Discussion of:
Interest Rate Risk in Banking
by Peter DeMarzo, Arvind Krishmamurthy, and Stefan Nagel

Philipp Schnabl

NYU Stern, NBER, and CEPR

Paper Summary

1. Duration of bank franchise value is positive (not negative!)

   - Prior work argued that duration of *deposit* franchise value is negative

   - But accounting for loan franchise, total duration is positive

2. Current models of deposit franchise value are incomplete

   - Do not properly account for interest insensitivity of present value of deposit spreads

   - Cannot explain why low-beta banks hold long-duration securities

Textbook View: Interest Rate Risk

1. Banks engage in maturity transformation

   - Banks borrow short term (issue deposits), lend long term (make loans, buy securities)

   - pay short-term (floating) rate, receive long-term (fixed) rate

2. Earn term premium but maturity transformation creates interest rate risk

   - a rise in short rate $\rightarrow$ interest expenses go up $\rightarrow$ profits fall

     $\Rightarrow$ assets fall relative to liabilities, equity capital depleted
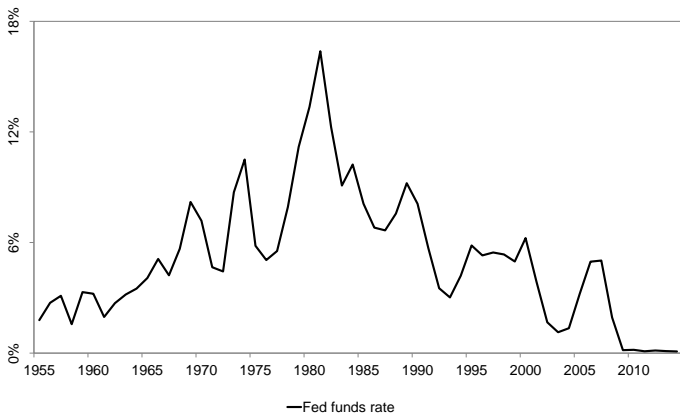
Banks' Maturity Transformation
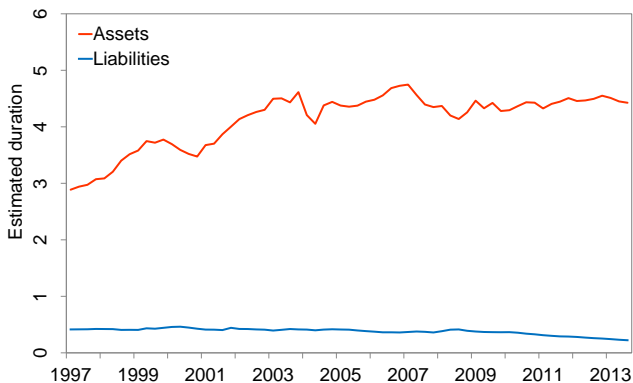
1. Aggregate duration mismatch is about 4 years

⇒ Under textbook view, a 100-bps level shift in rates leads to

  - 4 years of 100-bps lower net income (as % of assets)
  - in PV terms: a 4% drop in assets → a 40% drop in equity since banks are levered 10 to 1; stock price drops on impact
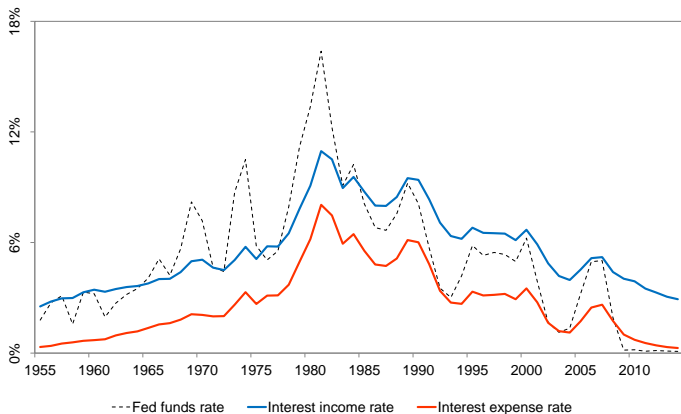
Bank Cash Flows and Interest Rates

—Fed funds rate

1. Interest rates have varied widely and persistently over past 60 years

Bank Cash Flows and Interest Rates
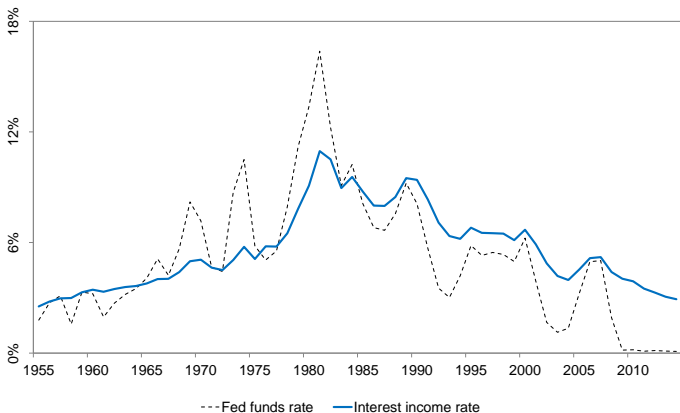
Legend: - - - Fed funds rate — Interest income rate

1. Interest rates have varied widely and persistently over past 60 years

2. Banks' **interest income** much smoother, reflecting long-term assets
   $\Rightarrow$ would suffer frequent and sustained losses if funded at Fed funds rate

Bank Cash Flows and Interest Rates

1. Interest rates have varied widely and persistently over past 60 years

2. Banks' **interest income** much smoother, reflecting long-term assets
   $\Rightarrow$ would suffer frequent and sustained losses if funded at Fed funds rate

3. But banks' **interest expense** much lower and smoother than Fed funds rate, because issue low-beta deposits (DSS (2017, 2021))

Banks' Net Interest Margin (NIM)
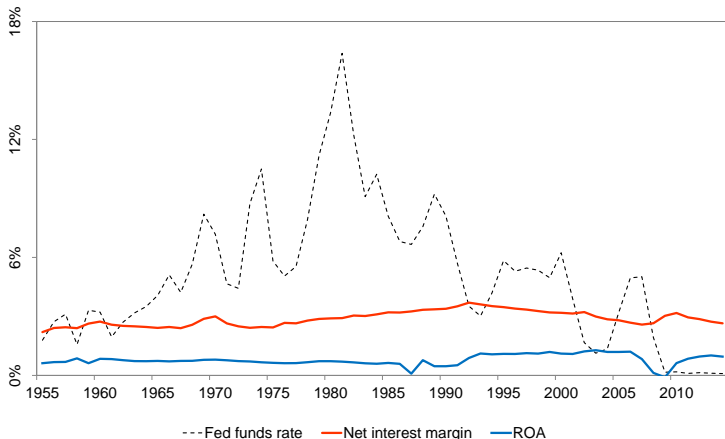
1. NIM = (Interest income - Interest expense)/Assets
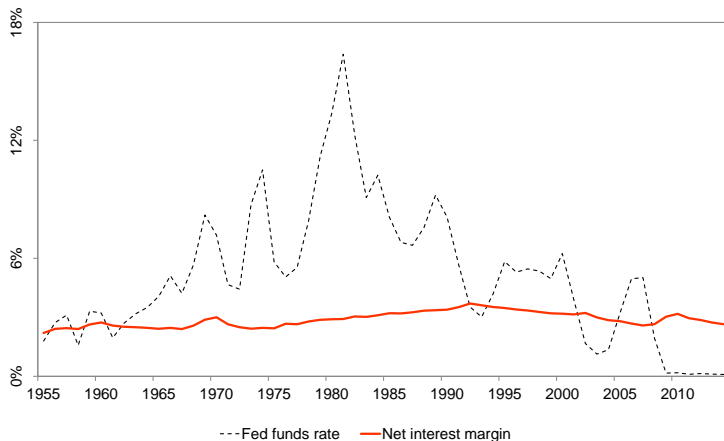
2. NIM is *uncorrelated* with short rate $\Rightarrow$ *corr*$(\Delta$NIM$, \Delta$FF rate$) \approx 0$

Banks' Net Interest Margin (NIM) and ROA

1. ROA = NIM + Fee income - Operating costs - Loan losses

2. ROA is uncorrelated with short rate $\Rightarrow corr(\Delta\text{ROA}, \Delta\text{FF rate}) \approx 0$

What is the duration of total franchise value?

1. DSS shows that banks engage in cash flow hedging

    - Cash flow hedging generates a steady perpetual cashflow (like non-financial firms)

    - Cash flows are always positive $\Rightarrow$ bank cannot go bankrupt from this risk $\Rightarrow$ Maturity transformation without interest rate risk

    - Bernanke and Kuttner (2001) find non-financial stocks decline by 2% to 4% for 100 bps increase in interest rates

    - Benchmark is the textbook view which predicts -40% for 100 bps increase in interest rates

What is the duration of bank franchise value?

1. Regress FF49 industry portfolios on Δ1-year rate around FOMC days
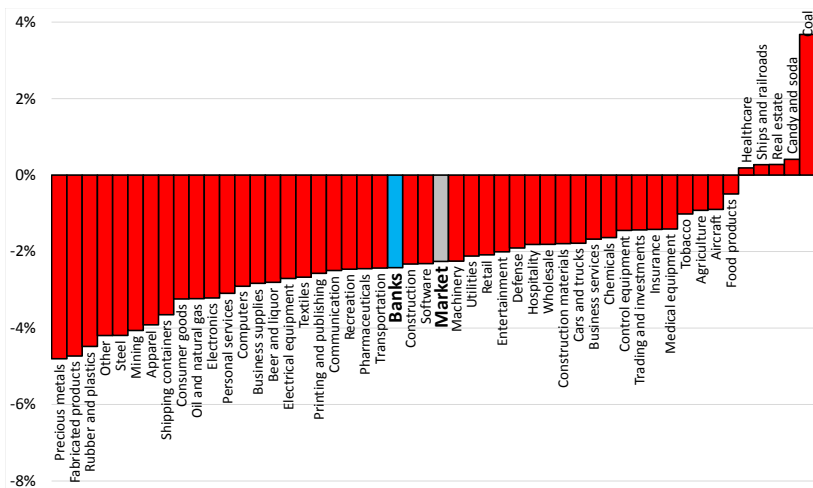
2. Like the market, bank stocks drop by just 2% per 100-bps rate shock ($\ll 40\%$)

Comment #1: Is there any disagreement?

1. DSS on interest rate risk
   - Banks hedge long-term assets with deposits to generate stable NIM and ROA
   - Stable NIM and ROA generate slightly positive duration $\Rightarrow$ same as non-financials
   - maturity transformation without interest rate risk

2. DKN on interest rate risk
   - Banks hedge loans with deposits to generate stable cash flows
   - Generates slightly positive duration for franchise value

   $\Rightarrow$ DSS and DKN appear to agree

Valuing the deposit franchise

1. DKN estimate franchise value, *not deposit franchise value*

   - Appear to disagree with prior work showing that duration of deposit franchise value is negative

   - But DKN do not estimate deposit franchise value $\Rightarrow$ only estimate value *after* netting out loans

   $\Rightarrow$ DKN analyze loans *after* hedging them with deposits

2. But to evaluate hedging, one needs to value deposit franchise separately

   - Important for assessing whether long-duration assets are hedged

   - Important for understanding run risk because uninsured deposits franchise value is runnable (DSS, 2023)

Valuing the deposit franchise (DSS (2021, 2023))

(Only) four assumptions:

1. Deposit base: D

2. Deposit rate: Deposit rate $r_d = \beta \times r$

3. Cost of per-dollar deposit: c

4. Exogenous outflows: $X_t = \delta D_{t-1}$

Valuing the deposit franchise (DSS (2021, 2023))

Yields simple formula for deposit franchise value:

$$\textit{Deposit Franchise Value:} \quad = \quad D\left[\frac{(1-\beta)r-c}{r+\delta}\right]$$

$$\textit{Dollar Duration:} \quad = \quad -D\left[\frac{c+(1-\beta)\delta}{(r+\delta)^2}\right] < 0$$

1. Deposit franchise value = discounted deposit spreads minus costs

2. Deposit franchise value has negative duration

3. DKN have the same deposit model with $\delta=0 \Rightarrow$ DKN deposit franchise has negative duration

Calibration: Deposit franchise value in 2023

- $\beta = 0.3$ (recently 0.2-0.4)
- $c = 1.5\%$ (between 1 and 2%)
- $r = 4\%$
- $D = \$17.5T$
- $1/\delta = 10$ years (FDIC: 10-15 y)

DF $=$ \$1.6T $\approx$ estimated losses on assets

Calibration: Bank values in 2023

Bank Equity Value	Dec 2021	Feb 2024
	(1)	(2)
Equity ratio without DF	10.26	2.91
	(2.08)	(3.22)
% Insolvent Banks	0.00%	17.10%
Equity ratio with DF	9.99	10.54
	(4.21)	(4.68)
% Insolvent Banks	0.84%	0.58%
Obs.	717	690

1. If we ignore DF, large decline in value, $\approx 1/4$ banks negative value (Jiang et al., 2023)

2. With DF, average bank hedged, almost no negative value

3. DSS also evaluates insured and uninsured DF

Comment #2: What is the DKN deposit franchise value?

1. DKN make different assumptions for deposit franchise

   - DKN assume $\delta = 0$

   - Assumes new deposit costs are included in operating costs

   - But new deposits costs likely increase with interest rates (deposit convexity) and due to outflows under deposits channel

2. DKN calibration implies large DF

   - It appears DKN implies DF value of $> 50\%$ of deposits if r is high

   - Can explain why DKN cannot match correlation of low-beta banks investing in long-duration security holdings

$\Rightarrow$ Provide separate estimates of deposit and lending franchise values

Takeaways

1. DSS and DKN agree that banks match their cash flows

   - Banks have same interest rate risk as non-financial despite large maturity mismatch
   - Otherwise, banks would fail regularly as interest rates move

2. DSS and DKN have differences on modeling deposit franchise value
   - Both agree that deposit franchise value has negative duration
   - Important for quantitatively matching bank valuation and portfolio decisions