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International transmission and business-cycle effects of financial stress☆

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ABSTRACT

We analyze the international transmission of financial stress and its effects on global economic activity. Our analysis is based on country-specific monthly financial stress indices (FSIs) over the sample period 1970–2012 for 20 major economies. First, we show that co-movement between the FSIs increases during major financial crises and towards the end of our sample period. Second, we show that the risk of large financial stress spillovers to an economy increases with its level of economic openness. Third, we show – using a global VAR (GVAR) model – that (i) a financial stress shock in the US quickly transmits internationally, (ii) financial stress shocks have lagged but persistent negative effects on economic activity, and (iii) that a negative US demand shock induces only limited financial stress on a global scale. Finally, we show that spillovers of financial stress run mainly from advanced to emerging economies and not in the opposite direction.

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1. Introduction

The financial and economic crisis of 2007–2009 had a widespread impact on countries all over the world. While advanced economies were directly exposed to the events in the wake of the default of Lehman Brothers, financial markets in emerging economies were also negatively affected (Baur, 2012). In nearly all countries, stock markets plummeted, bank stocks came under pressure due to systemic risk, and the volatilities in stock markets and foreign exchange markets increased significantly.[1]

These events have led to the view that an understanding of financial markets is much more important for policy-makers – especially during periods of financial stress – than suggested by the dominant belief before the crisis. It is now evident that economic policy needs answers to such questions as follows: How is financial stress, i.e., systemically relevant tensions over a broad range of financial market segments, transmitted internationally? What are the real economic consequences, e.g., in terms of business-cycle effects, of unexpected increases in financial stress? What determines the degree to which a country is exposed to financial stress spillovers from abroad? Addressing these types of questions is not only relevant for short-term policy reactions in response to financial stress shocks but also for financial market regulation.

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[1] For a chronology of the crisis, see Melvin and Taylor (2009) and the references therein.

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Measuring financial stress has become more and more prominent in recent years. As Holló et al. (2012) note, financial stress may be defined as a current state of financial instability, which in turn can be interpreted as the amount of systemic risk that has already materialized.[2] From this definition, it is clear that financial stress is unobservable. However, economic theory suggests that it is reflected in a wide range of financial variables, and many central banks, international organizations, private banks, and economic research institutes have constructed so-called financial stress indices (FSIs) to measure financial stress. In addition to simply measuring the degree of financial stress, there is also a growing literature attempting to link measures of financial stress to the dynamics of the real economy. Several studies find, for instance, that an increase in financial stress significantly reduces economic activity (Hakkio and Keeton, 2009; Hubrich and Tetlow, 2012; Mittnik and Semmler, 2013; Cevik et al., 2012; van Roye, 2014).

Beyond the rapidly growing literature analyzing the role of financial conditions and financial stress on the macroeconomy, few authors have investigated financial stress from a global perspective. Of these few studies, most concentrate on certain aspects of financial stress, i.e., specific market segments. Helbling et al. (2011), for instance, demonstrate the importance of US credit market shocks in global business-cycle dynamics. Eickmeier and Ng (2011) examine the propagation of credit supply shocks in various countries and emphasize the strong international transmission of US credit supply shocks. Cesa-Bianchi (2013) finds that U.S. housing demand shocks are quickly transmitted to other advanced economies, while the transmission to emerging economies is rather subdued. N'Diaye et al. (2010) examine how an increase in banks' and non-financial corporations' default risks is transmitted in the global economy. Focusing on the reverse causal effect, Castrén et al. (2010) investigate how global macro-financial shocks influence default probabilities in the corporate sector. The first paper analyzing the global transmission of financial stress based on a broad measure of financial stress is Balakrishnan et al. (2009). However, these authors focus solely on the transmission of financial stress from advanced to emerging economies and do not take into account business-cycle effects or feedback loops, i.e., second-round effects.

To model the effects on the real economy and endogenous feedback loops on a global scale, GVAR models may be used. Originally established by Pesaran et al. (2004), they were further developed by Dées et al. (2009) and Dées et al. (2010), among others. GVAR models can be used to analyze international interdependencies among countries and transmission channels of international shocks. This type of model has, for instance, been used to analyze the international transmission of oil price shocks (Cashin et al., 2012), house price shocks (Cesa-Bianchi, 2013), credit supply shocks (Eickmeier and Ng, 2011), cost-push shocks (Galesi and Lombardi, 2009), liquidity shocks during the Great Recession of 2007–2009 (Chudik and Fratzscher, 2011), and stress-testing of the financial sector (Castrén et al., 2010). To the best of our knowledge, however, it has not yet been used to analyze the international aspects of systemic financial-stress shocks.

We contribute to the literature on the international transmission of financial shocks along several dimensions. First, we analyze the international transmission and global business-cycle effects of shocks to (broadly measured) systemic financial stress in a GVAR model that endogenizes all relevant variables. Second, we analyze the interaction between financial stress in emerging economies with that in advanced economies, accounting for second-round effects. Third, we demonstrate how the degree of the co-movement of financial stress, i.e., cross-country spillover effects, varies over time and how this dynamic is related to major global financial crises. Finally, we use cross-section and panel-data evidence to show how the degree of financial stress spillovers in each country is related to the degree of economic openness.

The remainder of this paper is organized as follows. Section 2 explains the methodology that we use to construct the country-specific FSIs, describes the data, and presents estimates for the FSIs. Section 3 shows how the degree of co-movement of financial stress across countries varies over time, identifies regional patterns in the spillover effects of financial stress, and presents evidence on the correlation between the degree of financial stress spillovers and economic openness. Section 4 describes the GVAR model and analyzes how financial stress shocks are internationally transmitted and how they affect global economic activity. Section 5 presents brief conclusions for this study.

2. Measuring financial stress

The construction of FSIs to measure financial stress has been tackled in a large number of papers. Among the first, Illing and Liu (2006) construct an FSI for Canada to provide a "snapshot" of the degree of stress in the national financial system. Hakkio and Keeton (2009) and Kliesen and Smith (2010) construct FSIs for the US, which are regularly referred to by the Federal Reserve. The European Central Bank periodically publishes a Composite Indicator of Systemic Stress (CISS) as a tool for its macro-prudential monitoring Holló et al. (2012). FSIs have been established as thermometers for systemic financial risk in other countries as well.[3] In this paper, we are faced with a trade-off between the consistency of FSIs across countries, as data are scarce, especially for emerging economies, and complete coverage of all financial market segments. Given the systemic and broad character attributed to financial stress in the definition by Holló et al. (2012) cited above, we select a set of broadly available financial variables that reflect tensions in different financial market segments.

2.1. Methodology

To extract a common stress component of the financial variables, we apply a dynamic approximate factor model. The methodology is similar to that in Banbura and Modugno (2014) and van Roye (2014). In particular, we set up a model with the following form:

$$y_{i,t} = \Lambda_i f_{i,t} + \varepsilon_{i,t} \quad \textit{with}\ \varepsilon_{i,t} \sim \mathcal{N}(0, C_i) \tag{1}$$

In this equation, $y_{i,t}$ is a vector of stationary and standardized indicators for financial stress in country i, $f_{i,t}$ is a single country-specific latent factor, and Λ_i is a $n \times 1$ vector of the indicators' factor loadings.[4] The vector $\varepsilon_{i,t}$ represents the idiosyncratic component which is allowed to be slightly correlated both serially at all leads and lags and cross-sectionally.

The dynamics of the latent factor $f_{i,t}$ are described by the transition equation

$$f_{i,t} = A_i f_{i,t-1} + \xi_{i,t} \quad \textit{with}\ \xi_{i,t} \sim \mathcal{N}(0, D_i), \tag{2}$$

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[2] The precise definition of financial stress differs across the literature. For a survey on different definitions of financial stress and different methodologies for its measurement, see, e.g., Hatzius et al. (2010).

[3] Cardarelli et al. (2011), for instance, develop FSIs for a number of countries. van Roye (2014) and Aboura and van Roye (2013) construct FSIs for Germany and France, respectively.

[4] Likelihood ratio tests support our assumption of one factor against the alternative hypothesis of two or more latent factors for all countries in our sample.

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