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Contagion and banking crisis – International evidence for 2007–2009 ☆

Mardi Dungey [a,b,c,*], Dinesh Gajurel [a]

[a] Tasmanian School of Business and Economics, University of Tasmania, Private Bag 85, TAS 7001 Hobart, Australia
[b] CAMA, Australian National University, Canberra ACT 0200, Australia
[c] CFAP, University of Cambridge, Cambridge CB2 1AG, United Kingdom

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ABSTRACT

Policy makers aim to avoid banking crises, and although they can to some extent control domestic conditions, internationally transmitted crises are difficult to tackle. This paper identifies international contagion in banking during the 2007–2009 crisis for 54 economies. We identify three channels of contagion – systematic, idiosyncratic and volatility – and find evidence for these in 45 countries. Banking crises are overwhelmingly associated with the presence of both systematic and idiosyncratic contagion. The results reveal that crisis shocks transmitted from a foreign jurisdiction via idiosyncratic contagion increase the likelihood of a systemic crisis in the domestic banking system by almost 37 percent, whereas increased exposure via systematic contagion does not necessarily destabilize the domestic banking system. Thus while policy makers and regulatory authorities are rightly concerned with the systematic transmission of banking crises, reducing the potential for idiosyncratic contagion can importantly reduce the consequences for the domestic economy.

1. Introduction

Banking crises are costly, and a great deal of prudential effort is undertaken to avoid them. Bordo et al. (2001) estimate losses of around 6 percent of GDP associated with a banking crisis in the last quarter of the 20th century, whilst Laeven and Valencia (2013) document losses of about 30 percent of GDP during the global financial crisis (GFC) of 2007–2009. Maintaining sound macroeconomic fundamentals, a clear legal framework and strong prudential oversight are preventative measures within the remit of domestic authorities. However, banking crises transmitted from other jurisdictions present a considerable risk to the domestic economy (Kalemli-Ozcan et al., 2013), particularly as banking crises are often observed to precede even more costly currency and debt crises (Laeven and Valencia, 2013; Reinhart and Rogoff, 2009).

This paper empirically examines the evidence for the unexpected international transmission of banking crises via stressful conditions in financial markets during 2007–2009. These transmissions are beyond those which would occur by the known spillovers between banking sectors in different jurisdictions due to trading or portfolio links or institutional structures such as international subsidiaries, and instead consist of contagion effects; see also van Rijckeghem and Weder (2001), Bae et al. (2003), Bekaert et al. (2005), Corsetti et al. (2005), Dungey et al. (2005) and Forbes and Rigobon (2002). Although the crisis is often seen as having origins in overheated housing markets and the associated mortgage backed securities market, we concentrate on the international transmission of this stress which Aalbers (2009) forcefully argues is due to the financial intermediaries rather than the localized housing markets themselves.[1] We find significant evidence not only for the existence of contagion between banking sectors, but also for its role in promoting banking crises in regions geographically removed from the crisis source. Thus, we contribute to the growing body of literature examining the role of banks in the transmission of financial crisis of 2007–2009, most of whom find evidence of international transmission via the banking sector (Allen

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* Corresponding author at: Tasmanian School of Business and Economics, University of Tasmania, Private Bag 85, TAS 7001 Hobart, Australia. Tel.: +61 3 6226 1839; fax: +61 3 6226 7587.

E-mail addresses: mardi.dungey@utas.edu.au (M. Dungey), dinesh.gajurel@utas.edu.au (D. Gajurel).

[1] Allen and Carletti (2010) conclude that the housing price booms in a number of countries are due to common features of international credit conditions and loose monetary policy, and Claessens et al. (2010) find that pre-crisis house price appreciation is associated with the severity of the subsequent crisis recession.

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et al., 2014; Brealey et al., 2012; Kalemli-Ozcan et al., 2013; Popov and Udell, 2012).

The model encapsulates several potential channels of contagion and testable hypotheses in a single framework. Specifically, it captures potential structural changes in global systematic risk exposure (systematic contagion), additional US idiosyncratic shocks (idiosyncratic contagion), a structural shift (shift contagion), and additional US volatility spillovers to other markets (volatility contagion). The latter captures the argument that financial markets exhibit explosive volatility during crises that may spillover to other markets (Edwards, 1998; Engle, 2004; Hamao et al., 1990). Using a standard factor model representation of an international CAPM framework, the model allows for spillover effects outside crisis periods (Kim, 2001; Laxton and Prasad, 2000), volatility spillovers, heteroskedasticity and skewness in the financial data with a nested EGARCH specification. The framework is most closely related to the models of Baur (2012), Bekaert et al. (2014), Bekaert et al. (2005) and Dungey et al. (2005). As the crisis is widely accepted to have originated in the US we consider contagion effects from the US to 53 country banking sector indices - covering both non-crisis and crisis conditions from 2001 to 2009.

There are two major results. First, we categorize the evidence for contagion between the 54 banking sectors. The banking sectors in most economies experienced contagion from the US in some form – that is systematic, idiosyncratic, shift or volatility – but not necessarily all forms. About 60 percent of our sample banking markets experienced a break in global systematic risk exposure and about 60 percent of banking markets in our sample experienced idiosyncratic contagion originating from the US banking market. While most of the banking markets have volatility spillovers from the US banking market in non-crisis periods, the evidence for volatility contagion during the crisis is more mixed – when we divide the crisis into two phases volatility contagion is limited in the first phase and more prevalent in the second phase. Finally, shift contagion is always accompanied by other forms of contagion.

The second contribution links evidence on contagion to the occurrence of banking crises. Linking our results for contagion with the systemic banking crisis data in Laeven and Valencia (2013) reveals that crisis shocks transmitted from a foreign jurisdiction via idiosyncratic contagion increase the likelihood of a systemic crisis in the domestic banking system by almost 37 percent, whereas increased global systematic risk exposure via systematic contagion does not necessarily destabilize the domestic banking system. The existing literature argues that the probability of systemic banking crises is reduced by stronger regulatory capital (Acharya et al., 2010; Berger and Bouwman, 2013; Cole, 2012; Miles et al., 2013), the size of the banking sector and higher market concentration (Allen and Gale, 2000; Beck et al., 2006; Bretschger et al., 2012; Mirzaei et al., 2013), and reduced activity in the shadow banking sector (De Jonghe, 2010; Lepetit et al., 2008). We find that stronger regulatory capital, retail banking activities and higher market concentration lead to a reduced probability of banking crisis even in the presence of contagion effects. The evidence suggests a larger economic impact of stronger regulatory capital, where a 1 percent increase over current level reduces the probability of a crisis by around 15 percent, than for the proportion of non-interest income in total income, where a 1 percent decrease in income from this source decreases the probability of a crisis by less than 2 percent. Likewise, domestic conditions can help ameliorate the probability of crises; increased banking assets as a proportion of GDP lower the probability of crisis, but the economic impact is very small. An increase in the external debt to GDP ratio also increases the probability of crisis, consistent with the hypothesis that a feedback loop exists between sovereign debt and banking crises (Acharya et al., 2014; Adler, 2012). We extend the model to include interaction effects between contagion sources and the bank capital, and find that this interaction effect significantly decreases the probability of a banking crisis over the effects of the contagion channels alone.

The results indicate that the systematic contagion effects present in these markets during this crisis could not have been reduced by further banking regulatory measures such as increased capital requirements. However, there is scope for further reduction in the probability of banking crises promoted by international linkages via idiosyncratic contagion. Idiosyncratic contagion occurs in response to unanticipated country-specific banking sector shocks, and represents the transmission of these shocks other than via usual linkages such as portfolios, subsidiary or trading links which are also present during non-crisis periods, but perhaps consistent with arguments around herd behavior. Potentially there is gain for regulators and policy makers to consider how to creatively respond to calm these transmissions from extra vulnerability generated in one economy, but unexpectedly transmitting to another.

The rest of the paper proceeds as follows. In Section 2, we propose a model to test for several forms of contagion and describe the sample and data. Section 3 provides the results for contagion. In Section 4 we examine the cross-section of systemic banking crisis. Section 5 provides robustness checks for the results and Section 6 concludes the paper.

2. Modeling financial contagion

2.1. The empirical framework

In modern banking systems, banking institutions are often globally integrated through both on-balance sheet and off-balance sheet linkages.[2] These global linkages make the banking sector potentially more exposed to global systematic risk than other sectors. The financial sector is known to be highly globally integrated at sectoral level (Bekaert et al., 2009). We postulate that in a globally integrated banking system the exposure of banks in a given country to global systematic risk depends on the extent of global integration of the banking system.[3] We utilize a CAPM style framework based on a factor approach rather than based on observed linkages such as trade, subsidiary relationships or bank capital flows. The advantage of our approach is that it does not require an exhaustive and mutually exclusive list of data, but with the disadvantage that the exact source of the transmission in terms of observed variables is not available. The approach is related to the latent factor specifications used in the literature reviews of Corsetti et al. (2005) and Dungey et al. (2005) who both show how other frameworks to test contagion are nested within this general specification.

Let $r_{i,t}$ represent the return for banking sector of country i at time t. A standard international market model representation of asset returns takes the following form:

$$r_{i,t} = a_{0,i} + a_{1,i} f_t^{global} + e_{i,t}, \tag{1}$$

where f^{global} refers to global factor or common shock and can be proxied by the return on the aggregate global banking sector index and $a_{1,i}$ measures the global systematic risk exposure of banking sector of country i. This approach removes the common global effects from individual index returns.

[2] Our approach does not distinguish between parent and subsidiary institutions. There is some evidence that supports the transmission of liquidity shocks from parent to international subsidiary institutions in Allen et al. (2014). As this distinction requires balance sheet data and firm level characteristics we leave this extension for future research.

[3] See Kalemli-Ozcan et al. (2013) for a recent theoretical contribution.