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Uncertainty, systemic shocks and the global banking sector: Has the crisis modified their relationship?

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ABSTRACT

We estimate the impact of equity market uncertainty and an unobservable systemic risk factor on the returns of the major banks in the global banking sector. Our estimation combines quantile regressions, structural changes, and factor models and allows us to explore the stability of systemic risk propagation among financial institutions. We find that risk propagation has remained stable over the last decade, and we report evidence indicating that equity market uncertainty is a major systemic factor for the global banking system. Additionally, we provide a new simple tool for measuring the resilience of financial institutions to systemic shocks.

1. Introduction

Systemic risk can be defined as the risk that a financial institution faces during periods of widespread financial distress, following exposure to an extreme negative shock in the market. This shock may arise either as a consequence of the failure of an individual firm of sufficient size and connectedness that it imposes significant marginal distress costs on the rest of the system, or as a common shock to the financial structure that is absorbed and amplified by various firms depending on their own particular resilience (Jobst, 2014a). The materialization of systemic risk may lead to disruptions in the provision of key financial services due to impairments of all or parts of the financial system, which may in turn have adverse consequences for the functioning of the real economy (see Acharya et al., 2017; Adrian and Brunnermeier, 2014).

For these reasons, in recent years systemic risk has become a growing concern for regulators, who have made great efforts not only to measure the impact of systemic risk on individual firms, but also to identify systemically important financial institutions (SIFIs) that should adhere to stronger capital requirements to avoid giving rise to shocks which might destabilize the whole system. As a result, significant advances have been made in systemic risk regulation, as documented by both the Financial Stability Board (FSB) and the International Association of Insurance Supervisors (IAIS).[1]

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[1] See for example FSB (2011, 2012, 2013) and IAIS (2009, 2012, 2013).

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Several methodologies have been proposed for measuring systemic risk, above all in the banking sector.[2] The most common seek to estimate marginal increments in the value-at-risk statistics (VaR) of financial institutions, or increments in the marginal expected shortfall (ESF) of each firm, under a scenario of financial turmoil.[3] The reason for focusing on a financial institution's VaR or ESF is because extreme negative scenarios are naturally related to the lowest quantiles of the distribution of a set of financial variables (including, stock returns) and, hence, to systemic risk scenarios. However, traditional methods based on quantiles do not allow the researcher to identify the source of the shocks to the system; rather, they calculate the marginal contribution of each company to the risk of the system as a whole.

Our contribution to the literature is the examination of the characteristics and stability of systemic risk and uncertainty, in relation to the dynamics of the banking sector stock returns. Particularly, we are interested in exploring relevant hypotheses for the economics discipline regarding the stability of the systemic risk propagation mechanism across the global banking sector, and about the importance of equity market uncertainty as a source of systemic risk for global financial institutions. Both issues are instrumental for the design of macro policies, seeking to reduce systemic risk materialization episodes, or to construct a more resilient global banking sector in the forthcoming decades. Hence, we aim to measure the systemic risk in the global banking sector that arises from two primary sources: an unobservable systemic risk factor by White et al. (2015) and an economic equity market uncertainty factor (EMU) provided by Baker et al. (2016). Our proposal is novel in three respects. First, we consider the evolving nature of systemic risk, a characteristic mainly overlooked in the literature despite having evident policy and practical implications for the banking industry.[4] We provide evidence regarding the stability of the relationship between systemic shocks and the banks' responses over the last decade. This sort of evidence is new to the literature and is supportive of past claims, made in the field of macroeconomics (Stock and Watson, 2012), which hold that during the global financial crisis the financial system may have faced stronger versions of traditional shocks rather than a new type of shock.

Second, we undertake an empirical study of the role of equity market uncertainty, as measured by Baker et al. (2016), as a systemic risk factor for the banking industry. Uncertainty is known to play a critical role in determining economic dynamics during episodes of crisis and, in recent years, its study has attracted much attention in the literature to account for the non-linear negative dynamics that arise during episodes of economic distress (Bloom, 2009; Jurado et al., 2015). Empirical tools are now available that can provide accurate measurements of uncertainty (Baker et al., 2016), and its inclusion as an unobservable factor enhances our understanding of banking sector behavior during episodes of systemic stress in the financial markets. We report that for most of the banks analyzed, especially over the last decade, uncertainty is indeed a relevant consideration. As expected, more uncertainty leads to a reduction in equity prices in the banking industry, and this behavior has become more pronounced in the last few years, especially when compared to the situation 15 years ago.

Finally, we emphasize the vulnerability of each institution to systemic shocks (either EMU or systemic risk factors), rather than the vulnerability of the system as a whole to the failure of one specific, perhaps important, financial institution. The perspective we adopt has received considerably less attention in the literature.[5] By implementing our model, we are able to rank banks in accordance with their vulnerability to two common shocks: an unobservable systemic risk factor and the equity market uncertainty shock. Thus, we seek to identify systemically vulnerable financial institutions under scenarios of financial distress. Notice that the two factors in our model were selected as to measure two main different sources of vulnerability in the global banking sector. While the systemic risk indicator may be interpreted as a "financial" risk shock, the EMU index quantifies "economic" uncertainty related to equity markets. This distinction and its inclusion in the empirical exercise that we conduct in what follows are crucial to achieve a deeper understanding of the way in which the propagation of shocks occurs within and between financial and real markets.[6]

Our model involves combining dynamic factor models with quantile regressions, in line with Ando and Tsay (2011) and White et al. (2015).[7] Yet, unlike Ando and Tsay (2011), who are not concerned with systemic risk but rather with forecasting asset returns, we construct the factors for inclusion in the factor-augmented quantile regression by differentiating between a traditional systemic risk factor and an equity market uncertainty factor. Similar to White et al. (2015), we consider the systemic factor as being contemporaneously exogenous from the point of view of each bank. In contrast with them, we do not construct (pseudo) quantile impulse response functions, and this allows us to expand the analysis by including more relevant factors (e.g., the uncertainty factor). That is, our model lacks dynamics, and therefore it may exist additional feedback beyond the first period going from the idiosyncratic bank dynamics to the system dynamics. This can conduce to a total impact of the systemic shock higher than the one observed in the first period, which we report here. Nevertheless, we restrict our attention to the effect observed when the systemic shock first arises, which is the most relevant point in the total dynamic impact.[8] This contemporaneous reaction is crucial in terms of systemic risk and we aim at examining its stability through time. To this end we test for

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2 See Bisias et al. (2012) for a review.

3 These methods were originally proposed by Acharya et al. (2017) and Adrian and Brunnermeier (2014). Numerous empirical implementations followed, for example, in the work of Anginer et al. (2014a,b), Bernal et al. (2014), or Drakos and Kouretas (2015).

4 Two exceptions to this point are the studies by Straetmans and Chaudry (2015) and Kolari and Sanz (2015), which we discuss in the next section.

5 Some noticeable recent examples are given by Hartmann et al. (2006), Jonghe (2010) and Straetmans and Chaudhry (2015).

6 See for example the theoretical framework by Brunnermeier and Sannikov (2014) to motivate the importance of considering the interplay between macro and financial markets.

7 Factor models are popular in the asset pricing literature (Fama and French, 1993; Cochrane, 2005), while quantile regressions have gained considerable impetus in the financial branch in recent years (Engle and Manganelli, 2004; Li and Miu, 2010; Ciner et al., 2013; Mensi et al., 2014; among others).

8 See for example Figs. 2–4 in White et al. (2015) in which the first effect is always the maximum of the pseudo impulse responses.

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