Chapter 1

Introduction

1.1 Background Information

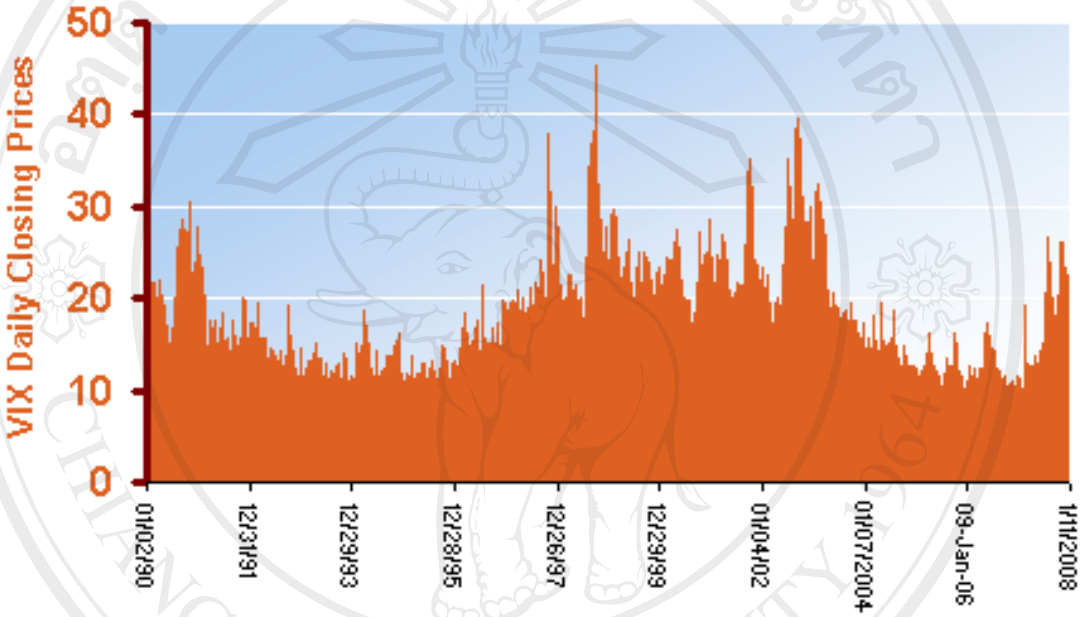
In the late 1960s, trading options may not have been widely understood on Wall Street, but options are now much more widely understood in world financial markets, especially in developed countries. This might be attributed to the way in which investors have learned about stock options during the internet boom or the hamburger crisis, or the role that derivatives and options play in modern financial markets.

In 1993, the Chicago Board Options Exchange (CBOE) introduced the CBOE Volatility Index, VIX, which quickly became the benchmark for stock market volatility. As volatility often signifies financial turmoil, the index is often referred to as the "investor fear gauge". The index is based on real-time option prices, and reflects investors' consensus view of future expected stock market volatility.

VIX measures market expectation of near term volatility conveyed by stock index option prices. The original VIX was constructed using the implied volatilities of eight different S&P 100 (OEX) option series so that, at any given time, it represented the implied volatility of a hypothetical at-the-money OEX option with exactly 30 days to expiration from an option-pricing model.

In 2003, the CBOE made two key enhancements to the VIX methodology. The New VIX is based on an up-to-the-minute market estimation of expected

volatility that is calculated by using real-time S&P 500 Index (SPX) option bid/ask quotes and incorporates information from the volatility "skew" by using a wider range of strike prices rather than just at-the-money series with the market's expectation of 30-day volatility and using nearby and second nearby options.



Source: CBOE and Bloomberg

Figure 1.1 CBOE Volatility Index (VIX)

The SPX is a capitalization-weighted index of 500 stocks from a broad range of industries. The component stocks are weighted according to the total market value of their outstanding shares. The impact of a component's price change is proportional to the issue's total market value, which is the share price times the number of shares outstanding. These are summed for all 500 stocks and divided by a predetermined base value. The base value for the S&P 500 Index is adjusted to reflect changes in capitalization resulting from mergers, acquisitions, stock rights, substitutions, etc.

Until 2006, VIX® began trading on the CBOE. The VIX options contract is the first product on market volatility to be listed on an SEC-regulated securities exchange. This new product can be traded from an options-approved securities account. Many investors consider the VIX Index to be the world's premier barometer of investor sentiment and market volatility, and VIX options are very powerful risk management tools. VIX is quoted in percentage points, just like the standard deviation of a rate of return.

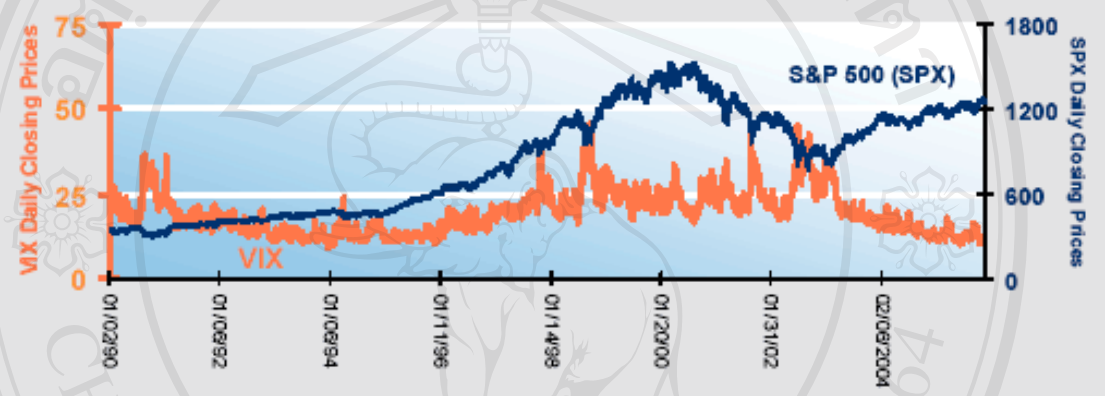
In 29 October 2007, the Stock Exchange of Thailand (SET), with the sub-company Thailand Futures Exchange (TFEX), launched the European-style options written on TFEX with ticker S50myycall/put strike price. For example, S50H09C600 denotes SET50 contract month of March in the year 2009 call option at the strike of 600. The contract multipliers of the options contracts are 200 Baht per index point.

1.2 Statement of the Problem and the Significance of the Study

Recently, options have become a significant diversification tool for investors to hedge their portfolios in both expected uptrend and (especially) downturn markets. In September 2008, options trading become an even more important profit tool than a risk diversification tool from investors. The U.S. SEC, U.K. FSA., and Australia stepped into stop short-selling for financial companies in order to stabilize those companies.

Investors have used options on the SPX for a variety of purposes over the past two decades, including investing, hedging, asset allocation, and the management of risk. Investors appreciate many features of the SPX options, including: the fact that the options are tied to the world's leading benchmark for institutional investors; SPX

options are powerful, flexible tools that allow investors to synthetically adjust their positions to a 500-stock portfolio; these listed options minimize counterparty risk - they are guaranteed by The Options Clearing Corporation, a triple-A rated clearinghouse. There is price discovery in competitive, SEC-regulated auction markets.



Source: CBOE and Bloomberg

Figure 1.2 Correlations between VIX and SPX Index

Due to a long period of high growth together with the effects of the global financial crisis, one of the keys to options trading is leveraging, whereby leverage allows traders to make a significant amount of money from a relatively small change in price. The trader enjoys the ability of less money at a low investment for bigger bets to hedge a portfolio. In addition, the options trader can minimize exposure to risk from stock investment as a hedge of an under-priced asset relative to its fair value. There are a number of options strategies that have a limited risk and practically unlimited profit potential.

However, with the limited information and diversification tool have been known about the issues, for example how volatility index affects options price, how these prices are interlinked with volatility index, and how volatility characteristics of financial time series, such as asymmetric and leverage effect, affect price. As of the interests, this dissertation is to bring a significant contribution to the science and practice.

1.3 Objectives of the Study

(1) To simplify the apparently complicated expected volatility formula into a simpler relationship, with the use of SET50 index data becoming a simple expected volatility (SEV) index.

(2) To adapt the new VIX calculation from CBOE to derive an implied volatility index (TVIX) for Thailand SET50 index options.

(3) To substitute the expected volatilities into the Black-Scholes model to predict call and put option prices.

(4) To compare the best performance of ARFIMA-FIGARCH and ARFIMA-FIAPARCH models for forecasting TVIX which are capable of capturing long memory and asymmetry in the conditional variance and power transformed conditional variance of process.

(5) To estimate ARMA-GARCH, -EGARCH, -GJR and -PGARCH models for Thailand Volatility Index (TVIX). These models are the extension of ARCH process with various features to explain the obvious characteristics of financial time series such as asymmetric and leverage effect.

1.4 Structure of the Dissertation

In the years of financial crisis, option trading is one of the most important diversification tools for investors to hedge their portfolio. It can also minimize exposure to risk from stock investment as a hedge of an under-priced asset relative to its fair value. Therefore, this dissertation focuses on the importance of volatility index and options trading. The remaining sections of the dissertation are organized as follows.

Chapter 2 presents the research methodology with the CBOE VIX formula, a Simple Expected Volatility Index (SEV Index), the Black-Scholes model, measure of statistic fit, ARFIMA, FIGARCH, and FIAPARCH Model, also, GARCH, Exponential GARCH (EGARCH), Glosten, Jagannathan and Runkle (GJR-GARCH) and Power GARCH (PGARCH) model. Then, the empirical results of the study are presented through Chapters 3 to 5.

Chapter 3 focuses on the simplification of the apparently complicated expected volatility formula into a simpler relationship, with the use of SET50 index data becoming a simple expected volatility (SEV) index, and to adapt the new VIX calculation from CBOE to derive an implied volatility index (TVIX) for Thailand SET50 index options. Then we substitute the expected volatilities into the Black-Scholes model to predict call and put option prices.

Chapter 4 concentrates in comparisons the best performance of ARFIMA-FIGARCH and ARFIMA-FIAPARCH models for forecasting TVIX. Chapter 5 focuses on the estimations of ARMA-GARCH, -EGARCH, -GJR-GARCH, and -PGARCH. Finally, conclusions, limitation of the study, and suggestions for further study are presented in Chapter 6.