CHAPTER 1

"A decision is said to be subject to risk when there is a range of possible outcomes and when probabilities can be attached to the outcomes." While "Uncertainty exists when there is more than one possible outcome to a course of action but the probability of each outcome is not known."

(Bussey, 1978 and Merrett& Sykes, 1983)

1.0 INTRODUCTION

This chapter provides readers with an overview of the whole research interest. The chapter begins with a discussion of the background of the study and some motivating issues justifying the purpose of this research. Based on these justifications, the section presents the three main research questions. Subsequently, four research objectives are identified in answer to the research questions. Finally, the chapter ends with the research contributions to the existing knowledge curve.

1.1 BACKGROUND OF STUDY

1.1.1 Overview of Commodity Market

Commodity refers to "*anything that land can produce such as raising, growing or extracting from land*" (Ali *et. al,* 2005 pp36). A standardised financial commodity futures market was introduced in late 1870's in the United State of America. In the 1980s, the world experienced a major crash in commodity prices. Based on the UNCTAD statistic in Table 1.1, food prices (including vegetables oilseeds and oils) dramatically reduced from 1% for the period of 1962-1980 to -10.1% for the period of 1980-1987. Similar trends were registered for other commodity prices. This crisis had a

considerable effect on many commodity producers globally. The instability caused a massive surge in the demand for commodities and further pressured countries GDP growth, resulting in a negative value. As a result, emerging countries tend to be more commodity price sensitive than the advanced markets. This is because most of these countries rely more on commodity exports than other sectors (see the effect of this commodity crisis in many emerging market's terms of trade in Table 1.2). Furthermore, any uncertain fluctuation in commodity prices will translate into higher inflation volatility in these countries more rapidly than in the advanced countries (Eichengreen, 2005).

Table 1.1: Trends and instability of prices of main commodity groups, 1962–87

	Trend in real prices (% p.a.)*		**Instability Index (%)****	
	1962-1980	**1980-1987**	**1962-1980**	**1980-1987**
Food (including vegetable oilseeds and oils)	1	–10.1	24.4	12.5
Tropical beverages	2.9	–2.4	25.5	12.4
Agricultural raw materials	0.5	–4.2	16.6	8.6
Minerals, ores, and metals	–0.5	–6.1	12.3	5.9
TOTAL	1.1	–5.6	15.2	7

* Average growth rates derived from semi-logarithmic regressions.
**Average percentage deviation from exponential trend.

Source: UNCTAD[1] Commodity Yearbook, 1987, Geneva, UN, Cited in Maizels (1992).

Additionally, in 1997, the Asian financial crisis forced many Asian countries into a dramatic recession period. The crisis had a significant immediate impact, especially on the banking industry. Subsequently, the crisis increased the volatility of the Asian stock and commodity markets. The volatility of the commodity market may be due to the uncertain volume traded in this market. For example, the volume traded in the Crude Palm Oil futures (FCPO henceforth) market was dramatically felt, falling

[1]UNCTAD refers to the UN Conference on Trade and Development.

from 289,659 in 1997 to only 80,174 in 1998 (see in Table 1.3). During the crisis, the average Crude Palm Oil (CPO henceforth) prices were traded at above RM2,000 per tonne metric, which populated at a higher level than the ex ante and ex post Asian financial crisis period (refer to Figure 1.1).

Table 1.2: Trends in commodities of terms of trade, 1958-60 to 1986-88

	Indices (1958-60 =100)			
	1958-60	**1968-70**	**1978-80**	**1986-88**
Non-oil commodities				
UNCTAD index [b, f]	100	93	92	62
World Bank index [c, f]	100	97	90	58
IMF index [d, g]	100	95	91	61
Petroleum[e]	100	70	390	211

a) Annual averages,b) 39 commodities, c) 33 commodities, d) 34 commodities, e) Average OPEC price (World Bank index).
f Weighted by value of exports from developing countries in 1979–81, g) Weighted by value of world exports in 1980.

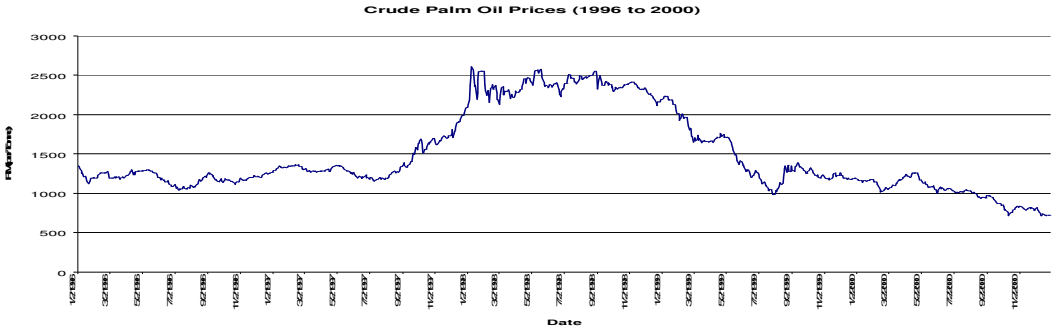
Source: Maizels (1992) pg 10

Table 1.3: Volume traded in Crude Palm Oil Futures (3mth)

Year	Volume	Year	Volume
1994	563,050	2001	238,351
1995	523,019	2002	574,427
1996	392,797	2003	908,246
1997	289,659	2004	877,997
1998	80,174	2005	708,820
1999	185,589	2006	1,249,790
2000	161,285	2007	1,605,411
		2008*	1,243,501

* as at August 2008 (Source: Bursa Malaysia Berhad)

Figure 1.1: Crude Palm Oil Prices from Year 1996 to 2000

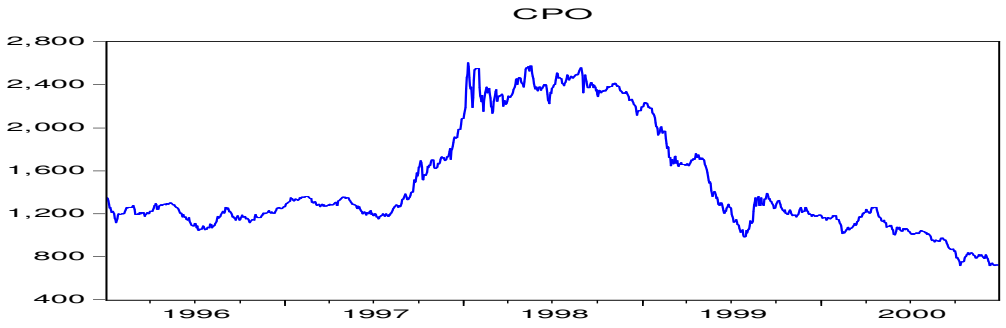


(Source: Malaysian Palm Oil Board)

Recently, the global economic tsunami affected many countries in differing ways. The most affected countries were the United States and those in Europe with the contagion moving slowly towards the Asian countries. In these uncertain global environments, institutions and individual investors were exposed to the high volatility of asset prices

Figure 1.2: Crude Palm Oil Prices from Year 2006 to 2008

RM(per Tonne Metric)



Date (Source: Malaysian Palm Oil Board)

Figure 1.3 (a) : Standard Deviation for Crude Palm & Soybean Oil

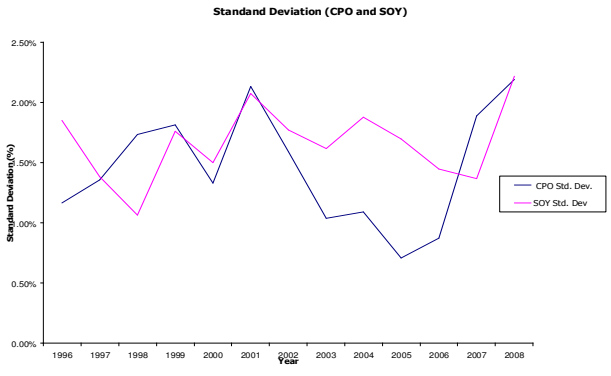


Figure 1.3 (b) IFS Index from 1957-1996

IFS Index: (Standard Deviations)	1957 -1971	1971-1996
Agricultural Raw Material	1.5	3.2
Beverages	2.82	5.95
Fertilizer	1.79	8.13
Food	1.42	3.78
Metals	3.24	4
Sugar	10.43	11.5

Notes: IMF's International Financial Statistics (IFS) reports monthly commodity price indexes.
(Source: Cunddington and Liang, 1996)

Based on Figure 1.2, the crude palm oil prices dramatically increased from RM1,419 in January 2006 to RM4,300 in March 2008. Later, in August 2008, the price dropped to RM2,468 per metric tonne. Such a scenario illustrates that the current global

recession period also translated into a higher volatility in the commodity price. Figure 1.3(a) shows larger ranges of crude palm oil's standard deviation compared to soybean oil. Additionally, Figure 1.3(b) infers an upward trend in most commodity indexes standard deviation between two sub periods. These figures support that the commodity prices volatility have increased and made the market condition more uncertain over a longer period. An increase in any commodity price volatility may lead to an unlimited profitable or unlimited loss situation. As the price volatility in the commodity market directly influences the emerging countries economic performance, it is crucial for the market participants to protect this risky movement through a hedging strategy.

1.1.2 Hedging in Commodity Market

Hedging[2] in derivative markets theoretically minimizes the unfavourable movement of asset prices (commonly commodities or financial instruments) against investors (Ali *et al.,* 2005). The existence of the derivative market has two well-known

[2]…. *An essential futures of commodity hedging is that the trade synchronizes his activities in two markets. One is generally the cash market (the market for immediate delivery; the other is generally the futures market (Johnson, 1960; 139).* Hedging in commodity market involves two positions either you go long or short (Reilly and Brown, 2003). Similarly, hedging in CPO futures market involves as a seller (CPO producer) or a buyer (CPO refiner). Ali et al. (2005) segregate hedging in CPO market into two groups consisting physical owners of palm oil - producers, suppliers (sellers) and the refiners, consumers or users (buyers). As a CPO buyer, an upward price movement will translates into a higher buying cost. By engaging into hedging strategy, the buyer able to lock the buying price and minimize the price risk exposed towards the buyer. To close the hedging transaction, the CPO buyer can simply take an opposite position in FCPO market and perform the actual buying transaction in the CPO market.

functions – price discovery and hedging mechanism. First, the markets provide an indication of future prices for commodities (storable and non-storable commodities) and financial instruments (such as stocks and bonds). Second, it provides an infrastructure for market participants to hedge against the risk. There are two contradictory opinions concerning the implication of introducing derivative instruments into the market. One group highlights the good side of derivative instruments that may carry a risk minimization function (Holthausen, 1979; to Alan Greenspan, 2008), while the opposing perspective claims that the instrument may create huge potential destruction in any financial system (demonstrated in Gennotte and Leland 1990). Considering these two contrary opinions, it is notable that the existence of the derivative market may have enormous speculation activities that make the market more explosive. However, the instruments do not harm the global investment setting if well-structured regulation and stringent enforcement are applied to the market participants.

Globally, the Chicago Board of Trade (CBOT henceforth) was established in 1874 and was the first organized futures trading introduced to the market. During the 1980s, this exchange had the heaviest futures transactions compared to other futures markets. In 2005, the exchange recorded 674 million contracts traded and it grew tremendously to 806 million contracts in 2007. During mid 2007, the CBOT successfully completed its merger exercise with the Chicago Mercantile Exchange and became the largest and most diversified exchange in the world.

Malaysia established the first Crude Palm Oil future market in 1980. During the mid-80's, Malaysia expanded its commodity futures market by introducing rubber, tin and cocoa futures contracts. In addition, Malaysia further introduced palm olein and crude palm kernel in 1990 and 1992, respectively. A sound and smooth trading in the CPO market is achievable though a well-structured regulatory framework. The regulations are threefold – to promote ethical trading activities in the market, encourage fairness and enhance the level of clear information disclosure among market participants, and the minimization of systematic failures that may potentially affect the whole market. A sound trading atmosphere will enhance the efficiency, and, therefore, facilitate market participants to estimate their potential risk exposure and further strategies concerning their investment strategy. Among the commodities markets in Malaysia, the FCPO remains the most successful and active crude palm oil futures market traded in the world. Thereafter, more recently, India and Indonesia launched their version of the CPO futures market in 2008 and 2009, respectively.

Since the inception of the derivative market, the hedging strategy is the most preferred strategy in addressing the high volatility of commodity and stock prices for either the developed or emerging markets. Commonly, the lower transaction cost requirement makes hedging the most popular loss financing technique consistently chosen by investors. Hedging theory claims that market participants will protect themselves against the unfavourable price movement and minimize this risk by entering into the futures market (Harrington and Niehaus, 2005). Using the portfolio selection theory, this research further relates this concept to the hedger point of view. The

Markowitz portfolio theory explains the idea of diversification in optimizing the investment income via the best combination of risk and return preferred by investors. The rationality of diversification strategy is relevant and we can relate it to the hedgers' position. The theory conjectures that all investors are risk adverse, and, similarly, hedgers are assumed to be risk adverse investors because their ultimate objective is mitigating the price risk. Therefore, using the concept of diversification, investors can combine their trading transactions on the spot and futures markets to minimize their risk exposure. However, the performance of hedging may vary over time since market participants will sometimes hedge more and sometimes less. Since the hedgers tend to revise their hedging proportion over time, how effectively is this strategy able to sustain its risk minimization function over a longer period? Therefore, it is essential to evaluate the effectiveness of this strategy consistently, either within a short or long period.

The effectiveness of hedging strategies can be measured using both the minimum variance framework (the traditional based model in Ederington, 1979 and econometric methodology in Lee and Yoder, 2007) and the mean-variance framework (from Bawa, 1975,1978 to Yang and Ellen, 2004). In the mean variance context, the hedging performance considers the investor's utility function (considering the mean and variance elements or risk and return tradeoffs), whereas the minimum variance framework focuses on the risk minimization when there is a significant reduction change in the variance of the hedged portfolio compared to the unhedged portfolio position. Extensive empirical evidence investigates the effectiveness of the hedging strategy within both frameworks. However, these unstable events may affect the

commodity prices volatility and, therefore, this hedging strategy may or may not uphold its main objective consistently for either the short-term or long term period.

1.2 PROBLEM STATEMENT

Theoretically, the hedging strategy asserts to be an effective strategy for market participants to downsize their price volatility. Until now, the study on evaluating the strategy's effectiveness or performance has been the centre of attention of many researchers. Almost all studies validate the effectiveness of hedging in the advanced commodity futures and stock index future markets. However, despite the overwhelming empirical evidence, a considerable number of studies have been conducted to investigate the hedging effectiveness in emerging commodity markets. In addition, limited research has explored the performance or effectiveness of hedging strategy in Malaysian context. In Malaysian context, the previous study only investigated the effectiveness of hedging in Kuala Lumpur Stock Index futures market (refer to Ford, Wee and Poshakwale, 2005) but no research on Malaysian CPO market. The Malaysia CPO market tends to have unique features compared to other developed commodity market. The market tends to differ from developed commodity market in term of i) level of market depth, ii) clear guideline on speculative activities, and iii) market efficiency.

The emerging commodity markets tend to be unique in comparison with the more advanced commodity markets. The uniqueness may be due to the dissimilar levels of market depth. The CBOT, as the largest and most advanced commodity market, was

established in the nineteenth-century. Currently, CBOT offers more than 50 derivative instruments and is the heaviest commodity trading market in the world. In the emerging commodity markets, for example, the CPO market, it was only introduced in the 1980s and tends to have a lower turnover of trade compared to CBOT. Since Liew and Brooks (1998) conclude that the depth of market influences the market volatility, we can assume that the emerging commodity price volatility may differ from the advanced market. In the CPO market, it clearly states the speculative position limits for trades to avoid unethical trading activities that may potentially cause the market to collapse. However, in CBOT the regulation is much more flexible and there is no clear guideline on the speculative transaction limitation specified by the exchange regulator.

Furthermore, more advanced markets have a better infrastructure than any emerging commodity market. The electronic trading system was introduced in the late 1990's in CBOT. Much later, other emerging commodity markets implemented the system conversion (e.g. 2001 in Malaysia and 2002 in India). An electronic trading system influences the transmission of information among market participants instantly; therefore, the market will be more efficient. Sahi and Raizada (2006) infer the non-existence of market efficiency and poor commodity price discovery channels in the emerging commodity markets such as India. Hence, a more established trading system might influence the market efficiency across different forms of markets. As such, on this basis we expect that the hedging performance analysis in emerging markets may differ from the more advanced markets. As the exchange has converted into a full electronic system, the existence of transaction costs is minimal (Ismath Bacha, 2007).

Hence, the research assumes that no transaction costs are incurred in measuring the effectiveness of hedging strategy in the CPO market.[3]

From time to time new information flows into the market and this information will have a direct impact on the futures market movement. Considering this new information, the market participants will execute their trading decisions and these decisions will further affect the related market volatility[4] movement. In addition, the market participants will incorporate this surrounding information to adjust their hedging position. As such, many researchers have explored the effectiveness of time varying hedging strategy in many futures markets. Subsequently, previous researchers focused on identifying the best hedging performance measurement in various developed futures markets. Over the years, these studies attempted to identify the measurement that captured the hedging performance in various futures markets within the mean variance and minimum variance framework. The studies explored various ranges of measurement from a conservative OLS approach, to the MGARCH modelling specifications. Massive empirical evidence modelled the strategy effectiveness estimation in various futures markets (Laws and Thompson, 2005; Yang, 2001; Brooks *et al*., 2002; and Ford, Wee and Poshakwale, 2005) in the stock market, (Graf, 1953; Bailie and Myers, 1991; and Bera, Gracia and Poh, 1997; and Mili and Abid, 2004) in the commodity market, and (Ederington, 1979; and Wilkinson *et al.*, 1999) in other financial instruments *inter alia*.

[3] The justification for no transaction cost is discussed in chapter 3.
[4] Sometimes the market tends to be calmer while other times it may be more volatile.

In addition, some hedging performance researchers also highlighted the importance of capturing the spot and futures return relationship (either in the short run or long run) for obtaining more accurate hedging ratio results. Lien (2004) emphasizes that without the long run relationship between spot and futures returns the model tends to estimate a lesser hedging ratio. As such, the research posits that the various mean specifications may influence the accuracy of hedging performance results. Previous researchers have demonstrated a simple return specification (see Baillie and Myers, 1991; Ford, Pok and Poshakwale, 2005; and Floros and Vougas, 2006), however, some have considered the short run relationship between spot and futures return (see Yang and Allen, 2004; Floros and Vougas, 2004; and Lien, Tse and Tsui, 2002), and some have emphasized the importance of a short and long run relationship between these two series (see Lien and Tse, 1999; Wilkinson, Rose and Young, 1999; Moschini and Myers, 2002; Brooks *et al*., 2002; Menue and Tarro, 2003; Lien, 2004; Mili and Abid, 2004; Floros and Vougas, 2006; and Switzer and El-Khoury, 2006). The above evidence is able to validate the existence of hedging performance in tested markets. However, there is no definite evidence that is able to confirm any specific measurement as being the best model that will guarantee the outstanding hedging performance.

Furthermore, taking into consideration the unexpected events, it may either directly or indirectly affect the market volatility over a shorter or longer period. Hence, we conjecture the possibility that any potential shift in this commodity markets' volatility behaviour may influence the hedging performance estimation results. Thus, the existence of many unexpected events may have a significant role in the hedging

performance estimation process. By modelling this potential shift, it is believed that it will portray the hedging performance characteristic more precisely over a longer period. Furthermore, not many researchers have tried to explore the consistency or sustainability of a hedging strategy for mitigating the market participant's price risk exposure. The consistency of hedging effectiveness can be measured using the risk minimization performance measurement (minimum variance framework) over a few sub periods (the sub periods are segregated according to unexpected events that happen during these periods). The research assumes that any potential of unexpected events may result in a regime shift in the commodity market volatility, and subsequently affect the hedging performance measurement. Only Lee and Yoder (2007) developed a regime switching model that caters for any regime shift in volatility persistency parameters in measuring hedging performance in two developed commodity futures (corn and nickel). Most regime shift studies concentrated on the effect of these breaks on the persistency parameters estimation result in most macroeconomic variables (refer to Gray, 1996; Chan *et al*., 1992; Aggrawal, Incland and Leal, 1999; Benati and Kapetanious, 2002; Malik, 2003; Fang and Miller, 2008;and Fang, Miller and Lee, 2008) rather than relate it to the hedging performance measurement.

Although the futures market in Malaysia is new, as the only actively traded CPO futures market globally, it is justifiable to consider the Malaysian CPO market as the unit of analysis for this hedging performance analysis. In addition, the findings may possibly provide a new dimension and complement the existing empirical evidence. Furthermore, the research will explore various ranges of mean and variance

specification models that may potentially effect the estimation of hedging performance. Subsequently, the research will introduce the structural break effect in the mean and variance estimation process. Ultimately, the research will relate the importance of structural breaks in the consistency of hedging effectiveness in mitigating the price volatility in the CPO market.

1.3 RESEARCH QUESTIONS AND OBJECTIVES

1.3.1 Research Questions

This research will attempt to answer the following questions:

i) How much do different mean returns and volatility clustering modelling affect hedging performance estimation in the CPO market?

ii) Do structural breaks play an important role in measuring hedging effectiveness?

iii) Do external factors influence the effectiveness of hedging strategy?

1.3.2 Objectives of Study

The major objective of this research is to identify the best hedging performance measurement and further evaluate the consistency of hedging effectiveness throughout various economic climates in the CPO market. The study will focus on the following objectives to:

i) Determine the effect of different mean returns modelling on the hedging performance in the CPO market.

ii) Identify the significant influence of vast volatility modelling in the hedging performance measurement.

iii) Investigate the existence of structural breaks in both mean and variance series and examine the significant effect of the structural breaks in hedging performance measurement.

iv) Evaluate the consistency of hedging effectiveness during the unexpected events (e.g. Asian financial crisis in Malaysia, Terrorist attack in US, Global Oil price shock and US Mortgage Sub prime crisis).

1.4 SIGNIFICANCE OF STUDY

The significance of the research can be explained according to the respective group of readers:

i) Academicians

This research will expand the existing literature and may differ from the previous empirical studies according to the following:

- Almost all studies validate the effectiveness of hedging in the advanced commodity futures. In order to bridge this gap, this research will add to the existing limited literature in measuring the hedging effectiveness in the crude palm oil futures market (the uniqueness of CPO market has already been discussed in Problem Statement section).
- Since Lien (2004) infers that omitting the long run equilibrium between the spot and futures prices tends to underestimate the hedging ratio result ,the research

posits that a different mean specification may influence the hedging performance results. To address this issue, the research applies three mean specification models, namely, Intercept, Vector Autoregressive and Vector Error Correction Model within indirect model (Baba, Engle, Kraft and Kroner or BEKK model henceforth) and two direct models (Conditional Constant Correlation and Dynamic Conditional Correlation model) to test the hedging effectiveness on a different scope of tested markets.

- The study further provides empirical evidence via combining the structural breaks effect into the hedging performance measurement model. The study introduces the significance of modelling the structural breaks in the mean and variance specification using a Modified BEKK model within the hedging performance context.
- The multiple unexpected events studies were carried out to investigate the consistency of hedging effectiveness throughout the sampling period.

ii) Practitioners

The test result will shed some light on the level of hedging performance activities in the CPO market. Such results will provide an overview of the effectiveness of hedging strategies in the risk management process in the tested market. If the findings provide a positive result, it will show that the market participants should include hedging strategies in their risk management process and vice versa.

iii) Government and Regulators

The research will provide in-depth information on the performance and effectiveness of hedging in the CPO futures market. The promising strategy's performance will urge the government to educate the local traders in engaging in hedging activities through consistent derivative workshops. In addition, the market regulators can work simultaneously with the government in implementing new measurements to promote a sound trading environment in the local derivative market and further provide smooth hedging activities.

1.5 CHAPTER ORGANIZATION

The remainder of this thesis is structured as follows. Chapter 2 provides a literature survey on issues relating to the hedging performance measurements and structural breaks. Chapter 3 explains both hedging and portfolio theory and presents the research theoretical framework. Subsequently, the next chapter briefly elaborates upon the data used and introduces the methodologies applied for this research. The next chapter presents the detailed analysis generated in this research. The chapter is segregated into three sections, which includes preliminary data analysis in Section I, model selection results in section II and structural effect in hedging performance consistency in section III. Chapter 6 concludes the findings for this research and presents several recommendations for academics, practitioners and government/regulators.