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Testing for asymmetric financial contagion: New evidence from the Asian crisis

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ABSTRACT

This paper investigates financial contagion as an asymmetric propagation mechanism across both equity and foreign exchange markets. In order to provide a robust analysis of the contagion dynamics, we apply an asymmetric generalized dynamic conditional correlation (AG-DCC) model. This specification allows examining the presence of asymmetric responses in correlations to negative returns, focusing on four countries affected by a specific emerging-market crisis (Asian crisis in 1997–1998). We find that conditional correlations among stock (currency) markets increase significantly during the crisis period, supporting the presence of asymmetric responses to negative shocks and the contagion phenomenon. The results also support the regional nature of this crisis, which is also spread with a higher magnitude among equity rather than currency markets. This evidence has important implications for portfolio diversification strategies and the effectiveness of policy responses to prevent the spread of the crisis among countries.

1. Introduction

The aim of this paper is to investigate the existence of a correlated-information channel, through which contagion can be viewed as the transmission of information from more-liquid markets – or markets with more rapid price discovery – to other markets, focusing on both equity and foreign exchange (FX) markets of four Asian countries (Indonesia, Korea, Malaysia and Thailand, including USA as a global factor) during the Asian crisis.[1] Following similar studies in the literature (e.g., Forbes & Rigobon, 2002; Bekaert, Harvey, & Lumsdaine, 2002), we maintain an equivalently strict definition of contagion as the increase in the probability of crisis, beyond the linkages in fundamentals, and the rapid increase in co-movements among markets during a crisis episode. This refers to "pure contagion", which is specified as a significant increase in cross-market correlations after a shock and relates to shifts in investors' appetite for or aversion to risk. When investors' appetite for risk rises, demand for risky assets increases and their value rise simultaneously. When investors' appetite for risk falls, they immediately reduce their exposure to risky assets and consequently fall in value together. Understanding the nature

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[1] The contagion literature identifies at least three possible contagion mechanisms: i) A correlated-information channel (e.g., Kaminsky, Reinhardt, & Vegh, 2003, among others); ii) A liquidity channel, through which contagion occurs through a liquidity shock across all markets (e.g., Allen & Gale, 2000, among others); iii) A risk-premium channel, through which contagion occurs as negative returns in the distressed market affect subsequent returns in other markets via a time-varying risk premium (e.g., Acharya & Pedersen, 2005, and others). In this paper, we restrict our investigation only on the first contagion mechanism, due to the lack of availability of consistent and compatible financial data in emerging markets.

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and the differences in crisis dynamics has crucial implications for international investors, policy makers and multi-lateral organizations.

It is eighteen years since the East Asian financial crisis or the Asian flu (1997–1998) struck the region. Together with the Tequila crisis (1994–1995) in Mexico and the Russian virus (1998), the recent financial crises in the emerging market economies have attracted considerable attention from academics, policymakers and fund managers and traders. The Asian crisis was initially triggered by the surrendering of the fixed exchange rate by Thailand and the immediate and spectacular collapse of the Thai Baht. Then, it ripped through the whole region and far beyond, to places that are as geographically apart as Latin America and Russia. It caused dramatic disruption to the region's financial stability as well as economic performance and altered the pricing of various financial assets and instruments.

The Asian financial crisis was characterized by currency and banking "twin crises". The twin crises act as reinforcement to each other exacerbating the crisis (Kaminsky & Reinhart, 1999). The financial crisis also spread to the real economy, as Thailand and Indonesia, for example, experienced negative GDP growth rates during the period 1997–1998. However, it was evident that the existing currency crisis models at the time were incapable to explain what was unfolding, sending out puzzling and confusing signals to policymakers, economists and financial specialists. Before the crises episodes of the 1990s, financial crises models were developed with regard to crises as events occurring in individual countries. However, the Tequila crisis of 1994–1995, the Asian flu of 1997-1998 and the Russian virus in 1998 refocused the empirical research on the examination of contagion effects and the inter-regional or inter-continental nature of the shocks.

Common to all crisis episodes occurred in the 1990s was the fact that the turmoil originated in one market extended to a wide range of markets and countries, in a way that was hard to explain on the basis of changes in fundamentals (Rodriguez, 2007). Generally, contagion refers to the spread of financial disturbances from one country to others. Early research on financial contagion used a range of different methodologies categorized as follows: (i) cointegration and vector error correction models (e.g., Masih & Masih, 1999); (ii) models of interdependence (e.g., Dungey, Fry, Gonzalez-Hermosillo, & Martin, 2003; Bekaert, Harvey, & Ng, 2005); (iii) unanticipated shock models using ARCH (Engle, 1982) and GARCH (Bollerslev, 1986) specifications (e.g., Fernandez-Izquierdo & Lafuente, 2004); (iv) models of asymmetries and nonlinearities (e.g., Baig & Goldfajn, 1999); (v) some additional models, such as the principle components model (e.g., Calvo & Reinhart, 1996) and spillover models (e.g., Glick & Rose, 1999).

However, since the thought-provoking paper by Forbes and Rigobon (2002) around the notion of "correlation breakdown" (a statistically significant increase in correlation during the crash period) for the Asian crisis, empirical evidence revealed that the literature based on the above approaches suffered from certain limitations. First, there is a heteroskedasticity problem when measuring correlations caused by volatility increases during the crisis. Second, contagion must involve evidence of a dynamic increment in the regressions, affecting at least in the second moments correlations and covariances (Pesaran & Pick, 2007). Third, there is a problem of omitted variables (such as economic fundamentals, risk perception and preferences) in the estimation of cross-country correlation coefficients due to the lack of availability of consistent and compatible financial data, especially in emerging markets. Otherwise, a continued market correlation at high levels is considered to be "no contagion, only interdependence" (Forbes and Rigobon, 2002).

This paper provides a robust analysis of financial contagion by applying the asymmetric generalized dynamic conditional correlation (AG-DCC) model developed by Cappiello, Engle, & Sheppard (2006), who generalized the DCC-GARCH model of Engle (2002). We estimate average conditional correlations between the source of the crisis-Thailand (the first country being hit and the hardest hit in the region during the crisis) and the other countries during stable and crisis periods into a multivariate asymmetric framework. In this set up, we separate the estimation of the stock market contagion and the FX contagion in order to identify which of the two markets constitute the stronger transmission channel during the Asian crisis.

The AG-DCC process has several advantages over other members of GARCH family models.[2] More specifically, it does not assume constant correlation coefficients over the sample period, allows for series-specific news impact and smoothing parameters, permits conditional asymmetries in correlation dynamics and accounts for heteroskedasticity directly by estimating correlation coefficients using standardized residuals. Furthermore, this specification overcomes the problem with omitted variables and is well suited to investigate the presence of asymmetric responses in conditional variances and correlations during turmoil periods.

Earlier studies on the Asian crisis (e.g., Baig & Goldfajn, 1999; Masih & Masih, 1999; Dungey et al., 2003; Fernandez-Izquierdo & Lafuente, 2004) use conventional approaches and provide evidence on contagion effects. Other more recent studies use various multivariate GARCH-DCC models in order to estimate the dynamic conditional correlations among stock markets during this shock (e.g., Chiang, Jeon, & Li, 2007; Yiu, Ho, & Choi, 2010; Kenourgios, Samitas, & Paltalidis, 2011; Kenourgios & Padhi, 2012).[3] Our analysis provides new evidence on financial theory of contagion by examining the existence

[2] A large number of studies apply several variants of GARCH models to accommodate the possibilities of non-normalities and asymmetries in the variance of returns (e.g., Bekaert et al., 2002; Baele, 2005). However, most of the GARCH family models assume that correlation coefficients are constant over the sample period, while their multivariate variants suffer from the curse of dimensionality.

[3] Corsetti, Pericoli, and Sbracia (2005) focus on the international transmission of shocks from the Hong Kong stock market crisis in October 1997 as a case-study, and find that the strong result of 'no contagion, only interdependence' obtained by previous contributions is quite dubious for a number of countries. Other advanced techniques used in the analysis of the Asian crisis are regime switching models (e.g., Boyer, Kumagai, & Yuan, 2006) and copulas with or without regime-switching (Rodriquez, 2007).