Risk Shifting and Regulatory Arbitrage: Evidence from Operational Risk

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Introduction

"Given the complexity of today's banking markets and the sophistication of technology that underpins it, it is no surprise that the OCC [Office of the Comptroller of the Currency] deems operational risk to be high and increasing. Indeed, it is currently at the top of the list of safety and soundness issues for the institutions we supervise.

This is an extraordinary thing. Some of our most seasoned supervisors, people with 30 or more years of experience in some cases, tell me that this is the first time they have seen operational risk eclipse credit risk as a safety and soundness challenge. Rising operational risk concerns them, it concerns me, and it should concern you."

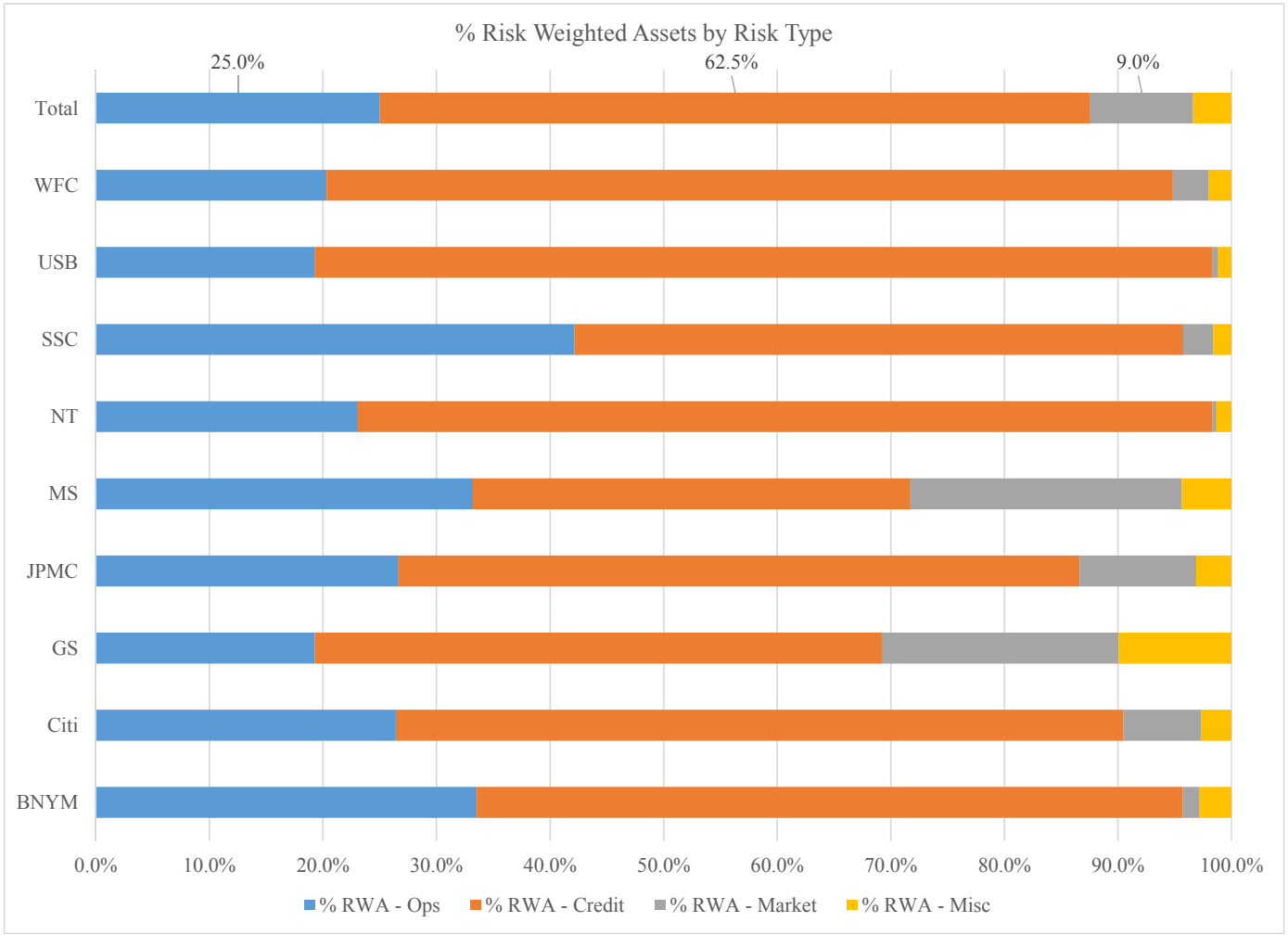
-Thomas J. Curry, Comptroller of the Currency (2012)

Economic Importance of Operational Risk

- Operational risk is defined as the the risk of a loss due to the failure of people or processes (essentially everything outside of credit and market risk)
  - the Boston Consulting Group, 2017 estimates North American and European banks paid $321 billion in fines since the crisis
  - High-profile losses (LIBOR, mortgage foreclosures, cross-selling, London Whale, etc.) led to monetary and non-monetary losses such as Senate hearings

- Operational losses can have consequences well-beyond the financial sector
  - Lax monitoring and controls led to foreclosure problems that affected borrowers
  - Cross-selling scandal impacted thousands of consumers
  - Operational events such as LIBOR and FX manipulation cases have obvious macro consequences

Operational Risk Weighted Assets (as of 2015:Q3)



The Rise of Operational Risk

- Why would banks take on operational risk exposure that carries a positive probability of such large losses?
  - We challenge the view that ops risk management is purely a cost minimization problem
  - Posit that banks have profit motives for taking on ops risk
  - Therefore, when ops risk is expected to yield a higher return relative to other risk types $\Rightarrow$ it is rational to increase exposure to ops risk

- This begs two questions:
  1. [*How*] Can banks profit from operational risk?
  2. What would make the expected return on ops risk attractive relative to other risks (credit, market, etc.)?

1. Can Banks Profit from Operational Risk?

- Why might banks increase exposure to ops risk?
  - Managerial incentives: Chernobai, Jorion, & Yu, 2011 show that short-term incentives increase ops risk
  - Many operational losses are realized with a lag
- Examples:
  - Failure to maintain proper IT infrastructure
  - Cost cutting on employee monitoring: relaxing controls may lead to agency problems within a bank
  - Model risk: Basak & Buffa, 2016 develop a theoretical model whereby banks intentionally take on model risk to save on costly implementation of sound internal models
  - Off-balance sheet exposure: MBS, R&W claims

$\Rightarrow$ Ops risk management is not purely a cost minimization problem and banks may rationally increase exposure to ops risk to increase profits

2. What would make the expected return on ops risk attractive relative to other risks (credit, market, etc.)?

- Under what conditions would ops risk be attractive to banks from a risk vs. return tradeoff standpoint?
- Market friction: regulations
  - Operational risk was largely unregulated prior to Basel II's implementation
  - There was no explicit capital charge required for ops risk in Basel I
  - Thus, if capital charges are costly to banks, it was rational for banks to shift their risk profiles toward ops risk
- This is commonly known as regulatory arbitrage

Risk Shifting and Regulatory Arbitrage

- Why did banks take on so much operational risk in the past decade?
  - Risk shifting
  - Regulatory arbitrage
- Evidence of regulatory arbitrage in other areas:
  - Asset-backed commercial paper (V. Acharya, Schnabl, & Suarez, 2013)
  - Mortgage backed securities (Demyanyk & Loutskina, 2016)
  - Trust-preferred securities (Boyson, Fahlenbrach, & Stulz, 2016)
  - Manufacturing tail risk (V. V. Acharya, Cooley, & Richardson, 2010)
  - CDS (Yorulmazer, 2013)
  - Cross-boarder M&A's (Karolyi & Taboada, 2015)
- Main testable hypothesis: *Capital constrained banks took on operational risk to shift their risk profiles and engage in regulatory arbitrage.*

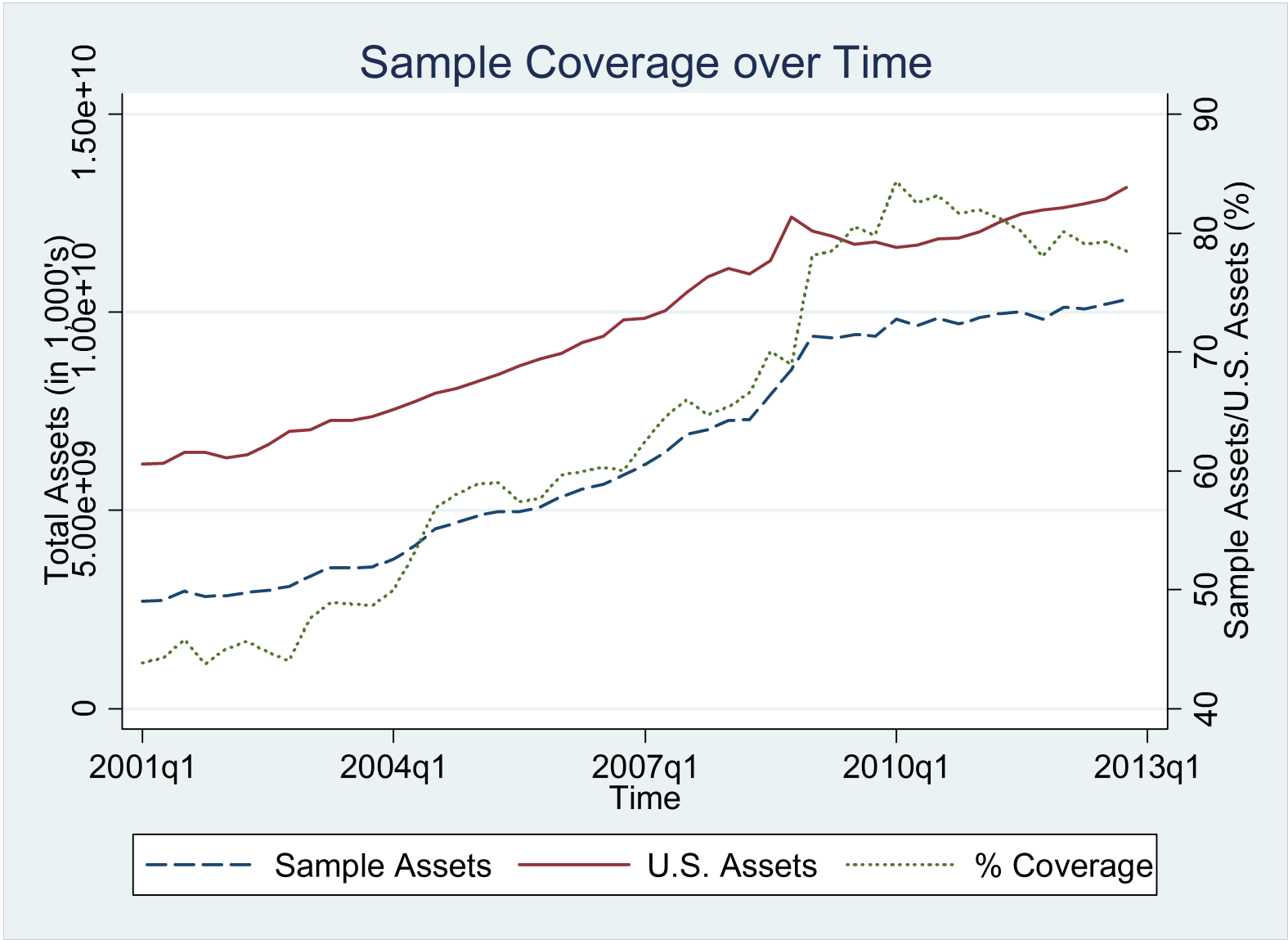
Overview of Our Findings

- We find that capital constrained banks were more likely to take on operational risk
- We identify our tests using a detailed history loss-level operational losses collected by U.S. banks from 2001–2012
- We exploit the fact that operational risk was unregulated under Basel I so banks could shift their risk profiles and take on risk without capital consequences

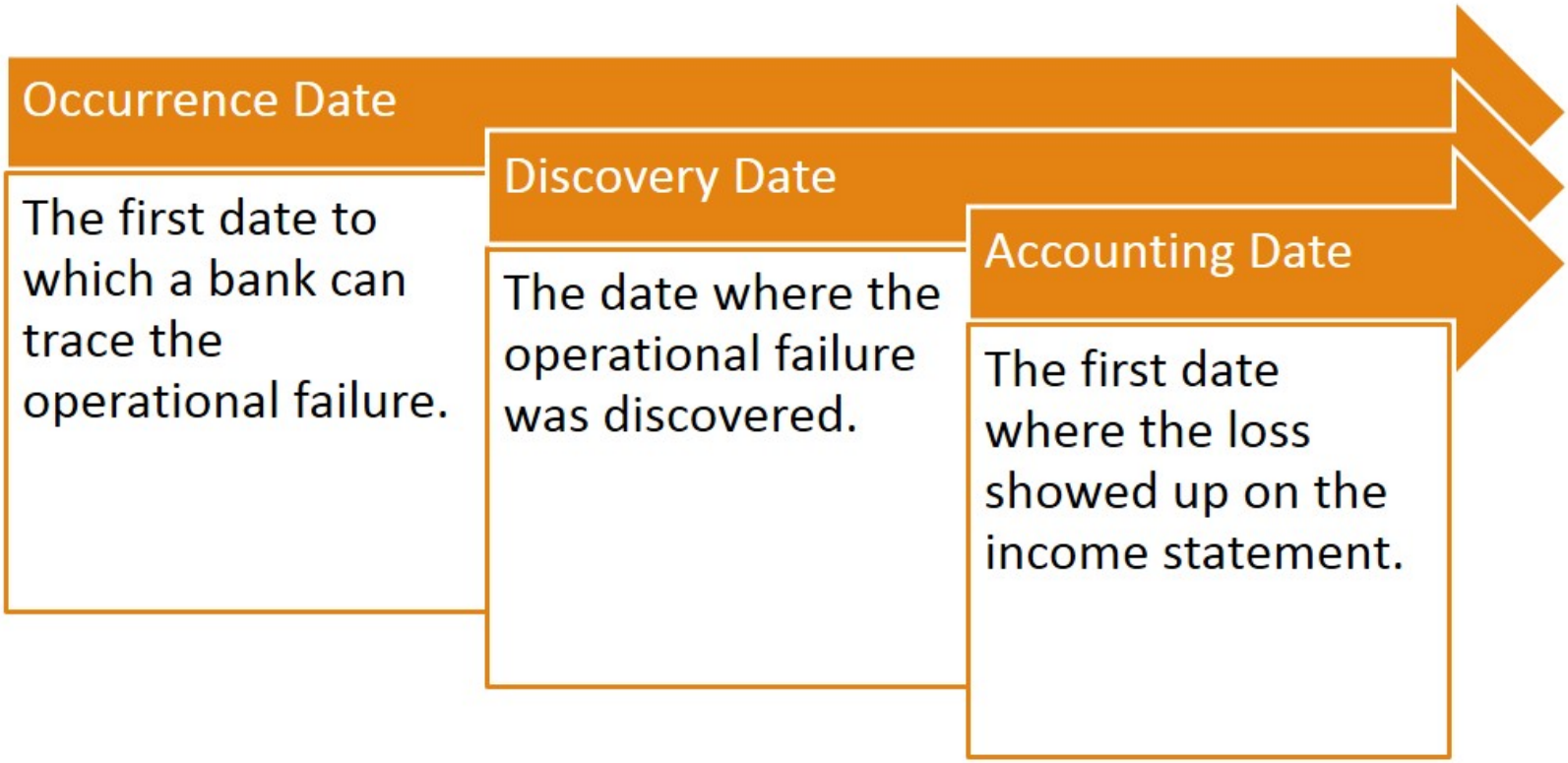
Data

- Federal Reserve's Y-14Q operational loss data
  - 19 BHCs complete ops loss databases
  - We restrict the analysis to 14 U.S. BHCs
  - Unbalanced panel starting in 2001 (main sample spans 2001-2012)
  - 498 bank-quarter observations
  - Drop all losses $< \$20,000$
  - Key features:
    - Losses are reported at the event level
    - Each loss has an occurrence date, discovery date, and accounting date
    - Losses are coded to Basel event types and business lines
- Other data:
  - CRSP/Compustat BHC data
  - Federal Reserve's Y9-C BHC data

Sample Coverage



Operational Loss Data: Dates



Measuring Ops Risk Exposure

- Spread losses over time from the *occurrence date* to the *discovery date* to better proxy for time-varying ops exposure:

  1. *OpsExp_Eq*: Equally weighted operational risk exposure. For this measure, we break up the total loss event amount and allocate it over time such that the total loss amount in each quarter between the loss occurrence and loss discovery date is an equal proportion of total assets while the sum of the quarterly loss amounts is equal to the total loss event amount.

  2. *OpsExp_Cum*: We refer to the second measure as the cumulative operational risk exposure. It captures the cumulative amount of operational risk outstanding over time and is defined as the cumulative sum of the above measure.

$\Rightarrow$ The measures assume that ops losses are proportional to overall exposure and the loss occurrence dates are a reasonable proxy for when banks take on ops exposure

Hypothesis

Poorly capitalized banks have an incentive to shift risk to avoid holding capital. Since operational risk was largely unregulated under Basel I, banks took on large amounts of operational risk to avoid capital charges.

- **Hypothesis**: There is a negative relation between capital adequacy and operational risk.

$$OpsExposure_{it} = \alpha_i + \delta_t + \beta CapitalRatio_{it-1} + \gamma X_{it-1} + \epsilon_{it} \quad (1)$$

where $OpsExposure_{it}$ is the operational loss exposure at bank i in the loss occurrence quarter t and is defined as either $ln\frac{OpsExp\_Eq}{Equity}$ or $ln\frac{OpsExp\_Cum}{Equity}$; α_i are bank fixed–effects; δ_t are year fixed–effects; $CapitalRatio_{it-1}$ is the capital ratio for BHC i at time $t-1$; X_{it-1} are a set of control variables; and ϵ_{it} is the residual.

Operational Loss Amounts by Event Type

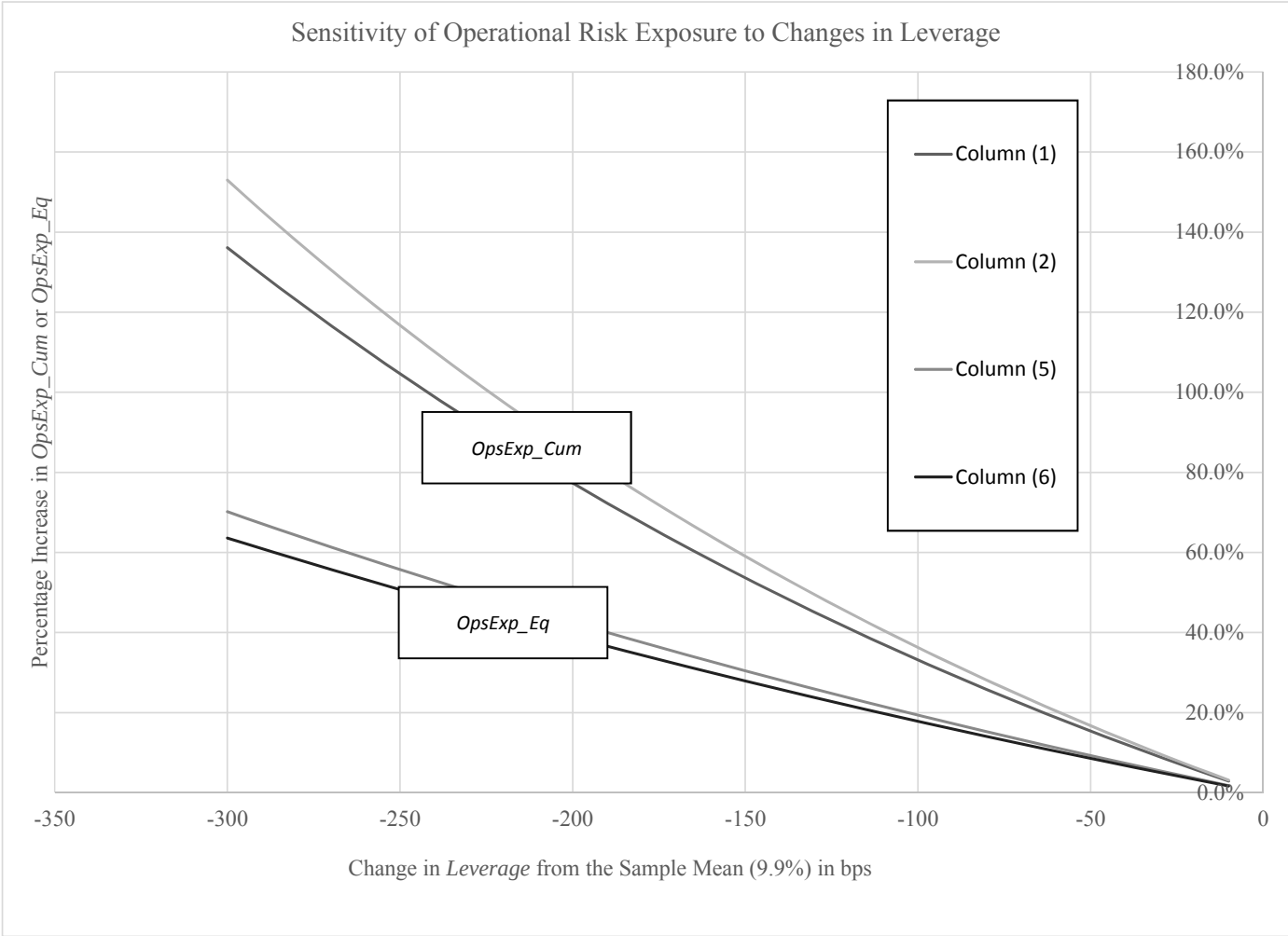
Year	IF	EF	EPWS	CPBP	DPA	BDSF	EDPM
2001	1.0%	2.7%	0.9%	81.1%	13.4%	0.1%	0.8%
2002	0.7%	2.4%	0.9%	90.1%	0.1%	0.2%	5.6%
2003	0.5%	1.1%	1.5%	91.0%	0.1%	0.1%	5.6%
2004	0.5%	0.8%	2.0%	90.8%	0.2%	0.1%	5.5%
2005	0.4%	0.8%	1.4%	92.1%	0.2%	0.1%	5.1%
2006	0.3%	0.9%	1.0%	93.1%	0.0%	0.1%	4.6%
2007	0.1%	0.4%	0.7%	96.4%	0.0%	0.0%	2.3%
2008	1.3%	1.4%	2.2%	84.7%	0.1%	0.3%	10.1%
2009	0.9%	2.9%	2.8%	78.7%	0.0%	0.4%	14.2%
2010	0.7%	1.2%	1.9%	81.6%	0.0%	0.7%	13.9%
2011	0.7%	1.3%	1.6%	84.4%	0.1%	0.4%	11.6%
2012	0.8%	1.1%	1.7%	76.6%	0.4%	0.6%	18.7%
Total	0.7%	1.4%	1.6%	86.7%	1.2%	0.3%	8.2%

Main Results - Level Regressions

	Dependent Variable: $ln\frac{OpsExp\_Cum}{Equity}$				Dependent Variable: $ln\frac{OpsExp\_Eq}{Equity}$			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Leverage_{t-1}$	-30.42***	-32.34**			-20.22**	-18.64**		
	(-3.129)	(-2.902)			(-2.750)	(-2.535)		
$Tier1Ratio_{t-1}$			-13.34*	-18.92**			-15.72**	-16.75**
			(-1.805)	(-2.278)			(-2.935)	(-2.318)
$Size_{t-1}$	0.96*	0.66	0.83	0.53	0.50	0.88	0.52	0.72
	(2.090)	(0.570)	(1.391)	(0.412)	(1.306)	(1.246)	(1.051)	(0.915)
ROA_{t-1}	-0.00	-0.02	-0.04	-0.02	0.00	-0.02	-0.03	-0.02
	(-0.060)	(-0.304)	(-0.586)	(-0.371)	(0.032)	(-0.416)	(-0.722)	(-0.502)
$LoanShare_{t-1}$	0.70	0.85	0.59	0.67	0.64	0.49	0.32	0.26
	(1.137)	(1.190)	(0.940)	(0.933)	(1.458)	(0.947)	(0.662)	(0.553)
$STDebt_{t-1}$	-0.13	-0.18	-0.04	-0.03	0.01	-0.10	-0.07	-0.07
	(-0.309)	(-0.423)	(-0.100)	(-0.077)	(0.059)	(-0.390)	(-0.253)	(-0.259)
$DepositShare_{t-1}$	0.00	0.02	0.06	0.10	-0.07	-0.03	-0.03	-0.00
	(0.039)	(0.233)	(0.779)	(0.771)	(-0.596)	(-0.259)	(-0.414)	(-0.018)
GDP_{t-1}	0.03	0.04	0.00	0.03	-0.02	-0.01	-0.04	-0.01
	(0.336)	(0.782)	(0.045)	(0.610)	(-0.289)	(-0.225)	(-0.592)	(-0.227)
Constant	-2.81**	-4.64*	-4.32***	-4.92*	-5.77***	-5.80***	-5.81***	-5.53***
	(-2.491)	(-1.790)	(-3.274)	(-1.778)	(-5.710)	(-3.179)	(-4.622)	(-3.299)
Constant	-2.86*	-4.18	-4.45**	-4.90*	-5.52***	-5.11**	-5.30***	-4.81***
	(-1.944)	(-1.694)	(-2.999)	(-1.907)	(-4.430)	(-2.785)	(-3.614)	(-3.124)
Observations	449	449	449	449	449	449	449	449
R-squared	0.578	0.588	0.550	0.563	0.494	0.504	0.487	0.499
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
CEO Pay	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Economic Significance



Main Results - Change Regressions

	Dependent Variable: $\Delta ln \frac{OpsExp\_Cum}{X}$				Dependent Variable: $\Delta ln \frac{OpsExp\_Eq}{X}$			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ *Leverage*	-22.81***	-13.93*			-28.36***	-19.47**		
	(-3.151)	(-1.918)			(-3.244)	(-2.251)		
Δ *Tier1Ratio*			-6.70	-2.98			-5.18	-1.47
			(-0.799)	(-0.371)			(-0.488)	(-0.143)
Δ *Size*	-0.05	-0.03	-0.04	-0.02	-0.00	0.02	0.01	0.03
	(-0.914)	(-0.537)	(-0.640)	(-0.357)	(-0.026)	(0.218)	(0.117)	(0.326)
Δ *ROA*	0.05*	0.04	0.03	0.03	0.06*	0.06*	0.04	0.04
	(1.826)	(1.723)	(0.760)	(1.071)	(2.015)	(1.929)	(0.908)	(1.171)
Δ *LoanShare*	-0.01	-0.02	-0.01	-0.02	-0.02	-0.03	-0.02	-0.02
	(-0.384)	(-0.646)	(-0.293)	(-0.512)	(-0.510)	(-0.710)	(-0.286)	(-0.447)
Δ *STDebt*	-0.04	-0.04	0.00	-0.01	-0.06	-0.06	-0.00	-0.02
	(-0.741)	(-0.700)	(0.055)	(-0.213)	(-0.889)	(-0.862)	(-0.078)	(-0.290)
Δ *DepositShare*	0.04	0.05	0.06	0.06	0.07*	0.07*	0.09*	0.09*
	(1.555)	(1.610)	(1.516)	(1.515)	(2.132)	(2.085)	(1.822)	(1.832)
Δ *GDP*	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.03
	(0.361)	(0.307)	(0.315)	(0.290)	(0.404)	(0.359)	(0.386)	(0.366)
Constant	0.50***	0.49***	0.57***	0.54***	0.20	0.19	0.30**	0.26*
	(4.897)	(4.320)	(5.757)	(4.959)	(1.446)	(1.267)	(2.206)	(1.817)
Observations	444	444	444	444	444	444	444	444
R-squared	0.074	0.059	0.055	0.052	0.072	0.060	0.049	0.048
Scaling Variable (X)	Equity	FTE	Equity	FTE	Equity	FTE	Equity	FTE
CEO Pay	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Ops Risk Exposure and Leverage by Quartile of Regulatory Capital

	Dependent Variable: $\Delta ln \frac{OpsExp\_Cum}{X}$		Dependent Variable: $\Delta ln \frac{OpsExp\_Eq}{X}$	
Variables	(1)	(2)	(3)	(4)
Δ $LeverageXRC_1$	-41.22***	-29.18**	-49.44***	-37.40***
	(-4.243)	(-2.628)	(-4.519)	(-3.123)
Δ $LeverageXRC_2$	-54.00***	-47.19***	-66.37***	-59.56***
	(-5.992)	(-4.726)	(-5.832)	(-4.809)
Δ $LeverageXRC_3$	-0.00855	9.263	-2.579	6.693
	(-0.00115)	(1.240)	(-0.299)	(0.765)
Δ $LeverageXRC_4$	-14.32	-8.854	-16.74	-11.27
	(-1.322)	(-0.897)	(-0.986)	(-0.684)
RC_1	0.467***	0.456***	0.202	0.191
	(4.664)	(4.371)	(1.252)	(1.151)
RC_2	0.559***	0.549***	0.251	0.241
	(4.489)	(4.237)	(1.352)	(1.263)
RC_3	0.355	0.355	-0.0151	-0.0153
	(1.765)	(1.709)	(-0.0528)	(-0.0526)
RC_4	0.597**	0.600**	0.357	0.360
	(2.928)	(2.848)	(1.128)	(1.114)
Observations	444	444	444	444
R-squared	0.101	0.087	0.100	0.088
Scaling Variable (X)	Equity	FTE	Equity	FTE
CEO Pay	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Robustness - Placebo Test using Accounting Dates

	Dependent Variable: $\Delta ln \frac{OpsExp\_Accounting}{X}$			
Variables	(1)	(2)	(3)	(4)
Δ *Leverage*	-6.69	2.19		
	(-0.605)	(0.204)		
Δ *Tier1Ratio*			-11.49	-7.77
			(-1.308)	(-0.898)
Δ *Size*	0.13*	0.14**	0.11*	0.13*
	(2.050)	(2.283)	(1.839)	(2.144)
Δ *ROA*	0.14	0.14	0.14	0.14
	(1.565)	(1.554)	(1.608)	(1.648)
Δ *LoanShare*	0.01	-0.00	-0.01	-0.01
	(0.174)	(-0.005)	(-0.126)	(-0.292)
Δ *STDebt*	-0.06	-0.06	-0.06	-0.07
	(-0.737)	(-0.702)	(-0.792)	(-0.990)
Δ *DepositShare*	0.10	0.10	0.10	0.10
	(0.899)	(0.961)	(0.974)	(0.939)
Δ *GDP*	0.15	0.14	0.14	0.14
	(1.676)	(1.644)	(1.615)	(1.593)
Constant	0.82*	0.81*	0.81*	0.77
	(1.868)	(1.794)	(1.866)	(1.724)
Observations	444	444	444	444
R-squared	0.057	0.058	0.059	0.059
Scaling Variable (X)	Equity	FTE	Equity	FTE
CEO Pay	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Robustness - Duration of Operational Events

$$Duration_{it} = \frac{\sum_{j=1}^{n} t_j \frac{OpsLoss_j}{(1+r)^{t_j}}}{\sum_{j=1}^{n} \frac{OpsLoss_j}{(1+r)^{t_j}}} \quad (2)$$

Variables	(1)	(2)	(3)	(4)
$Leverage_{t-1}$	-24.98**		-21.32**	
	(-2.253)		(-2.393)	
$Tier1Ratio_{t-1}$		-5.56		-6.84
		(-1.104)		(-1.158)
$Size_{t-1}$	1.01	1.03	0.70	0.69
	(1.150)	(1.045)	(0.748)	(0.669)
ROA_{t-1}	0.08	0.07	0.08	0.08
	(1.356)	(1.084)	(1.383)	(1.149)
$LoanShare_{t-1}$	0.07	0.12	0.32	0.32
	(0.133)	(0.180)	(0.534)	(0.458)
$STDebt_{t-1}$	-0.30	-0.10	-0.19	-0.04
	(-0.786)	(-0.280)	(-0.679)	(-0.134)
$DepositShare_{t-1}$	0.08	0.16	0.02	0.08
	(0.568)	(1.211)	(0.100)	(0.692)
GDP_{t-1}	0.13	0.12	0.12	0.12
	(1.712)	(1.556)	(1.588)	(1.499)
Constant	9.38***	7.72**	6.83***	5.67**
	(4.259)	(2.813)	(3.157)	(2.206)
Observations	445	445	445	445
R-squared	0.466	0.438	0.490	0.470
CEO Pay	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Summary

- Main finding:
  - Strong and robust negative relation between operational risk exposure and leverage
- Interpretation:
  - Capital-constrained banks took on operational risk as a form a regulatory arbitrage

References I

Acharya, V., Schnabl, P., & Suarez, G. 2013. Securitization without risk transfer. *Journal of Financial Economics*, *107*, 515-536.

Acharya, V. V., Cooley, T., & Richardson, M. 2010. *Manufacturing tail risk: A perspective on the financial crisis of 2007-2009*. Now Publishers Inc.

Basak, S., & Buffa, A. M. 2016. A theory of operational risk. *Available at SSRN 2737178*.

Boyson, N. M., Fahlenbrach, R., & Stulz, R. M. 2016. Why don't all banks practice regulatory arbitrage? evidence from usage of trust-preferred securities. *The Review of Financial Studies*, *29*(7), 1821. Retrieved from +http://dx.doi.org/10.1093/rfs/hhw007 doi: 10.1093/rfs/hhw007

Chernobai, A., Jorion, P., & Yu, F. 2011. The determinants of operational risk in us financial institutions. *Journal of Financial and Quantitative Analysis*, *46*(06), 1683–1725.

References II

Demyanyk, Y., & Loutskina, E. 2016. Mortgage companies and regulatory arbitrage. *Journal of Financial Economics*, *122*, 328–351.

Karolyi, G. A., & Taboada, A. G. 2015. Regulatory arbitrage and cross-border bank acquisitions. *The Journal of Finance*, *70*(6), 2395–2450.

the Boston Consulting Group. 2017. Staying the course in banking. *Global Risk*.

Yorulmazer, T. 2013. Has financial innovation made the world riskier? cds, regulatory arbitrage and systemic risk. *CDS, Regulatory Arbitrage and Systemic Risk (April 23, 2013)*.