

Latent Fragility: Conditioning Banks' Joint Probability of Default on the Financial Cycle*

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Systemic risk has two separate dimensions: First, the buildup of systemic vulnerabilities (cyclical dimension) and second, the propagation of risk (cross-sectional dimension). But in practice, these dimensions of systemic risk are not independent. The severity of systemic risk materialization is hardly divorced from the buildup of macro excesses in financial credit and asset prices. In this paper, we propose a new method – the CoJPoD – for linking these two dimensions. We show that combining the two dimensions into a conditional measure of financial market implied banking sector distress is particularly useful for signaling the onset of crises – when information on their potential severity is scarce. In this sense, explicitly linking the two dimensions of systemic risk may contribute to improving the precision with which macroprudential policies are set. Specifically, such a perspective may well indicate when core macroprudential instruments, such as countercyclical capital buffers, should be released – thereby enabling policy makers to take timely actions to mitigate the severity of financial crises.

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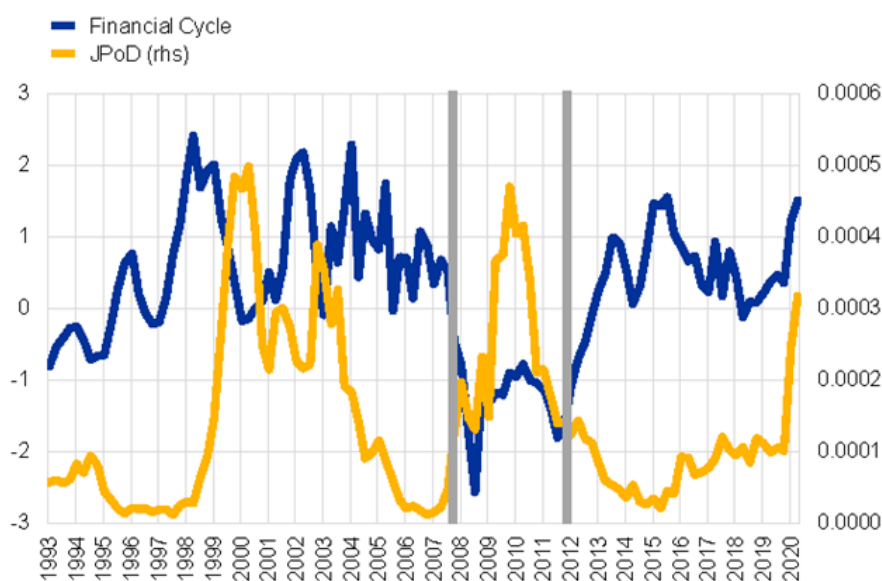
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Holistic view of macroprudential policy

In financial crises, relatively small initial financial losses at the banking level can be endogenously magnified to systemic dimensions through interconnectedness and contagion. The prospect of such systemic amplification mechanisms may depend on the degree of leverage in the financial system, which varies with the financial cycle. This implied dependence suggests a clear role for methods which adequately provide a measurement of the buildup of vulnerabilities, upon which changes in the interconnectedness structures of banks are conditional. However, the empirical literature suffers from an effective separation between papers analyzing the buildup of cyclical risk and those analyzing structural amplification and contagion (see Benoit et al. (2017)). Such a separation might also inhibit a holistic view of macroprudential policy, resulting in methods suitable for informing the setting of structural buffers that buttress the resilience of systemic institutions being considered separately from methods used to inform the setting of time varying buffers to counter country financial cycles.

Conceptually, strong links exist between national financial cycles and associated banking systems. In practice, this is borne out by the link between bouts of systemic stress in banking systems (as measured by banks' joint probability of default, or JPoD, which covers the cross-sectional dimension of systemic risk) and corrections in the buildup of vulnerabilities (as measured by the financial cycle, which captures the cyclical dimension of systemic risk and is a proxy for system-wide balance-sheet leverage) – see Figure 1, which confirms this relationship for the United States. In particular, systemic risk appears to be most virulent when its cyclical and cross-sectional dimensions coalesce, as indicated by a downturn in the financial cycle and a jump in the JPoD around the period of the Global Financial Crisis, for instance. Research has confirmed this, showing that economic welfare suffers most in deep recessions (see Claessens et al. (2012)), when financial fragility combines with downturns in financial cycles. That is, in contrast to standard recessions, financial recessions occur less frequently, are deeper, and last longer – particularly when combined with a banking crisis. Empirical and theoretical research has confirmed that financial recessions follow credit booms (see Jordá et al. (2013), Schularick and Taylor (2012), and Boissay et al. (2016)), underscoring how credit growth, in particular, is an essential part of the buildup of imbalances presaging financial recessions and the subsequent unwinding of these imbalances. At the same time, financial cycles exhibit considerable persistence, with evidence of marked duration, particularly when compared with business cycle counterparts. This implies lengthy periods of vulnerability building up which align with the amplification – visible in the JPoD – stemming from this latent buildup during long corrective phases. In this way, unwinding imbalances can suddenly create exposures to latent risk factors that increase interconnectedness across financial entities and amplify interconnectedness and contagion in the banking system in corrective phases of the financial cycle. A joint evaluation of these factors could therefore allow for better crisis signals and an evaluation of tradeoffs associated with the prevention and mitigation of systemic risk.

Figure 1: Financial cycle and banks' joint probability of default (JPoD) in the United States



Notes: The financial cycle is estimated using the method of Schüler et al. (2015, 2020). The JPoD follows the method of Segoviano (2006) and Segoviano and Goodhart (2009). Horizontal black lines correspond to the first and last quarter as given by Laeven and Valencia (2018).

Linking the cross-sectional and cyclical dimensions of systemic risk

We offer a method to empirically capture the interactions between the cyclical and cross-sectional dimensions of systemic risk. We do so by deriving the JPoD from banks' joint density of equity returns conditional on the future state of the financial cycle, and term the resulting measure "conditional joint probability of default", or "CoJPoD" for short. The empirical measure of the cyclical dimension of systemic risk is the financial cycle estimated using the method of Schüler et al. (2015, 2020). This method summarizes aggregate financial conditions by extracting the momentum common to credit and prices in equity, bond and property markets (thus capturing fundamental balance-sheet leverage at the financial system level). The empirical measure of the cross-sectional dimension of systemic risk is the joint default probability among several banks (thereby measuring the propagation of shocks), estimated using the methodology of Segoviano (2006) and Segoviano and Goodhart (2009). This measure aligns well with systemic banking crises. Importantly, our proposed method allows for conditioning on future tail outcomes on the financial cycle at any point in time, even when financial conditions are currently benign, which makes our method a useful tool for scenario analysis. We also propose the Δ CoJPoD, a measure that highlights the systemic risk amplification potential from a deteriorating financial cycle. Specifically, Δ CoJPoD is defined as the difference of the CoJPoD conditional on a realization of the financial cycle in its lower tail compared to the CoJPoD conditional on a realization of the financial cycle at its median.

Overall, we find that our integrated empirical treatment of the cross-sectional and cyclical dimension of systemic risk sharpens the identification of crisis regimes and, in particular, their onsets. Neither the JPoD nor the financial cycle *individually* signal the onset of crises with great precision, with the financial cycle performing worse than the JPoD. For the selected jurisdictions (euro area, United Kingdom, United States), we find that the Δ CoJPoD significantly outperforms the JPoD in signaling the onsets of crises, improving on the JPoD's capacity by up to 24 percentage points. But also regarding the identification of crises, more generally, we find that the Δ CoJPoD significantly improves on the capacities of the JPoD. The intuition behind our result is that financial cycle downturns amplify banks' joint probability of default. Similarly, financial cycle upturns dampen banks' joint probability of default. Therefore, linking these measures increases the precision with which one can distinguish systemic events from non-systemic events.

Increasing macroprudential policy precision

In this sense, we provide initial evidence that linking the cross-sectional dimension of systemic risk and the cyclical dimension of systemic risk can improve the precision with which macroprudential policies are set. Conditioning the joint density of banks' prospective equity returns on the financial cycle provides a needed policy-relevant perspective on the potential virulence of cross-sectional measures of systemic risk. This is because default probabilities (via dependence and potential contagion) are reduced if the financial cycle indicator does not predict risks due to system-wide balance-sheet leverage in the future.

Specifically, our approach may provide a valuable perspective for better understanding when time-varying capital requirements, such as countercyclical capital buffers, should be released, as it signals the onsets of financial crises with greater precision, mapped to the amplification of systemic risk. This perspective may thereby enable policy makers to take timely actions to mitigate the severity of financial crises.

Beyond this risk materialization phase, the *ex ante* phase of prudential policy is also relevant, as our measure highlights the complementary nature of preventative macroprudential measures in financial downturns. That is, our approach can also be used to conduct systemic stress tests by conditioning on severe, but plausible, tail outcomes of prospective financial cycle developments. It may thus highlight measures which reduce the interdependence of banks in stress periods and measures which address phases in which vulnerabilities build up in the financial cycle. ■

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Paul Bochmann is a Financial Stability Expert in the Systemic Risk and Financial Institutions Division of the European Central Bank (ECB). He holds a M.Sc. in Statistics from Humboldt University Berlin. His research interests are in the fields of systemic risk, time series analysis and financial economics.

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