How Banks Fail: A Model of the Joint Dynamics of Book and Market Value Capital Ratios

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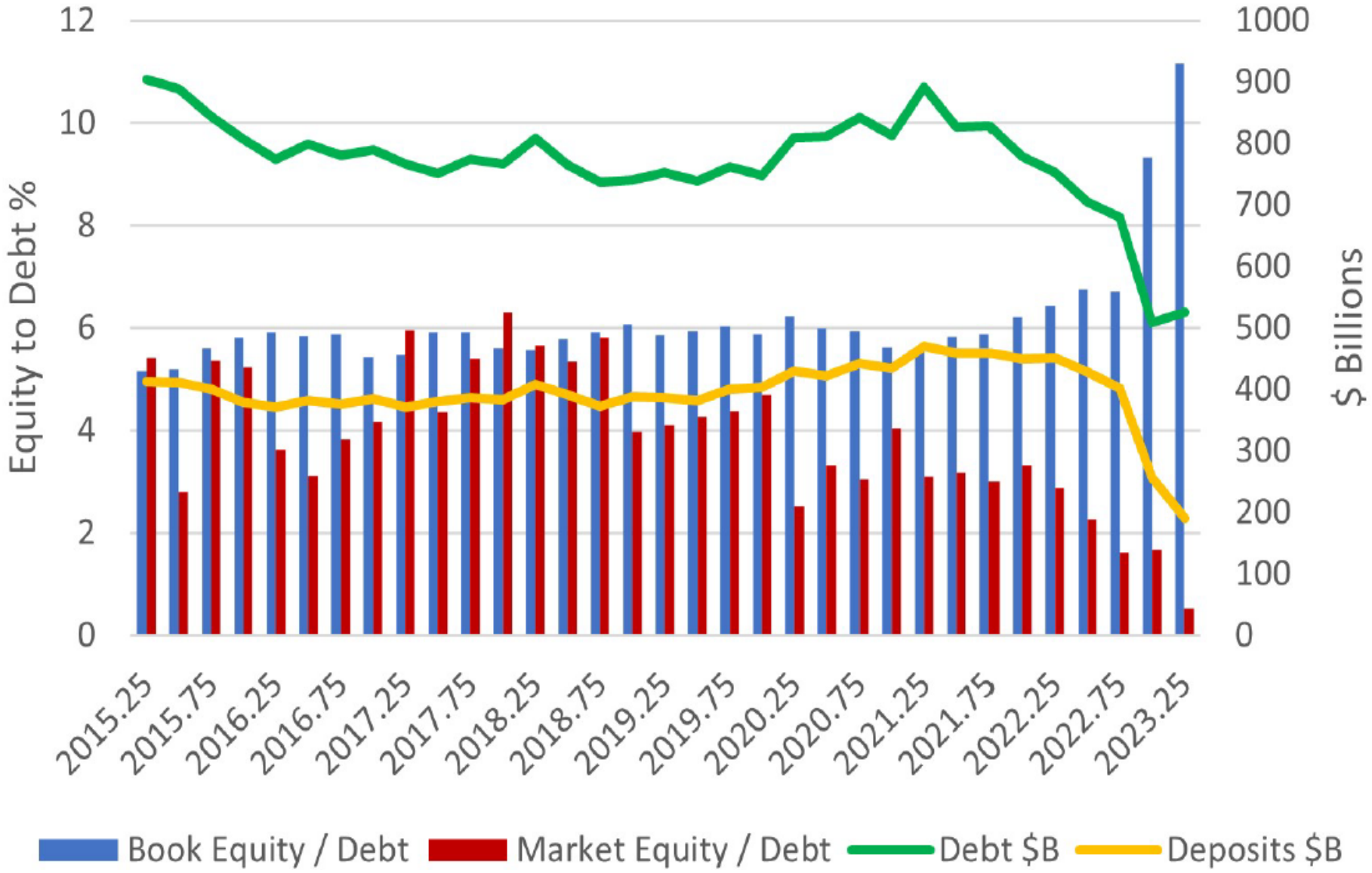
Motivation: Banks' Book versus Market Values

- Banks' regulatory capital accounting uses "book" values that measure most assets at their amortized historical cost rather than their "fair" or "marked-to-market" values.
- Safety and soundness regulations, such as minimum capital standards, stress testing, and the design of "Additional Tier 1" capital (CoCos), are based on book value capital ratios.
- Yet investors owning banks' stock and uninsured debt/deposits tend to focus on fair market values of assets and capital.
- The disconnect between book capital and proxies for market capital (stock capitalization) is stark when major banks fail: they often move in opposite directions!

Credit Suisse Book and Market Equity, Debt, and Deposits



Characteristics of Major Bank Failures

- Failures of major banks are almost never due to deficient regulatory book capital ratios.
- When Spain's Banco Popular failed in 2017 and when Silicon Valley Bank, Signature Bank, Credit Suisse, and First Republic failed in 2023, they were well-capitalized based on regulatory accounting.
- What precipitated their failures (non-viability) were runs by uninsured depositors and short-term creditors who lost confidence in the banks' fair market solvency.
- These facts were also true of major bank failures during the 2008-2009 financial crisis (Haldane (2011)).

Our Paper's Model

- This paper seeks to better understand the divergence between a bank's book value and market value capital ratios by developing a model of their joint dynamics.
- Its continuous-time model combines features of the:
  - earnings-based model of Goldstein, Ju, & Leland *JB* 2001.
  - leverage targeting model of Collin-Dufresne & Goldstein *JF* 2001.
  - partial, gradual capital gains realization model of Begenau, Bigio, Majerovitz, & Vieyra *REStud* 2025.
- It assumes that a bank's book capital fully reflects retained earnings but only partially reflects asset capital gains/losses.
- The bank targets its regulatory capital ratio by adjusting shareholder payouts and its debt/deposits (leverage) which, in turn, also affect its market value capital ratio.

Our Paper's Model (continued)

- A bank is assumed to fail the first time either:
  - its book regulatory capital is deficient by falling below 3% of total debt (Regulatory Failure).
  - its fair market capital falls below -10% of total debt, triggering a run (Market Failure).
- The model's parameters are calibrated to 1995-2021 data on 46 large North American banks and 48 large European banks.
- A Monte Carlo simulation of the model over many years is used to analyze regulatory policies such as:
  - the effectiveness of raising minimum book capital ratios.
  - the intensity of monitoring book capital ratios.
  - costs/benefits of greater marking-to-market of book assets.

Model Results

- The calibrated model replicates the empirical findings that:
  - book and market capital ratios are negatively correlated.
  - bank failures almost always occur due to runs (Market Failure) rather than deficient regulatory capital (Regulatory failure).
- Still, raising and more intensively supervising book capital ratios reduce failure probabilities.
- Greater marking-to-market of banks' book assets:
  - initially raises, but then lowers, the probability of market failure.
  - raises the probability of regulatory failure.
  - initially raises but then lowers the government's expected losses from failures due to more prompt corrective action.

Conclusions

- This paper modeled the joint dynamics of market and book values of assets for a bank that targets its book value capital ratio by adjusting shareholder payouts and leverage.
- Calibrated to data on North American and European banks, the model replicates the opposite movements of book and market capital ratios and the prevalence of "market" failures.
- The model's predictions include:
  - raising book capital standards and supervisory intensity reduces the probability of market and regulatory failures.
  - greater marking to market of book assets has a non-linear effect on failure probabilities and losses, with negligible expected losses at high levels due to greater regulatory prompt correction action.