Evaluation of systemic risk in a financial system using dynamic mode decomposition

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Abstract (should be within 1st page)

Constant economic growth and increasing levels of debt pose questions about the reliability and stability of current financial networks. Despite tighter regulation since the 2007-2008 crisis, the resilience of the global financial system is currently being tested by new sources of risk such as geopolitical turmoil. In addition to external factors, the banking sector itself contributes to systemic risk. The complexity of banking networks makes it difficult to monitor the overall stability of a financial system. To determine how the non-linear dynamics and interconnectedness of participants affect the stability of a financial system, we propose a metric for systemic risk evaluation based on a dynamic mode decomposition approach. We analyze banking statements combined with the market data prior to the financial crisis of 2007-2008 and approximate the dynamics of a financial system using the Koopman operator. We define the metric of financial instability by considering the maximum real part of the Koopman operator's eigenvalues. Using the proposed metric, we analyze the performance of major banks and compare our results with the existing methods.