Instruction for Authors on Paper Style

General State Space Modeling and Japan's Stock and China's Stock Volatility

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ABSTRACT

In this paper, we introduce General State Space Modeling to explain the comovement of Japan's stock and China's stock volatility. Chinese markets trade A-shares for domestic investors and otherwise identical B-shares for foreign investors. For A-shares, we find that volatility declined steadily over the decade. Relative to world markets, we find no asymmetric volatility effect in China and less volatility persistence for B-shares. And, contrary to the global trend of increasing cross-country correlations, we find stationary correlations for the Chinese markets. A-shares indices never correlated with world markets and for B-shares indices, we find constant low correlation with Japan (0-5%).

Keywords: general state space modeling, Chinese markets.

1. Introduction

It has been commonly claimed that the world's stock markets have become more closely inter-connected. Lai, Lai, and Fang(1993) observe relationships between the New York and Japanese stock markets. Peek and Rosengren (1997) argue that Japanese stock market was transmitted internationally to the US. Cheung(1995) discover relationship among five stock markets: Malaysia, Hong Kong, Korea, Singapore, and Thailand. Bahng(2003) focus on China, Japan, and South Korea, found stron relationship among Japan and South Korea, weak relationship with China.
However, we found that has been little research done on relationships of eatheast Asian stock markets of China and Japan.
The objectives of this study is to determine if Chinese stock and Japanese stock markets are closely linked.
The paper is organized as follows. Section 2, we focus on State space model and Vecor error correction model(VECM) for our empirical analysis. Both the data and test results are explained in Section 3, with conclusions in Secion 4.

2. Methodology

2.1 State space model

To investigate relationship among China's and Japan's stock indices across geographical regions, the following model is analyzed ,that is state space model. A linear state space model consists of two equations.
Observation equation:

$$\underset{(m\times1)}{y_t} = \underset{(m\times k)}{A_t'}\underset{(k\times1)}{x_t} + \underset{(m\times r)}{H_t'}\underset{(r\times1)}{\xi_t} + \underset{(m\times1)}{\omega_t} \qquad (1)$$

State equation:

$$\underset{(r\times1)}{\xi_t} = \underset{(r\times r)}{F_t}\underset{(r\times1)}{\xi_{t-1}} + \underset{(r\times1)}{\upsilon_t} \qquad (2)$$

The disturbance are assumed to satisfy

$$\left.\begin{pmatrix} v_t \\ w_t \end{pmatrix}\right| x_t \sim i.i.d.N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} Q_t & 0 \\ 0 & R_t \end{pmatrix}\right)$$

y_t, x_t : observable variables.
ξ_t : unobservable state vector.
A_t, H_t, F_t : coefficients.
Many models can be written in state space form.
ξ_t : can be estimated using an algorithm called the Kalman filterl.

2.2. Vecor error correction model (VECM)

Granger(1969) introduced a testable of causality of predictability in a set of non-cointegrated variable by Granger(1988). He suggested that in a set of cointegrated variables for the shortl-term relations among these variables should be examined the error correction modle(VECM).

$$W = (Shaindex, Shab, Topix)' \qquad (3)$$

where Shaindex is the ShangHai A-shares indices, Shab is the ShangHai B-shares indices, Topix is the Tokyou indices.Let $W_t = (Shaindex_t Shab_t Topix_t)'$ denote a three-componet vector. A three variable VECM can be written as

$$\Delta W_t = \phi_0 + \phi(L)\Delta W_{t-1} + \varepsilon_t \quad (4)$$

where $\phi_0 = (\phi_{10}\phi_{20}\phi_{30})'$ is a constant tern and $\phi(L) = \sum_{\ell=1}^{p} \phi_{ij,\ell} L^{\ell}$,where p is the degree of the polynomial, ε_t is a vector of error term with $E(\varepsilon_t) = 0$ and $E(\varepsilon_t \varepsilon_s') = \Omega$,for $t = s$ and zero otherwise. For the Shanghai stock indices, Eq.(3) can be written as

$$\Delta Shaindex_t = \phi_{10} + \sum_{\ell=1}^{p} \phi_{11,\ell} \Delta Shaindex_{t-\ell} + \sum_{\ell=1}^{p} \phi_{12,\ell} \Delta Shab_{t-\ell} + \sum_{\ell=1}^{p} \phi_{13,\ell} \Delta Topix_{t-\ell} + \varepsilon_t \quad (5)$$

３.Empirical results

3.1 Data

We obtained the daily stock indices of Shanghai A-shares, B-shares and Japan. The specific name of those indices being the Shanghai A-shares Index(code: Shaindex), Shanghai B-shares index(code: Shab), web aper size Topix (code: Topix).the data cover 13 years from the beginning of 1992 to the May 2004. We have transformed the raw index data into logarithmic returns. Time Period I: from January 1,1992 to January 1, 1996, that is, the pre-Asian crisis period. Time period II:January 2, 1996 to May 14, 2004.

3.2 Empirical results

We tested for the stationarity and existence of co-integrating vectors in order to identify the time series properties of the variables. First, the existence of ujit roots is tested using ADF=-37.2(augmented Dickey-Fuller9 and PP=-53.9(Phillips-Perron) tests(t-statistic). The nul hypothesis in fovor of the existence of the unit root was not rejected for the log first-differences or log return variables. Thus,the VECM model can be used .

VECM results: the Time Period I log is (1,1); Time Period II log is (4.4).

(1992,1.1-1996.1.1)Make models list is:

$$R_{Shaindex(t,t)} = 0.072 * Shab_{(t,t)} - 0.573 * Topix_{(t,t)} - 1.038 \quad (6)$$

$$R_{Shab(t,t)} = 0.012 * Shaindex_{(t,t)} - 0.042 * Topix_{(t,t)} - 0.224 \quad (7)$$

$$R_{Topix(t,t)} = -0.004 * Shaindex_{(t,t)} - 0.017 * Shab_{(t,t)} - 0.001 \quad (8)$$

(1996,1,2-2004.5.14)Make model list is:

$$R_{Shaindex(t,t)} = -0.006 * Shab + 0.03 * Topix_{(t,t)} - 2.41 \quad (9)$$

$$R_{Shab(t,t)} = 0.019 * Shaindex_{(t,t)} + 0.019 * Shab_{(t,t)} - 0.213 \quad (10)$$

4. Conclusion

The following results were obtained from our analysis. First, we found that (1992.1.1-1996.1.2)the movements of the Shanghai A-shares, Shanghai B-shares and Topix was strong than(1996.1.2-2004.5.14) pre-Asian crisis. The second is that the Chinese stock market is segregated.

Further research is needed to determine if this phenomenon of asymmetric responses exists in other regions.

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