Chapter 8

The Volatility for Pre and Post Global Financial Crisis: An Application of Computational Finance

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ABSTRACT

The asymmetric volatility, temporary volatility, and permanent volatility of financial asset returns have attracted much interest in recent years. However, a consensus has not yet been reached on the causes of them for both the stocks and markets. This paper researched asymmetric volatility and short-run and long-run volatility through global financial crisis for eight Asian markets. EGARCH and CGARCH models are employed to deal with the daily return to examine the degree of asymmetric volatility (temporary volatility and permanent volatility). The authors find that after global financial crisis asymmetric volatility is lower (expect Hong Kong), and the long-run effect is more than the short-run effect. The empirical results for the short-run show that, after global financial crisis, there is significant decreasing in China and Taiwan but not in Japan; the others are significantly increasing. For the long-run, there is significant decreasing (except Thailand and Korea).

1. INTRODUCTION

The phenomenon of asymmetric volatility refers to a situation when new information often causes price change. When new information is positive, future price volatility is smaller; on the contrary, when new information is negative, future price volatility is greater (Chelley-Steeley & Steeley, 1996; Hung, 1997; Laopodis, 1997; Yang, 2000). Asymmetric volatility is firstly observed in stock market research. Black (1976) examines data and firstly finds that current returns have a negative correlation with future volatility. Christie (1982) and Schwert (1990) also find the same results. Based on these studies, it can be assumed
that when new information results in the falling
of stock prices, then, the financial leverage of
companies will be rose; in other words, the risk
of holding a stock will be increased, and future
returns will be more volatile. On the other hand,
when new information causes stock price to be
rose, the financial leverage of companies will be
decreased, and future returns will be less volatile.
This phenomenon is called the leverage effect.
However, Sentana and Wadhwani (1992) assume
that the phenomenon of asymmetric volatility is
due to herding behaviors by traders; while Lo and
MacKinlay (1987) consider it as resulting from
non-synchronous trading. It is still not conclusive
whether asymmetric volatility of stock return
values is caused by leverage effects or not.

In the empirical modeling, when dealing
with high-frequency financial data, Engle (1982)
establishes the ARCH model (autoregressive
conditional hetroskedasticity) to solve self-relative
and hetroskedasticity problems. Bollerslev (1986)
extends it into the GARCH model (generalized
ARCH) to describe the phenomenon of volatility
clustering of returns. However, the GARCH model
cannot distinguish the difference of volatility
between positive and negative information (the
phenomenon of the violability asymmetries), thus,
Nelson (1991) develops the exponential GARCH
model (EGARCH) to distinguish this difference;
Campbell and Hentschel (1992) distribute the
asymmetric volatility by the quadratic GARCH
model (QGARCH). Later, Engle and Ng (1993)
compare these two models and find that the
EGARCH model has a better distribution, and
Hafner (1998) proves that, with empirical data,
the EGARCH model is better at distributing the
volatility of high-frequency data. In addition,
the EGARCH model is widely applied to high-
frequency data; therefore, this research uses
the EGARCH model to discuss the asymmetric
volatility of stock returns.

As to the persistence of stock return volatility,
Ding and Granger (1996), Ding, Granger, and
Engle (1993) and Engle, Granger, and Robins
(1986) all proclaim that volatility contains high
persistence and it can have long memory behavior
or be fractionally integrated. In the volatility
model, long memory behavior can be divided into
two parts, an approximate unit root and a quick
(1990) and Bollerslev, Engle, and Nelson (1994),
extend these two parts into a more complicated
academic process, and conclude it to a permanent
and transitory volatility. Permanent volatility can
be regard as long-run volatility, while transitory
volatility can be considered short-run volatility.
The distinguishing feature of these two types of
volatility is that short-run volatility is faster mean-
reverting compared to long-run volatility. Besides,
the model of component GARCH has been widely
used in the empirical analysis. Christoffersen,
Jacobs, and Wang (2008) analyze the volatility of
the option by long-run and short-run effects; they
find that the biased estimate of the volatility of the
option can be decreased. Tobias and Rosenberg
(2008) also think the risks at stock markets can be
influenced by short-run and long-run volatility,
and even if the mean of the risk premium is smaller
than the long-run volatility effect, the important
factor is that the return of the volatility for size
and the book-to-market ratio can be influenced
by short-run volatility effect. According to the
above, we claim that the volatility of return has
long-run and short-run effects. Hence, this research
uses the CGARCH model to discuss long-run and
short-run effects of volatility.

This paper extends the lemma of heterogeneous
expectation made by Hogan and Melvin (1994)
and Tse and Tsui (1997), considering that the more
the government interferes in the stock market, the
more heterogeneous expectations there are; thus,
asymmetric volatility is more significant. That is
to say, government’s interference and the asymmetric
volatility should exhibit positive relations. Other
researchers like Ding and Granger (1996), Ding,
Granger, and Engle (1993), and Engle, Granger,
and Robins (1986) all declare that volatility has