MARKET EFFICIENCY IN KUALA LUMPUR OPTIONS AND FINANCIAL FUTURES EXCHANGE: BEFORE AND DURING THE ECONOMIC CRISIS

BY

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ABSTARCT

This paper analyzes the causality relationship between daily price of the Kuala Lumpur Composite Index (KLCI) and KLCI Futures using Granger-Causality methodology. The study consisted two sample periods: Before and during the economic crisis period. The study differentiates between the short-run and long-run.

The empirical results indicated that, in the short-run, the futures price leads the spot price during the crisis period only. On the other hand, the futures price does not bear all the error-correction mechanism (ECM) after deviations from the long-run equilibrium in both periods. The paper concluded that during the period of study, the Kuala Lumpur Options and Financial Futures Exchange (KLOFFE) market behaved as an inefficient market.

The Chow results are consistent with the short-run causality results. There is significant change of estimated relationship from before the crisis period to during the crisis period.

APPROVAL PAGE

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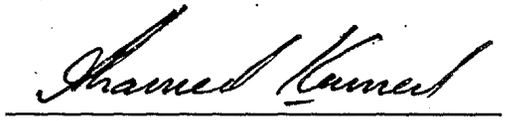
Signature: 

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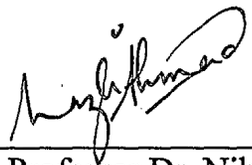

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DECLARATION

I hereby declare that this project paper is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by reference notes and a bibliography is appended.

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Abbreviations

KLOFFE	Kuala Lumpur Options and Financial Futures Exchange
KLCI	Kuala Lumpur Composite Index
SIF	Stock Index Futures
VLCI	Value Line Composite Index
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
MMI	Major Market Index
ADF	Augmented Dickey Fuller
ECM	Error Correction Mechanism
X	Spot Price
Y	Futures Price

Chapter 1

Introduction

1.1 Introduction

The business environment of today is exposed to economic globalization and greater financial interdependence among nations. This necessitates the need to have risk management tools to cope with the increasing volatility of financial assets and investment. This needs is particularly crucial for developing nations like Malaysia.

As a response to this need, the Kuala Lumpur Options and Financial Futures Exchange (KLOFFE) was established in December 15, 1995. With its introduction, Malaysia became the fourth Asian economy after Hong Kong, Singapore and Japan to offer equity derivatives products.

KLOFFE's first product is the stock index futures contract, which is based on the Kuala Lumpur Composite Index (KLCI) and started trading in December 1995. Until now, KLCI Futures contract is the only contract traded in KLOFFE. In the future, KLOFFE plans to introduce KLCI Options contract and Islamic index futures and options.

Since the introduction of KLOFFE in the Malaysia financial market, various studies have been carried out to test the effectiveness or impact of derivatives market on Malaysia market. For instance, Khairuddin (1999) studied the introduction of KLCI Futures in the Malaysia financial market. The study found the introduction of index futures market does not affect the volatility of the underlying cash market.

This paper intends to explore further Ibrahim (1999) study. The study investigated the lead-lag relationship and found the futures price lead spot price during the period of 'bad' news. However, the study does not take into consideration of the interaction between the KLOFFE and its underlying cash market through second moment. Second moment implies the empirical study of interdependence of the two markets in both long-run and short-run. Moreover, by studying second moment using Granger-Causality, the market efficiency of KLOFFE can be investigated.

The objectives of the paper are:

- To test whether KLOFFE is as an efficient market by comparing future price and spot price in short-term and long-term basis. In this case, the lead-lag causality relationship is tested.
- To test whether there is any difference in the estimated relationship between the two periods: before and during the economic crisis. Chow test is used to test it.

1.2 Financial futures

1.2.1 Historical perspective

The futures market has its origin from the agriculture sector. Before any formal exchange for futures trading was established, farmers, distributors and processors of agricultural products were engaged in forward trading of agricultural commodities. They participated in forward transactions to insulate themselves from the risk of anticipated price change.

The first commodity exchange in the USA, Chicago Board of Trade (CBOT) was set-up in 1848. Its main purpose was to locate the forward contracting activities in one central place. In 1865, CBOT offered its first futures trading in standardized futures contract. Since then, the number of commodity futures contracts grew rapidly.

Financial futures first came to the market in 1972 when International Monetary Market (IMM), a wholly owned subsidiary of Chicago Merchantile Exchange (CME), was established. The first financial futures contract listed were futures on foreign currencies. In 1976, IMM introduced the Treasury Bill (T-Bill) futures contract and followed by Treasury Bond Futures contract in 1978.

Stock Index Futures (SIF) market was opened in 1982, with three SIF contracts made their debut in the USA. First, in February, Kansas City Board of Trade introduced the first SIF contract based on the Value Line Average. Second, in April, CME began trading a futures contract based on the S&P 500 index. In May, New York Stock Exchange (NYSE) started the trading of NYSE Composite Index Futures Contract.

1.2.2 The Economic Rationale of Stock Index Futures (SIF)

The dual purpose of a futures instrument are the facilitation of the price discovery process and the provision of means for the efficient and economic transfer of risk. The SIF contract provides a streamlined instrument for capturing information, which is fed back to the cash market. Furthermore, it is a powerful, broad-spectrum tool for the transferring of price risk in the equity market. Its helps the capital market to function more smoothly as the routine use of futures by market makers to reduce risk and thereby makes possible increased productivity of capital.

The advent of SIF permits the active management of portfolio risk. The market risk (systematic risk) profile of a stock portfolio can alter quickly and economically. Market timing is also significantly improved, permitting the capture of profit opportunity more efficiently.

1.2.3 The Stock Index Futures (SIF) Contract

The SIF does not have a single asset underlying the contract: the underlying asset of SIF contract can only be approximated by a diversified portfolio. A contract on it, therefore, represents a contingent claim on a proxy of the equity market. As such, the delivery of the asset is not practicable. To overcome this problem, the contract specification calls for cash settlement at maturity date.

Since the SIF contract represents a market portfolio, there is little unsystematic risk in the instrument. It possesses mainly systematic risk, which is caused by macroeconomic and political factors. Under Capital Asset Pricing Model (CAPM), investors are only compensated for bearing systematic risk. No compensation is deemed necessary for carrying unsystematic risk. Therefore, the SIF contract appears to be a more diversified instrument of the equity market.

1.2.4 Use of Stock Index Futures (SIF)

The use of SIF typically falls into one of the three categories:

- Hedging, which involves the purchase or sale of index futures in anticipation of an intended cash market trade, whereby the hedge provides compensation for adverse price moves prior to the cash transaction.
- Arbitrage, which involves the simultaneous purchase and sales of stock and futures in order to capture realignment of relative prices following a perceived mispricing opportunity.

- Trading, which involves the active use of futures to speculatively take advantage of anticipated broad market price movements.

While arbitrage uses both cash and futures contracts, hedging and trading strategies normally incorporate only one type of instrument at any given point of time.

Chapter 2

Literature Review

2.1 Theory: Pricing of Stock Index Futures (SIF) Contract

Theoretically, the futures price of SIF contract should be higher than the current level of index price (spot price). Many studies have attempted to explain the pricing relationship between futures price and spot price in terms of arbitrage behavior. The pricing of SIF contract relative to spot price should fall within the range that are not sufficient to allow arbitrage activities to occur.

The Cost of Carry Model is normally used for pricing the SIF contract. The model explains the relationship between the stock index futures price and stock index portfolio price, which is represented by the following equation:

$$\mathbf{F_t = S_t\, e^{(r-d)(T-t)}} \qquad \textbf{(1)}$$

Where $\mathbf{F_t}$ is the index futures at time **t**, $\mathbf{S_t}$ is the index price at time **t**, **r-d** is the net cost of carrying the underlying stocks in the index, that is, the rate of interest cost **r** less the rate at which dividend yield accrues to the stock index portfolio holder **d**. **T** is the expiration date of the futures contract, so **T-t** is the time remaining in the futures contract life. Note

that in this information the riskless rate of interest and the dividend yield on the underlying stock index are assumed to be known, constant, continuous rates.

The market force driving the above cost-of-carry relation is the never-ending search for a "free lunch." When the futures price is above the level implied by the right-hand side of (1), a riskless arbitrage profit equal to the difference between the futures price and index price plus the cost of carry, a long arbitrage profit of $\mathbf{F_t - S_t e^{(r-d)(T-t)}}$ can be earned by selling the futures contract and buying the stock index portfolio, financing the stock purchase with the riskless borrowings. On the other hand, when the futures price falls below the right-hand side of (1), a short arbitrage profit of $\mathbf{S_t e^{(r-d)(T-t)} - F_t}$ can be earned by buying the futures and selling the portfolio of the stocks, investing the proceed of the sale of stock at the riskless rate of interest.

In perfectly efficient and continuous futures and stock market with the absence of transaction cost, riskless arbitrage profit opportunities should not appear so the cost-of-carry relation (equation 1) should be satisfied at every instant t during the futures contract life. If such is the case, the instantaneous rate of price appreciation in the stock index equal the net cost of carry of the stock portfolio plus the instantaneous relative price change of the futures contract:

$$\mathbf{r_{c,t} = (r-d) + r_{f,t}} \qquad \mathbf{(2)}$$

where $r_{c,t} = \text{In } C_t/C_{t-1}$ and $r_{f,t} = \text{In } F_t/F_{t-1}$

Several implications follow from (2) under assumption that the short-term interest rate and dividend yield of the stock index are constant and that the index futures and stock markets are efficient and continuous. There are:

1. The variance of the rate of return of the futures contract equal to the variance of the rate of return of the underlying stock index.
2. The contemporaneous rates of the return of the futures and cash are perfectly, positively correlated.
3. The non-contemporaneous rate of return of the futures contract and underlying stock index portfolio are uncorrelated, therefore, no lead-lag relationship would exist.

However, it is frequently observed that the futures price is mispriced even when the cost of carry is positive. Various explanations have been offered by researchers to account for this discrepancy. Cornell and French (1983) suggested the inverted price structure could be due to the difference in the way stock and futures contracts are taxed. For instance, in the USA, the stockholder pays taxes only on realized gain or losses. This means that the stockholder has a valuable timing option. If the stock price drops, pass part of the loss can be passed on to the government by selling the stock. On the other hand, if the stock price rises, one can postpone the tax payment by not realizing the gain. However, this option is not available for the futures trading. The futures trader must pay taxes on all gain and losses, whether realized or not, at the end of the year. However, the Malaysia government does not impose any tax on capital gains or losses in both the cash and the index futures markets.

Nevertheless, Cornell (1985) tested the above hypothesis empirically and found that the timing option is not a significant factor in the pricing of the stock index futures. Factors such as transaction cost, limitation on capital loss deduction and other tax-related constraints reduce the timing option.

Modest and Sundaresen (1983) attributed the discount on the futures price due to the cost of transaction. They reasoned that constraints might exist for the short selling of stock for most traders. Only the most efficient of them (traders) can fully utilize the proceed from the short sales in the cash market. As such, transaction cost for short selling of stocks may be significant for less efficient traders (the interest foregone by the lack of full use of the proceeds from the short sales is counted in a transaction cost). Therefore, the investors who want to go short will be attracted to futures market. The combination of low transaction cost and short selling action will drive down the futures price resulting in it being at a discount from the spot value. This explanation is supported by Cornell and French (1983), Stephan and Whaley (1990), and Miller (1990).

Figlewski (1984) explained that the negative basis could be due to investors' expectations and preference. Most investors holding stocks for long-term basis have carefully selected portfolios, which they believe will "beat the market". For them, futures contracts on the market portfolio are not good substitutes for their holding. They will not necessarily want to sell their stock at the market prices which they feel are below their true value just because index futures are also undervalued. They would do so only if the discount on futures became significantly greater than the expected excess return on their stocks. But if

they are pessimistic about the market, they may be willing to sell index futures at a discount to hedge their portfolios. In the process, the index futures price is driven down.

Zeckhauser and Niederhoffer (1983a) showed that the slowness of the broad base index to response to the market change is the cause of the inverted price structure frequently observed. If the market makes a significant downward move, some of the stocks in the index may not be traded yet. The index, based in part on premoved prices of less actively traded stocks, will overrepresent the market. A futures contract, by contrast, attempts to jump to the equilibrium value on each trade. As such, the futures price might be below the spot price.

It is argued by Gastinean and Madansky (1983) that the lumpiness of dividend payment for the stock caused the basis to be negative at certain periods. During the period when the dividend payment is concentrated, the dividend yield could exceed the risk free interest rate. This result is a negative cost of carry . Consequently, there will be a discount in the futures price relative to the spot price.

Gay and Jung (1999) examined the pricing of Korean Stock Exchange Index Futures and found that there is underpricing of futures during the period of downward market trend. They found a substantial portion of the underpricing can be explain by transaction costs: However, a high incidence of mispricing did remain after accounting for the level of transaction costs faced by the lowest cost trader group: the Korean Stock Exchange members. The study also noted the high frequency of underpricing, during the period of

downward market trends, attributed partly to the restriction on short sales, along with accounting conventions.

2.2 Market Efficiency in Stock Index Futures

Market efficiency has been defined by Jensen (1978) as follows: '*A market is efficient with respect to information set θ_t if it is impossible to make economic profits by trading on the basis of information set θ_t*'. Thus, efficiency is defined relative to particular information set, and a market can be both efficient with respect to one information set and inefficient with respect to another. The literature has recognized three different information set: all past prices (weak efficiency); all public information (semi-strong efficiency); and all information, both public and private (strong efficiency).

Unlike stock market, futures markets are zero-sum game (excluding transaction cost) since any profit made by one trader represents an equivalent loss for another trader. Therefore, to the extent, a trader is able to use some information set to " beat the market" meanwhile other trader, in total, must consistently lose out.

Various studies on index futures markets show that, in general, there is weak efficiency. No conclusion can be drawn for semi-strong and strong form efficient due to lack of studies. Thus, the results of these studies are indicative rather than conclusive for efficiency in stock index futures.