Conference Overview and Summary of Papers

International Conference on Financial Cycles, Systemic Risk, Interconnectedness, and Policy Options for Resilience

Jointly organized by the Asian Development Bank Economic Research and Regional Cooperation Department and the Institute of Global Finance – University of New South Wales, the conference gathered leading academics, central bankers and financial regulators, and international financial organizations and discussed the theory, practices, and policy implications of financial interconnectedness for systemic risk and financial stability.

About the Asian Development Bank

ADB’s vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region’s many successes, it remains home to a large share of the world’s poor. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

About the Institute of Global Finance

Based at the University of New South Wales, Sydney, the Institute of Global Finance (IGF) is housed at Australia’s leading business school: the UNSW Business School. The IGF has collaborated and published joint research with a number of international institutions, such as the BIS, the IMF and the World Bank. The IGF collaborates with New York University’s Volatility Institute. The IGF’s work with the NYU Volatility Institute focuses on banks’ systemic risk, global financial stability and financial institutions. The IGF is currently working with business and finance organizations such as PwC, KPMG and BlackRock and collaborates with international institutions such as the Asian Development Bank and the World Bank, with the aim of providing cutting edge research with policy applications for the finance industry and policymakers. Another objective of the IGF is the promotion of global financial prosperity through financial policies which contribute to greater global financial and regional resilience and enhancement of the process of regional and global financial integration.

CONFERENCE OVERVIEW AND SUMMARY OF PAPERS

INTERNATIONAL CONFERENCE ON FINANCIAL CYCLES, SYSTEMIC RISK, INTERCONNECTEDNESS, AND POLICY OPTIONS FOR RESILIENCE

Sydney, Australia, 8–9 September 2016
Early Warning Indicators of Systemic Financial Risk in an International Setting

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Summary

We introduce a new top-down approach to measure systemic risk in the financial system, combining information since 1990 on macroeconomic, financial, and ratings factors in four representative countries or regions of the world: Both Australia and the People’s Republic of China (PRC) have experienced minimal faults in the sample period. The United States (US) and the European Union are major superpowers that have experienced many and large financial defaults.

One of our aims is to create early warning indicators for systemic financial risk in these “regions.” These indicators are the probability for the occurrence and the expected severity of a systemic default event. We register a systemically important event in a region in a month if the accumulated actual defaults to total market capitalization ratio exceeds a threshold. We consider two alternative thresholds—a low one and a high one—and construct a range of models to explain such events. We measure the severity of an event as an integer approximation of the ratio of the event loss to the threshold.

Another aim of the paper is to determine which variables are the key predictors of systemic events, in terms of their probability and expected severity, in a comparative framework of four alternative statistical models—a Poisson (PN), a Negative Binomial (NB), a conditional hurdle (CH) and an unconditional hurdle or zero-inflated Negative Binomial (ZINB) model.

Our data suggests that the CH model is preferred overall for explaining in-sample and predicting out-of-sample systemic events. We allow for different explanatory variables for the two stages of the hurdle models. This distinction in covariates between the zero and non-zero severity counts is important because we find only a world macroeconomic factor helps in explaining the severity of a crisis, while both regional macroeconomic and financial risk factors are important in explaining the occurrence of a systemic crisis (the non-zeros), especially a large one.

These covariate factors give a parsimonious representation of the myriad of information that could help explain systemic risk. Employing these factors in the systemic risk regressions conserves precious degrees of freedom, which is especially important given the large number of zeros in our sample of systemic defaults. The macroeconomic factors are generated from a dynamic factor model using a variety of observed macroeconomic and financial variables in each region, which may be stock or flow variables arriving at mixed frequencies. The financial risk and ratings factors in each region are derived from observed Moody’s/KMV expected
default frequencies for major financial institutions, conditional on actual ratings and the estimated macro factors.

A key result is that lags of the world macroeconomic factor are a good prediction of the severity of both high and low threshold events. Therefore, given that a systemic event occurs, worsening global macroeconomic conditions increase the expected severity of a systemic event in any region. Given the very high persistence of our macroeconomic factors, longer lags of deteriorating world macroeconomic conditions build the necessary conditions for greater systemic severity. Regional macroeconomic factors will be seen to affect the probability of an event, but not its expected severity. This indicates that severity is driven by negative macroeconomic externalities. For the “zero” component of the conditional and unconditional hurdle models, we find that Australia and the PRC have lower risk than the EU and the US for both low and high threshold events. Finally, we find modest evidence of a contagion effect from the lagged US probability of a systemic event to the current probability of systemic risk in the other regions.

These estimates generally show that lagged macroeconomic factors predict the occurrence and severity of systemic crises. They imply that more recent bad regional macroeconomic outcomes admit a possible systemic event, while the expected severity is greater if world macroeconomic conditions have been building up for some time.

Our proposal for systemic risk indicators using the preferred CH model can be thought of as having two components: the probability of a systemic event; and given an event, the expected severity of a systemic event. An unusual spike in these provides an early warning indication of a future systemic event. We present in Figures 1, 2 and 3 the actual number of systemic events, the estimated probability of a systemic event, and the estimated severity of systemic events for the case of a high threshold for Australia, the PRC, and the US. For the US (Figure 1), the probability of observing a high threshold systemic event increased noticeably in 2008, to 40%, up from a medium term average of about 10%. It is important to observe how the probability and expected severity measures for the US in the recent crisis are virtually coincident in timing. For the other regions, the expected severity lags the probability. This is

Figure 1: United States Systemic Index—High Threshold

Source: Authors.
what one might expect since this crisis originated in the US, spreading rapidly in its financial effects, but then spreading later in its real effects on other regions.

**Implications for Australia and the People’s Republic of China**

For Australia, which had only two low threshold systemic events, the inferences have to come largely from the default experiences in the United States and the EU. Figure 2 shows that the probability of a systemic event spiked in 2008, but was about a tenth of that for high events in the United States. The probability very quickly normalized in 2009. A similar pattern is seen for the expected severity measure during the 2008 crisis. When a low threshold event occurred in October 2012—the default of the Brookfield Australian Opportunities Fund with a mere 0.006% of total Australian market capitalization—the probability and expected severity remained small. These results reinforce the wide understanding that the 2008 crisis had minimal impact on Australia. This was because it had both a well-supervised financial system and benign macroeconomic conditions due to its booming commodities trade with Asia and very accommodative fiscal and monetary policy.

Results for the PRC are illustrated in Figure 3. Throughout the sample period, the PRC experienced only one default—in May 2009, Greentown China Holdings, a real estate developer located in Hong Kong, China, which was a noticeable 0.29% of the total market capitalization in the PRC plus Hong Kong, China. Again, based on inference from the United States and EU, the probability and the expected severity of a high threshold crisis rose somewhat in 2008 (reaching 1.6%, and 58 respectively) and a little less than in Australia, and much less than in the United States. This was probably because of the strong macroeconomic factor in the PRC throughout the crisis period. Approaching 2012, the probability of a systemic crisis increases noticeably, but the scale of the probabilities remained very small. Compared to other countries, the PRC government is more directly involved in the financial

![Figure 2: Australia Systemic Index—High Threshold](image)

Source: Authors.
system, and so the likelihood and severity of a financial crisis remains small. However, the recent escalations are interesting, and indicative of potential financial problems ahead.

In summary, our systemic risk estimates (in probability and expected severity) indicate that the recent crisis emanated from the United States. Our model could have predicted the 2008 crisis in the United States through the rise in our estimates in the previous 2 years. These early warning indications were a result of the significant negative effects of the fall in US house prices on our derived US macroeconomic factor, which in turn significantly increased the probability and intensity of a globalized systemic event in 2008. Though Australia and the PRC experienced very few defaults in the sample period, they still managed to exhibit a jump in the probability and then expected severity of a systemic crisis. Though the risk did escalate, it did remain small and a crisis did not eventuate, which may be a testament to good regulation and supervision of their financial systems and resilient macroeconomic conditions in Australia and the PRC.

Stronger regional macroeconomic conditions will reduce the probability of a systemic event, but if it occurs, its expected severity will be lessened should world macroeconomic conditions be more benign. Policymakers need to ensure macroeconomic stability over the longer term to avoid such systemic crises, and to coordinate policies across countries to reduce the expected severity. Ratings failures were not found to be relevant for systemic events, and therefore we find no evidence that ratings agencies were culpable in the recent crisis. After accounting for ratings, the residual financial risk factor in a region arising out of expected default frequency data are an important indicator of the probability of a future systemic event. Therefore, financial regulators and supervisors need to ensure that such unobserved financial risk factors in their region are not escalating.
Discussion

Juan Miguel Londono-Yarce suggests that understanding of the drivers of systemic events makes a very interesting contribution to the literature, and the paper illustrates a thorough and careful empirical exercise. However, he expressed some concerns about a forward-looking bias in the applied model, and possible measurement errors. He suggested that the forward-looking bias may arise when the set of factors estimated from the full sample are used in the out of sample exercise. The discussant suggested the use a “rolling window” approach for estimating the factors. The issue of measurement error may arise when estimated factors in one model are used as regressors in another model.

Response

We would like to thank the discussant for his comments. With regards to the mentioned forward-looking bias, the out of sample exercise is a test of the derived factors in predicting systemic events. Although the macroeconomic and financial variables in the full sample were used to derive the factors, no information about systemic events was used. Therefore, while we could use filtered factors rather than smoothed factors to avoid the use of “future” macroeconomic and financial risk information, we would not expect much difference in the results. Unfortunately, the suggested “rolling window” approach is rather difficult to implement due to the computational effort of estimating the state-space multifactor model.

The issue of measurement errors has been examined by Pagan (1984) and Bai and Ng (2006). As shown by Pagan (1984), when derived factors are used in another regression model, the coefficient estimates remain consistent, but their variances may not be consistent and may need to be adjusted. We will look into the methods suggested by Pagan (1984) and Bai and Ng (2006) to adjust our estimators’ variances.

References
