International contagion through financial versus non-financial firms

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A R T I C L E   I N F O

A B S T R A C T

The role of financial firms in the transmission of financial shocks across countries is well recognized in the literature. However, contagion through non-financial firms has not received much attention. This study examines the role of financial vis-à-vis non-financial firms in transmitting shocks across countries using a dynamic conditional correlation analysis. We provide empirical evidence from a sample of 49 countries. A novel finding of our study is that non-financial firms play a more pronounced role in the cross-market transmission of shocks than financial firms. Financial contagion is positively related to the level of equity market development and bilateral trade intensity. It is higher during periods of US economic downturns and financial crises. Given that the extent of international contagion varies across economic states and is more prevalent in the non-financial than in the financial sector, this study has implications for global sector rotation strategies.

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1. Introduction

A large body of literature on financial contagion has emerged since the early 1990s. However, there is still no consensus regarding the definition of contagion.[1] The World Bank cites three definitions of contagion—broad definition, restrictive definition, and very restrictive definition.[2] These definitions are not mutually exclusive. Under the broad definition, contagion is the cross-country transmission of shocks (Calvo and Reinhart, 1996). In the restrictive definition, contagion is the cross-country transmission of shocks beyond fundamental economic linkages and beyond common shocks (Bekaert et al., 2005). Under the very restrictive definition, contagion occurs when cross-country correlations increase during crisis periods compared to tranquil periods (Forbes and Rigobon, 2002). This study adopts the restrictive definition of financial contagion, which refers to the excess cross-market correlation that cannot be explained by economic fundamentals. This definition allows us to avoid erroneously interpreting fundamental economic interdependence as contagion and accommodates the

possibility that contagion may occur not only in a crisis state but also in a tranquil state. We operationalize this measure of contagion within a time-varying conditional correlation model for a sample of 49 countries. This research setting is flexible enough to determine how the extent of cross-market correlation varies over different economic states and across countries with differing degrees of fundamental economic linkages. Thus, our findings may be of interest to a wider audience regardless what definition of contagion they use.

The unique role of financial firms in the transmission of shocks across markets has been well recognized in the literature (Kaufman, 1994). It has been argued that contagion through financial firms occurs rapidly and destabilizes the financial system in the midst of volatile capital flows. World capital flows increased from <7% of world GDP in 1998 to over 20% in 2007 (Milesi-Ferretti and Tille, 2011). However, during the global financial crisis (GFC), world capital flows (in US dollars) declined by 44% in December 2008 from its peak in 2007 (Tong and Wei, 2011). Negative capital shocks can lead to an immediate liquidity crunch in financial firms, which can shake market confidence in other financial firms, and induce investors to withdraw money and force those firms to liquidate assets at a price below their intrinsic value. Thus, liquidity risk may lead to solvency risk and vice versa. Transmission of shocks across financial firms can be intensified by their linkages within and across national boundaries. Cetorelli and Goldberg (2011) observes that global banks played an important role in the transmission of the GFC to emerging countries, and Kalemli-

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  [1] See Pericoli and Sbracia (2003) and Cheung et al. (2009) for a survey of various definitions of financial contagion.
  [2] These definitions of contagion are available at the World Bank website: http://go.worldbank.org/JIBDRK3YC0.

Ozcan et al. (2013) provide similar findings for developed countries. The role of financial firms in transmitting shocks across countries is also documented in Batten et al. (2013), Kollmann (2013), and Akhtaruzzaman et al. (2014).

Therefore, the prevailing notion is that financial firms are the main conduit for financial contagion from country to country. To verify this idea, we extend our analysis to examine cross-market contagion through non-financial firms. Domestic non-financial firms are directly interconnected to their foreign counterparts through international trade. Trade linkages lead to business cycle synchronization across countries (see Frankel and Rose, 1998; Kose and Yi, 2001) and increase output co-movement at the sect or level (Giovanni and Levchenko, 2010). This interdependence in real economic activities gives rise to interdependence in non-financial stock returns, which has been substantially strengthened by, firstly, the liberalization of international trade, and, secondly, the rapid rise of multinational corporations. Multinational corporations accounted for about one-third of gross output in many developed countries (Cravino and Levchenko, 2015) and US multinational corporations alone comprised >10% in several countries (Desai and Foley, 2006). There are a number of interrelated channels through which multinational corporations affect the co-movement of economic activities across countries. First, multinational corporations play an important role in increasing vertical production linkages across countries, which in turn magnifies the impact of bilateral trade on output co-movement (Burstein et al., 2008). Second, investment rates and returns of foreign affiliates are strongly correlated with those of their parent companies (Desai and Foley, 2006). Third, the sales growth of the headquarter is strongly associated with the sales growth of foreign affiliates. Thus, the role of multinational corporations, along with the move towards free trade in recent decades, has facilitated the transmission of demand and supply shocks across countries through non-financial firms. This is also echoed in Dungey and Gajurel (2014) finding that the extent of contagion through financial sector stocks was less than that of the aggregate equity market during the GFC, which gives us an empirical motivation to examine the role of non-financial firms in transmitting contagion.

This study contributes to the literature in a number of ways. First, we use a large sample of 49 countries to investigate the role of non-financial firms in transmitting financial shocks from the US to developed, emerging, and frontier economies.[3] International contagion through the financial sector is also examined to compare with its non-financial counterpart. Shocks are measured in terms of unexpected sectoral stock returns denominated in local currency. Engle's (2002) dynamic conditional correlations generalized autoregressive conditional heteroskedasticity (hereafter DCC-GARCH) model is used to estimate time-varying correlations. Given the predominant role of the US in the world economy, this study examines the correlation of the US sectoral return with its non-US counterparts. Correlations observed among sectoral returns of non-US stock markets may primarily manifest those markets' correlations to the US stock market (Dimitriou et al., 2013; Kim et al., 2015; Moore and Wang, 2014). Our approach helps avoid capturing spurious cross-market correlations and conduct DCC analysis in a parsimonious framework.[4] Our analysis of sector-specific contagion enables us to test whether contagion occurs primarily through the financial or the non-financial sector.[5] Second, we examine how the dynamic conditional correlation is related to the level of market development (developed, emerging and frontier equity markets). More importantly, we use a regression model to explain dynamic conditional correlations in terms of economic state variables, such as financial crises, bilateral trade intensity, and business cycles. Finally, we check the robustness of the key findings to the use of (i) US dollar-denominated returns instead of local-currency-denominated returns, (ii) weekly returns instead of monthly returns, (iii) alternative measures of the business cycle stage, (iv) a multiple structural change model (Bai and Perron, 1998), and (v) a regime-switching model (Hamilton, 1989) of conditional correlations.

This study uses monthly data from January 1990 to March 2014 with a sample of 49 countries, comprising 24 developed, 19 emerging, and 6 frontier countries. The major findings can be summarized as follows. First, conditional correlations are higher for the non-financial sector than for the financial sector, and this finding holds for both normal and crisis periods, which suggests that non-financial firms play a more pronounced role in the cross-market transmission of shocks. Second, conditional correlations between the US and developed markets are higher than those between the US and emerging/frontier markets. Moreover, conditional correlations between the US and emerging markets are higher than those between US and frontier markets. These results hold for both financial and non-financial sectors and suggest that cross-market correlation is positively related to the level of market development. Third, the regression results suggest that conditional correlations generally exhibit counter-cyclical movement and are higher during the GFC, European sovereign debt crisis, and Asian and Russian financial crises. Fourth, conditional correlations largely increase as the bilateral trade intensity between the US and a non-US country increases. Finally, these results are robust regardless of whether local currency or US dollar-denominated stock returns are used and whether monthly or weekly returns are used. Moreover, both the Bai and Perron (1998) test and the Markov regime-switching model show that periods of high DCC coincide with a bad economic state, which validates the findings from regression analysis using predetermined economic state variables.

The study proceeds as follows: Section 2 presents a brief review of the related literature, Section 3 describes the methodology and data, Section 4 presents the empirical results, and Section 5 checks robustness. Finally, Section 6 draws conclusions concerning the main themes covered in this paper.

2. Related literature

There have been numerous studies on financial contagion, but the literature is still overrepresented by studies at the aggregate market level and in the context of developed markets (King and Wadhwani, 1990; Min and Hwang, 2012; Samitas and Tsakalos, 2013). In a seminal study, King and Wadhwani (1990) observe that after the stock market crash of October 1987, cross-market correlations substantially increased between the US, the UK, and Japan. Samitas and Tsakalos (2013) find a contagion effect from Greece to European countries during the Greece debt crisis. Min and Hwang (2012) also find evidence of contagion spreading from the US to Australia, Japan, Switzerland, and the UK during the GFC.

Financial contagion from developed economies to emerging economies has been examined by several recent studies (Aloui et al., 2011; Cai et al., 2016; Chiang et al., 2007; Kenourgios et al., 2011; Shen et al., 2015). Chiang et al. (2007) find increased cross-market correlations

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[3] As per the FTSE country classification, there are three broad categories of countries: developed, emerging and frontier. Financial contagion across these markets has been recently examined by Beirne and Gieck (2014) and (Mollah et al., 2016). However, these studies focus on contagion at the market level, while we focus on contagion through financial and non-financial sectors. Also, the sample periods are January 2006 to December 2010 in Beirne and Gieck (2014) and July 1998 to June 2011 in (Mollah et al., 2016), which exclude the Asian and Russian financial crises and only partly include the European sovereign debt crisis period. Our study uses a larger sample, covering the period January 1990 to March 2014.

[4] Under this framework, for our sample of 49 (n) stock markets, we need to estimate 48 rather than 1176 [$(n^2 - n)/2$] correlation coefficients for each month for each country–sector pair.

[5] An analysis of inter-sector contagion is beyond the scope of this study. Even in our parsimonious framework, an examination of both inter-sector and intra-sector contagion in 49 countries would substantially increase the number of conditional correlations to be estimated. More importantly, inter-sector contagion has been examined by other recent studies (e.g., Baur, 2012). Thus, our study focuses on the extent of contagion through either the financial or the non-financial sector.