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Spillover effects of the U.S. financial crisis on financial markets in emerging Asian countries☆

Bong-Han Kim [a,1], Hyeongwoo Kim [b,*], Bong-Soo Lee [c,2]

[a] Department of International Economics, Kongju National University, Gongju, Chungnam, South Korea
[b] Department of Economics, Auburn University, Auburn, AL 36849, United States
[c] Department of Finance, Florida State University, Tallahassee, FL 32306, United States

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ABSTRACT

We examine spillover effects of the recent U.S. financial crisis on five emerging Asian countries by estimating conditional correlations of financial asset returns across countries using multivariate GARCH models. We propose a novel approach that simultaneously estimates the conditional correlation coefficient and the effects of its determining factors over time, which can be used to identify the channels of spillovers. We find some evidence of financial contagion around the collapse of Lehman Brothers in September 2008. We further find a dominant role of foreign investment for the conditional correlations in international equity markets. The dollar Libor-OIS spread, the sovereign CDS premium, and foreign investment are found to be significant factors affecting foreign exchange markets.

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1. Introduction

This paper attempts to identify the transmission mechanisms of the recent global financial crisis, which was triggered by the collapse of the U.S. housing market and the ensuing sub-prime mortgage market crash in the summer of 2007 using a multivariate GARCH model framework.

Although the episode is considered the first global crisis since the Great Depression (e.g., Claessens, Dell'Ariccia, Igan, & Laeven, 2010), it seems that emerging economies were somehow able to minimize the influence of these external shocks from the U.S. until the bankruptcy of Lehman Brothers in September 2008, which resulted in a direct shock that has spread to these emerging economies rapidly (e.g., Dooley & Hutchison, 2009).[3] The equity price in Taiwan, for instance, dropped by 38.5% in three months following September

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* Corresponding author at: Department of Economics, Auburn University, 0339 Haley Center, Auburn, AL 36849, USA. Tel.: +1 334 844 2928; fax: +1 334 844 4615.
E-mail addresses: bongkim@kongju.ac.kr (B.-H. Kim), gmmkim@gmail.com (H. Kim), blee2@cob.fsu.edu (B.-S. Lee).

[1] Tel.: +82 41 850 8391; fax: +82 41 850 8390.

[2] Tel.: +1 850 644 4713; fax: +1 850 644 4225.

[3] Okubo, Kimura, and Teshima (2014) point out that Asian countries were able to recover quickly from the 2008 financial crisis as the so-called Asian fragmentation (product networks in Asia) helped invigorate international trade in Asia. Ando and Kimura (2012) also reported similar findings using highly disaggregated industry level data.

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15, 2008. During the same period, the Korean Won depreciated against the U.S. dollar by 19.2%, which led to strong deteriorating spillover effects on real sectors.

In spite of the importance of understanding the nature of contagion or spillover effects in financial markets, the profession has failed to reach a consensus even on the existence of contagion during earlier financial crises. Correcting for heteroskedasticity bias, Forbes and Rigobon (2002) find virtually no evidence of increases in "unconditional" cross-market correlation coefficients, which is somewhat at odds with previous evidence of contagion (see, among others, Calvo & Reinhart, 1996; King & Wadhwani, 1990; Lee & Kim, 1993). Corsetti, Pericoli, and Sbracia (2005), however, point out their test can be biased towards the null hypothesis of no contagion and report stronger evidence of contagion with an alternative test.

This paper investigates the transmission of the recent U.S. crisis to financial markets in five emerging Asian economies: Indonesia, Korea, the Philippines, Thailand, and Taiwan. We choose these emerging economies instead of countries with fully developed financial markets because financial markets in developed countries are well integrated with each other.[4] So it seems rather obvious that adverse (or favorable) shocks would propagate to other target countries through highly integrated financial market channels as well as real activities channels. However, the propagation mechanisms in these emerging Asian countries are not currently very well identified because they are not fully integrated with the rest of the world including the U.S. and emerging markets generally show low correlations with developed markets.

Although China is one of the most influential economies among Asian countries, we exclude China in our major empirical analyses because our work heavily relies on marketable assets where government interventions play a limited role. For example, Chinese Yuan has virtually stayed pegged to the U.S. dollar for about two years since the summer of 2008 after being allowed steady appreciations against the dollar until the beginning of the financial crisis. Hong Kong also has employed similar foreign exchange market intervention policies. See Fig. 1. Further, our multivariate GARCH models do not work well when these asset returns show such inertial movements.

Furthermore, stock markets in China are not fully accessible to foreign traders yet. China's financial markets are considered as "mostly unfree" based on freedom index data from the Heritage Foundation. Further, China's financial freedom index and investment freedom index have stayed at around 30 out of 100 since 2000. These indices were downgraded from "mostly unfree" to "repressed" category since 2000.[5] Other important variables such as market interest rates also seem closely influenced by the government.[6] Since we are interested in the propagation mechanism via market activities in private sectors, we decide not to include China in the present analysis, focusing on emerging Asian economies with relatively more market-oriented financial markets.[7]

We are particularly interested in the following questions: 1) Is there empirical evidence of contagion from the U.S. to emerging Asian financial markets? 2) If so, when did it occur and for how long did it last? 3) More importantly, through what channels did the contagion spread to those markets? To address these questions, we employ an array of multivariate generalized autoregressive conditional heteroskedasticity (MGARCH) models.

To address the first two questions, we employ the conventional BEKK model by Engle and Kroner (1995) and Engle's (2002) dynamic conditional correlation (DCC) model in addition to our own MGARCH model. Throughout the paper, we focus on time-varying dynamic conditional correlations during the recent crisis instead of unconditional correlation coefficients because in our view the latter lacks practical usefulness from policy perspectives. Overall, transitions from the tranquil period to the turmoil period seemed to occur very quickly and lasted for fairly short period of time. This implies that these countries experienced a sudden acceleration of systemic risk when exogenous shocks occur. We do not claim, however, that the conditional correlation was the highest during the crisis in the entire sample period. Instead, we demonstrate that the correlation of asset returns of the source and the target countries tends to increase rapidly during the crisis.

To address the third question, we propose a novel DCC–MGARCH-type model with exogenous variables (DCCX–MGARCH), which estimates both the dynamic conditional correlation and the effects of explanatory variables at the same time in a unified framework. The DCCX–MGARCH method can be very useful in investigating economic fundamental variables that affect the cross-country correlations in order to identify the channels of contagion.[8] A number of variables can be considered for the factors that determine the time-varying conditional correlations. We consider the following three channels of contagion.

The first one is the factors that proxy the vulnerability of the U.S. financial markets. For this purpose, we consider the VIX index, the Chicago Board Options Exchange market volatility index, which is a popular measure of the implied volatility of S&P 500 index options. The TED spread, the difference between the three-month Libor and the three-month T-bill interest rate, and the daily 3-month U.S. dollar Libor-overnight index swap (OIS) spread are also considered as liquidity availability measures. Second, we use the sovereign credit default swap (CDS) premium as a proxy for weakness of emerging Asian markets. The last factor is the amount of foreign order flow (foreign investment) to quantitatively measure the role of foreign capital.

We find a dominant role of foreign capital for the conditional correlations in international equity markets. In foreign exchange markets, the Libor-OIS spread, the sovereign CDS premium, and the market share of foreign investors are found to play important roles. These findings provide valuable policy implications. The importance of foreign capital, for instance, calls for institutional arrangements such as currency swap agreements.

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[4] Hong Kong and Singapore are not included in our main empirical analysis because their financial markets are normally considered as those of developed countries. For example, stock markets in these countries belong to the MSCI Developed Markets group, while 5 countries we study in this paper are classified as the MSCI Emerging Market Asia group.

[5] All data are available at http://www.heritage.org/index/country/china.

[6] The Monetary Policy Committee under the People's Bank of China has provided the benchmark lending and deposit rate determined in their quarterly meetings.

[7] We do not include India and Malaysia due to similar reasons and data availability. For example, financial index of India and Malaysia implies that these countries are considered "repressed" and "mostly unfree", respectively. Also, India does not have sovereign credit default swap due to the low level US dollar denominated debts.

[8] Min and Hwang (2012) and Kim, Kim, and Min (2013) employed this method from Kim and Kim (2011), an earlier version of the present manuscript.

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