CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Volatility has been studied by various sectors of the financial world. Most of these studies have been performed by academics, students and representatives of fund managing organisations. Reports of these studies can be easily accessed from international financial magazines and journals, which are easily available through the internet nowadays.

In the Eastern or developing world, studies have not been as extensive as those done in the Western world. This maybe because these equity markets are still young or underdeveloped. This lack of studies implies that many market behaviours are still unknown to financial experts and fund managers.

In this section of report, studies done on local and international financial markets have been presented.

2.2 Previous similar studies on the Malaysian stock market

Many approaches and techniques can be used to describe a stock market time series.

Since the financial time series is dynamic in nature, there is no specific technique that can be said to be suitable for the series all of the time. However, for a specific series over a specific period a suitable or most closely mimicking technique can be identified. Shamiri, Isa and Hassan (2008) investigated the most suitable volatility model and distribution specifications for KLCI by utilizing a rigorous density forecast comparison methodology. They employed the Kullback-Leibler Information Criterion (KLIC) density model to evaluate, compare and assess to identify that the volatility model and/or distribution were statistically more able to mimic the time series behaviour of KLCI returns. They used the Kuala Lumpur Composite Index (KLCI) daily returns for the period between January 1991 and December 2004 using symmetric and asymmetric distribution. They studied normal (Gaussian), Student-t, GED, skewed-t and Skewed GED distributions. They had also used a family of GARCH volatility Models i.e. GARCH, EGARCH, GJR and APARCH. They concluded that identifying the distribution model was much more important than the volatility model, that is, once a good distribution model was chosen, the choice of GARCH model might not be as important.

The best representation of a time series model for KLCI could be achieved by employing the ARCH/GARCH framework. In a similar study to the one described above, Hassan and Shamiri (undated) studied the GARCH, EGARCH and GJR-GARCH models. Data from daily observations for a fourteen-year period from January 1991 to December 2004 were used. Their study identified that student-t

model was a better choice to mimic the densities of KLCI daily series when compared to the Gaussian model. They also found that this point was not true for Singapore's STI data. They concluded that both market samples showed heteroskedasticity and as such justified the use of an ARCH/GARCH framework with the GJR-GARCH closely mimicking the KLCI series. For Singapore's STI data they identified that the EGARCH model best mimicked the series.

To forecast future volatility Shamiri and Isa (2009) studied another set of models within the ARCH/GARCH family, i.e. the EGARCH and the NAGARCH and tested the difference between the normal tailed symmetric, heavy tailed symmetric distributions and heavy tailed combined with asymmetric distributions for estimating the KLCI return from January 1998 to December 2008. Their work showed that for volatility forecast the EGARCH was the better model for out of sample forecast. They also found asymmetric model with student-t distribution also performed very well with the data they used.

In their paper, Zaharim, Zahid, Zainol, Mohamed and Sopian (2009) set out to find a model to represent the daily return volatility of the KLCI daily returns. They used the daily return from KLCI from August 1990 to August 2005. They employed the GARCH model and further tested the results with the Ljung-Box-Pierce-Q-Test (LBQ) and Engle's ARCH test at lags 10, 15 and 20. Their overall conclusion was that the GARCH model could be used to model the volatility of

the KLCI daily returns, however, the performance of the model can be said to only be fair.

One of the characteristics of financial time series is the existence of the leverage effect. Har, Lenan and Ong (2008) wrote that the general GARCH model was insufficient to capture leverage effects on financial time series and this has led many researchers to prepare extensions to the basic GARCH model such as the EGARCH, TARCH and TGARCH. Further, Har, Lenan and Ong studied the leverage effect of the Kuala Lumpur Composite Index (KLCI) using the EGARCH framework and investigated its efficiency using the Augmented Dicker-Fuller (ADF) technique. Weekly closing pricing data from January 2004 to June 2007 were used for their analysis. Their analyses did not indicate the presence of the leverage effect and at the same time suggested that KLCI was a weak form of hypothesis. Har, Lenan and Ong's conclusion contradicted a study done by Hassan and Shamiri that pointed out the existence of volatility clustering and leverage effect on KLCI when they studied the KLCI data from January 1991 to December 2004. It should be noted that the timeframe used in these studies was different and proved the dynamic behaviour of financial time series.

Shamiri and Isa (2009) found the existence of the leverage effect for KLCI time series data between January 1998 and December 2008. This was a clear example of the dynamic behaviour of a financial time series i.e. a

specification/character may not exist in a long series but may exist in a short series within the same long series.

Volatility clustering was another characteristic that was observable in a financial time series. Zaharim, Zahid, Zainol, Mohamed and Sopian (2009) observed the existence of the volatility clustering effect at certain periods within the KLCI return data for the period between August 1990 and August 2005. They used the GARCH process to model the financial time-series.

2.3 Previous similar studies on developing and developed markets

Bekaert and Harvey (1997) studied volatility in emerging capital markets. Country index data for twenty emerging markets from the International Finance Corporation (IFC) of the World Bank were used for observations and analysis. Malaysia was one of the twenty countries observed. The observed period was between January 1977 and December 1992, though the periods for some countries were shorter. They concluded the following facts:

- Volatility was difficult to model in emerging markets.
- In fully integrated markets, they believed that volatility was strongly influenced by world factors but in segmented markets volatility was influenced by local factors.
- Open economies (world trade) had lower volatilities.

- And finally they found that market liberalizations had no or little impact in thirteen out of seventeen countries while sharp drops in volatility was observed in five countries.

Campbell and Taksler (2003) explored the effect of equity volatility on corporate bond yields in the US. They used a relatively unstructured econometric approach to explore the effect of equity volatility on the cost of corporate borrowing. Firstly, when they compared the average yield spreads reported by Standard and Poor's and Moody's with a panel data set on corporate bond transactions between 1995 and 1999, they found that the credit spread widened in the late 1990's. Secondly, their findings revealed that idiosyncratic equity volatility was directly related to the cost of borrowing for corporate issuers. Thirdly, using Standard and Poor's and Moody's corporate bond yield indexes between 1963 and 1999, they found that aggregate corporate yield spreads widened during periods of higher idiosyncratic risk.

Chowhan and Shukla studied the factors that influenced the volatility of the Indian stock markets during the period of 1998-2000. They concluded that there were no fundamental factors that emerged to influence high levels of volatility but there were other persistent factors that led to hyper activity in the market trading during the period. The persistent factors they proposed were psychological phenomenon, the information boom, the IT revolution, the internet myth, the

feedback effect, cultural changes, stock market deregulations, dematerialization and the introduction of rolling statement.

Engle and Patton (2001) used the daily closing price data of the Dow Jones Industrial Index (DJIA) from August 1988 to August 2000 to identify a good volatility model which can forecast and capture commonly held stylized facts about conditional volatility. The stylized facts include persistence in volatility, mean-reverting behaviour, asymmetric impact of negative versus positive return innovations and the possibility that exogenous or pre-determined variable facts may have significant influence on volatility. They used the simple GARCH(1,1) model for their analysis. Their study concluded that sampling frequency had little effect on the results. They further found that the volatility of the DJIA was quite persistent and mean-reverting, negatively lagged return innovation had impact on conditional variance and higher interest rates lead to higher equity return volatility.

Fang, Yee and Chien (2006) explored the transmission of volatility between the stock and bond markets in Japan and the U.S. They used daily data from the Nikkei 225 Stock Average and Dow Jones Industrial Average Index (DJIA) to represent Japan and US stock markets respectively. Their study period was from 1998 to 2004. They used the multivariate GARCH (1,1) framework with simple Granger causality tests to carry out their analysis. Their findings suggested that

the volatility transmission was unidirectional from the stock market to the bond market and not vice-versa.

Farozzi, Tunaru and Wu (2004) studied return volatility and volatility transmission to identify the best GARCH model to represent the Shenzen and Shanghai markets in China. The econometric package PcGive10.0 was used to model using the GARCH platforms. Daily closing prices between November 1992 and November 2001 from the Shenzen and Shanghai markets obtained from datastreams were used. Their study showed that there was evidence of volatility clustering, a result that was different from previous studies. From the GARCH models tested, they found that the daily data from the Shenzen market fitted well with the GARCH(1,1) model while the daily data from the Shanghai market fitted well with the TAGARCH(1,1) model. The two models captured well the dynamics of the volatility, which was an important feature of the risk management process. Their study also found that there was no empirical evidence of spill-over effect between the two exchanges even though they were operating in the same country.

Steely (2006) studied the international transmission of volatility between short-term risk-free yields, long-term bond yields and equity return in the UK. Daily closing data of FTSE-100 (to represent stock returns), long term government stocks FTLG (to represent more than fifteen years maturity), short term government stocks FTSG (represent less than five years to maturity) were

analysed. Steely used the GARCH modelling framework for a twenty year period from June 1984 to June 2004 for analysis. Steely concluded that correlation between short term bond yield shocks and long-term bond yields shocks was relatively stable, while the correlation between each of these markets and equity was not stable.

Khedhiri and Muhammad (2008) used various models to study volatility characteristics (stylized facts) i.e. fat tail, volatility clustering and leverage effects on the UAE stock market and predicted its future performance. They used daily data from 2001 to 2005 on stock returns from the Abu Dhabi stock market. EGARCH, TGARCH, CHARMA, VaR-ARCH and Switching ARCH models were studied. The EGARCH and TGARCH models were computed with EViews while the remaining were performed with the RATS programs. They concluded that the switching ARCH (SWARCH) models provided better results in representing and forecasting market volatility. Their study further showed that irregular behaviour in the stock market resulted from the introduction of a new regulation which allowed foreign investors to participate in the UAE stock markets.

Meng and Rafikova (2006) evaluated the performance of alternative models for predicting stock price volatility on the Swedish stock market, namely, Random Walk, Moving Average, Exponentially weighted moving average, the GARCH family models and implied volatility in deriving volatility forecast. They used data from OMX (Nordic Derivatives Market), specifically closing quotes for the

OMXS30 Index for the period between December 1993 and November 2005. They concluded that their study did not contradict earlier literature whereby implied volatility provided the best future prediction. All other models including the GARCH family model made predictions based on past data. They also stated that the EGARCH(1,1) model performed better than the GARCH (1,1) model for data they used.

Nguyen (2005) studied the dynamic behaviours of conditional volatility around stock market liberalization for emerging markets. The most advanced emerging markets including Argentina, Brazil, Chile, Colombia, Malaysia, Mexico, Thailand and Venezuela were studied. The sample period was between January 1976 and January 2003 except for Colombia, Malaysia and Venezuela for which the data started in January 1986. Nguyen used a bivariate conditional GARCH in mean model (GARCH-M) in his investigation. The results showed that conditional volatility measures tended to be predictable and persisted over time. Furthermore, he found that when stock market liberalization took place, volatility did not increase after stock market reforms were undertaken. More importantly, the volatility tended to decrease significantly when emerging markets became more open to foreign capital flows.

Nishina, Maghrebi and Kim (2009) examined the stochastic properties and forecasting performance of stock market volatility implied in option prices using a model-free implied volatility index technique on Japanese and US markets.

Fifteen-years of daily options data covering many periods of financial crisis such as the Asian Financial Crisis 1997 and the Latin American debt crisis in 2002 were used in their study. They developed an implied volatility index for the Nikkei 225 (NIX) based on the VIX for S&P 500 benchmark that was used to compare as a benchmark index. The empirical analysis showed that the implied volatility index (NIX) was reflective of the actual Nikkei index and the implied index revealed some, but not all information about future volatility. The VIX also showed upward bias. They concluded that by using a model-free measure of uncertainty, the implied volatility indices could throw some light on the debate over what constituted excessive market volatility.

Oh, Lau, Chin and Mansor (2010) studied the volatility co-movements of the ASEAN-5 equity markets. The five ASEAN markets were represented by JSX (Jakarta), KLSE (Malaysia), PSE (Philippines), SET (Thailand) and SEX (Singapore). Data for a period of 21 years between January 1987 and December 2007 were analysed and tested using the GARCH modelling framework. They also conducted tests on two sub-periods i.e. pre-crisis (1987-1997) and post-crisis (1997-2007). Their findings indicated that volatility during the pre-crisis period was partially integrated but was totally integrated during post-crisis period.

Kupiec (1991), in his paper on trends in stock market volatility in the OECD countries, stated that the most common measure of stock return volatility was the sample standard deviation of returns even though there were more sophisticated

systems such as the ARCH estimator of Engle (1982). He used thirty-year monthly price indices from fifteen countries from financial market database in his analysis but he did not clearly state the years that made up the thirty years (for this thesis, the period was assumed to be between 1960 to 1990 since the paper was presented in 1991). Paul Kupiec observed that over the thirty years, stock return volatility appeared to have increased in many OECD countries. He further observed that the statistical evidence that nation's stock market were more likely to record above-average returns and concurrently exhibited above-average return volatility.

Mala and Reddy (2007) studied the volatility of the stock market returns of the Fijian stock exchange, the South Pacific Stock Exchange (SPSE) which was formerly known as the Suva Stock Exchange (SSE). In their study they employed the ARCH and GARCH models to determine the presence of volatility in Fiji's stock market. The analysis was done using daily data for the period between 2001 and 2005 on specific firms listed on the exchange. LM tests were carried out to quantify the levels of volatility. Their findings indicated that seven out of the sixteen firms analysed were more volatile than the others. The volatility of stock returns were then regressed against the interest rates and the results showed that the interest rate changes had a significant effect on stock market volatility.

Bashel, Hassan and Islam (2007) empirically investigated the return behaviour and persistence of shocks on the volatility of the Dhaka Stock Exchange (DSE). They used the ARCH and GARCH models to analyse stock market data for the period between 1986 and 1999. Daily return data was used for analyses. Their findings indicated that DSE volatility tended to change over time and that it was an inefficient market. They also found that there was a significant relationship between conditional volatility and the DSE stock returns but the risk-return parameter was negative, and this is not consistent with portfolio theory.

Umutlu, Akdeniz and Salih (2008) examined the impact of foreign equity flow on the aggregated stock-return volatility of the Turkish stock market. The purpose of their investigation was to eliminate problems arising from previous literature, such as inaccuracies involved in dating the liberalisation of the market and detecting effective foreign participation. They also used aggregated total volatility of stock returns instead of return volatility. The timeframe of their study was between January 1997 and June 2006. The data they used comprised returns of stocks that were listed in the S&P/IFC (Standard & Poor's/International Finance Corporation) Global Index of Turkey. Their investigation revealed that aggregated total volatility was negatively related to the foreign equity flow, even after market development was controlled. The findings suggested a two-way impact of foreign equity flow on the aggregated total volatility. While a positive net equity flow (inflow) had a decreasing impact on aggregated stock return volatility, a negative net equity flow (outflow) had an increasing impact.

Bello (2010), investigated the volatility and the level of diversification of the US domestic equity mutual funds for a twenty-year period between 1988 and 2008. He used regression to analyse the data but was not specific about the models nor the software employed. His study concluded that the volatility intensity of equity mutual funds change over the period was not consistent with a previous study done for the period from 1962 to 1997. However, he found that the stock prices were more volatile during economic recessions, which was consistent with the previous study.