Empirical Analysis of Stock Returns and Volatility: Evidence from Seven Asian Stock Markets Based on TAR-GARCH Model

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Abstract. This paper investigates the time-series behavior of stock returns for seven Asian stock markets. In most cases, higher average returns appear to be associated with a higher level of volatility. Testing the relationship between stock returns and unexpected volatility, the evidence shows that four out of seven Asian stock markets have significant results. Further analyzing the relationship between stock returns and time-varying volatility by using Threshold Autoregressive GARCH(1,1)-in-mean specification indicates that the null hypothesis of no asymmetric effect on the conditional volatility is rejected for the daily data. However, the null cannot be rejected for the monthly data.

Key words: stock returns, volatility, Asian stock markets, asymmetric effect, TAR-GARCH model

JEL Classification: G12, G15

1. Introduction

Since the events of the stock market crash in October 1992 and the Asian crisis in July 1997, a considerable amount of research has been devoted to the investigation of the sensitivity of stock returns toward risk and to the covariance of stock returns across different markets. The accumulated empirical evidence suggests that, in addition to the traditional economic forces (Chen et al., 1986), stock returns have been analyzed typically by employing time-series models. The research may be categorized into two approaches: (i) investigation of time-series patterns and cross correlations of stock returns and (ii) examination of the relationship between stock returns and conditional variance. The main concern of the first approach is to detect whether there is a predictable pattern associated with stock-return series. A predictable pattern implies a profitable trading rule, rejecting an efficient-market hypothesis. The evidence reported by Fama and French (1988), Poterba and Summers (1988), and Ding et al. (1993) suggests that there is a long memory or mean reversion in
stock returns. These studies conclude that not all of the time series of stock returns follow a random-walk process. In cross-country studies, findings provided by Kim and Rogers (1995), Koutmos and Booth (1995), Wei et al. (1995), and Chiang and Jiang (1998) indicate that national stock returns are significantly correlated; and the linkages among international stock markets have grown more interdependent over time.

The second approach of studying stock series is to link the stock returns to risk factors. It has been observed that stock volatility exhibits a clustering phenomenon, i.e., large changes tend to be followed by large changes and small changes tend to be followed by small changes. In modeling this market phenomenon, Autoregressive Conditional Heteroscedasticity (ARCH) and the extension to the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model (Bollerslev, 1986) have been employed. As reported by Bollerslev et al. (1992), the GARCH(1,1) model appears to be sufficient to describe the volatility evolution of stock-return series. Due to the fact that the GARCH model fails to take into account the asymmetric effect between positive and negative stock returns, the weighted innovation models such as exponential GARCH (Nelson, 1991) and Threshold Autoregressive GARCH or TAR-GARCH model (Glosten et al., 1993, henceforth, GJR; Engle and Ng, 1993; Tsay, 1998) have been advanced. This line of research highlights the asymmetric effect by emphasizing that a negative shock to returns will generate more volatility than a positive shock of equal magnitude.

Despite a substantial amount of empirical research on stock-market behavior, most studies have concentrated on the major developed stock markets. There have been only a few comparable research works devoted to investigation of Asian Stock Markets. For this reason, we examine time-series behavior of seven Asian stock markets, including Hong Kong, Malaysia, the Philippines, Singapore, South Korea, Thailand, and Taiwan. Particular attention is given to the empirical relationship between stock returns and volatility by employing a TAR-GARCH specification.

Our research interest in Asian markets is further motivated by recent developments in market phenomena. First, Asian stock markets, with the exceptions of Japan, Hong Kong and Singapore, have experienced a rapid growth in gross national product, contributing to a significant rise in savings and, hence, in the supply of loanable funds. An increase in demand for international financial assets has resulted. Second, since deregulation of the financial industry in most Asian countries in recent years, stock prices and capital movements are sensitive to news, return differentials, technological innovations, changes in business conditions, and political events in domestic market as well as in external sources. As a result, the volatile behavior of asset returns interacts dynamically with shocks in the rest of world through a contagion effect or other channels of transmission. Thus, the issue of volatility is not only a regional phenomenon, but also an integral part of global risk analysis. To provide more accurate information to aid global portfolio managers in achieving an efficient mean-variance frontier and to provide policy-makers with a more definite basis on which to formulate appropriate risk-management strategy, it is of interest to conduct an empirical investigation on stock-return reaction to risk.

This paper extends the existing research (Choudhry, 1996; De Santis and Imrohoroglu, 1997; Chiang and Jiang, 1998) in several ways. First, we use more recent daily data, starting from the post-crash period of 1987 and focus on seven Asian markets. Second, in addition