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Chinese and world equity markets: A review of the volatilities and correlations in the first fifteen years ☆

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ABSTRACT

After more than 15 years of Chinese equity markets, we study how variance, covariance, and correlations have developed in these markets relative to world markets, based on the dynamic conditional correlation (DCC) model of Engle [Engle, R., 2002. A dynamic conditional correlation: A simple class of multivariate generalized autoregressive conditional heteroskedasticity models. Journal of Business & Economic Statistics 20(3), 339–350.]. Chinese markets offer A-shares to domestic investors and otherwise identical B-shares to foreign investors. We find that the volatility of A-shares has declined over the past decade. We find no asymmetric volatility relative to world markets in China. Contrary to the global trend of increasing cross-country correlations, we find stationary correlations for China. A-share indices have never been correlated with world markets, and B-share indices exhibit a low degree of correlation with Western markets (0–5%) and a slightly higher degree of correlation with other Asian markets (10–20%). We interpret these findings using Gordon's growth model.

1. Introduction

As China celebrates its 15-year modern stock market history, we look back at and investigate the way in which Chinese markets have developed vis-à-vis world markets. Chinese markets currently rank ninth globally in terms of market capitalization, which was US$1145 trillion at the end of 2006. The country's capitalization growth is unrivalled and seems likely to continue, given that the Chinese economy appears to be on a path of strong growth despite weaknesses in the global economy and turmoil in the economies of other countries and regions. China's economic development appears to be resistant to potentially contagious effects, as is evidenced by its continued growth during the Asian financial crisis of 1997.

The current literature on Chinese markets focuses primarily on the country's market segmentation, with A-shares available to domestic investors and otherwise identical B-shares to foreign investors. B-shares are traded at a lesser value than A-shares. Since foreign investors can diversify country risk, it would seem B-shares could trade at a premium (see Bailey, Chung, & Kang, 1999), as they do in other markets. This puzzling situation has motivated a number of studies on the potential information

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advantage of domestic investors, the illiquidity of the B-share market, and a speculation premium for A-share markets (see Chakravarty, Sarkar, & Wu, 1998; Fernald & Rogers, 2002; Mei, Scheinkman, & Xiong, 2003; Karolyi & Li, 2003; Chan, Menkveld, & Yang; 2007, 2008).[3]

In this paper, we study how variance, covariance, and correlations have changed over time for the two Chinese equity markets—Shanghai and Shenzhen—and for world markets. For the Chinese markets, we distinguish between those for A-shares and those for B-shares. Thus we consider four markets: Shanghai-A, Shanghai-B, Shenzhen-A, and Shenzhen-B. Inspired by Fernald and Rogers (2002), we interpret our findings in terms of Gordon's (1962) standard dividend discount model, which explains price changes in terms of either the changes in dividend growth rates or the changes in the equity risk premium. We develop the following expectations based on this model. First, we expect B-share returns to correlate positively with world market returns, as changes in (world) equity risk premiums affect the price levels in all of the markets that are available to international investors, including B-share markets. Second, based on the dividend growth aspect of these price levels, we expect the correlation of B-share returns with world market returns to increase over time as Chinese companies and their dividend growths become increasingly dependent on the state of the world's economy. The correlation of the Chinese market with a particular foreign market depends on the extent to which Chinese and foreign firms react to fluctuations in the global economy. Third, we expect the correlations of A-share returns with world equity returns to be lower than those of B-share returns with world equity returns, since the A-share markets are more segmented (or separated) from world markets. This segmentation means that equity risk premium changes in the A-share market may be different from those in the world market (or the B-share market for that matter). Fourth, according to the dividend growth component, we also expect the correlation between A-share returns and world market returns to increase over time. Based on a simple economic model, we additionally note that knowledge of volatility and market interrelationships is crucial for portfolio selection, risk management, and the pricing of primary and derivative securities. Finally, knowledge of the correlations among the A- and B-share markets allows the Chinese government to judge to what extent this dual-share policy deprives domestic investors of opportunities for diversification.

We estimate a generalized form of the dynamic conditional correlation (DCC) model proposed by Engle (2002) to accommodate changing variance, covariance, and correlations.[4] This model is a two-step approach that captures the dynamics. First, we identify and estimate univariate ARMA/GARCH models. Second, we capture the changing market interdependencies through a multivariate GARCH structure for the correlation matrix of standardized returns. These standardized returns use the conditional variance retrieved from the univariate GARCH model estimates. The correlation matrix is estimated from sequentially decomposed bivariate GARCH sub-models. This sequential approach has the flexibility of the univariate GARCH, but lacks the complexity of the conventional multivariate GARCH, which is numerically demanding for estimating a large set of markets. We allow for asymmetric effects in both stages, as changes to variance, covariance, and correlations may depend on whether the previous return was positive or negative. For example, the correlations among equity returns increase in bear markets and decrease in bull markets (see Erb, Harvey, & Viskanta, 1994; De Santis & Gerard, 1997; Longin & Solnik, 2001; Ang & Bekaert, 2002; Das & Uppal, 2004).

We estimate the model using weekly index returns from December 28, 1992 to December 29, 2006 for the main Chinese markets, the other five largest Asian markets, the U.S. market, and the three main European markets.

We find only partial support for our economic expectations in our estimation results. First, we find supporting evidence of positive correlations between weekly B-share returns and world equity returns. However, these correlations are surprisingly low: 0–5% for the correlation with Western and Japanese markets and 10–20% with the other Asian markets (10–20%). Second, we do not find that these correlations increase over time, which is contrary to our expectation based on the dividend growth component of Gordon's growth model. Third, we find that A-share returns are less correlated with world market returns than are B-shares, which is consistent with our expectation. Finally, we find no increase in the correlation between A-share returns and world market returns over time, which is contrary to our fourth expectation. The largest surprise is the lack of a correlation increase over time between Chinese returns (both A- and B-shares) and world returns in spite of China's growing importance to the world's economy. This finding is in sharp contrast to the general upward trend of correlations within the world's main equity markets (see Cappiello, Engle, & Sheppard, 2003).

We further report a number of interesting results for the volatility process. We find that the A-share market has matured, in that volatility levels have come down to levels that are comparable to those of world markets. Contrary to the case of world markets, however, we find no evidence of asymmetric volatility in either the A- or B-share market. Market downturns do not seem to cause disproportionate volatility.

The remainder of the paper is organized as follows. Section 1 introduces the Chinese markets and reviews Gordon's growth model. Section 2 outlines our econometric methodology: the sequential DCC model. Section 3 introduces the data and presents summary statistics and the model estimates. Section 4 summarizes our main findings.

2. Chinese equity markets

In this section, we introduce the Chinese equity markets and discuss Gordon's growth model to develop intuition about why Chinese and world markets may be correlated.

[3] We should also mention Sun and Tong (2003), whose study deals with the issue of corporate governance in China. To the best of our knowledge, this is the only study on the subject.

[4] Cappiello et al. (2003) were the first to apply this model to world equity markets with a focus on asymmetric dynamics and the introduction of the euro. The Chinese markets, however, were not included in their sample.