

Original article

Volatility spillovers from the Chinese stock market to economic neighbours

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Abstract

This paper examines whether there is evidence of spillovers of volatility from the Chinese stock market to its neighbours and trading partners, including Australia, Hong Kong, Singapore, Japan and USA. China's increasing integration into the global market may have important consequences for investors in related markets. In order to capture these potential effects, we explore these issues using an Autoregressive Moving Average (ARMA) return equation. A univariate GARCH model is then adopted to test for the persistence of volatility in stock market returns, as represented by stock market indices. Finally, univariate GARCH, multivariate VARMA–GARCH, and multivariate VARMA–AGARCH models are used to test for constant conditional correlations and volatility spillover effects across these markets. Each model is used to calculate the conditional volatility between both the Shenzhen and Shanghai Chinese markets and several other markets around the Pacific Basin Area, including Australia, Hong Kong, Japan, Taiwan and Singapore, during four distinct periods, beginning 27 August 1991 and ending 17 November 2010. The empirical results show some evidence of volatility spillovers across these markets in the pre-GFC periods, but there is little evidence of spillover effects from China to related markets during the GFC. We undertook some additional analysis for this period featuring an exploration of whether there was any spillover effect in the mean equations as well as in the variance equations. We used a bimean equation to model the conditional mean in the individual markets plus an ARMA model to capture volatility spillovers from China to the five markets considered. This augmented model showed much greater evidence of spillovers. We also suspected that the correlations were not constant and applied a moving window of 120 days of daily observations to explore time-varying conditional and fitted correlations. There was evidence of non-constant correlations and even a period of negative correlations between the US and China at the height of the GFC. This is presumably because the GFC was initially a US phenomenon, before spreading to developed markets around the globe and it was not a Chinese phenomenon.

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1. Introduction

Over the past two decades, China has established itself as one of the world's leading economic powers. Its strong economic growth has seen it become one of the world's industrial superpowers. This growth has had a significant impact on other economies around the world through Chinese imports and exports. One economy that has been particularly affected by the strong Chinese growth is the Australian economy, as China relies heavily on Australia's rich mining and resources sector for its growing industries. The Chinese stock market has also grown significantly since its inception in 1991 and has gone through many changes, both regulatory and operational. This paper examines whether there is evidence of spillovers of volatility from the Chinese stock market to its neighbours and trading partners, including Australia, Hong Kong, Singapore, Japan and USA. The paper will use the GARCH(1,1), VARMA–GARCH and VARMA–AGARCH models to estimate volatility and determine evidence of volatility spillovers.

1.1. Literature review

In 2003, approximately 1.1% of the world's 3.2% growth was attributed to China based on Purchasing Power Parity (PPP). China has been said to be the “manufacturing breadbasket of the world” [1, p. 2]. China has demonstrated strong growth, which is among the highest in the world, and has maintained it for over a decade. The Gross Domestic Product at the end of 2004 was more than 8 times its size in 1978, the year in which major economic reforms made a turning point in the previously struggling economy. Such growth has led to China's GDP being the 6th largest in the world in 2004. Once the figures have been adjusted for PPP, China was the second largest in the world, after the USA [1]. It had also contributed to the fact that China's GDP has grown by at least 7% per year since 1991 [26].

This economic reform was carried out by the then newly appointed leader, Deng Xiaoping, following the death of the Communist Party leader, Mao Zedong, in 1976, whose economic reform failures since 1949 (including collectivisation of farms and focus on heavy industry) had led to impoverishment and left China isolated from the global market [5]. Deng's 1978 economic reform has been described as “a watershed in Chinese economic policy” [1, p. 1]. Barth et al. [1, p. 1] state that 1978 was the year in which “China began taking its first tentative steps away from a centrally-planned communist economy towards a mixed socialist-market system”, and as a result “has produced rapid growth in both GDP and exports, and has been supported by large flows of foreign private direct investment rather than external official assistance”. In other words, China has opened itself to international trade more than ever before, and was richly rewarded for doing so.

In 2002, after several reforms, banks controlled approximately 80% of total financial assets. In addition, shares only accounted for about 15% of total financial assets (compared with 46% for USA), and approximately two-thirds of the shares listed on the Shenzhen and Shanghai stock exchanges, China's only two stock exchanges at the time, were government owned and non-tradable. Corporate bonds accounted for less than 1% [1, p. 4]. Such financial systems are often very sensitive to institutional failure and contagion, particularly as the ‘big four’, China's largest 4 banks, all state-owned, accounted for 59% of banking assets and about one-half of the total of national financial assets [1, p. 7], which would make funds difficult to obtain in the event of institutional failure.

To make matters worse, it is estimated that prior to the 1998, more than 20% of total loans in the banking system were bad or non-performing [6]. In addition, the lack of efficient capital markets implies that the allocation of capital to firms, and their investment decisions, is at the discretion of banks rather than markets. As a result, firms could obtain funds for sub-optimal investments, whereas in more efficient capital markets, the securities issued by those firms might suffer if their investments were sub-optimal, non-performing, or if a misuse of capital were to occur (see [1]).

Green [11] claims that, if China's economic growth is to be sustained in the long run, it must create effective financial institutions. There have been several reforms made by the Chinese government to try and develop a financial system that is better adjusted and secure. Green [11] identifies three distinct periods or phases of institutional change:

1. The first period is from the end of 1990 to the end of 1992. In a move to try and create a more balanced financial system, the government opened two stock exchanges: Shanghai in late 1990, and Shenzhen in mid-1991. Barth et al. [1] state that this was one of the major reforms or innovations to the Chinese financial system in recent years. Nevertheless, although the exchanges were formed on “the status of a legal-person organization and not a government bureau” [12, p. 9], and were generally at the senior staff's discretion, the People's Bank Of China still maintained control of operational and policy issues. Green [12, p. 9] claims this was simply a “proxy for control by

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