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Dependence structures between Chinese stock markets and the international financial market: Evidence from a wavelet-based quantile regression approach

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ABSTRACT

In this study, we investigate the dependence structures between six Chinese stock markets and the international financial market including possible safe haven assets and global economic factors under different market conditions and investment horizons. The research is conducted by combining a quantile regression approach with a wavelet decomposition analysis. Although we find little or insignificant dependence under short investment horizons, we detect the strong asymmetric dependence of oil prices and the US dollar index on the six Chinese stock markets in the medium and long terms. Moreover, not only is crude oil not a safe haven, it may damage Chinese stock markets as it increases over the long term, even in bull markets. Meanwhile, appreciation of the US dollar (depreciation of RMB) damages (boosts) Chinese stock markets during bull (bear) market conditions under long investment horizons. Moreover, we find that VIX (volatility index)-related derivatives may serve as good risk management tools under any market condition, while gold is a safe haven asset only during crisis periods.

1. Introduction

Understanding how global economic factors influence the performance of Chinese stock markets is an important issue to market participants, particularly during bear and bull markets. Changes in global economic factors affect economic growth in China and therefore Chinese stock markets. By considering different market conditions, we can thus describe the changes in dependence structures and spillovers across assets, which is crucial information for constructing portfolios and making financial decisions (Ciner, Gurdgiev, & Lucey, 2013).

With the development of the stock markets in China, Chinese investors can purchase a variety of assets. Indeed, six stock markets are available to satisfy different types of investors. First, the main markets (the Shanghai A and Shenzhen A share markets; termed SHA and SZA hereafter) consist of large companies that aim to provide investors with relatively stable dividend incomes. One

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difference between these two markets is that most state-owned corporations are listed on the Shanghai A share market, while private corporations are listed on the Shenzhen A share market. Second, the corresponding B share markets (SHB and SZB) are suitable investment vehicles for both local and foreign investors. Third, the small enterprise market (SEM) was established in May 2004 for enterprises that do not qualify for the main market. Finally, to encourage the development of high-tech enterprises, the Chinese government launched the growth enterprise market (GEM) in September 2009, which has fewer listing requirements than the SEM. Therefore, the SEM and GEM are riskier than the main markets.

This study investigates how global economic factors affect these six Chinese stock markets under different market conditions and in different investment horizons. First, separating these markets allows us to capture the landscape of the dependence structures between them and global economic factors based on their characteristics. Second, by separating time into different investment horizons, we can provide useful information for speculators (e.g., hedge funds and market makers), arbitrageurs, and long-term investors (e.g., institutional investors and bankers). In addition, this study aims to identify the safe haven assets suitable for Chinese investors since the "flight to quality" phenomenon also occurs in China (Caballero & Krishnamurthy, 2008; Baur & Lucey, 2010; Baur & McDermott, 2010).

Following Mensi, Hammoudeh, Reboredo, and Nguyen (2014), we combine a quantile regression (QR) approach with a wavelet decomposition analysis. The QR approach allows us to investigate dependence at the different quantiles including the states of downturn (lower quantiles), normality (intermediate quantiles), and upturn (upper quantiles) markets. The wavelet analysis allows us to capture the whole picture of the dependence structure based on the different investment horizons studied herein.

The remainder of this article is structured as follows. Section 2 provides a brief literature review. Section 3 presents the methodology. Section 4 describes the data and descriptive statistics. Section 5 presents the empirical results. Section 6 concludes the paper and discusses the implications of the findings.

2. Literature review

Three types of fundamental theory can explain the interactions between local and international stock markets. Firstly, the degree of economic integration has increased significantly over recent decades. During the globalization of the international economy, international stock markets have become more integrated (Chen, Roll, & Ross, 1986), with numerous studies providing evidence by employing different approaches (Broadstock & Filis, 2014; Li, Zhang, & Gao, 2015; Vithessonthi & Kumarasinghe, 2016).

Secondly, financial contagion may occur, which is when stock markets slump in one country and this causes a decline in the stock market in another country. Therefore, the comovement among different stock markets in this category cannot be explained by economic fundamentals. Other researches propose that two factors may explain the irregular comovement among stock markets, namely informational and institutional factors (see also Neaime, 2016; Wang, Xie, Lin, & Stanley, 2017). Further, Wang et al. (2017) state that financial contagion occurs dependent on the recipient country as well as the timescale.

Finally, stock market characteristics themselves also affect the comovement among markets, such as industry similarity, volatility, and market size (Banz, 1981; Bekaert & Harvey, 1997; Bracker, Docking, & Koch, 1999). Since then, various factors have been introduced to investigate the reasons driving comovements among stock markets, including gold prices, oil prices, interest rates, and exchange rates (Mensi et al., 2014; Chiang & Chen, 2016; Chen & Chiang, 2016).

Further, numerous studies discuss the relationship between Chinese stock markets and other financial markets (Li & Zou, 2008; Panchenko & Wu, 2009; Chan, Treepongkaruna, Brooks, & Gray, 2011; Hammoudeh, Nguyen, Reboredo, & Wen, 2014; Broadstock & Filis, 2014; Li et al., 2015). Most authors investigate dependence structures by combining two markets such as bond–stock, oil–stock, and gold–stock. For example, Li and Zou (2008) find that the T-bond market and bond–stock correlations in China bear more of the brunt of the macroeconomic contractions. Hammoudeh et al. (2014) provide evidence that commodity futures are a desirable asset class for portfolio diversification.

Although these studies investigate pairs of stock markets and other financial markets in detail, they fail to incorporate other macroeconomic factors into their analyses (Mensi et al., 2014; Chiang & Chen, 2016; Chen & Chiang, 2016). For example, Chiang and Chen (2016) show that returns from emerging stock markets are determined by domestic as well as global economic factors and that a better macroeconomic climate and an improvement in liquidity help explain Chinese stock returns. Indeed, few researchers discuss the changes in the relationship between global economic factors and Chinese stock markets under different market conditions and investment horizons. We thus employ a wavelet-based QR approach to bridge this gap in the literature.

3. Methodology

3.1. QR analysis

Although correlation coefficients are widely used to measure the statistical relationships between variables, they only discuss symmetric linear associations without any consideration of dependence structures. To model dependence structures between financial time series, a more sophisticated statistical tool should thus be employed. By adopting the combination of wavelet analysis and QR, this study is capable of investigating the structure of complex dependence across different time horizons.

Since its introduction by Koenker and Bassett (1978), QR has been widely employed to model dependence structures. Compared with traditional regressions, it provides a more accurate landscape to analyze the effect on the dependent variable from conditional