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Determinants of time varying co-movements among international stock markets during crisis and non-crisis periods

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ABSTRACT

In this paper, we use the DCC MIDAS approach to assess the validity of the wake-up call hypothesis for developed and emerging markets during the global financial crisis (GFC). We use this approach to decompose the total correlations into short- (daily) and long-run (quarterly) correlations for the period from 1999 to 2011. We then examine the transmission mechanisms by regressing the quarterly economic, financial, and behavioral variables on the quarterly DCC–MIDAS correlations. We find that country specific factors are crisis contingent transmission mechanisms for the co-movements of emerging country pairs and mixed pairs of advanced and emerging countries during the global financial crisis. However, we do not observe wake-up calls in the transmission of the crisis among advanced country pairs. The classification of the transmission mechanisms for crisis and non-crisis periods with the different country pairs has important implications for crisis management as well as for portfolio investment strategies. Thus, our findings contribute to the discussion on the role and effectiveness of the international financial architecture.

1. Introduction

After the global financial crisis, theorists, empirical researchers, and practitioners began to pay increasing attention to the co-movements in the international stock markets. The global financial crisis of 2007 to 2009 has been called the worst crisis since the Great Depression of the 1930s. The crisis erupted in the United States and took on worldwide proportions shortly after the collapse of Lehman Brothers in September 2008, eventually affecting developed as well as emerging countries. The sudden and simultaneous economic turn-downs in many countries around the world triggered important questions about the determinants of co-movements. What are these determinants? And do the co-movements between different equity markets change during a crisis? When there is a crisis in one country, for example the United States, does it serve as a wake-up call to investors in other markets to re-assess the fundamentals? Are the stability and commonality of the determinants of the co-movements during crisis and non-crisis periods especially important? This paper answers these questions by investigating the co-movements of the international stock markets from 190 advanced[1] and emerging countries during the global financial crisis and during the non-crisis periods before and after the global crisis.

Despite the research on the factors driving the co-movements between the United States and other countries (see, e.g., Didier et al., 2010), little exists in the literature on the factors driving the co-movements across the world's equity markets. Van Rijckeghem and Weder (2003) examine volatility spillover through the lending channel of banks and how they contribute to the transmission of a currency crisis. Buchholz and Tonzer (2013) show how using certificates of deposit spreads a high degree of co-movement in sovereign credit risk. From their work on sovereign debt yields, Pagano and Sedunov (2014) show that the risk exposure of weaker nations has a spillover effect on stronger nations' financial systems. However, the research does not address the transmission mechanisms of the interlinkages among the various advanced and emerging markets. Moreover, recent studies demonstrate that emerging markets are more segmented compared to developed markets (e.g., Bekaert et al., 2014; Carrieri et al., 2007; Christoffersen et al., 2012)

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[1] See Didier et al. (2010) for the definition of an advanced or developed market. We use the word advanced and developed interchangeably.

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due to their fundamental characteristics such as size, institutional structure, and geographical location (Forbes and Rigobon, 2002; Carrieri et al., 2007; Christoffersen et al., 2012). Our study fills this research gap by investigating the drivers of the stock markets' co-movements during the global financial crisis and non-crisis periods among three country pairs (advanced-advanced, emerging-emerging, and mixed). We use Goldstein's (1998) "wake-up call" hypothesis and the theoretical work of Ahnert and Bertsch (2013) as the basis for our analysis. King and Wadhwani (1990) argue that due to incomplete information, market participants can be uncertain about the relevance of a financial crisis in one country for the fundamentals of another country. The literature assumes that the problems that cause a crisis in one country are common to a wider group of countries and that a crisis in one country leads to short-run pressures that thus, lead to crises in similar countries. However, the wake-up call hypothesis argues that a crisis in one country leads to a re-assessment of the fundamentals in other countries. A crisis in one country serves as a wake-up call to market participants in other countries by sending a signal that they should take a closer look at the fundamentals in their own country. If the investors detect any problems, then contagion occurs. This is different from King and Wadhwani's (1990) argument that the signal from a wake-up call results in a closer look that removes the uncertainty about the relevance. Goldstein (1998, p. 18) clearly explains a wake-up call as: "I refer to it as a wake-up call because to judge from most market indicators of risk, private creditors and rating agencies were asleep prior to the outbreak of the crisis." Ahnert and Bertsch (2013) show in their theoretical model that contagion occurs even if investors learn later that the fundamentals have no correlation ex post and that common links do not exist.

The empirical work on the wake-up call hypothesis is very limited. Karas et al. (2013) examine crisis induced wake-up calls in terms of how they interact with the numbing effect of deposit insurance. Giordano et al. (2013) and Basu (2002) examine wake-up calls in bond markets, Van Rijckeghem and Weder (2003) in bank lending, and Ramirez and Zandbergen (2013) in the historical context of bank runs. We analyze the wake-up call hypothesis by examining the transmission mechanisms across world stock markets in two ways: First, we examine the stable transmission mechanism or transmission mechanisms of interdependence that do not change in both non-crisis and crisis periods. Second, we investigate the transmission mechanism whose sign and significance only change during crises. These are crisis contingent variables that the market participants become aware of because of the wake-up call. These variables then identify the determinants of the co-movements.

We contribute to the literature by identifying the determinants of time-varying conditional correlations between stock markets during non-crisis and crisis periods. We do so by incorporating different combinations of country pairs. The time-varying nature of the co-movements is widely documented (e.g., Hamao et al., 1990; Bekaert and Harvey, 1995; Longin and Solnik, 1995, 2001; Caporale et al., 2005; Bekaert et al., 2009)[2]. The common message from these studies is that the co-movements in the international stock market have changed over time due to globalization and liberalization. There are some studies on international financial markets (see, e.g., Corsetti et al., 2005; Chiang et al., 2007; Samarakoon, 2011) that address co-movements during crises. Among them, Samarakoon (2011) reports that US shocks drive interdependence, and emerging markets drive contagion. In brief, few studies that investigate the determinants of co-movements are silent regarding the stability and commonality of the transmission mechanisms among the country pairs (see Bracker and Koch, 1999; Carrieri et al., 2007; Wälti, 2011; Christoffersen et al., 2012). In particular, researchers are still silent about the country specific factors that make countries vulnerable to a crisis after a wake-up call and the exact mechanisms through which these factors are transmitted at any given time.

Further, this paper addresses the wake-up call hypothesis by combining high frequency (daily) data on the stock markets with low frequency (quarterly) economic and financial data for the period from 1999 to 2011. We use the Dynamic Conditional Correlation (DCC) model coupled with the Mixed-Data Sampling (MIDAS) approach of Colacito et al. (2011) to decompose the total correlations into daily and quarterly correlations. Thereafter, we use a panel regression for quarterly correlations of the economic and financial variables to investigate the transmission mechanism. The MIDAS framework was first introduced by Andreou and Ghysels (2004) and Ghysels et al. (2006) to allow data with different frequencies to enter into the same empirical model. Engle and Rangel (2008) apply this technique to the GARCH framework to form the spline GARCH model. Combining the spline GARCH framework and the volatility-decomposing approach (see Ding and Granger, 1996; Engle and Lee, 1999; Bauwens and Storti, 2009; Amado and Teräsvirta, 2013), Engle et al. (2013) creates the GARCH–MIDAS model to incorporate macroeconomic information into the long-run variance component. Conrad and Loch (forthcoming) use the GARCH–MIDAS framework to decompose stock returns into short- and long-run components to examine the long-run volatility component. Baele et al. (2010) and Colacito et al. (2011) apply the MIDAS technique to Engle's (2002) DCC model to decompose the co-movement of stocks and bonds into short- and long-run components. Further, Conrad et al. (2014) and Asgharian et al. (2016) extend the DCC–MIDAS model by allowing the macro-finance variables to enter the long-run component of the correlations. To the best of our knowledge, the current study is the first to use the DCC MIDAS framework to test the validity of the wake-up call hypothesis. The dependent variable of our regression model [Eq. (6): pairwise conditional correlations of stock returns], is estimated by extracting the short-run components of correlation and using similar interval data of independent variables help us efficiently test our main research question (i.e., the wake-up call hypothesis).

We show that economic, financial, and cultural factors become important during crisis periods and that they also vary across developed and emerging country pairs. The results of our study support the wake-up call hypothesis and have an implication for macroeconomic policy during a crisis. Our results show that the conditional correlation is usually significantly higher for all country pairs during a global crisis compared to non-crisis periods, except for the advanced market pairs. When we study the transmission mechanisms in relation to the country specific variables, we observe that the transmission mechanism between a country pair is not always stable during crisis and non-crisis periods among the three country pairs. We show that a number of economic and financial factors (e.g., different market sizes, different inflation rates, different GDP growth rates, total trade size, different term spreads) and behavioral factors (e.g., similarity in religion, and cultural differences) drive cross-country co-movements in the equity markets. These factors are stable across crisis and non-crisis periods for advanced country pairs. However, the GDP growth rate and the term spread are crisis contingent variables for the mixed country pairs. We also find that bilateral trade and culture are additional wake-up call proxies for the emerging country groups. We further confirm that common religion[3] is the most stable transmission mechanism in the interdependence between stock markets.

[2] The studies are done mostly in mature markets except Bekaert and Harvey (1995) and Caporale et al. (2005).

[3] Religion is a fundamental measure of social norms (see, e.g., Lucey and Zhang, 2010).