so that it volatility assumed non constant, that is to use GARCH models. Meanwhile, the risk will be measured using the Value-at-Risk (VaR) Model [2]. This paper aims to investigate the weight (proportion) of capital allocation will be invested in each stock portfolio that is made, so that will be gained the maximum return portfolio and the minimum level of risk (VaR). Optimization is done by using the Lagrangean multiplier and the Khun-Tucker theorems. Furthermore, the methods mentioned above will be used to analyze a few stocks that are in the Indonesian capital market.

2 Methodology

2.1 GARCH Model

We use R_{mt} as random variable and r_{mt} is realization of random variable of market return at time t . Consider the log return r_t of an asset. A general time series model for r_{mt} can be written as:

$$r_{mt} = \phi_0 + \sum_{i=1}^p \phi_i r_{mt-i} + a_t - \sum_{j=1}^q \theta_j a_{t-j}, \quad a_t = \sigma_{mt} \varepsilon_t, \quad (1)$$

$$\sigma_{mt}^2 = \alpha_0 + \sum_{i=1}^m \alpha_i a_{t-i}^2 + \sum_{j=1}^n \beta_j \sigma_{mt-j}^2 \quad (2)$$

where a_t is residual and $\{\varepsilon_t\}$ iid random variables with zero mean and unit variance [4], [5].

Equation (1) and (2) are the mean and volatility equations for r_{mt} . There two equation can be used to obtain 1-step ahead forecasts of the conditional mean and conditional variance of r_{mt} assuming that the parameters are known. Specifically, we have:

$$r_{mt(1)} = \phi_0 + \sum_{i=1}^p \phi_i r_{mt+1-i} + a_t - \sum_{j=1}^q \theta_j a_{t+1-j}, \quad (3)$$

and