Measuring the Stability of the Banking System:
Capital and Liquidity at Risk with Solvency-Liquidity Interactions

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Background and contributions

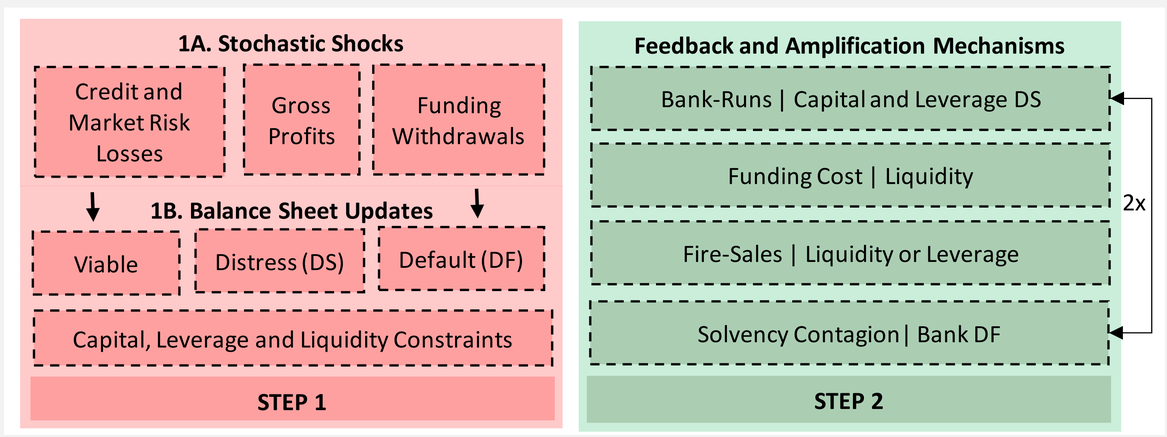
We extend the Capital at Risk methodology of Covi et al. (2022) as a policy tool for tail risk monitoring, scenario and sensitivity analysis and capital calibration, by taking into account both solvency and liquidity risks, and their interaction. The tail risk indicator we construct for the UK banking system is the 1-year average default probability of major UK banks weighted by their relative size.

We provide an assessment of the resilience of the UK banking sector if tail risks were to materialise given the prevailing macro-financial risk environment and can also evaluate adverse stress test scenarios.

Methodology and Data

Methodology integrates established approaches from stress testing, financial contagion, and network theory into a two-step framework. Step 1 uses a stochastic model to simulate asset and funding shocks from counterparty defaults, based on actual risk parameters and macro-financial conditions across sectors and countries. These shocks are transmitted through a granular network of exposures on both the asset and liability sides of banks' balance sheets.

Step 2 applies deterministic feedback and amplification mechanisms, driven by updated balance sheet positions and empirically calibrated behavioural responses. These responses are triggered by breaches of regulatory constraints or deviations from historical risk tolerance.

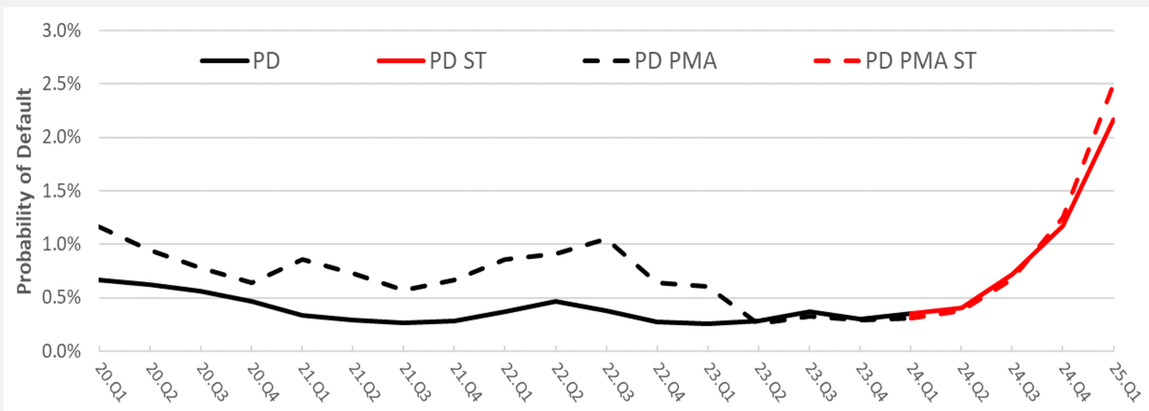


Data includes seven major UK banking groups capturing £6.289 billion of total assets as of Q1 2024 and spanning between Q1-2015 and Q1-2024, from Supervisory COREP and FINREP, and stress testing data.

Results

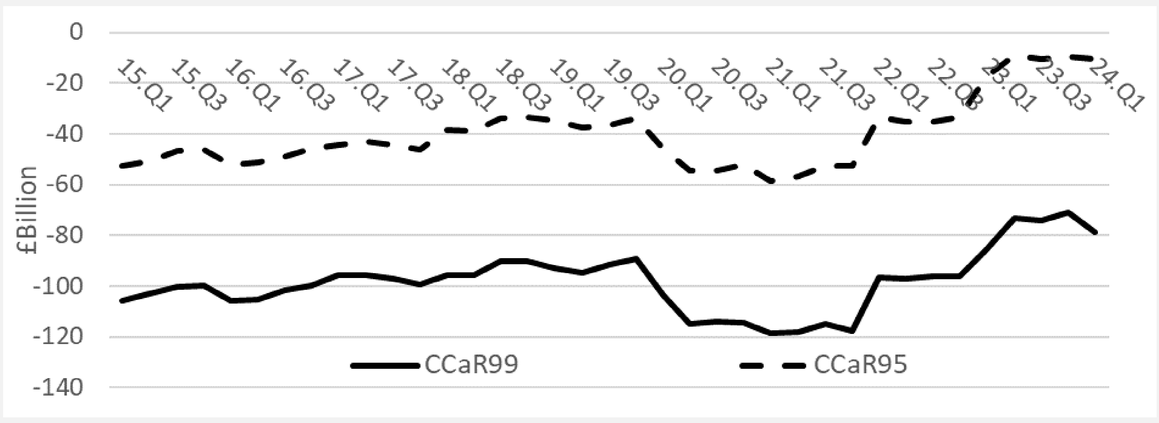
We find that the bank PD is historically floating around 0.43% (Figure 1), implying 1 bank default every ~ 230 years. Considering the potential impact from banks' management actions leads the bank default probability (PD PMA) to increase to 0.7% on average, or 1 bank default every ~ 143 years.

Figure 1. 1-Y weighted average bank default probability



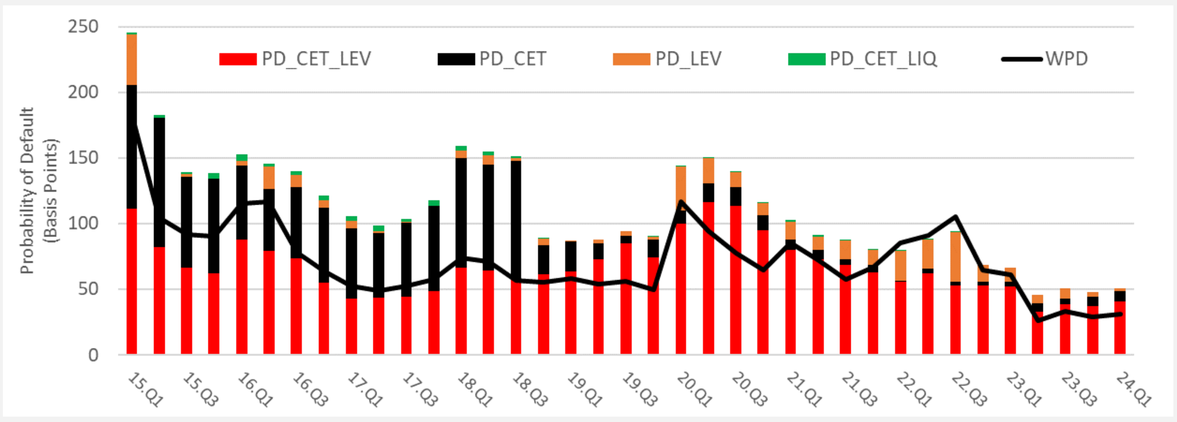
We find that over time the UK banking system may experience on average with 1% probability (CCaR99) £95 billion of losses within one year horizon, whereas £35 billion with 5% probability tracked by CCaR95 index (Figure 2).

Figure 2. Tail risk losses over time



Decomposition of the PD (Figure 3) shows that a bank is most commonly in default due to a simultaneous breach of both minimum CET1 ratio and leverage ratio minimum requirements (PD_CET_LEV). we find that CET1 minimum requirements (PD_CET) are more binding in the first part of the sample than the leverage ratio (PD_LEV), whereas the opposite effect take place in the second part of the sample. We find only a limited contribution from illiquidity-led default (PD_CET_LIQ).

Figure 3. Decomposition of 1-Y PD

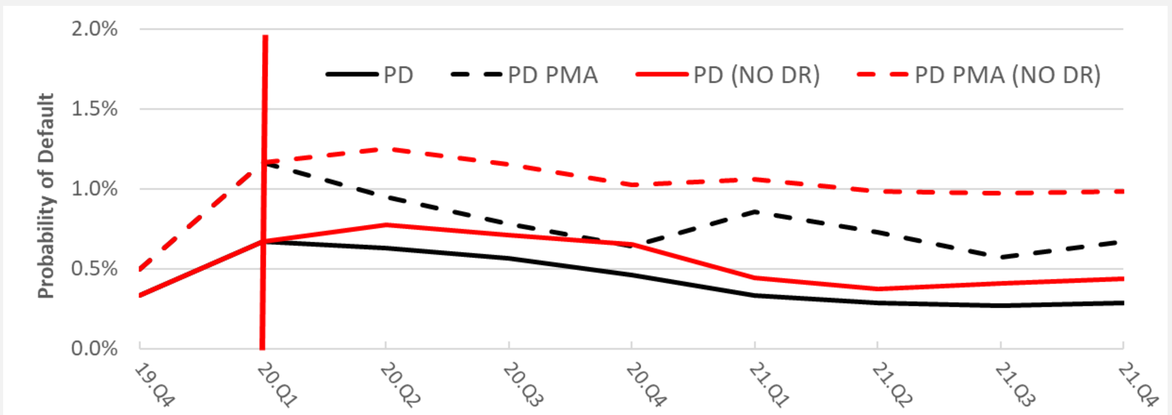


Applications for macroprudential policy

Measuring dividend restriction action effects

This is a tool which has been widely used by central banks (BOE, ECB) during Covid-19 period. We compare the actuals to the counterfactual of not having this tool in place. Figure 4 shows that the average bank default probability without the implementation of dividend restrictions (PD NO DR and PD PMA NO DR) would have been on average higher by roughly 32 bps over 2020 and 2021.

Figure 4. Impact of Dividend Restrictions on Banks' Default Probability



Macroprudential stress test application

We perform a stress testing exercise in which macro-financial conditions materially deteriorates over 1-year horizon in line with the Bank of England 2024 adverse scenario. Figure 1 also shows the corresponding PDs for the case of no management (PD ST) and management actions (PD PMA ST). PD would increase from 31 bps in 2024q1 to 2.5% in 2025q1 driven by core PD ST estimates stemming from credit and market risk losses. Amplifying effects from banks' management actions become material (33 bps increase or 15%) especially at the peak of the stress in Q1-2025.