Assessing tail correlations: dangerous dances in times of stress

This article describes an empirical assessment of the extent to which distress at individual banks occurs in tandem with market distress. The assessment sought to apply a simpler methodology than the corresponding approaches described in the academic literature. Interesting insights were gained, but simplicity came at a price. Results were unstable over time. This made it difficult to draw conclusions regarding the impacts of individual banks on the system.

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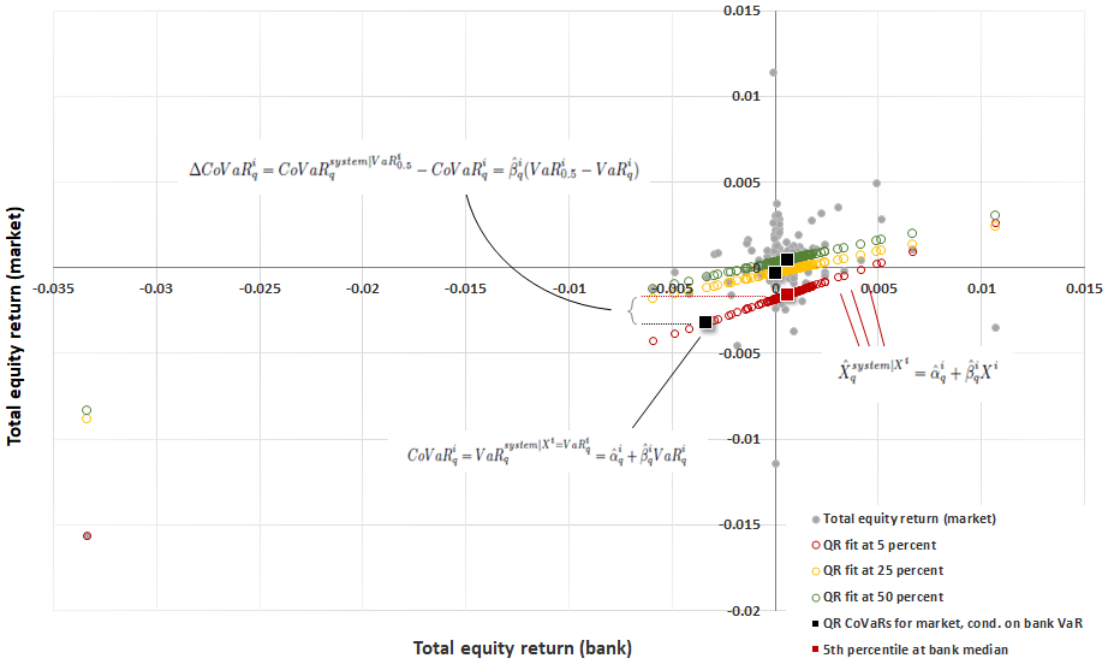

The study uses quantile regression methods to assess the relationship between the incidence of stress at a bank and stress across the market. Its novelty is that it utilises only the monthly book values submitted by banks to the South African Reserve Bank. Others blend monthly or quarterly book values with stock market data.

Methodology in a nutshell

Value at Risk (VaR) for an asset or portfolio is the difference between the median value of that asset and its corresponding (low) value under conditions of extreme adversity. If we could determine the statistical distribution of possible outcomes of such values, the VaR would be the 50th percentile of this distribution minus the 5th percentile, say, or the 1st percentile, depending on our choice of such parameter.

For the whole banking market, we could calculate monthly returns on equity (grey dots in the image, vertical axis, excluding the bank in question) and compute the VaR. Let us also determine the spread of monthly returns over the same period for a particular bank (grey dots, horizontal axis) and estimate the CoVaR. This is the VaR of the market conditional on each value of the corresponding returns of the bank (red dots, vertical axis, fitted using quantile regression). Now define ΔCoVaR as the difference between the value of this conditional return for the bank in its median state and its value when the bank is distressed.

This shows the extent of the relationship between the state of the bank and the corresponding state of the market. It provides an indication of the tendency of the bank to contribute to systemic risk. For the bank in this image, this difference is positive: when the bank is suffering, the market is also in distress. In some instances, the line of red dots runs the other way. In such cases, bank distress is negatively associated with market distress. These banks may actually help to defend against systemic risk.

It turns out that, for many of the large banks, results were in line with expectation. But they were not stable over time. Dividing the 20-year period of investigation into two 10-year periods, or four 5-year periods, we found that this relationship varied. As a result, we could not show that results at certain banks were more likely to move with the market. Disappointing as the results were, the method is intuitively helpful and can be applied to other metrics of each bank. Tail dependency is an important aspect of systemic risk that deserves careful attention. Rob Rusconi

Illustrations are from my PhD thesis, University of Pretoria, published in 2025.

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