Comments On

Navigating The Digital Frontier: Unraveling the Impact of Bank Technology Innovations on Idiosyncratic and Systemic Risks
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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 \((ROA_{t-1}, Size_{t-1}\text{ etc.})\) and current macro variables \((GDP_t\text{ and } \pi_t)\) 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 \(\pi_t\) 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