Securities Portfolio Management in the Banking Sector

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Motivation

- Marketable securities make up 20 percent of the assets of the U.S. banks but we still don't know much about how and why banks manage them relative to other balance sheet items
- We should care about understanding the way banks manage their securities portfolios because:
  1. Directly related to other bank decisions we care about (e.g., lending)
  2. Informative about regulatory constraints and financial frictions
  3. Systemic risk concerns from indirect contagion and fire sales

Summary of Our Analysis and Results

What We Do:

- Measure bank-qtr-level securities buying/selling using publicly available data
- Document stylized empirical facts regarding bank portfolio management
- Establish empirical relationships between selling and bank-level outcomes
- Test mechanisms relied upon in structural models

Summary of key findings:

- Deposit shocks explain majority of securities activity
- Banks only sell securities to meet withdrawals when cash holdings are low
- Less capitalized banks do not sell risky securities upon a funding shock

Data Overview

- FR Y-9C for quarterly BHC-level balance sheet, income statement, and regulatory data
- Our aggregate sample excludes:
  - Consolidated subsidiary BHCs
  - Small BHCs that report semi-annually
  - Nontraditional BHCs
- Regression analysis focuses on large BHCs with over $50 billion in assets:
  - 36 unique BHCs
  - 2001:Q1 – 2019:Q4

Figure: First Page of Schedule HC-B in the FR Y-9C Reporting Form

Schedule HC-B—Securities

	Held-to-Maturity								Available-for-Sale							
	(Column A) Amortized Cost				(Column B) Fair Value				(Column C) Amortized Cost				(Column D) Fair Value			
Dollar Amounts in Thousands	BHCK	Bil	Mil	Thou	BHCK	Bil	Mil	Thou	BHCK	Bil	Mil	Thou	BHCK	Bil	Mil	Thou
1. U.S. Treasury securities	0211				0213				1286				1287			
2. U.S. government agency obligations (exclude mortgage-backed securities):																
a. Issued by U.S. government agencies[1]	1289				1290				1291				1293			
b. Issued by U.S. government-sponsored agencies[2]	1294				1295				1297				1298			
3. Securities issued by states and political subdivisions in the U.S.	8496				8497				8498				8499			
4. Mortgage-backed securities (MBS)																
a. Pass-through securities:																
(1) Guaranteed by GNMA	1698				1699				1701				1702			
(2) Issued by FNMA and FHLMC	1703				1705				1706				1707			
(3) Other pass-through securities	1709				1710				1711				1713			
b. Other mortgage-backed securities (include CMOs, REMICs, and stripped MBS):																
(1) Issued or guaranteed by FNMA, FHLMC, or GNMA	1714				1715				1716				1717			
(2) Collateralized by MBS issued or guaranteed by FNMA, FHLMC, or GNMA	1718				1719				1731				1732			
(3) All other mortgage-backed securities	1733				1734				1735				1736			
5. Asset-backed securities (ABS)	C026				C988				C989				C027			
6. Other debt securities:																
a. Other domestic debt securities	1737				1738				1739				1741			
b. Foreign debt securities	1742				1743				1744				1746			

Note: Picture above from the reporting form used on December 31, 2008.

Computing Bank Selling Outcomes

For a security type i, the transition equations for the AC and FV of a bank j's holdings in their banking book from period $t-1$ to t are

$$AC^{bb}_{j,i,t} = (1 - s^{bb}_{j,i,t}) AC^{bb}_{j,i,t-1}$$
$$FV^{bb}_{j,i,t} = (1 - s^{bb}_{j,i,t})(1 - \Psi^{bb}_{j,i,t}) FV^{bb}_{j,i,t-1}$$

where $s^{bb}_{j,i,t}$ is the net share of the banking book holdings sold during the quarter and $\Psi^{bb}_{j,i,t}$ is net percent decline in the market value of the holdings over the quarter.

Note: We are careful to use the term “net" because we do not and cannot observe gross purchases or sales during the period in the FR Y-9C data.

Computing Bank Selling Outcomes

Expression for net share sold of security type i by bank j in their banking book between $t-1$ and t is

$$s^{bb}_{j,i,t} = \frac{AC^{bb}_{j,i,t-1} - AC^{bb}_{j,i,t}}{AC^{bb}_{j,i,t-1}}$$

and the expression for net percent decline in market value is

$$\Psi^{bb}_{j,i,t} = 1 - \frac{FV^{bb}_{j,i,t}}{(1 - s^{bb}_{j,i,t})FV^{bb}_{j,i,t-1}}$$

Computing Bank Selling Outcomes

Limitation: AC values are only reported separately for securities held on the banking book, not securities held in the trading book.

Solution: Estimate the net share of the holdings in the trading book sold of security type i by bank j using the following expression

$$s^{tb}_{j,i,t} = 1 - \frac{FV^{tb}_{j,i,t}}{FV^{tb}_{j,i,t-1}(1 - \Psi^{bb}_{agg,i,t})}$$

where $\Psi^{bb}_{agg,i,t}$ is the net market price decline computed according to banking book holdings (AC and FV) of security type i aggregated across all BHCs.

Note: We use aggregated data instead of the individual bank's data to avoid the potentially distortive impact of outlier values on the net share sold estimates.

Figures

Computing Amounts Sold

Converted selling to dollar amounts:

$$sold^{bb}_{j,i,t} = s^{bb}_{j,i,t} AC^{bb}_{j,i,t-1}$$
$$sold^{tb}_{j,i,t} = s^{tb}_{j,i,t} FV^{tb}_{j,i,t-1}$$

Sum the banking and trading books subtotals

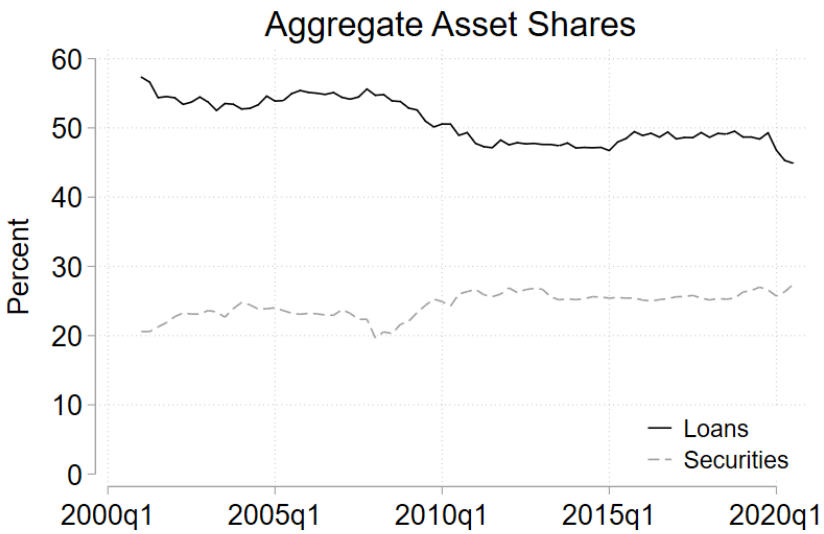
$$sold_{j,i,t} = sold^{bb}_{j,i,t} + sold^{tb}_{j,i,t}$$

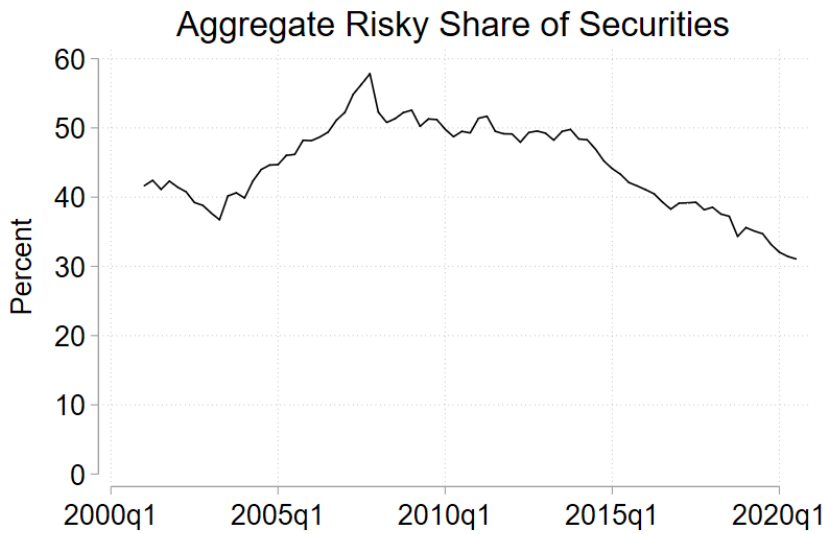
Amounts can be summed across any set of security types for bank j:

$$sold_{j,tot,t} = \sum_i sold_{j,i,t}$$

Unrealized Losses

Bank Holding Companies in Aggregate



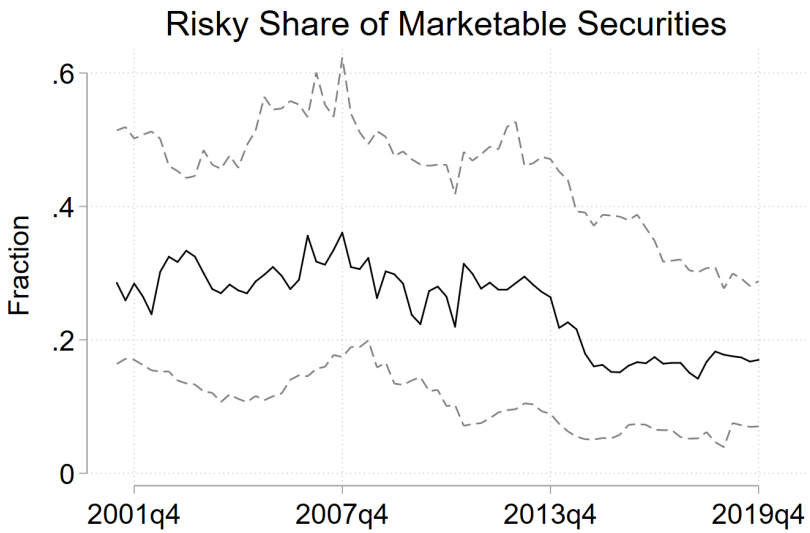


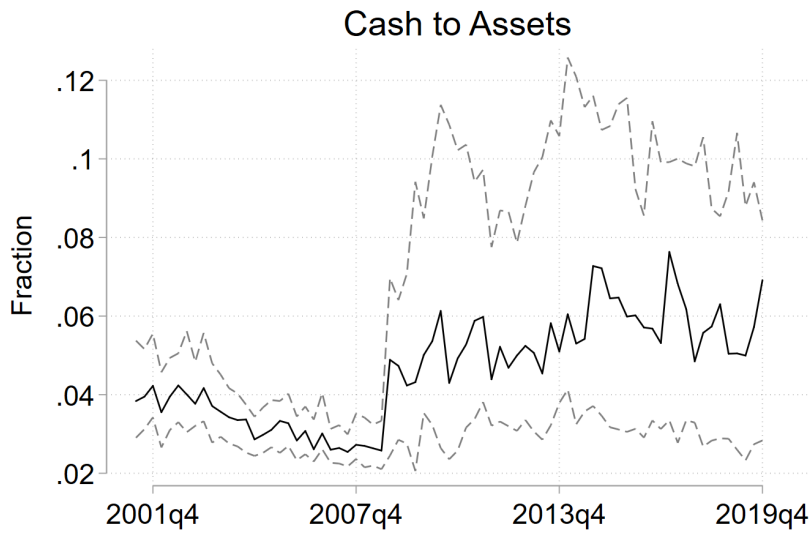
- Around 20% of assets in marketable securities
- 40–60% of marketable securities are risky

Safe securities: U.S. Treasury securities, U.S. government agency obligations, and agency mortgage-backed securities (MBS)

Risky securities: everything else, which include non-agency MBS, asset-backed securities (ABS), corporate debt, structured financial products (SFP), equities, and municipal bonds

Bank Holding Companies in Regression Sample

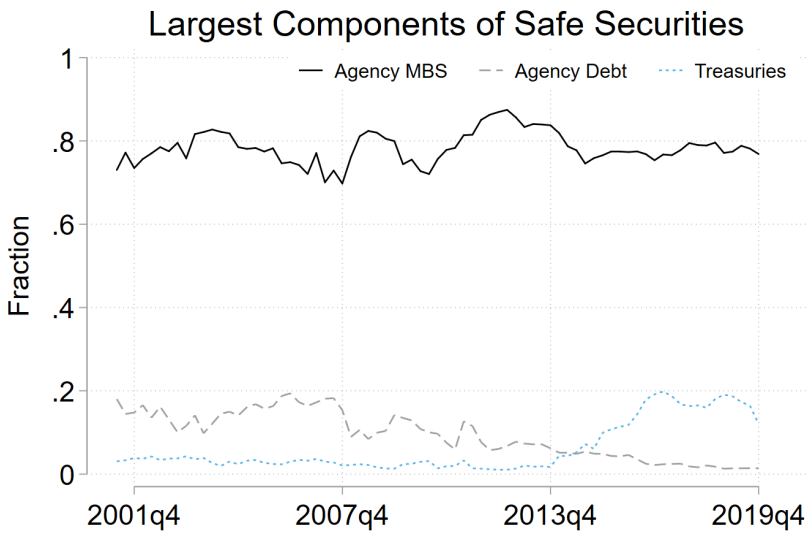


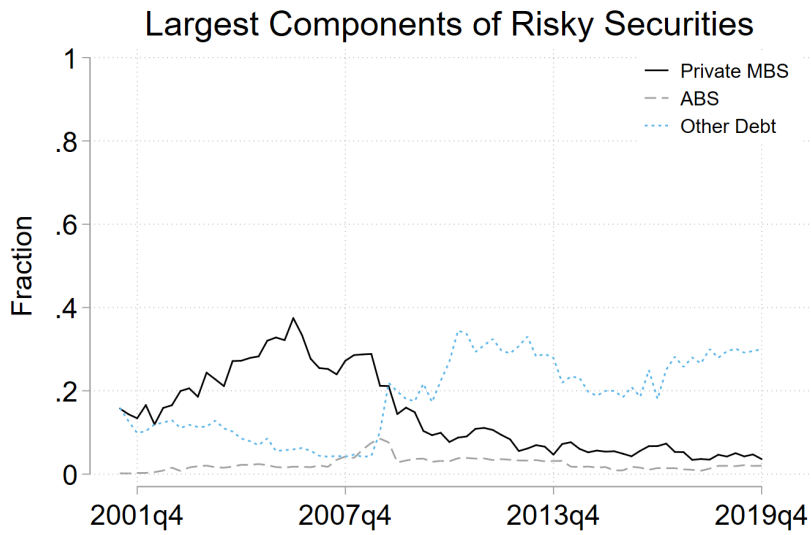


Note: Solid lines are median, dashed lines are 25th/75th percentiles.

- Cross-sectional variations in risky proportions of banks' securities portfolios and relative cash holdings, particularly since GFC

Bank Holding Companies in Regression Sample

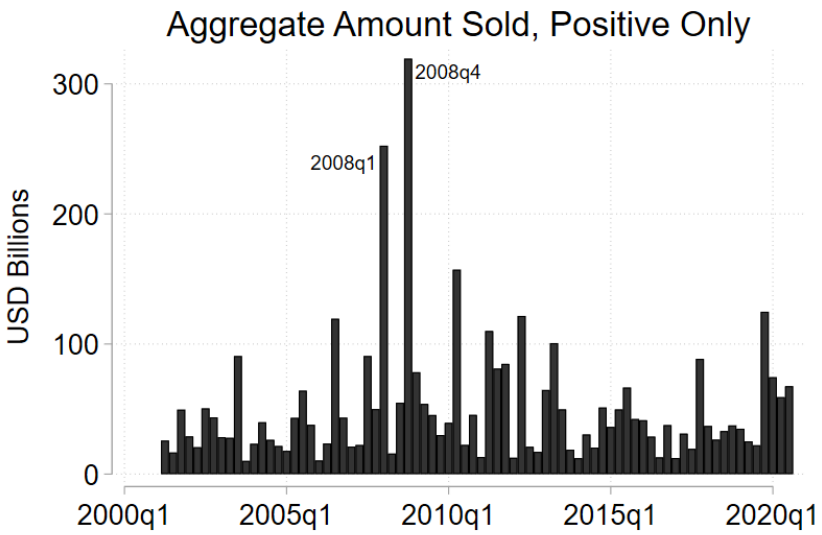


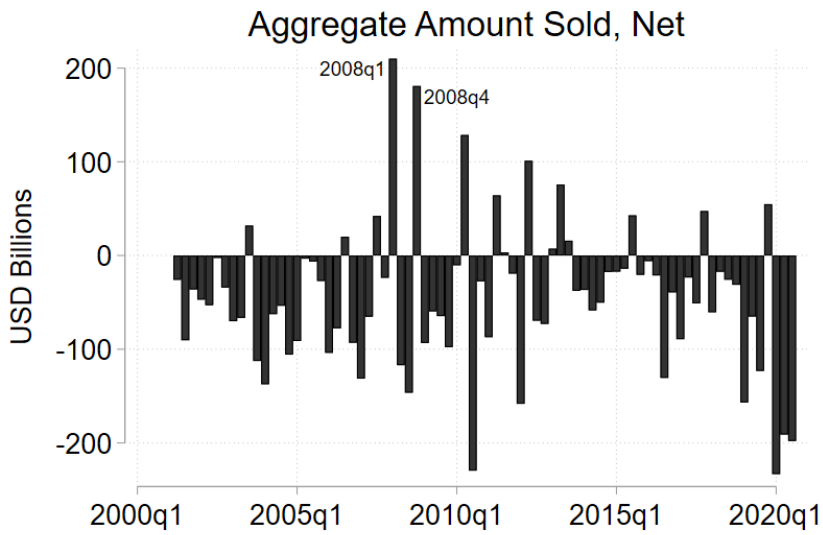


Note: Lines are cross-sectional medians.

- Largest safe security type is agency MBS
- Risky securities mostly private MBS before GFC and "other" debt thereafter

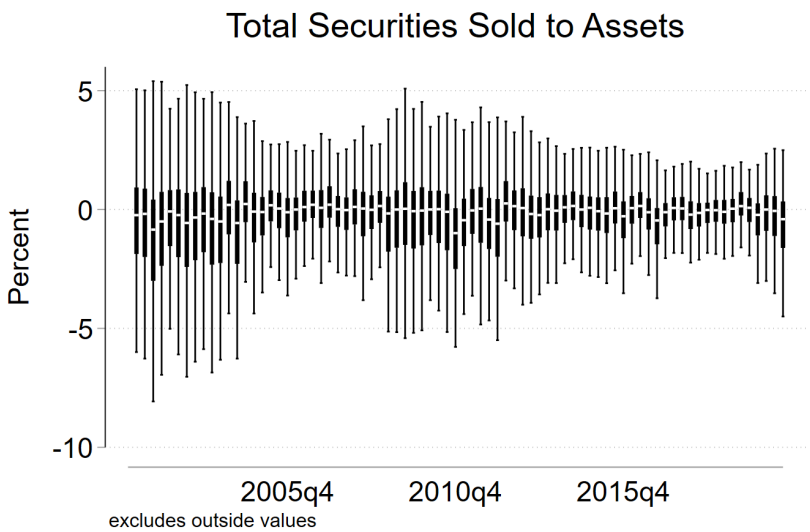
Bank Holding Company Securities Selling in Aggregate

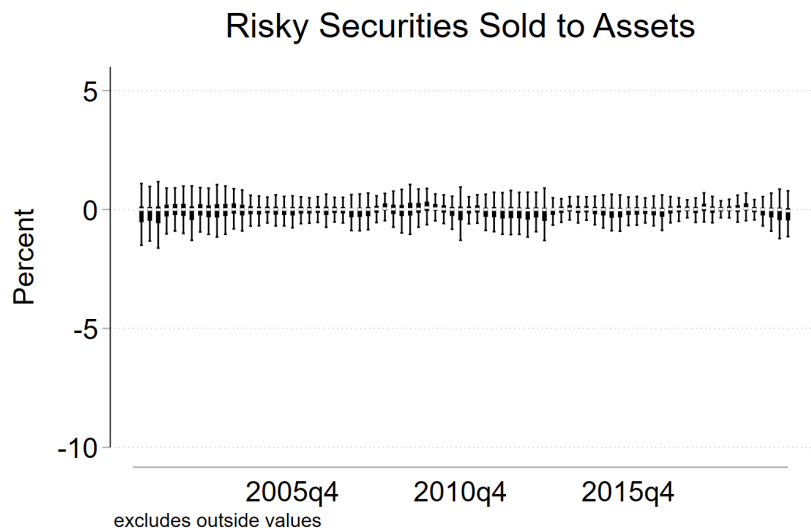




↪ BHCs as a whole tend to be net purchasers of securities

Securities Selling Across Bank Holding Companies





↪ BHCs tend to adjust safe securities holdings (e.g., agency MBS)

Empirical Analysis: Conceptual Framework

Banks makes investment and financing decisions to maximize an objective function subject to constraints including balance sheet identity

$$\Delta Assets = \Delta Debt + \Delta Equity$$

that can be decomposed as follows:

$$\Delta Assets = \underbrace{\Delta Loans + \Delta Cash + \Delta Securities + \Delta OtherAssets}_{Endogenous}$$
$$\underbrace{+\Delta UnusedCommit + NetChargeoff + \Delta SecurityValues}_{\approx Exogenous}$$

$$\Delta Debt = \underbrace{\Delta FFP + \Delta Repo + \Delta OBM}_{Endogenous} + \underbrace{\Delta Deposits}_{\approx Exogenous}$$

$$\Delta Equity = \underbrace{\Delta BusiComb - NetEquityPayout}_{Endogenous} + \underbrace{\Delta RetainedEarnings}_{\approx Exogenous}$$

Bank-Qtr Panel Regression Approach

Divide all variables by $Assets_{j,t-1}$ and then regress endogenous outcomes on the "exogenous" variables

$$\underbrace{y_{j,t}}_{Endogenous} = \beta_1 \Delta Deposits_{j,t} + \beta_2 \Delta UnusedCommit_{j,t} + \beta_3 NetChargeoff_{j,t}$$
$$+ \beta_4 UnrealizedLosses_{j,t} + \beta_5 \Delta EquityFromRE_{j,t} + \epsilon_{j,t}$$

Note: these RHS variables are not highly correlated Table

Summary Statistics for Bank-Qtr Reg Sample

	N	Mean	SD	1%	10%	50%	90%	99%
Securities Purchased	2152	0.52	2.02	-4.86	-1.21	0.18	2.64	9.21
Risky Securities Purchased	2152	0.15	1.05	-3.18	-0.56	-0.00	1.06	5.35
Unreal. Losses Securities	2152	-0.00	0.23	-0.73	-0.27	-0.00	0.26	0.78
New Loans	2152	0.56	4.52	-14.40	-2.73	0.11	3.70	25.69
Δ Unuse. Comm.	2152	0.52	3.63	-16.00	-1.63	0.39	2.73	19.57
Net Chargeoffs	2152	0.12	0.15	-0.00	0.00	0.06	0.30	0.86
New Cash	2152	0.24	2.07	-5.99	-1.64	0.03	2.27	8.76
New Other Assets	2152	0.24	1.63	-4.63	-1.20	0.08	1.70	7.83
Δ Deposits	2152	1.61	4.29	-7.40	-1.77	0.91	5.28	26.97
Δ FFP	2024	-0.01	0.88	-3.36	-0.73	0.00	0.76	3.43
New Other Borrowing	2152	0.21	2.11	-5.92	-1.97	0.05	2.57	8.13
Net Equity Payout	2152	0.00	0.64	-2.62	-0.69	0.10	0.39	2.39
Δ Equity through RE	2152	0.05	0.71	-3.15	-0.76	0.21	0.53	2.37

Note: All variables are computed as percent of $Assets_{t-1}$.

Bank-level Deposit Growth: Systematic vs Idiosyncratic

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Bank-level Deposit Growth		-0.056**			-0.062***		-0.062**
		(-2.42)			(-2.61)		(-2.51)
Agg. Comm. Bank Deposit Growth			0.834***		0.755***		
			(5.06)		(4.51)		
Δ Eff. Fed. Funds Rate				-0.012***	-0.009**		
				(-2.94)	(-2.10)		
Constant	0.022***	0.023***	0.008***	0.022***	0.010***	0.022***	0.023***
	(16.77)	(16.08)	(2.76)	(16.92)	(3.47)	(17.10)	(16.39)
Quarter FE	No	No	No	No	No	Yes	Yes
R^2	0.000	0.003	0.015	0.008	0.021	0.072	0.077
N	2044	2008	2044	2044	2008	2044	2008

↪ Majority of bank-qtr-level variation in deposits are idiosyncratic

↪ Use fitted values and residuals from (5) *at the BHC-level* to measure systematic and idiosyncratic portions Figures

Benchmark Regression Results

	Assets				Debt			Equity
	New Securities	New Loan	New Cash	New OA	New Repo	New FFP	New OBM	NEP
Δ Deposits (Idiosyncratic, Positive)	0.224***	0.909***	0.213***	0.239***	0.030***	-0.005	0.175***	-0.034***
	(9.38)	(9.98)	(8.59)	(11.39)	(3.45)	(-0.44)	(6.73)	(-3.81)
Δ Deposits (Idiosyncratic, Negative)	0.120***	-0.006	0.424***	0.065***	-0.005	-0.065***	-0.116***	0.007
	(3.92)	(-0.15)	(14.06)	(2.63)	(-0.43)	(-4.04)	(-3.40)	(1.03)
Δ Deposits (Systematic)	0.184***	0.191***	0.352***	0.058**	0.002	-0.039***	0.040	-0.011
	(5.11)	(2.73)	(10.80)	(2.34)	(0.18)	(-3.20)	(1.30)	(-1.43)
Δ Unuse. Comm.	0.008	-0.852***	-0.044***	0.010	-0.000	0.000	0.017	0.005
	(0.68)	(-19.77)	(-3.45)	(0.83)	(-0.00)	(0.02)	(1.01)	(1.48)
Net Chargeoffs	-0.168	-3.425***	0.878***	-0.131	-0.169*	-0.353***	-1.677***	-0.092
	(-0.62)	(-6.02)	(3.55)	(-0.60)	(-1.87)	(-3.17)	(-4.96)	(-0.70)
Unreal. Losses Securities	0.498**	-0.008	-0.197	-0.260*	-0.182*	-0.153*	-0.500**	0.269***
	(2.02)	(-0.03)	(-1.20)	(-1.85)	(-1.85)	(-1.77)	(-2.57)	(5.17)
Δ Equity through RE	0.014	-0.109	0.010	-0.027	-0.009	0.015	-0.237***	0.536***
	(0.21)	(-0.94)	(0.17)	(-0.51)	(-0.27)	(0.46)	(-2.88)	(15.22)
Constant	0.001	0.001	-0.002**	-0.000	-0.000	0.000	0.000	0.000
	(1.56)	(0.34)	(-2.45)	(-0.83)	(-0.06)	(0.76)	(0.01)	(1.57)
R^2	0.169	0.594	0.321	0.220	0.016	0.024	0.087	0.355
N	2080	2080	2080	2080	2016	2016	2080	2080

↪ Deposit shocks appear to be important

↪ Asymmetric response to idiosyncratic deposit shock

↪ Less than 20% of securities activity explained by "exogenous" variables $\Longrightarrow$ primarily endogenous choice

Variance Decompositions: Shapley Percentages

	Assets				Debt			Equity
	New Securities	New Loan	New Cash	New OA	New Repo	New FFP	New OBM	NEP
Δ Deposits (Idiosyncratic, Positive)	59.2	48.5	37.7	78.2	62.1	7.8	47.7	4.6
Δ Deposits (Idiosyncratic, Negative)	9.9	1.2	45.3	5.8	2.4	52.3	7.1	0.1
Δ Deposits (Systematic)	23.6	3.1	14.1	6.2	0.9	21.0	6.2	0.2
Δ Unuse. Comm.	5.7	44.3	1.6	9.2	13.7	0.6	17.3	0.2
Net Chargeoffs	0.6	2.8	1.0	0.2	5.5	12.6	17.5	0.4
Unreal. Losses Securities	0.9	0.0	0.0	0.3	15.1	3.8	1.0	1.4
Δ Equity through RE	0.1	0.1	0.3	0.2	0.3	2.0	3.1	93.1
R^2	0.170	0.511	0.273	0.241	0.017	0.026	0.097	0.345
N	2008	2008	2008	2008	1944	1944	2008	2008

↪ Confirm nearly all of explained variation in securities purchases from deposit shocks, mostly positive idiosyncratic

New Securities: Risky vs Safe

	New Securities		
	Any Type	Risky Only	Safe Only
Δ Deposits (Idiosyncratic, Positive)	0.218***	0.058***	0.155***
	(8.71)	(3.70)	(7.52)
Δ Deposits (Idiosyncratic, Negative)	0.127***	0.051***	0.051*
	(3.97)	(2.72)	(1.88)
Δ Deposits (Systematic)	0.236***	0.103***	0.114***
	(5.57)	(4.34)	(3.47)
Δ Unuse. Comm.	0.018	-0.002	0.021*
	(1.23)	(-0.17)	(1.65)
Net Chargeoffs	-0.087	-0.258	0.140
	(-0.32)	(-1.55)	(0.69)
Unreal. Losses Securities	0.312	-0.060	0.398*
	(1.26)	(-0.41)	(1.92)
Δ Equity through RE	-0.018	-0.027	-0.013
	(-0.26)	(-0.62)	(-0.24)
Constant	0.001	0.000	0.001
	(0.64)	(0.20)	(0.79)
R^2	0.170	0.065	0.107
N	2008	2008	2008

↪ Similar deposit-based findings for risky securities but (1) lesser magnitudes and (2) no apparent asymmetry

What factors influence selling decisions?

Bank-specific relative characteristics that may matter:

- Cash holdings
- Equity capital
- Leverage

Regulatory environment as proxied by sub-period:

- 2001–2007: Pre-GFC regulatory regime and credit boom
- 2008–2009: GFC and immediate aftermath
- 2010–2015: Transition to post-GFC regulatory regime
- 2016–2019: "Modern" regulatory regime

Approach: use interaction terms to proxy for partial derivatives. For example:

$$\frac{\partial \Delta Securities_t}{\partial \Delta Deposits_t^- \partial Cash_{t-1}} < 0 \Longrightarrow \underbrace{\beta}_{<0} \Delta Deposits_t^- \times \mathbb{I}_{LowCash,t-1}$$

Impact of Initial Cash Holdings

	(1)	(2)	(3)	(4)
Δ Deposits (Idiosyncratic, Positive)	0.218***	0.191***	0.191***	0.181***
	(8.71)	(5.27)	(7.26)	(4.98)
x Cash Ratio $\leq$ 4%		0.040		0.013
		(0.86)		(0.26)
x Post-2016 Dummy			0.127***	0.077
			(3.01)	(0.72)
x Cash Ratio $\leq$ 4% x Post-2016 Dummy				0.064
				(0.54)
Δ Deposits (Idiosyncratic, Negative)	0.127***	0.067*	0.126***	0.062
	(3.97)	(1.81)	(3.62)	(1.44)
x Cash Ratio $\leq$ 4%		0.178***		0.182***
		(4.04)		(3.56)
x Post-2016 Dummy			0.032	0.049
			(0.72)	(0.97)
x Cash Ratio $\leq$ 4% x Post-2016 Dummy				-0.006
				(-0.07)
Other Exo. Vars	Yes	Yes	Yes	Yes
R^2	0.170	0.178	0.175	0.183
N	2008	2008	2008	2008

↪ Banks primarily sell securities to meet deposit withdrawals only when cash holdings are relatively low

↪ Sensitivities not different in recent period that now features the LCR

Impact of Equity Capitalization (All Securities)

	(1)	(2)	(3)	(4)
Δ Deposits (Idiosyncratic, Positive)	0.218***	0.258***	0.210***	0.248***
	(8.71)	(7.92)	(7.99)	(7.38)
x Cap Ratio $\leq$ 10%		-0.105**		-0.114***
		(-2.47)		(-2.74)
x GFC Dummy			0.063	0.190
			(0.94)	(1.59)
x Cap Ratio $\leq$ 10% x GFC Dummy				-0.108
				(-0.74)
Δ Deposits (Idiosyncratic, Negative)	0.127***	0.129***	0.123***	0.119***
	(3.97)	(3.31)	(3.76)	(3.04)
x Cap Ratio $\leq$ 10%		-0.009		0.005
		(-0.22)		(0.10)
x GFC Dummy			0.017	0.046
			(0.23)	(0.39)
x Cap Ratio $\leq$ 10% x GFC Dummy				-0.074
				(-0.55)
R^2	0.170	0.175	0.171	0.179
N	2008	2008	2008	2008

↪ Less capitalized banks purchase less securities upon deposit inflows

Impact of Capitalization (Risky Securities)

	(1)	(2)	(3)	(4)
Δ Deposits (Idiosyncratic, Positive)	0.058***	0.057***	0.048***	0.049**
	(3.70)	(2.67)	(2.99)	(2.30)
x Cap Ratio $\leq$ 10%		0.003		-0.004
		(0.10)		(-0.13)
x GFC Dummy			0.087*	0.156***
			(1.90)	(2.64)
x Cap Ratio $\leq$ 10% x GFC Dummy				-0.091
				(-1.16)
Δ Deposits (Idiosyncratic, Negative)	0.051***	0.071***	0.049***	0.066***
	(2.72)	(3.17)	(2.58)	(2.87)
x Cap Ratio $\leq$ 10%		-0.067***		-0.061**
		(-2.64)		(-2.20)
x GFC Dummy			-0.004	0.017
			(-0.09)	(0.27)
x Cap Ratio $\leq$ 10% x GFC Dummy				-0.027
				(-0.36)
R^2	0.065	0.069	0.071	0.076
N	2008	2008	2008	2008

↪ Less capitalized banks sell *less* risky securities upon deposit withdrawals

↪ Does not support view that BHCs amplify fire sales in risky securities

Impact of Leverage (All Securities)

	(1)	(2)	(3)	(4)
Δ Deposits (Idiosyncratic, Positive)	0.218***	0.221***	0.210***	0.223***
	(8.71)	(6.27)	(7.99)	(6.35)
x Lev Ratio $\leq$ 10%		-0.014		-0.036
		(-0.31)		(-0.79)
x GFC Dummy			0.063	-0.024
			(0.94)	(-0.15)
x Lev Ratio $\leq$ 10% x GFC Dummy				0.144
				(0.84)
Δ Deposits (Idiosyncratic, Negative)	0.127***	0.206***	0.123***	0.213***
	(3.97)	(5.49)	(3.76)	(5.68)
x Lev Ratio $\leq$ 10%		-0.141***		-0.160***
		(-3.16)		(-3.47)
x GFC Dummy			0.017	-0.037
			(0.23)	(-0.37)
x Lev Ratio $\leq$ 10% x GFC Dummy				0.114
				(0.80)
R^2	0.170	0.175	0.171	0.177
N	2008	2008	2008	2008

↪ Similar to result for less capitalized banks and risky securities, more levered banks do not sell securities to fund deposit withdrawals

Impact of Leverage (Risky Securities)

	(1)	(2)	(3)	(4)
Δ Deposits (Idiosyncratic, Positive)	0.058***	0.033	0.048***	0.027
	(3.70)	(1.51)	(2.99)	(1.26)
x Lev Ratio $\leq$ 10%		0.054*		0.046
		(1.92)		(1.61)
x GFC Dummy			0.087*	0.070
			(1.90)	(0.77)
x Lev Ratio $\leq$ 10% x GFC Dummy				0.010
				(0.10)
Δ Deposits (Idiosyncratic, Negative)	0.051***	0.080***	0.049***	0.084***
	(2.72)	(3.10)	(2.58)	(3.05)
x Lev Ratio $\leq$ 10%		-0.052*		-0.062**
		(-1.86)		(-2.09)
x GFC Dummy			-0.004	-0.037
			(-0.09)	(-0.65)
x Lev Ratio $\leq$ 10% x GFC Dummy				0.067
				(0.83)
R^2	0.065	0.073	0.071	0.079
N	2008	2008	2008	2008

↪ More levered banks do not sell risky securities to fund deposit withdrawals either

Why do banks sell one security type over another?

$$NewSecurities_{jit} = \beta' X_{jit} + \eta_{it} + \eta_{jt} + \epsilon_{jit} \qquad i \in (Risky, Safe)$$

	(1)	(2)	(3)
Securities Type Starting Holding	0.008	0.008	0.008
	(1.48)	(1.47)	(1.47)
Securities Type Price Decline	0.045**	0.036**	0.034*
	(2.19)	(2.03)	(1.83)
Price Decline x Dummy Cap. Ratio $< 10\%$	-0.006		0.005
	(-0.16)		(0.15)
Price Decline x Dummy Cap. Ratio $> 15\%$		0.066	0.068
		(1.12)	(1.14)
Bank-Qtr FE	Yes	Yes	Yes
Sec. Type-Qtr FE	Yes	Yes	Yes
R^2	0.547	0.547	0.547
N	4232	4232	4232

↪ Larger security-type-specific price declines at bank j predict more purchases

↪ Relative capitalization levels do not appear to affect this relationship

Conclusion

What We Do:

- Measure bank-level securities buying and selling activity using publicly available data
- Document stylized empirical facts regarding bank portfolio management
- Establish empirical relationships between selling and bank-level outcomes
- Test mechanisms used in structural models

Summary of key findings:

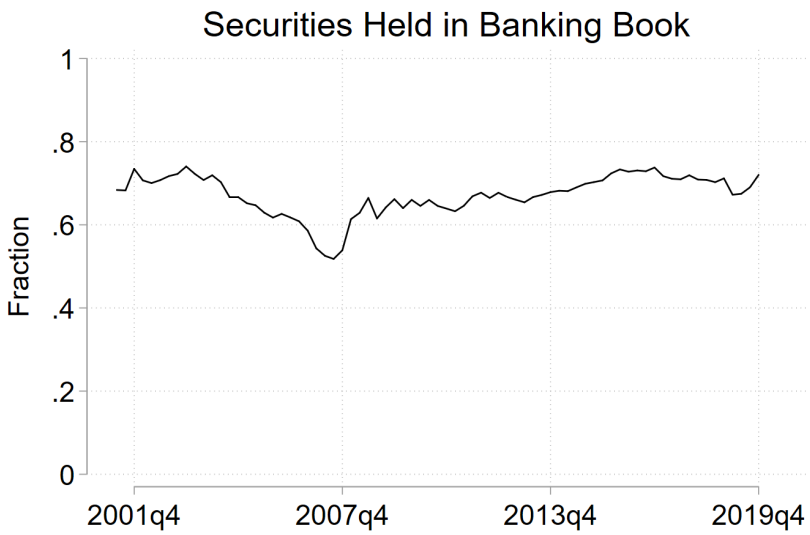
- Deposit shocks explain majority of securities activity
- Banks only sell securities to meet withdrawals when cash holdings are low
- Less capitalized banks do not sell risky securities upon a funding shock

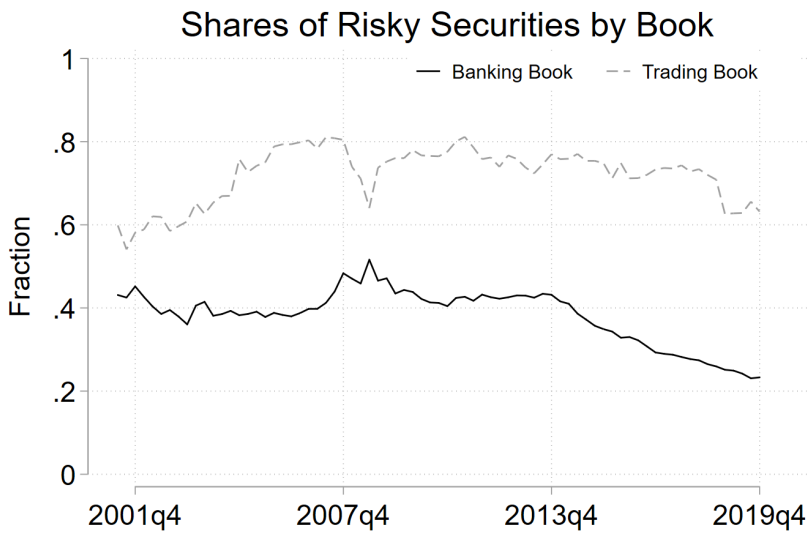
Policy Implications:

- Systemic risk from fire sales by undercapitalized banks may be overstated
- Higher cash balances perhaps induced by current regulatory infrastructure are mitigating securities selling

Thank you!

Banking versus Trading Book: BHCs in Regression Sample





Note: Lines are weighted averages.

- $\approx$ 75% of securities held in banking book
- Risky securities are disproportionately held in trading book

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Computing Unrealized Losses

Compute unrealized losses:

$$unreal^{bb}_{j,i,t} = \left(\frac{\Psi^{bb}_{j,i,t}}{1 - \Psi^{bb}_{j,i,t}} \right) FV^{bb}_{j,i,t}$$

$$unreal^{tb}_{j,i,t} = \left(\frac{\Psi^{bb}_{agg,i,t}}{1 - \Psi^{bb}_{agg,i,t}} \right) FV^{tb}_{j,i,t}$$

Sum the banking and trading books subtotals

$$unreal_{j,i,t} = unreal^{bb}_{j,i,t} + unreal^{tb}_{j,i,t}$$

Amounts can be summed across any set of security types for bank j:

$$unreal_{j,tot,t} = \sum_{i} unreal_{j,i,t}$$

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Correlations Between "Exogenous" Variables

Table: Cross-correlation table

Variables	New Dep.	Chg. Unuse Comm.	NCO	Unreal Loss	Chg. Equity Exo
New Dep.	1.000				
Chg. Unuse Comm.	0.289	1.000			
NCO	-0.079	-0.087	1.000		
Unreal Loss	-0.011	0.033	-0.053	1.000	
Chg. Equity Exo	0.072	0.079	-0.058	-0.089	1.000

↪ Shocks are not very correlated

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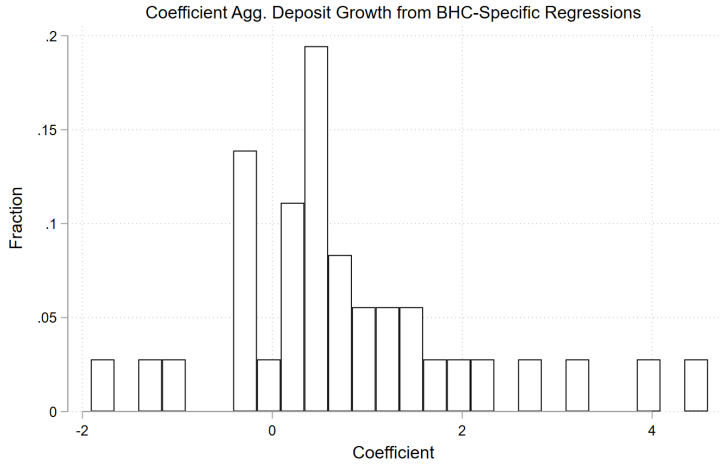
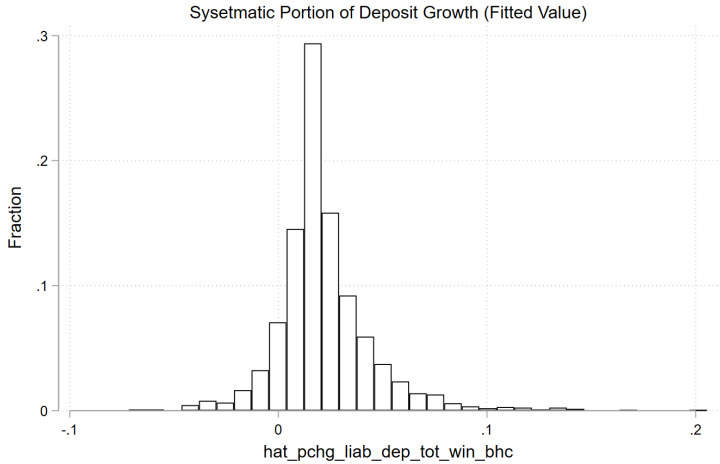
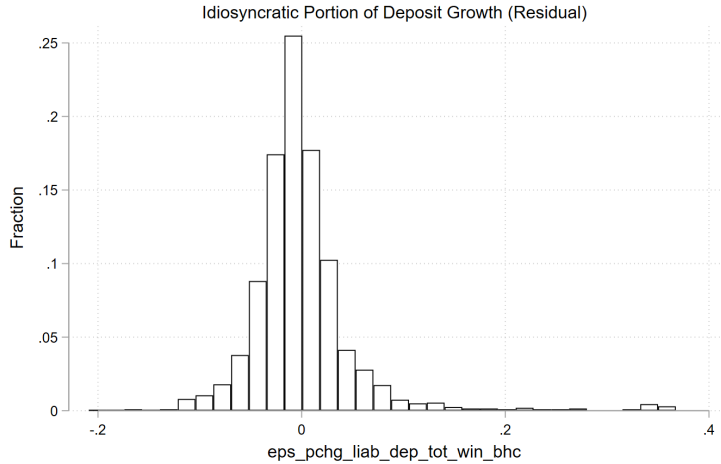
Bank-level Deposit Growth: Systematic vs Idiosyncratic







↪ Cross-sectional variation in agg. deposit growth betas

↪ Cross-sectional variation in portions

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