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Volatility clustering and nontrading days in Chinese stock markets

Ralph Friedmann*, Walter G. Sanddorf-Köhle

Department of Economics, University of Saarland, Im Stadtwald, D-66123 Saarbrücken, Germany

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Abstract

In this paper we analyze volatility dynamics in the Chinese stock markets comparing the EGARCH with the GJR GARCH model. The empirical results, which are quite stable under the alternative specifications, reflect the different dynamics due to the market segmentation in domestic A-shares and foreign B-shares. For the daily returns on A-shares we find there is highly significant impact of the number of nontrading days on volatility, as well as a significant reduction of volatility by introducing the price change limit. The evidence varies more mixed for the B-shares. For the analysis of the impact of news on volatility we propose a modification of the news impact curve. Using the concept of a conditional news impact curve we show that in periods of high volatility there is a potential acceleration of the news impact in the GJR GARCH model, while the news impact remains invariant under the EGARCH approach. The theoretical comparison is confirmed by the empirical results.

JEL classification: C52; G12

Keywords: Chinese financial markets; Volatility; Price limits; News impact curve

1. Introduction

The assessment of expected volatility in financial markets is important for portfolio selection and risk management as well as for the pricing of assets. Empirical research over the past two decades has provided much evidence that volatility is time-varying, and that changes in volatility are predictable, to some extent, in many asset markets. Numerous approaches of

* Corresponding author. Tel.: +49-681-302-2111; fax: +49-681-302-3551.
E-mail address: friedmann@mx.uni-saarland.de (R. Friedmann).

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forecasting volatility have been proposed in the literature; most of them are linked to the autoregressive conditional heteroskedasticity (ARCH) models originally introduced by Engle (1982) and generalized (GARCH) by Bollerslev (1986). A unified treatment of a variety of symmetric and asymmetric GARCH models is discussed in Hentschel (1995).

Generally the ARCH–GARCH-type approaches of conditional heteroskedasticity can be interpreted as models of news effects on volatility. This interpretation requires accommodation for the effect of accumulating news during weekends and holidays on the volatility. For developed stock markets, several empirical studies (French & Roll, 1986, Nelson, 1991, and Bollerslev, Engle, & Nelson, 1994) have shown that nontrading periods have a significant impact on volatility. The effect of the number of nontrading days between the current and the preceding trading day is particularly interesting in the Chinese stock market because it exhibits unusually long periods of trading holidays around Chinese Spring Festival.

Asymmetric effects of good news (unexpected increase in price) and bad news (unexpected drop in price) were motivated by theoretical and empirical evidence presented by Black (1976), French, Schwert, and Stambaugh (1987), and Nelson (1991), among others. Engle and Ng (1993) compare asymmetric volatility models, which allow good and bad news to have different effects on future volatility. They recommend the concept of a news impact curve as a standard measure of how news effects predicted volatility. Fitting a variety of asymmetric volatility models to daily Japanese stock returns, they initially conclude that the asymmetric model proposed by Glosten, Jagannathan, and Runkle (1993) and the EGARCH model introduced by Nelson (1991) are superior. They provide further evidence that the EGARCH model produces conditional variances which are much larger than those predicted by the other models. As a consequence, the standard deviation of the EGARCH estimated conditional variance in Engle and Ng's (1993) study is even higher than that of the squared residual itself. This contradicts the basic theoretical decomposition of the variance of the squared residual. Engle and Ng find that the best model is the one proposed by Glosten, Jagannathan, and Runkle (GJR). In this paper we will compare the performance of the EGARCH and the GJR model fitted to daily Chinese stock returns.

The correct specification of a volatility model is an important task for any specific financial market. The Chinese stock markets, i.e., the Shanghai Securities Exchange and the Shenzhen Securities Exchange, are quite young, and the market volatility is very high. The only studies we know which focus explicitly on modeling the volatility dynamics in the Chinese stock markets are those by Su and Fleisher (1998) for weekly returns, and Yeh and Lee (1997) for daily returns. Su and Fleisher (1998) estimate a GARCH model assuming a non-Gaussian, fat-tailed stable distribution for the innovations. They find that goverment's market intervention policies have affected stock market volatility. Yeh and Lee (1997) use the asymmetric GARCH approach proposed by GJR. They argue that the application of the GJR model to daily Chinese stock returns leads to the overshooting of estimated conditional variances, in periods of high volatility, that was previously in an EGARCH model in the study by Engle and Ng. This casts some doubt on the general superiority of the GJR model.

In this paper we apply both the EGARCH model and the GJR model to daily Chinese stock index returns. We use the flexible parametric family of generalized error distributions (GED) in the error distribution for both models. We model the log excess volatility around a deterministic, time-varying volatility component, which depends on the number of nontrading days between