

# Bank Leverage Limits and Regulatory Arbitrage: New Evidence on a Recurring Question

Dong Beom Choi   Michael R. Holcomb   Donald P. Morgan

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Paul Volker (1987):

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Fed Vice-Chair Quarles (2018):

. . . a leverage requirement that is too high favors high-risk activities and disincentivizes low-risk activities

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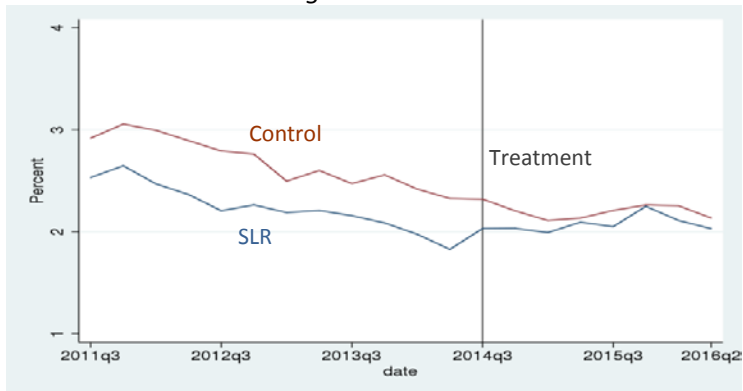
# Supplementary Leverage Ratio

$$SLR = \frac{\textit{tier 1 capital}}{\textit{total leverage exposures}} > k$$

- Motivated by “model error” concerns with in RBC
- Timeline
  - 2010: Basel proposes LR
  - 2012: US version-SLR- proposed
  - 2014q3: SLR finalized (treatment)
  - 2015: public disclosure
  - 2018: effective/compliance

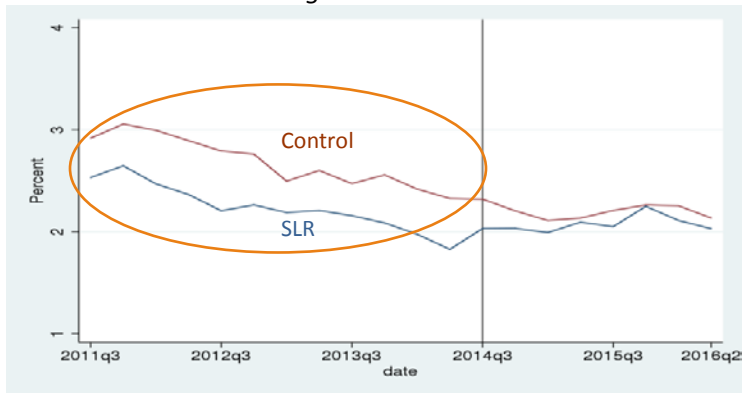
# Diff-in-Diff & Reach for Yield

*Average Securities Yield*



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Parallel before (SLR lower) ...

# Diff-in-Diff & Reach for Yield

*Average Securities Yield*



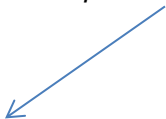
... SLR rising after (data quarter end)

## Difference-in-Difference: Detail

$$Risk_{bt} = \alpha + \beta * SLR_b * Post_t + \gamma * C_{bt-1} + FE + \varepsilon_{bt}$$

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- 15 SLR v 18 next largest banks (\$50b - \$250b)
- Similarly (*not* identically) regulated otherwise
  - all CCAR banks

## Difference-in-Difference: Detail

$$Risk_{bt} = \alpha + \beta * SLR_b * Post_t + \gamma * C_{bt-1} + FE + \varepsilon_{bt}$$

Log(assets)

RBC capital (T1/RWA)

Liquidity stress ratio (FRBNY)

Proxy for liquidity rule exposure (LCR)

Stricter rule for SLR banks may attenuate SLR effect

## Difference-in-Difference: Detail

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Bank & year-quarter FE  
Bank clustered SE



## Difference-in-Difference: Detail

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1. Risk-weighted asset shares (RWA/A)

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1. Risk-weighted asset shares (RWA/A)
2. Security yields (novel)
  - holdings from Y-14; match with yields
  - portfolio & bank x security level

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## Finding 1 : Higher RWA/A

Table 2: Difference-in-Differences in Risk-weighted Asset Shares

	(1)	(2)	(3)	(4)
	Total Assets	Securities	Trading Assets	Loans
SLR Bank $\times$ Post	3.14** (1.22)	5.42** (2.63)	6.52 (5.06)	0.07 (1.51)
Observations	684	684	634	684
R-Squared	0.97	0.66	0.78	0.91

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Shift in more liquid assets e.g. securities ...

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... no shift in loans. Less liquid, less “shifty”?

## Finding 1: Magnitudes

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5% of pre-mean

25% of pre-mean

Substantial (relative) effects

## Finding 1: Larger Effect for SLR Tighter?

Table 3: Difference-in-differences in Risk-Weighted Asset Shares by SLR “Tightness”

	(1) Total Assets	(2) Securities	(3) Trading Assets	(4) Loans
SLR Tighter × Post	5.31*** (1.30)	5.90* (2.97)	4.15 (4.38)	0.07 (3.23)
SLR Looser × Post	1.31 (1.37)	5.00* (2.64)	8.34 (7.13)	0.06 (0.85)
Observations	684	684	634	684
R-Squared	0.97	0.66	0.78	0.91
F-test p-value	0.01	0.65	0.56	1.00

SLR slack above/below median in 2013



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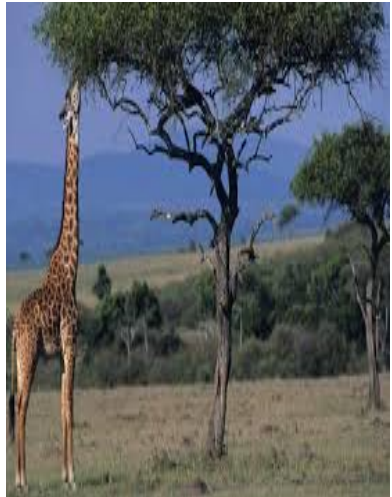
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Mixed: yes overall; no for securities

## Finding 2: Reach for Yield

- Yields immune to concerns model error with risk weights
- Estimate same models, with portfolio yields



## Finding 2: Reach for Yield

Table 6: Difference-in-differences in Weighted Average Yield of the Securities Portfolio

	(1)	(2)
SLR Bank $\times$ Post	0.34** (0.15)	
SLR Tighter $\times$ Post		0.42* (0.24)
SLR Looser $\times$ Post		0.26 (0.16)
Observations	467	467
R-Squared	0.85	0.85
F-test p-value		0.55

34 bp (relative) increase in mean portfolio yields

## Finding 2: Reach for Yield

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Only significant at more constrained SLR banks

... but can't reject equivalence

## Placebo and Robustness

Are we conflating SLR with other big bank regulation (CCAR, LCR, NFSR, GSIB... )?

Pervasive concern since many reforms conterminous

Placebo/robustness tests for some reassurance  
not picking up other sized-based regulatory effects

## Placebo and Robustness Tests

Size placebo: assets > median; assets  $\in$  [\$10 – \$50bn]

Dodd Frank placebo: 2010q3

Null effects (no diff-in-diff) for both

## Placebo and Robustness Tests

Include *post*  $\times$  *log(assets)*

Tough test: SLR treatment largely function of size

## Placebo and Robustness Tests

Include *post*  $\times$   $\log(\text{assets})$

	(1)	(2)	(3)	(4)	(5)
	Total Assets	Securities	Trading Assets	Loans	Securities Yield
SLR Bank $\times$ Post	1.22 (1.59)	4.18* (2.09)	2.81 (7.87)	-0.58 (1.70)	0.35 (0.21)
Observations	684	684	634	684	467
R-Squared	0.97	0.66	0.78	0.91	0.86

Robust...



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Estimate nearly identical but insignificant

## Finding 3: Active Arbitrage

Adding riskier assets or just shedding safe ones?

As act of commission, active arbitrage indicative of culture

Answer not obvious; some banks arbitrage less than others all (Boyson, Fahlenbrach, Stulz 2016)

## Finding 3: Active Arbitrage

Study holdings of same security by different banks

$$H_{sbt} = \alpha + \beta * SLR_b * Post_t * HY_{st} + \dots$$



Log(holding of s by b at t)



1 if s yield in top quartile at t (or t-1)

## Finding 3: Active Arbitrage

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$$H_{sbt} = \alpha + \beta * SLR_b * Post_t * HY_{st} \\ + \gamma * C_{bt-1} + \alpha_b * \alpha_s + \alpha_b * \alpha_t + \varepsilon_{sbt}$$

$\beta$  identified by changes in high yield holdings only

Passive only (shedding low yield) implies  $\beta = 0$

## Finding 3: Active Arbitrage

SLR Bank $\times$ Post $\times$ High Yield	0.028*	0.074***		
	(0.016)	(0.016)		
SLR Tighter $\times$ Post $\times$ High Yield			0.080***	0.132***
			(0.026)	(0.027)
SLR Looser $\times$ Post $\times$ High Yield			0.005	0.038***
			(0.014)	(0.014)
Security, Bank, Time FE	Yes	No	Yes	No
Bank $\times$ Security FE	No	Yes	No	Yes
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Observations	————— 748377 —————			
R-Squared	0.996	0.996	0.996	0.996
F-test p-value			0.001	0.000

Reject “passive” only

### Finding 3: Active Arbitrage

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SLR tighter banks more active

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## Epilogue: Higher Overall Risk?

Examine overall risk measures (book and market)

- Z-score
- CD spreads
- Volatility
- Put option delta



## Epilogue: Higher Overall Risk?

	Zscore	Equity Volatility	5-year CDS Spread	Implied Vol.	Put Option Delta
SLR Bank $\times$ Post	-21.97 (35.31)	-0.11 (0.08)	0.40* (0.20)	1.28 (1.47)	-0.01 (0.00)
Observations	550	500	492	487	487
R-Squared	0.46	0.89	0.76	0.88	0.95

Mostly not ...

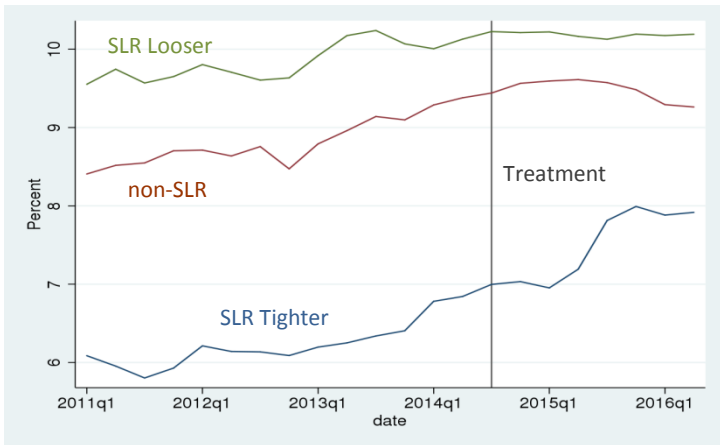
## Epilogue: Higher Overall Risk?

... or not where expected

	Zscore	Equity Volatility	5-year CDS Spread	Implied Vol.	Put Option Delta
SLR Tighter $\times$ Post	-43.48 (30.42)	-0.23*** (0.08)	0.26 (0.23)	0.94 (1.62)	-0.00 (0.00)
SLR Looser $\times$ Post	-3.99 (43.98)	-0.04 (0.08)	0.51** (0.21)	1.52 (1.54)	-0.01* (0.00)
Observations	550	500	492	487	487
R-Squared	0.46	0.89	0.77	0.88	0.95
F-test p-value	0.25	0.04	0.21	0.62	0.30

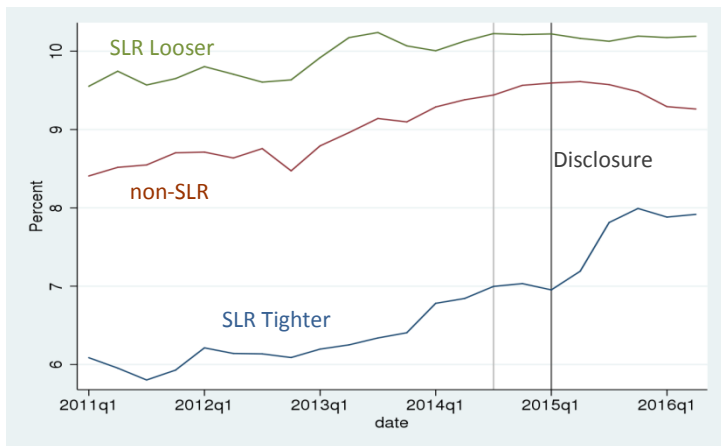
# More Constrained Banks Increase Leverage Capital

## Mean Leverage Ratio



## ... at Disclosure Date

### Mean Leverage Ratio



Higher Leverage Capital Offset Riskier Assets?

## Conclusions and Implications

Banks appear to *actively* arbitrage leverage rules

- extends evidence of passive arbitrage in repo

Rule had unintended but not perverse consequence

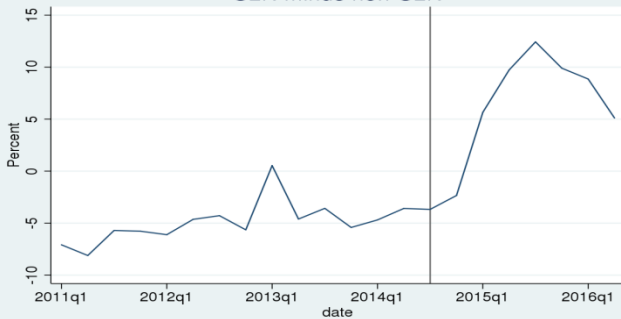
- overall risk not higher

Caveats:

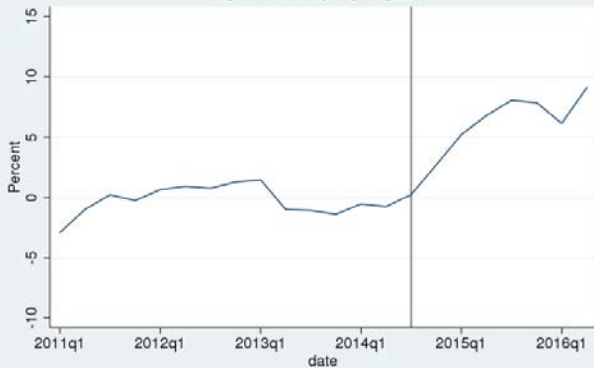
- effects not always strongest where expected
- may conflate effects of other reforms ...*incent* risk

Design regulations expecting “full on” arbitrage

Risk-Weighted Trading Assets Share,  
SLR minus non-SLR

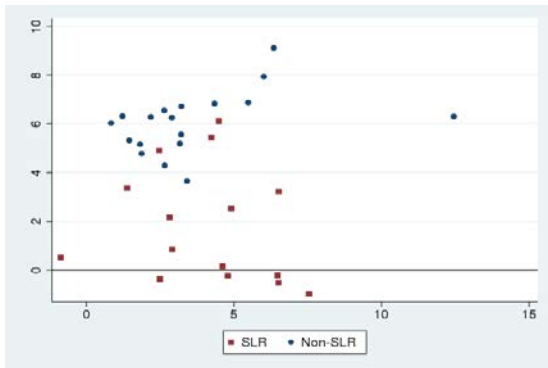


Risk-Weighted Securities Share,  
SLR minus non-SLR



# Leverage Limit More Binding for Some Banks

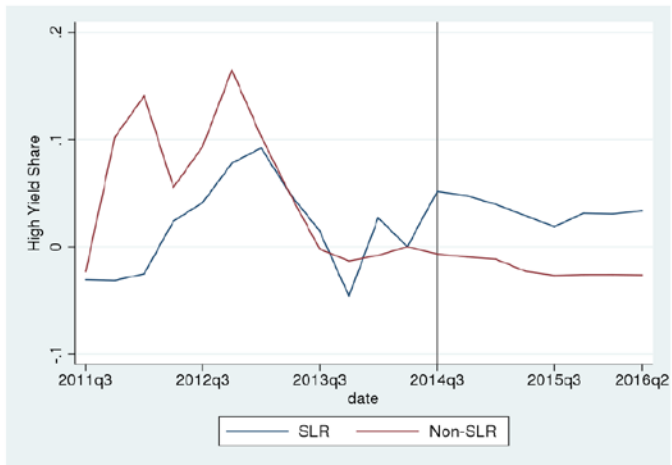
Slack in percentage points at 2013:Q4



Risk-based capital Slack



Figure 4: Share of High Yield Securities Holdings for SLR and Non-SLR Banks



## Reference slides

- not only shedding safe (repo) assets  
Allahrakha et al. (2016), Bicu et al. (2017), Kotidis  
and Van Horen (2018), Bucalossi and Scalia (2016)

## ...Not Even at More Constrained SLR Banks

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