On the Scale of Financial Intermediaries

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Do banks manage size?

- Modigliani and Miller (1958):
  Balance sheet decisions do not affect economic outcomes

- With frictions:
  Amount of leverage and timing of payouts affect firm value
  $\Rightarrow$ Size and leverage become state variables in equilibrium

- Myers and Majluf (1984):
  Scale of non-financial firms measured by assets

- This paper:
  Scale of banks measured by (book) equity

This paper

- Study how publicly-traded banks manage balance sheets
  - Both in the long-run and at the business-cycle frequency
  - Both in book and market value terms
- In the long-run, banks manage to a slow-moving optimal scale of equity
- In the short-run, banks use retained earnings and dividend payouts to manage book leverage

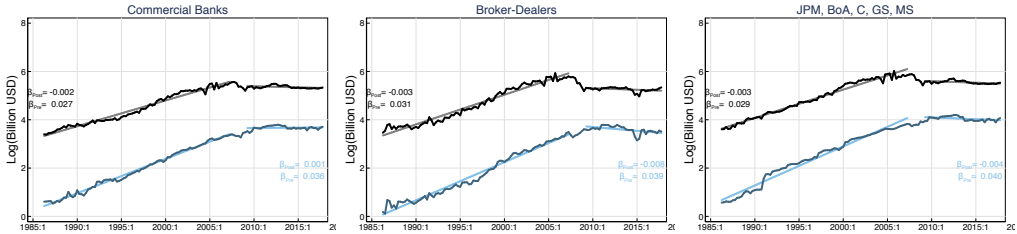
  $\Rightarrow$ Book leverage directly under bank control
- Market leverage determined by B/M ratio

  $\Rightarrow$ Market leverage largely outside of bank control
- Persistent deviation from trends post-crisis

Data

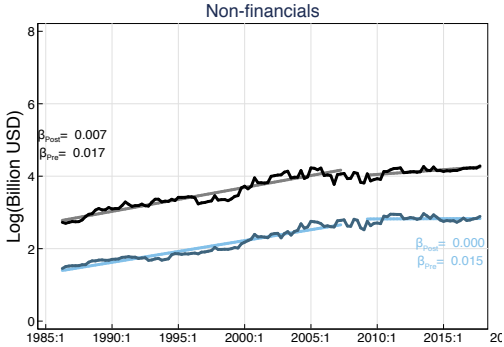
- Balance sheet and income statement information from Compustat
- Market value information from CRSP
- Classify firms into:
  - Commercial banks: SIC codes 6000 – 6200
  - Broker-dealers: SIC codes 6200 – 6300, 6712
  - Universal banks: Bank of America, Bear Stearns, Citigroup, JP Morgan, Goldman Sachs, Lehman Brothers, Merrill Lynch, Morgan Stanley
- Sample: Q1 1985 – Q3 2018
  - Common equity only
  - Firm characteristics winsorized at 5% and 95% level
    - Long-run trends: value-weight by lagged assets
  - Drop firms with total assets below $2 billion, with zero observations for total assets, book equity or market equity

Long-run trends



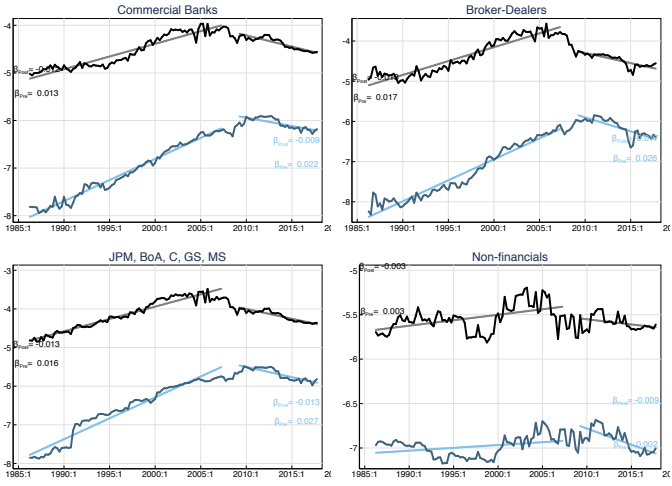
- Broker-dealers grow at a faster pace and operate at higher leverage
- Banks and broker-dealers actively smooth book equity
- Structural break post-crisis

Long-run trends



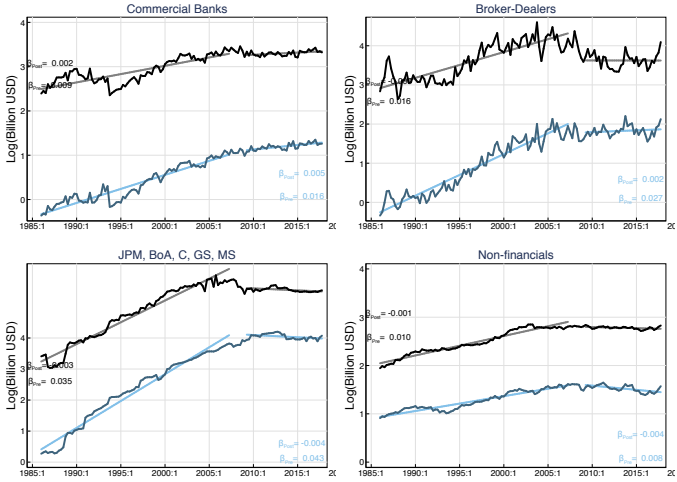
- Broker-dealers grow at a faster pace and operate at higher leverage
- Banks and broker-dealers actively smooth book equity
- Structural break post-crisis
- Non-financials assets and equity move in parallel $\Rightarrow$ leverage dynamics less important

Long-run trends (relative to GDP)



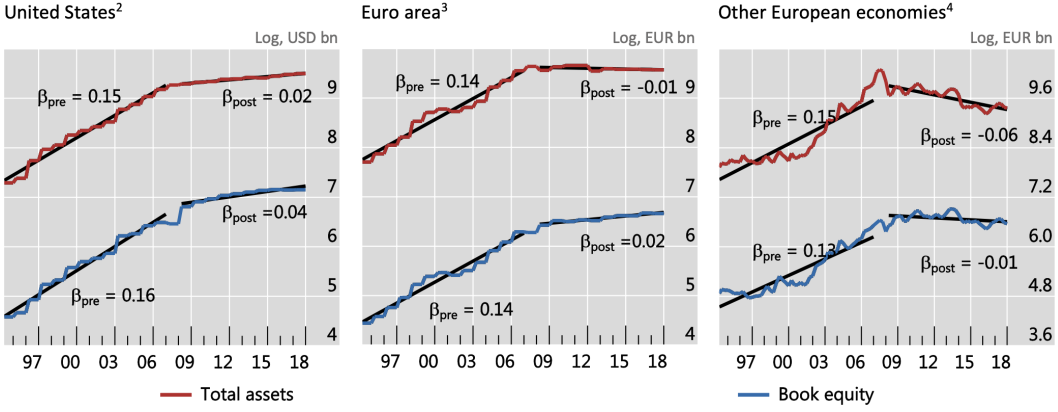
- Structural break post-crisis even relative to GDP

Long-run trends (relative to GDP, equal weighted)



- Structural break post-crisis even in equal-weight terms
  - $\Rightarrow$ Both average and marginal banks shrink post-crisis

Long-run trends (internationally)



- Structural break post-crisis globally
  - Suggests role of global low interest rate environment
- Biggest changes in Europe

Post-crisis Trends

	1985:1 - 2007:3		2009:3 - 2018:3		$t_{pre-crisis \neq post-crisis}$	
	Assets	Book Equity	Assets	Book Equity	Assets	Book Equity
	Panel A: Testing for differences in slope					
Broker-Dealers	0.031	0.039	-0.011	-0.018	12.536***	15.704***
Commercial Banks	0.027	0.036	-0.003	-0.001	15.901***	25.691***
JPM, BoA, C, GS, MS	0.029	0.040	-0.004	-0.006	18.146***	17.780***
Non-financials	0.017	0.015	0.003	-0.004	5.912***	9.621***

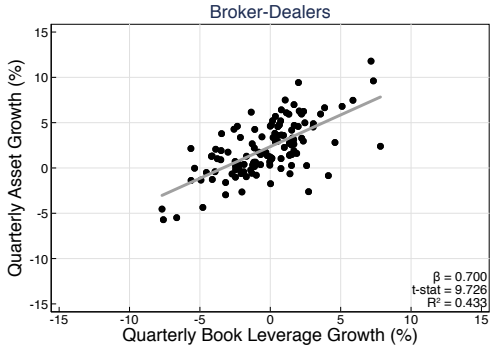
- Negative trend growth in both assets and equity for banks post-crisis
- Negative trend growth in equity and much lower trend growth for assets for non-financials post-crisis

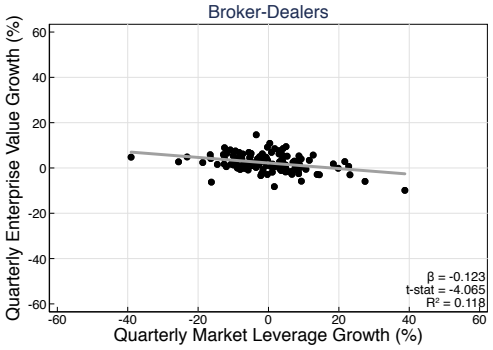
Post-crisis Trends

	1985:1 - 2007:3		2009:3 - 2018:3		$t_{pre-crisis \neq post-crisis}$	
	Assets	Book Equity	Assets	Book Equity	Assets	Book Equity
	Panel B: Testing for differences in MAD					
Broker-Dealers	0.130	0.116	1.526	0.900	11.375***	5.505***
Commercial Banks	0.098	0.061	0.915	0.656	8.425***	5.537***
JPM, BoA, C, GS, MS	0.081	0.139	1.311	1.072	11.941***	7.733***
Non-financials	0.104	0.090	0.469	0.252	4.542***	1.989**

- Negative trend growth in both assets and equity for banks post-crisis
- Negative trend growth in equity and much lower trend growth for assets for non-financials post-crisis
- Much larger deviations from pre-crisis trend post-crisis
  - 10x increase in MAD for banks
  - 4x increase in MAD for non-financials

Book vs market leverage

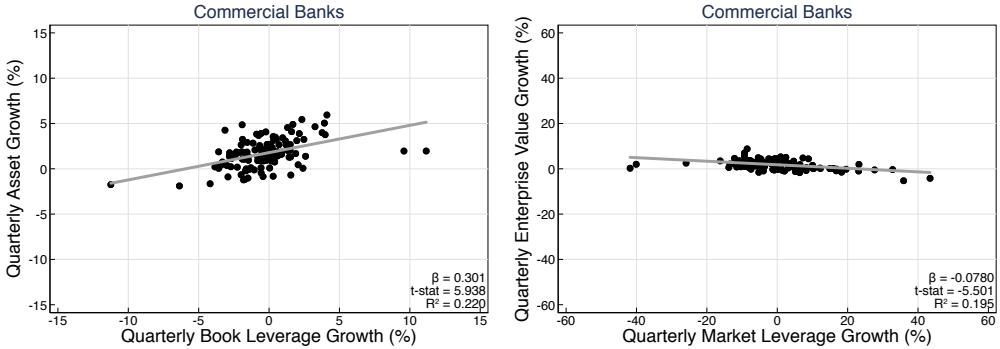




- Financials book leverage procyclical, market leverage countercyclical

⇒ Financials actively manage book leverage; market leverage determined primarily by market forces

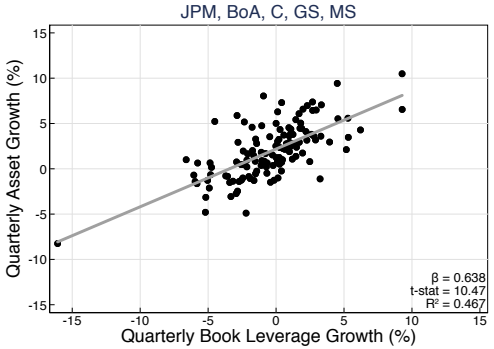
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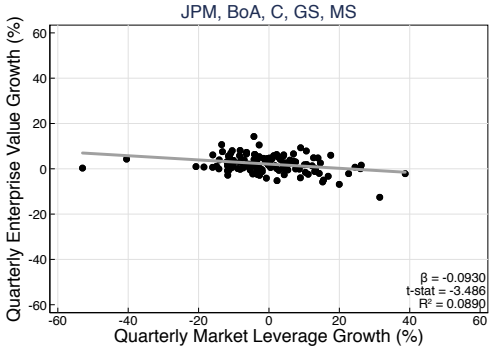


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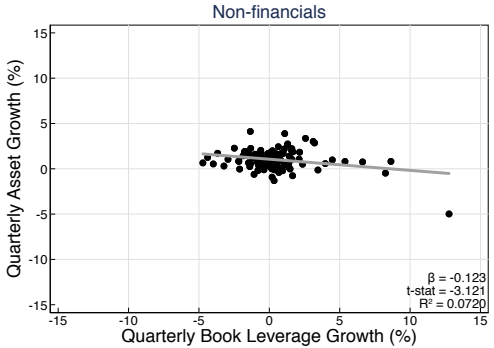


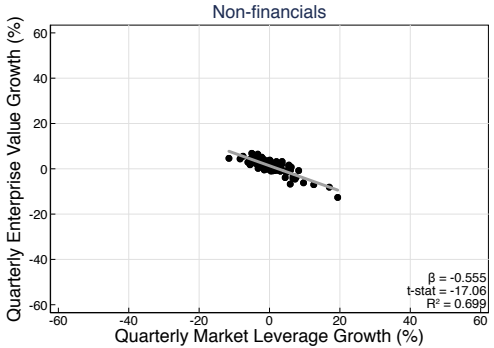


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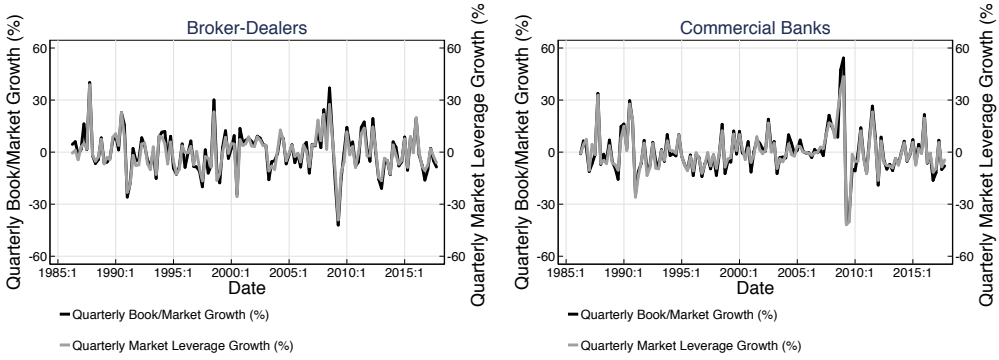


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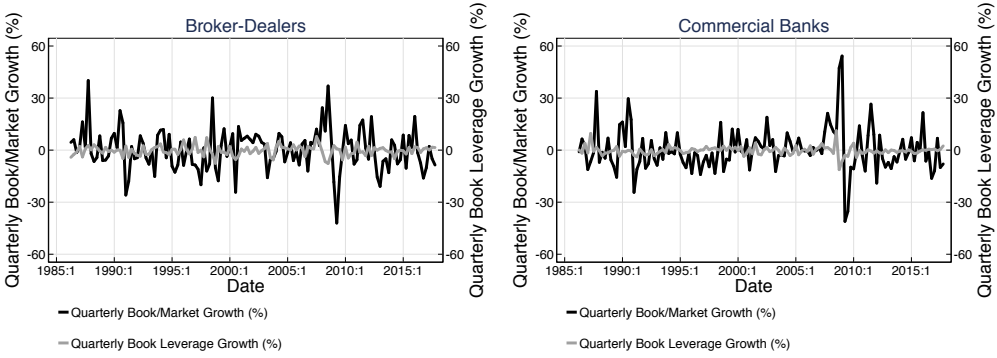
- Non-financials: passive management of book value of equity; strong negative correlation between enterprise value and market leverage

Leverage and book-to-market ratio



- Market leverage moves one-to-one with B/M ratio

Leverage and book-to-market ratio



- Market leverage moves one-to-one with B/M ratio
- Low correlation between book leverage and B/M ratio
- Not about accounting standards: broker-dealers mark-to-market; commercial banks use historical-cost accounting

Leverage cyclicality

	Asset Growth			Enterprise Value Growth		
	(1)	(2)	(3)	(4)	(5)	(6)
Book Leverage Growth	0.245***	0.261***	0.265***			
Market Leverage Growth				−0.058***	−0.017	−0.016
Adjusted R^2	0.105	0.194	0.191	-0.002	0.097	0.080
Observations	17443	17453	17443	17423	17433	17423
Firm FE	Yes	No	Yes	Yes	No	Yes
Time FE	No	Yes	Yes	No	Yes	Yes

- **Financials**:
  - Book leverage procyclical both in TS and XS
  - Market leverage countercyclical in TS, no relationship in XS
  - High R^2 for asset growth

Leverage cyclicality

	Asset Growth			Enterprise Value Growth		
	(1)	(2)	(3)	(4)	(5)	(6)
Book Leverage Growth	0.076^{**}	0.102^{***}	0.105^{***}			
Market Leverage Growth				-0.339^{***}	-0.259^{***}	-0.260^{***}
Adjusted R^2	-0.004	0.086	0.071	0.209	0.295	0.284
Observations	24818	24835	24818	24796	24813	24796
Firm FE	Yes	No	Yes	Yes	No	Yes
Time FE	No	Yes	Yes	No	Yes	Yes

- **Non-financials**:
  - Book leverage procyclical both in TS and XS
  - Market leverage countercyclical both in TS and XS
  - High R^2 for enterprise value growth

What determines net payouts for banks?

	Net Payouts, as a percent of:					
	Contemporaneous Assets			4Q Lagged Assets		
	(1)	(2)	(3)	(4)	(5)	(6)
Detrended Book Equity (4Q) Lag	1.204***	1.091***	0.973***	1.220**	1.216***	1.067***
Market/Book (4Q) Lag		-0.080	-0.072		-0.003	0.008
Book Leverage (4Q) Lag			-0.042**			-0.053**
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4069	4057	4057	4058	4057	4057
Adjusted R^2	0.060	0.059	0.064	0.031	0.030	0.035

- One-for-one increases in bank net payouts for increases in book equity

$\Rightarrow$ Banks finance credit through debt and erode book equity through higher payouts

What determines net payouts for non-financials?

	Net Payouts, as a percent of:					
	Contemporaneous Assets			4Q Lagged Assets		
	(1)	(2)	(3)	(4)	(5)	(6)
Detrended Book Equity (4Q) Lag	0.889***	1.090***	0.864***	0.898***	1.087***	0.895***
Market/Book (4Q) Lag		0.292***	0.405***		0.266***	0.361***
Book Leverage (4Q) Lag			-0.154***			-0.130***
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17382	17282	17282	17283	17283	17283
Adjusted R^2	0.066	0.076	0.082	0.057	0.064	0.068

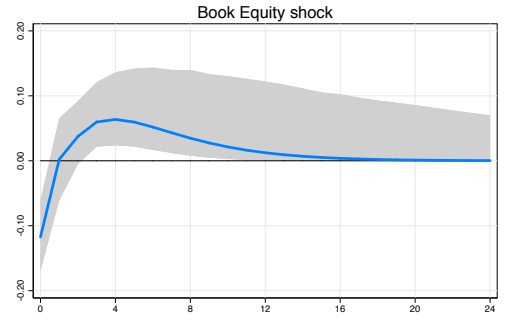
- Lower sensitivity of net payouts to increases in book equity for non-financials
- Net payouts also increase in response to increases in M/B

How do banks manage their balance sheet?

$$E_t - E_{t-1} = \text{Earnings}_{t-1,t} + \text{Net Payouts}_{t-1,t} + A_t - A_{t-1} - (D_t - D_{t-1})$$

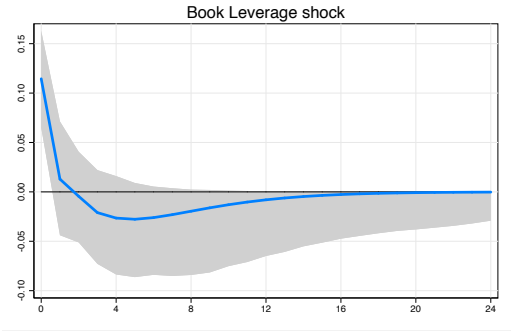
- Equity changes because of earnings, net payouts, changes in assets and in debt
- Estimate a panel VAR in M/B, book equity, book leverage and net payouts (as a fraction of assets)
  - Shocks order: M/B, book equity, book leverage, net payouts/assets
  - Focus on response of net payouts to shocks from book equity and book leverage

How do banks manage their balance sheet?



- Instantaneous response of net payouts to book equity shock negative
- But longer-term response positive

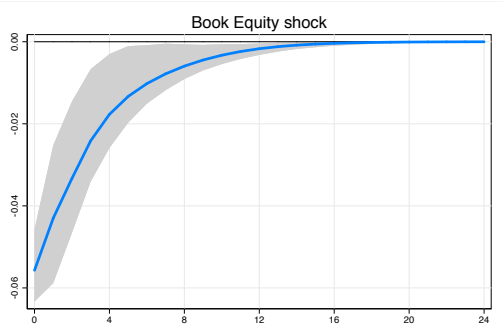
How do banks manage their balance sheet?



- Instantaneous response of net payouts to book equity shock negative
- But longer-term response positive
- Instantaneous response of net payouts to leverage shock positive

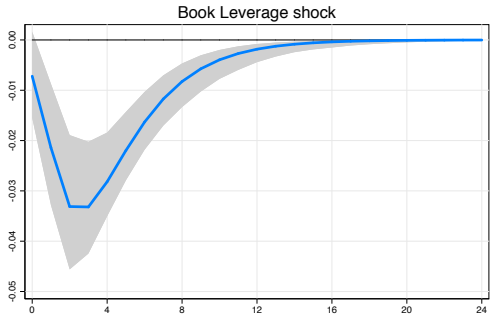
$\Rightarrow$ Banks actively manage book equity to stay on a smooth path

How do non-financials manage their balance sheet?



- Negative response of net payouts to book equity shock at all horizons

How do non-financials manage their balance sheet?



- Negative response of net payouts to book equity shock at all horizons
- Delayed negative response of net payouts to leverage shock

$\Rightarrow$ Non-financial firms manage to a leverage target

Recap

1. Banks actively manage to trend-equity growth
2. Banks issue cash dividends that dissipate book equity
3. Shareholders reluctant to be diluted by new issuance

$\Rightarrow$ Suggest existence of a slow-moving optimal scale of equity E^*

$\Rightarrow$ Suggest decreasing returns to scale (of bank equity)

What determines leverage?

	Panel A: Book Leverage Growth				
Net Payouts	0.207***				0.070**
Book Equity Growth		−0.689***			−0.779***
Market Equity Growth			−0.038***		0.053
Book/Market Growth				−0.033***	0.035
Adjusted R^2	0.007	0.381	0.013	0.010	0.416
Observations	4837	9775	9755	9755	4837
Firm FE	Yes	Yes	Yes	Yes	Yes

- Higher payouts increases book leverage but with low R^2
- Lower book equity increases book leverage with high R^2

$\Rightarrow$ Net payouts and market valuation matter to the extent they affect book equity

$\Rightarrow$ Book leverage directly in the control of firms

What determines leverage?

	Panel B: Market Leverage Growth				
Net Payouts	−0.360				−0.005
Book Equity Growth		−0.286***			−0.150**
Market Equity Growth			−0.813***		−0.498***
Book/Market Growth				0.779***	0.298***
Adjusted R^2	0.004	0.010	0.866	0.810	0.858
Observations	4837	9755	9755	9755	4837
Firm FE	Yes	Yes	Yes	Yes	Yes

- Market leverage primarily affected by market variables
- Market leverage higher when market equity growth is lower and M/B is higher

$\Rightarrow$ Book equity matters to the extent it affects market equity

$\Rightarrow$ Market leverage largely outside of the firms' control

Conclusion

- Banks manage payouts and leverage to achieve optimal long-run book equity scale
- In short-run, bank assets fluctuate as a function of market conditions
  - Net payouts is high in booms
  - Equity issuance only in severe financial crisis
- Book leverage directly managed in a procyclical manner
- Market leverage determined by fluctuations in valuations
- Post-crisis decreases in bank size trend, even relative to GDP trend growth