Comments On

Navigating The Digital Frontier: Unraveling the Impact of Bank Technology Innovations on Idiosyncratic and Systemic Risks

Hryckiewicz, Tchorzewska, Borsuk and Tsomocos

Anthony Murphy, FRB Dallas*

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*The views expressed are my own and not those of the Federal Reserve Bank of Dallas or the Federal Reserve System

Technology Innovations and Risks

- Measure adoption of financial technology
  - Use counting approach like Kwan et al. (KLPT, JFQA 2023)
  - New technology represented by step function - 0 before technology introduced, 1 afterwards
    - Don’t have measures of the extent or success of the investment in technology, unlike KLPT
  - “High” technology adoption if five plus new technologies adopted
- Suggest endogeneity of technology adoption measure not a major concern
  - Plausible? No, not very plausible?
  - Good instruments for 23 countries hard to find
  - Pierri & Timmer (JME 2022) use historical location of land grant (technical) universities for US
- Use difference-in-difference (DiD) approach to estimate causal effect on two measures of risk
  - Idiosyncratic risk = NPL non-performing loan ratio
    - Terminology inaccurate - NPLs include a systemic component!
  - Systemic risk = SRISK measure of Acharya et al. (AER 2012) inter alios
  - DiD assumptions plausible? No, not very plausible?
- Adoption of financial technology lowers NPLs and reduces SRISK systemic risk

Data

- Data for 64 European and US banks covering the 11-year period 2009 to 2019
  - Largest banks in 23 (unspecified) countries
- Banks vary dramatically in size
  - Should regressions be weighted? Smaller European banks may be driving results
- Risk measures
  - NPL ratios very high – mean 3.7% of assets, with std. deviation of 6% and max of 49.5%!
  - Should SRISK measure be scaled?
- European banks experienced two crises – the Global Financial Crisis and the European Banking Crisis
  - Inter alia, banks in Greece, Ireland, Italy, Portugal and Spain languished for years with a big overhang of non-performing loans etc.
  - Inefficient and unprofitable banks were slow to innovate
  - Present separate results for US and Europe?
- Panel data with very small T = 11 and pretty small N = 64
  - Econometrics tricky

Systemic Risk Measure

- SRISK depends on size, leverage and risk

$$SRISK_{b,t} = E_{t-1}(CapitalShortfall_{b,t} | Crisis_t)$$
$$\approx \left(k \frac{DEBT_{b,t-1}}{ASSETS_{b,t-1}} + (1-k)(1 - LRMES_{b,t}) \frac{EQUITY_{b,t-1}}{ASSETS_{b,t-1}}\right) ASSETS_{b,t-1}$$

  - k = Prudent capital ratio (8%)
  - $LRMES$ = Long Run Marginal Expected Shortfall
  - $Crisis$ = Market returns fall by 40%

- Want apples to apples comparisons
- Scale $SRISK$ by $EQUITY$ (or $ASSETS$) so that size effect washes out?
  - To some extent, bank fixed effects should control for scale but the results in Table 5 suggest that they are not doing so
- $SRISK(\%)$ = Contribution to total $SRISK$ of financial system
  - Smaller in some countries than others, e.g., US versus Iceland or Ireland

Endogeneity

- Table 2 uses lagged bank variables (ROA_{t-1}, $Size_{t-1}$ etc.) and current macro variables (GDP_t and π_t) to explain $N_{b,t}$, the stock of technologies in use at time t
  - The stock $N_{b,t}$ is nondecreasing
  - ROA_{t-1}, $Size_{t-1}$ and GDP_t etc. may explain the adoption of new technologies
  - What about the lagged stock $N_{b,t-1}$?
- Unsurprisingly, ordered logit results in column 1 very mixed
  - Significant coefficients: positive ROA_{t-1}, positive $Size_{t-1}$, negative $LOAN_{t-1}/ASSET_{t-1}$, negative GDP_t, positive π_t etc.
- Do probit results in other columns refer to the stock or flow of technologies?
- Instrumental variable results for NPL in Table 11
- Possible instruments = number of bank branches, fintech credit, number of patents filed by or granted to a bank
- Unclear how good instrument are in practice
  - Choice of instrument leads to very significant variation in estimates of effect of $N_{b,t}$

"Difference-in-Difference" Results

- Stable unit treatment value assumption (SUTVA)?
  - Citi's adoption of mobile payment technology does not affect Chase's or Well Fargo's adoption of the same technology?
- Unconfoundness?

  $E(NPL_{b,t}|N_{b,t}, X_{b,t-1}, Z_t, FE_b, FE_t) = E(NPL_{b,t}|X_{b,t-1}, Z_t, FE_b, FE_t)$ for "treated" group
- Even if you DiD framework is appropriate, Woolridge and coauthors suggest using a different regression specification
- Also staggered treatment
- Empirical Results in Tables 3 (NPLs) and 5 (SRISK)
- Surprisingly large estimated effect of high digital (5+) adoption on NPLs
  - Estimated coefficient approx. -0.02 versus a mean NPL of 0.037
  - Digital adoption variable may be picking up post GFC, European Banking Crisis improvement in NPLs
- SRISK result hard to interpret because SRISK is not scaled
- Estimated effects of high digital adoption on SRISK(%) is modest
  - Lagged size and capital significant; other risk drivers included lagged NPLs insignificant
  - Are the high R squares generated by the bank and time fixed effects?

Other Issues and a Cautionary Note

- Non-performing loan (NPL) ratio
  - US definition is ratio of 90+ days past due and non-accrual loans to total loans not total assets
- Adjustment of SRISK measures?
  - Different accounting treatment of derivatives in US and Europe
- Are the two groups of banks in Figures 5 and 6 constant over time?
- Important cautionary note: Adoption of new financial technology comes with significant operational risk of tail events
  - Frame et al. (2023) find that large US bank holding companies that engaged in more financial innovation prior to or during the GFC had more severe operational losses
  - US cyber risk vulnerabilities have increased
  - PayPal cyber incident affected the firm but not the financial system
  - MOVEit secure file transfer incident affected thousand of organizations …. the resulting loss of data put many financial institutions at risk of large-scale fraud and theft

Figure 5: The average distribution of non-performing loans (NPL_Ratio) among two groups of banks.