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Financial contagion between the US and selected developed and emerging countries: The case of the subprime crisis

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ABSTRACT

This paper assesses the contagion between the US equity market and selected developed and emerging stock markets over the period from January 3, 2005 to January 21, 2014 with a particular focus on the contagion risk caused by the subprime crisis of September 2008. The analysis opts for the methodologies of Sander and Kleimeir (2003, *Journal of International Financial Markets, Institutions and Money*, *13*, 171) and Ramlall (2009, *International Research Journal of Finance and Economics*, *30*, 30) based on cointegration techniques and Granger causality tests. It is complemented by examining the impulse response functions and variance decomposition to measure the response time of the financial markets considered to a shock on the US stock market. The study is conducted over both the pre- and post-subprime crisis periods and provides significant evidence of contagion effects between the US stock market and the developed and emerging equity markets after the global financial crisis.

1. Introduction

The subprime mortgage crisis put the US in the worst recession and it is considered by many researchers as the most severe financial crash since the Great Depression of 1930. The subprime crisis affected first the US economy and then the worldwide economy. The phenomenon of shock transmission to other countries due to factors other than common shocks is termed "contagion effect[1]. There is so far no consensus on what contagion means (Forbes & Rigobon, 2001). It is argued, however, that higher correlations of market returns indicate contagion during a crisis period. This characterizes periods of high volatility with higher correlations of market returns (Brière, Chapelle, & Szafarz, 2012)[2]. In this respect, Forbes and Rigobon (2001) correct this conditioning bias and show the absence of contagion during recent crises. Particularly, Samarakoon (2011) identifies contagion as the impact of shocks during crisis times while interdependence as their impact during normal times. The transmission of shocks across markets is continuously observed due to strong linkages that exist between them. During crises periods, however, the size of shocks becomes larger and their effects are different in crisis times compared to normal times.

Economic fundamentals are a determinant factor in triggering contagion. Indeed, contagion is measured by the excess correlation of returns over the expected correlation due to economic fundamentals, as argued by Bekaert, Harvey, and Ng (2005). However, there is no consensus regarding the definition of the fundamentals, their potential country-specific nature, and the mechanism that links them to asset correlation. Equity market comovements and contagion effects between countries have been a major topic of debate in the international finance literature, mainly due to various international events that have shaken the world such as the Exchange Rate Mechanism attacks of 1992, the Mexican crisis of 1994, the Asian crisis of 1997, the Russian collapse of 1998, the Brazilian devaluation of 1999, the terrorist attacks of September 2001, and the recent global financial crisis of 2007–2009.

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[1] Contagion also refers to unanticipated transmission of shocks while interdependency is defined as the relationship that exists between financial assets on average over a sample period.

[2] See Boyer et al. (1999) and Forbes and Rigobon (2001).

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In this paper, we explore the empirical evidence of contagion effects between the US equity market and selected emerging and developed stock markets to see whether the subprime crisis that deepened with the fall of Lehman Brothers impacted such a contagion. The subprime crisis was the most severe unanticipated crisis in the recent history. It affected differently stock markets worldwide. The US stock market dropped by 43% whereas the emerging markets fell sharply by 50% and frontier markets by 60%. We also seek to identify the main role of the US in the financial integration of world equities. Our empirical study is of great interest, given that the US equity market is very promising and accessible to investors from both emerging and developed countries, which can increase its integration into international stock markets, particularly during periods of instability such as the subprime crisis. The results in this paper have important implications, especially for investors who want to diversify their portfolios and minimize the associated risk.

The set of countries we consider is selected so that we can detect dissimilarities in contagion effects between the US and emerging countries, on the one hand; between the US and developed countries, on the other hand; and within a set of countries belonging to the same geographical area. We supplement the cointegration approach employed by most of the related empirical works, by employing the Granger causality test, impulse response functions, and variance decomposition to investigate the contagion effects among the selected equity markets. By doing so, we can determine the directions of the causal linkages between stock prices, which cannot be achieved when relying on cointegration tests alone. Highlighting the causal relationships and their directions between equity markets allows a better understanding of the financial integration phenomenon and helps make good decisions and policies such as the design and implementation of an appropriate monetary policy mix that gives more prominence to stock markets. This mix also stimulates market growth and develops the prevailing financial system to make it immune to shocks due to contagion.

The results are of great interest and can be summarized as follows: (i) The correlations between the US market and most of the other considered developed and emerging markets increase during the post-crisis period, (ii) the number of cointegrating relationships is higher after the Lehman Brothers bankruptcy for seven out of ten equity markets, (iii) the causality from the US to the developed and emerging countries was amplified after the subprime crisis, (iv) the results of the VAR-VECM models reveal more important short-term comovements for most cases and higher error correction term coefficients for the corresponding markets over the crisis period, and (v) impulse response functions and variance decomposition indicate that the responses of the innovations of the countries considered to US innovations increased over the post-crisis period. All these insights outline the presence of financial contagion effects between the US market and capital markets as well as their emerging counterparts.

The remaining of the paper proceeds as follows. Section 2 reviews research related to financial contagion effects. Section 3 presents the data and methodology, followed by empirical results and interpretations in Section 4. Section 5 concludes the paper and provides policy recommendations.

2. Literature review

Dornbusch, Park, and Claessens (2000) outline that contagion may be due to a shock in one country or a set of countries that induces significant links among markets. Forbes and Rigobon (2002) contribute to the literature in this context and distinguish between contagion effect and common shocks. They argue that contagion involves structural change in the equity linkages, with a significant increase during crisis periods[3]. To detect contagion effects, many studies resort to the calculation of time-varying correlation coefficients among equities to see whether they change over stable and turbulent periods. Accordingly, contagion occurs if there is a significant increase in the correlation coefficients across the crisis period. Within this context, King and Wadhwani (1990) are among the pioneers who investigated contagion effects among equities after the crash of 1987 in the US stock market. They examine the equity linkages among the US, UK, and Japanese markets, hourly, from July 1987 to February 1988. Their findings show evidence of significantly increased correlations among the markets after the 1987 US crash. In the same context, Bertero and Mayer (1990) study the impact of the US crash of 1987 on contagion effects among the equity markets of 23 industrialized and developing countries. They arrive at the same conclusion, with correlation increasing after the crash. Lee and Kim (1993) opt for the same approach and find increased cross-market correlations after the US crash for 12 major stock markets. Calvo and Reinhart (1996) investigate the effect of the 1994 Mexican crisis on cross-market linkages for a set of Asian and Latin American emerging countries. The results support the view that correlations among equities tend to be higher after the crisis. Baig and Goldfajn (1999) conduct an in-depth analysis of the contagion effects among equities, currency prices, interest rates, and sovereign spreads for selected emerging countries. Their evidence favors a correlation surge among many countries during the 1997–1998 Asian financial crisis.

In the same context, Cappiello, Engle, and Sheppard (2006) use an asymmetric generalized dynamic conditional correlation GARCH (AGDCC-GARCH) model to investigate the correlations among equity and bond returns. They find evidence of a significant break in correlations among variables at the time of the introduction of the euro, in January 1999. Kenourgios and Samitas (2011) find that the correlations among Balkan equity markets and the US and developed European markets tended to be higher during the global financial crisis of 2008. They outline that the findings have important implications for international portfolio diversification. More recently, employing the DCC-GARCH process of Engle (2002) and a structural break approach over the period 1988–2009, Arouri, Lahiani, and Nguyen (2013) find that the correlation among US and Latin American equities varies over time. Gjika and Horváth (2013) opt for the ADCC-GARCH model of Cappiello et al. (2006) and find strong correlations among equities in Central Europe and between these countries and the euro area over the period 2001–2011. They also stress that the global financial crisis of 2007–2009 affected the correlations among the selected equities. Over the period 2006–2011, Horvath and Petrovski (2013) find much higher correlations for Central European markets and low dependence between the Southeastern and Western European markets, except for the Croatian equity, which is correlated with mature stock markets only. The authors also note that the 2007–2009 financial crash exerted no impact on the correlation dynamics among equities.

In addition to the correlation approach, alternative techniques are employed to study the financial contagion effects between countries. Indeed, the correlation approach allows assessment of the extent of comovements across equity markets, but cannot be informative about the causal links between such markets. Using a different approach based on impulse response function and variance decomposition, Rogers (1994) outlines that contagion effects can be observed either when the impulse response function changes abruptly over periods of instability compared to tranquil

[3] For a discussion of contagion, the readers are also referred to Edwards (2000), Forbes and Rigobon (2001), and Pericoli and Sbracia (2003).