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# Do international investors cause stock market spillovers? Comparing responses of cross-listed stocks between accessible and inaccessible markets

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## ABSTRACT

This study provides evidence that international stock investors' transactions are a cause of stock market spillovers. We analyze return and volatility spillovers between eight major stock markets and stocks cross-listed on an accessible market (H-shares in Hong Kong) and an inaccessible market (A-shares in mainland China) by applying the spillover indexes proposed by Diebold and Yilmaz (2012, 2014) to those markets. Results suggest that spillovers of both return and volatility are greater in an accessible market than in an inaccessible one. We also find that spillover effects intensify as openness of a stock market increases.

## 1. Introduction

Global integration of national economies, as well as financial deregulation in major countries since the 1980s, has strengthened relationships among international stock markets, which led to closer spillovers of stock prices across national borders. Global stock market selloffs caused by events such as a calamitous stock price plunge in New York (Black Monday of October 19, 1987), Shanghai (February 27, 2007), and again New York (September 29, 2008) have occurred as well. These events represent cases in which an incident occurring in one market had an immediate and widespread effect on global markets. As such, they aroused interest among economists to explore empirical and theoretical questions posed by stronger stock price spillovers.<sup>1</sup>

One hypothesis to explain such spillovers is based on fundamentals (fundamentals-based hypothesis), and posits that, given a frictionless economy and rational investors, stock prices are determined by fundamentals and, thus, stock price spillovers are solely caused by changes in fundamentals. According to this traditional view global news on corporate fundamentals will alter stock prices of various countries sequentially, because national stock markets open and close at different times, leading to an apparent phenomenon of spillovers to subsequent markets.

Another hypothesis is based on investor behavior (investor-induced hypothesis), and maintains that stock market spillovers are caused by the behavior of international investors, such as adjustments in international portfolios. Theoretical models have been developed to explain the phenomenon in which stock price changes in one country lead to changes in other markets through portfolio holdings of international investors. As such, Kyle and Xiong (2001) assert that big losses incurred in a market plunge will result in selloffs in other markets because investors unwind positions to cover losses. Moreover, Kodres and Pritsker (2002) propose a theoretical model that shows propagation of crisis situations through portfolio adjustments involving several different stock markets. Hong and Stein (2003) show that new information that results in large-scale portfolio reallocations will cause international price changes. Finally, Mondria and Quintana-Domeque (2013) find that shocks in a given market will cause investors to allocate too much attention to that market and that their portfolio reallocation helps spread the effects on other markets.

The aforementioned theoretical research hypothesizes that international investors' behavior causes stock market spillovers, but there is little empirical research on this hypothesis. The limited empirical research tends to focus on periods of contagion following a major

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<sup>1</sup> Another line of research studies "comovements", in which stock prices move concurrently. This line also focuses on the causes of comovements and examines whether they are fundamentals-based or friction-based or sentiment-based. See Barberis et al. (2005) and Bartram et al. (2015).

financial crisis (e.g., Boyer et al., 2006, Petmezas and Santamaria, 2014).<sup>2</sup> Consequently, one of the purposes of this study is to determine the factors that explain international stock market spillovers in non-crisis periods.

The question is how to determine which of the two hypotheses is valid in explaining spillovers. As such, we consider two different stock markets: one that is open to international investors (accessible market) and one that is not (inaccessible market). We subsequently focus on stocks cross-listed on these two markets. By analyzing how these cross-listed stocks react to changes on a major foreign market such as the U.S. stock market, we can verify which hypothesis is supported. If the fundamentals-based hypothesis is valid, changes in fundamentals affecting American firms will have an impact on domestic firms, but the degree of response must be identical for the two markets. Alternatively, if the investor-induced hypothesis is correct, while the prices in the inaccessible market remain unaffected because of the absence of international investors, stock prices on the accessible market are affected by portfolio adjustments. In this instance, international stock market spillovers are observed only on the accessible market. Examining whether spillovers are observed equally in these cross-listed stocks enables us to determine which of the two hypotheses is valid in explaining international stock price spillovers. A new contribution of this study is the method of focusing on differential responses of cross-listed stocks on an accessible and an inaccessible market.

Another analytical framework is exploring the effects of opening an inaccessible market to foreign investors. If the fundamentals-based hypothesis is correct, the spillover effects on the inaccessible market will remain unchanged after the market opens for foreign investors, because stock prices in such a market are determined with their fundamental values. However, if the investor-induced hypothesis holds true, the opening of an inaccessible market will increase the degree of international price linkage on this market.

In order to execute the above tests, we use a unique feature of Chinese stock markets: the existence of two independent stock markets with differing degrees of international openness. An internationally accessible market is provided by the H-share market in Hong Kong and the inaccessible market by the A-share market in mainland China (Shanghai and Shenzhen).<sup>3</sup> We investigate the stocks of 86 companies that are cross-listed on these two markets. The stock of a cross-listed company is subject to the same fundamentals and external shocks (e.g., changes in regulation, shocks idiosyncratic to the industry, etc.), and the only difference between the two listings is whether the stock is purchasable by international investors or not. Because A-shares cannot be bought/sold by foreign investors,<sup>4</sup> if the H-share price more strongly comoves with a major foreign stock market than the A-share price, it can be interpreted as reflecting the behavior of international investors.

We attempt to analyze the average responses for the 86 stocks that

<sup>2</sup> In this paper, spillover of stock prices is defined as a phenomenon in which a rise (fall) in return/volatility on one market leads to a similar rise (fall) in return/volatility on other markets. Spillover is different from contagion which is defined by Forbes and Rigobon (2002) to signify “a significant increase in cross-market linkages after a shock to one country (or group of countries).”

<sup>3</sup> There is a B-share market in mainland China accessible to foreign investors. B-shares are specifically issued for foreign investors and denominated in a foreign currency (US dollars in the case of the Shanghai Stock Exchange and Hong Kong dollars in the case of the Shenzhen Stock Exchange). However, the market capitalization of B-shares represented only 0.46% of the entire market capitalization (A + B shares) at the end of 2014. Issuance of the two types of shares at the same time was banned in 1998, and issuance of B-shares has all but disappeared since then. Therefore, we ignore B-shares in our analysis.

<sup>4</sup> A-shares can also be purchased by the so-called Qualified Foreign Institutional Investors (QFII) and RMB Qualified Foreign Institutional Investors (RQFII). However, the actual amount of investment officially permitted is miniscule. Specifically, the amount allocated to the QFII is 72.15 billion US dollars and that to RQFII is 53.7 billion US dollars, amounting to only 0.21% of the market capitalization. Consequently, we can ignore international investors on the A-share market.

are listed on both the A-share and H-share markets. Therefore, we need to compile a stock price index composed of these stocks. As such, we obtain tick data on them and extract prices at five-minute intervals. We subsequently compute the capitalization-weighted average of those prices to produce the desired price index for cross-listed stocks.

We estimate return and volatility spillovers between the two Chinese markets and major foreign stock markets, respectively. Preceding works in the field used various methods to estimate return and/or volatility spillovers. Our study adopts a new spillover index<sup>5</sup> proposed by Diebold and Yilmaz (2012, 2014). This is a summary measure of forecast-error variance decompositions using vector autoregressions (VAR), which captures, in a simple manner, spillovers between markets as a whole and offers information on the magnitude and direction of spillovers.

The remainder of this paper is structured as follows: Section 2 discusses related literature; Section 3 explains the hypotheses we consider and the methodologies used to test the hypotheses; Section 4 outlines the data used; Section 5 discusses the estimation results; and Section 6 concludes our paper.

## 2. Literature review

Studies on the investor-induced hypothesis include Boyer et al. (2006) and Petmezas and Santamaria (2014). Boyer et al. (2006) examine whether transmission of the Asian financial crisis of 1997 to other markets occurred through stock holdings of international investors or through changes in fundamentals. As there are certain emerging markets not accessible to foreign investors, they compare responses on an accessible market with those on an inaccessible market for plunging stock prices in the crisis country (Thailand). The result is that the former is larger than the latter, implying that stock market contagion is more likely caused by investor behavior than by the common effects of fundamentals. Therefore, investor-induced contagion is more plausible than the fundamentals-based contagion. Their focus on different responses on accessible and inaccessible markets is interesting, but not without problems. They are not controlling for the effects of fundamentals. In our study, however, we analyze cross-listed stocks in two markets with or without accessibility to foreign investors. Since they are subject to the same fundamentals, we do not have to control for different fundamentals. While Boyer et al. (2006) focus on the issue of contagion during a major financial crisis, this study analyzes international stock market comovement periods without major crises. Moreover, Petmezas and Santamaria (2014) emphasize the wealth and portfolio-rebalancing effects as the cause of investor-induced contagion, and compare these effects during the global financial crisis, between 2007 and 2012, by analyzing correlations between stock and bond markets.<sup>6</sup>

This study also investigates spillover effects of return and volatility. Early research in this field focused on returns only, such as studies by Eun and Shim (1989), Jeon and Von Furstenberg (1990), Cheung and Mak (1992), Janakiraman and Lamba, (1998), Leong and Felmingham (2003). More recent studies analyze volatility spillovers in addition to return spillovers, including Hamao et al. (1990), Ng (2000), Bae et al. (2003), Baur and Jung (2006); Diebold and Yilmaz (2009), Mukherjee and Mishra (2010). Simultaneous analysis of return

<sup>5</sup> Note that Diebold and Yilmaz (2014) refer to this index as the connectedness index.

<sup>6</sup> Additionally, there are studies which analyze the relationships between macroeconomic news and stock market spillovers. King et al. (1994) conclude that observable economic variables (e.g., interest rates, industrial production, inflation, etc.) can explain only a small part of international stock market spillovers. Connolly and Wang (2003) show that the bulk of the observed spillover in intraday and overnight returns on the U.S., the U.K., and Japanese stock markets cannot be attributed to public information about economic fundamentals. Albuquerque and Vega (2009) find that the U.S. macroeconomic news does not affect stock market spillovers between the U.S. and Portugal. Consequently, we can conclude that we have not found clear evidence that macroeconomic news cause stock market spillovers.

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