

Lending to Hedge Funds: Does Competition Erode Risk Management?

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Motivation: Repercussions of hedge funds' defaults

Long-Term Capital Management (LTCM), 1998

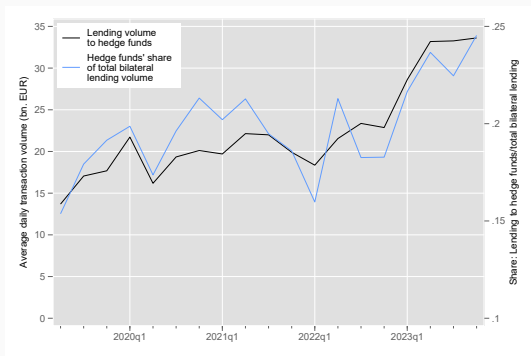
- Highly leveraged hedge fund experienced significant losses during the Russian financial crisis.
- Fed organized a rescue package of \$3.6 bn. from 14 banks.

Archegos Capital Management, 2021

- Family office but strategies akin to those of hedge funds.
- Losses over \$10 bn. for banks worldwide. [Details](#)
- Archegos default resulted in \$5.5 bn. losses for Credit Suisse, stock price decline of more than 20%.

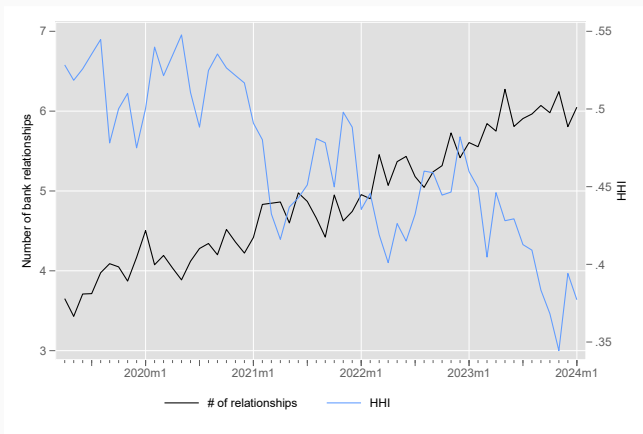
Trend: Growth of NBFIs and especially of hedge funds

- Growing interconnectedness between banks and NBFIs (Acharya, Cetorelli, and Tuckman, 2024)
- Hedge fund industry more than tripled within a decade to \$4.8 tn. AUM in 2022



Trend: Evolving bank-hedge fund relationship

- Worldwide: Hedge funds with multiple prime brokers: 2016: 10%, 2021: 45%. (Dahlquist, Rottke, and Sokolovski, 2024)
- Similar trend in Euro area:



Research question

Trends:

- Increasing interconnectedness: banks and hedge funds.
 - Hedge funds have expanded the number of banks they engage with.
- Concern: Market power may compromise banks' risk management (Bernanke, 2006; FSB, 2024)

Anecdotal evidence: Independent investigation report on Credit Suisse [CS] and Archegos: *“In its negotiations with CS, Archegos told [...] that [...] other prime brokers had more favorable margin rates [...]. In an effort to offer a competitive rate [...] CS agreed to a significant change”*

This paper: How does the greater bargaining power of hedge funds impact risk management measures (haircuts) of banks?

The paper in a nutshell

Setting:

- We analyze haircuts (initial margins), designed to address market and liquidity risk, as a function of market power.
- Data: MMSR. Comparison of identical repo transactions.

Findings:

1. **Higher bargaining power reduces haircuts.**
 - Regression: Identified within bank, collateral, and date
 - Quasi-natural experiment: Exogenous shock to bargaining power (Credit Suisse's exit from prime brokerage)
2. **Higher bargaining power increases the risk that haircuts are insufficient to cover large but plausible price fluctuations.**

Literature & Contribution

Data and institutional background

- **Banks' lending to hedge funds**

1. Money market transactions of Euro area banks (MMSR)
⇒ lender (bank), borrower (hedge fund), collateral, haircut
2. Credit registry of Euro area banks (AnaCredit)
⇒ probability of default

- **Hedge funds**

- SEC Form ADV (from IAPD) ⇒ AUM, broker information

- **Banks**

- Bank balance sheet data (EBA transparency exercise)

- **Collateral**

- Rating, maturity, and issuer information (CSDB)
- Price information (Refinitiv)

- **Repo transactions:** Background
Banks lending cash against collateral to hedge funds, overnight tenor.
- **14 Euro area banks** lending to hedge funds
- **179 hedge funds**
 - Almost exclusively domiciled in Cayman, while management is predominantly in the US or UK
 - On average: \$20 bn. AUM; 4 brokers; PD of 1.5% (B+)
- **Collateral:** 90% government bonds; 40% high-grade

Bank/Hedge funds: stats

Collateral: by issuer/rating

Collateral: by country

SD: haircuts

Costs and benefits of multiple broker relationships

- **Benefits of multiple relationships:**
 - Diversification of funding and increased bargaining power.
 - **Costs associated with establishing new/maintaining existing relationships:**
 - Extensive and time-consuming onboarding processes.
 - Increased requirements for counterparty risk monitoring and management.
 - Greater operational complexity due to integration with order and portfolio management systems.
 - Minimum volume commitments.
 - Heightened risk of information leakage.
- ⇒ These frictions effectively limit the number of broker relationships a hedge fund can establish.

Saturated regression

Empirical specification

$$\begin{aligned} \text{Haircut}_{I(bfct)} &= \beta \text{BargainingPower}_{ft} \\ &+ \gamma PD_{bft-1m} + \alpha_{bct} + \varepsilon_{I(bfct)} \end{aligned} \quad (1)$$

- $\text{Haircut}_{I(bfct)}$: haircut (%) applied by bank b for collateral c in a repo transaction with hedge fund f at date t
- $\text{BargainingPower}_{ft}$: # banking relationships of hedge fund f at date t based on the previous month.

Multiple banking relationships \rightarrow greater bargaining power (sequential competition) (Duffie, Gârleanu, and Pedersen, 2005).

- α_{bct} : bank-collateral-date FEs .
- PD_{bft-1m} : probability of default of hedge fund f reported by bank b in the previous month $t - 1m$ (1 year horizon).

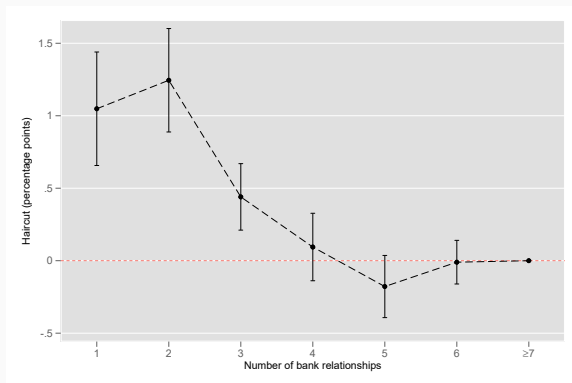
Effect of bargaining power on haircuts

Dependent variable: Haircut (%)	(1)	(2)	(3)
Bargaining power	-0.19*** (-4.81)	-0.20*** (-4.36)	-0.20*** (-3.71)
PD	17.60** (1.99)	19.56* (1.83)	20.69 (1.58)
R^2 (%)	98.0	98.2	96.8
N	449,578	446,519	229,561
Fixed effects:			
Trade date	✓	✓	-
Bank × collateral × trade month	✓	-	-
Bank × collateral × trade week	-	✓	-
Bank × collateral × trade date	-	-	✓

Hedge funds with an additional banking relationship: haircuts are .2 pp lower.

alternative proxies

Nonlinearity in bank relationships and haircuts



Whiskers indicate 95% confidence intervals.

- Diminishing marginal effect of an additional bank relationship on bargaining power.
⇒ Dummy: Bargaining power high (≥ 3 bank relationships)

Effect of high bargaining power on haircuts

Dependent variable: Haircut (%)	(1)	(2)	(3)
Bargaining power high	-1.09*** (-3.92)	-1.06*** (-3.63)	-1.16*** (-3.14)
PD	27.60*** (2.93)	29.09** (2.54)	30.93** (2.20)
R^2 (%)	98.1	98.2	96.8
N	449,578	446,519	229,561
Fixed effects:			
Trade date	✓	✓	-
Bank × collateral × trade month	✓	-	-
Bank × collateral × trade week	-	✓	-
Bank × collateral × trade date	-	-	✓

Hedge funds with high bargaining power: haircuts are 1.16 pp lower.
(note: within collateral-day SD: 0.91 pp)

Further analyses and robustness checks

- Controlling for repo rates and accounting for counterparty unobservables [Link](#)
- Heterogeneity by collateral type: bargaining power effect present across all maturities, especially in sovereign bonds and in lower credit quality [Link](#)
- Controlling for net exposure within bank and hedge fund relationship [Link](#)
- Zero vs. positive haircuts [Link](#)
- Extended sample of all repo maturities [Link](#)
- Filtered O/N transactions (excl. potential open repos) [Link](#)
- Robustness using alternative PD measures [Link](#)
- Alternative clustering [Link](#)

Quasi-natural experiment

Credit Suisse's exit from prime brokerage

Event: Announcement to exit the prime brokerage business (Nov, 2021):

- Unanticipated, exogenous event for the affected hedge funds (ad-hoc disclosure).
- Prospect of a reduction in available funding options
→ weaker bargaining power.
- Hedge funds with relationships to Credit Suisse experience lower growth in broker relationships Broker growth
- Note: We examine Euro area banks' haircuts in response to Credit Suisse's exit (a non-Euro area institution).

Credit Suisse: Empirical strategy

$$\begin{aligned} \text{Haircut}_{I(\text{bfct})} = & \beta \text{POST}_t \times \text{CS}_{f,2020} + \gamma \text{PD}_{\text{bft}-1m} \\ & + \delta_{\text{bfc}} + \eta_{\text{bct}} + \varepsilon_{I(\text{bfct})} \end{aligned} \quad (2)$$

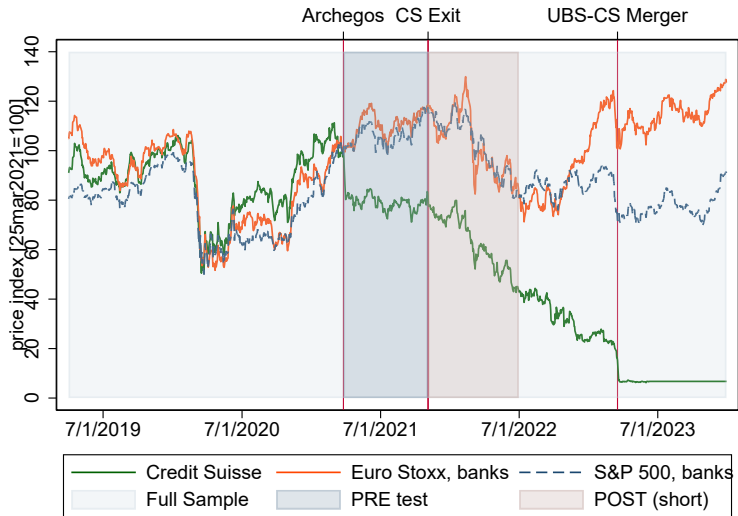
- POST_t : equals one after Credit Suisse's exit announcement (November 4, 2021), zero otherwise.
- $\text{CS}_{f,2020}$, equals one if hedge fund f has broker relationship with Credit Suisse as of 2020, zero otherwise (SEC filings).
- Fixed effects: δ_{bfc} : within bank-fund-collateral, η_{bct} : bank-collateral-date FEs.

Effect of Credit Suisse's exit on haircuts

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)
<i>POST</i> × <i>CS</i>	0.47** (2.28)	0.29** (2.09)	0.34** (2.14)	0.42** (2.09)
<i>R</i> ² (%)	97.4	98.3	98.3	98.1
N	355,840	204,994	204,299	167,289
Controls & fixed effects:				
PD	✓	✓	✓	✓
Bank × counterparty × collateral	✓	✓	✓	✓
Trade date	✓	–	–	–
Collateral × trade date	–	✓	✓	–
Bank × trade date	–	–	✓	–
Bank × collateral × trade date	–	–	–	✓

Hedge funds exposed to Credit Suisse: haircuts are .42 pp higher after Credit Suisse's exit (announcement).

Credit Suisse: Chronology of events in detail



Effect of Credit Suisse exit on haircut: robustness

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)
$POST \times CS$	0.24** (2.05)	0.28* (1.83)	0.24** (2.22)	0.23* (1.69)
$PRE_{Archegos \rightarrow Exit} \times CS$			-0.00 (-0.08)	-0.06 (-1.39)
R^2 (%)	98.1	97.9	98.1	97.9
N	118,005	97,946	118,005	97,946
Controls & fixed effects:				
PD	✓	✓	✓	✓
Bank \times counterparty \times collateral	✓	✓	✓	✓
Collateral \times trade date	✓	-	✓	-
Bank \times trade date	✓	-	✓	-
Bank \times collateral \times trade date	-	✓	-	✓

- Short post period: Excluding monetary policy tightening.
- No pre trend (after Archegos default, before Credit Suisse 's exit announcement), (3) and (4). [Details](#)

Further analyses and robustness checks

- Differential effect depending on existing lending relationships [Link](#)
- Accounting for tradeoff between haircut and rate [Link](#)
- Control for net exposure within bank and hedge fund relationship [Link](#)
- Zero vs. positive haircuts [Link](#)
- Extended sample of all repo maturities [Link](#)
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Adequacy of haircuts

Can haircuts cover large but plausible price fluctuations?

$$1(\text{Haircut}_{l(\text{bfct})} < \text{Haircut}_{ct}^m) = \beta \text{BargainingPower}_{ft} + \gamma PD_{\text{bft}-1m} + \alpha_{\text{bct}} + \varepsilon_{l(\text{bfct})}$$

Dependent variable: Dummy indicating that haircut is insufficient based on a specific model and value-at-risk.

- Haircut_{ct}^m model-implied haircut (VaR) based on model m for collateral c at time t .
- Applied models: historical approach, Exponentially Weighted Moving Average (EWMA), GARCH (1,1)
- Different VaR confidence levels (10%, 5%, 1%).

Adequacy of haircuts: results

	(1)	(2)	(3)	(4)	(5)	(6)
	Historical		EWMA		GARCH	
Dep. variable: Insufficient haircut (VaR 5%)						
Bargaining power high	0.12*** (3.17)	0.13*** (2.72)	0.13*** (3.54)	0.14*** (3.07)	0.14*** (4.07)	0.15*** (3.53)
PD	-2.64*** (-2.61)	-2.55** (-2.14)	-2.38** (-2.46)	-2.29** (-2.00)	-1.44* (-1.72)	-1.37 (-1.38)
R^2 (%)	96.3	93.6	95.8	93.6	94.2	93.2
N	297,584	153,535	298,071	153,547	317,185	164,531
Fixed effects:						
Trade date	✓	-	✓	-	✓	-
Bank × collateral × trade week	✓	-	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓	-	✓

VaR 1%

VaR 10%

Conclusion

1. Higher bargaining power reduces haircuts.
 - Identified within bank, collateral, and date.
 - Identified through a exogenous shock (Credit Suisse exit from prime brokerage).
2. Higher bargaining power increases the risk that haircuts are insufficient to cover large but plausible price fluctuations.

Potential vulnerabilities arising from the evolving dynamics in the bank - hedge fund relationship.

→ Policy discussions: minimum haircut requirements.

Thank you!

Appendix

Exposure to Archegos

Rank	Bank Name	Broker Segment		Hedge Fund Size (\$ bn)	Archegos	
		Volume (\$ bn)	Count		Exposure	Loss
1	Barclays	5,739	656	8.75		
2	Morgan Stanley	5,195	2,162	2.40	yes	\$911m
3	Citigroup	4,888	778	6.28		
4	Credit Suisse	4,452	1,092	4.86	yes	\$5.5bn
5	Goldman Sachs	4,626	2,363	1.96	yes	~ 0
6	J.P. Morgan	4,623	1,562	2.96		
7	UBS	3,481	841	4.14	yes	\$861m
8	ING	3,401	1,083	3.14		
9	Deutsche Bank	3,101	645	4.81	yes	~ 0
10	Merrill Lynch	2,631	328	8.02		
11	BNP Paribas	1,983	347	5.72		
...						
14	Wells Fargo	805	361	2.23	yes	~ 0
15	Nomura	705	54	13.05	yes	\$2.9bn
...						
20	Société Générale	405	37	11.0		

Related literature

- **Interconnectedness of banks & NBFIs/hedge funds**

- Hedge funds' role in systemic risk & leverage

(Acharya, Cetorelli, and Tuckman, 2024; Brunnermeier and Pedersen, 2009; Gennaioli, Shleifer, and Vishny, 2013; Acharya and Viswanathan, 2011).

⇒ We examine bank lending to hedge funds using granular loan-level data.

- **Hedge fund - prime broker relationship**

- Importance of prime brokers for hedge funds.

(Kruttili, Monin, and Watugala, 2022; Di Maggio, Kermani, and Song, 2017; Agarwal, Ruenzi, and Weigert, 2017; Chung and Kang, 2016; Dahlquist, Rottke, and Sokolovski, 2024; Dahlquist, Rottke, Sokolovski, and Sverdrup, 2024)

⇒ We examine how bargaining power shapes this relationship.

Related literature (cont'd)

- **Bank lending & competition**

- Discussion on how competition affects loan pricing, risk-taking, and financial stability.

(Petersen and Rajan, 1995; Hauswald and Marquez, 2006; Keeley, 1990; Jiménez, Lopez, and Saurina, 2013; Martínez-Miera and Repullo, 2010; Beck, De Jonghe, and Schepens, 2013; Goetz, 2018; Besanko and Thakor, 1987; Jiménez, Salas, and Saurina, 2006)

⇒ We examine how bargaining power affects non-price terms of loans.

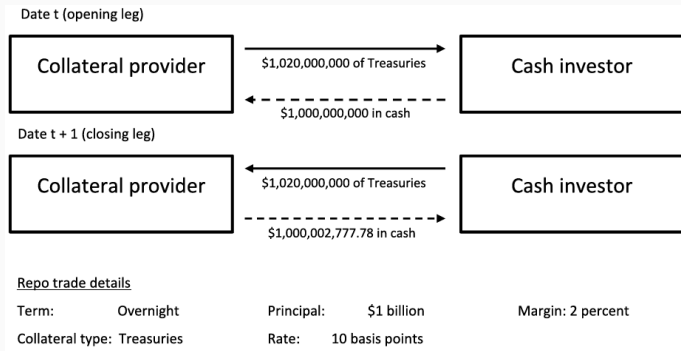
- **Over-the-counter (OTC) markets/repo markets**

- Market power leads to discriminatory pricing.

(Duffie, Gârleanu, and Pedersen, 2005; O'Hara, Wang, and Zhou, 2018; Hendershott, Li, Livdan, and Schürhoff, 2020; Hau, Hoffmann, Langfield, and Timmer, 2021; Eisenschmidt, Ma, and Zhang, 2024)

⇒ We show that discriminatory pricing also undermines counterparty credit risk measures.

Institutional background: Repo transaction



(Baklanova, Caglio, Cipriani, and Copeland, 2019)

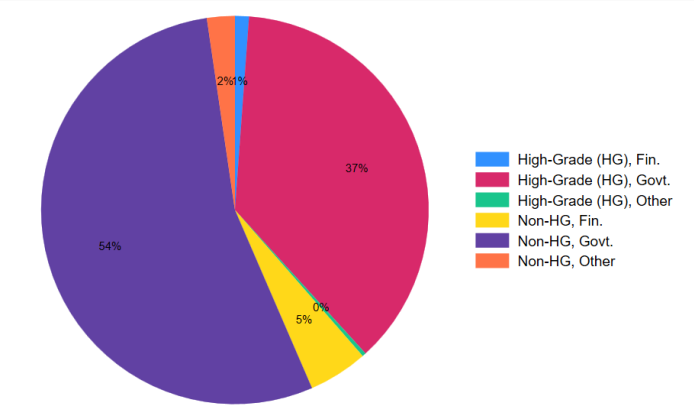
- Collateral serves as protection in the event of a default.
- Haircut to protect against fluctuations in the collateral's market value.

Dataset

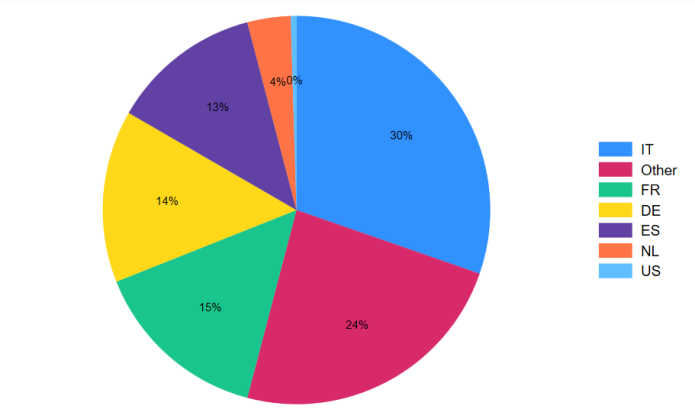
Panel A: Bank	Sample (N=14)		Reference (N=66)	
	Mean	SD	Mean	SD
Assets (in € bn)	928.16	629.57	142.72	211.74
G-SIB Bucket	.79	.97	.06	.30
CET1 Ratio	.15	.03	.19	.08
Traded Assets / Total Assets	.15	.03	.04	.07
Liquid Assets / Total Assets	.12	.05	.15	.10

Panel B: Hedge Fund	Sample (N=179)		Reference (N=6,864)	
	Mean	SD	Mean	SD
Number of Broker Relationships	4.08	2.64	1.95	1.90
AUM (in \$ bn, Company)	161.55	190.63	23.34	68.62

Collateral: breakdown by rating and issuer type



Collateral: breakdown by country



Variation of haircuts

Haircut std. dev. (pp)	(1)	(2)	(3)	(4)	(5)
	Haircuts demeaned by...				
Rating	collateral	collateral- month	collateral- week	collateral- date	
High Grade	1.08	0.37	0.27	0.25	0.24
Medium-Low Grade	4.57	1.43	0.9	0.86	0.84
Speculative Grade (or NA)	6.33	2.53	1.53	1.45	1.43
Full Sample	5.74	1.59	0.98	0.93	0.91

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Alternative measures for bargaining power based on funding concentration

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Concentration measure:							
	HHI		CR ₁		CR ₂		CR ₃	
Funding concentration	1.23*** (3.03)	1.30*** (2.60)	1.31*** (3.28)	1.40*** (2.80)	2.10*** (4.62)	2.23*** (3.95)	2.81*** (5.40)	3.01*** (4.60)
R ² (%)	98.2	96.7	98.2	96.7	98.2	96.7	98.2	96.7
N	446,519	229,561	446,519	229,561	446,519	229,561	446,519	229,561
Controls and fixed effects:								
PD	✓	✓	✓	✓	✓	✓	✓	✓
Trade date	✓	-	✓	-	✓	-	✓	-
Bank × collateral × trade week	✓	-	✓	-	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓	-	✓	-	✓

Robustness test: controlling for repo rates and accounting for counterparty unobservables

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)	(5)	(6)
Bargaining power high	-1.04*** (-3.56)	-1.13*** (-3.04)	-0.54*** (-2.77)	-0.70** (-2.35)	-0.54*** (-2.79)	-0.70** (-2.38)
Rate	0.01*** (3.68)	0.02*** (2.96)			0.01*** (2.67)	0.02** (2.07)
R^2 (%)	98.3	96.9	98.7	97.6	98.7	97.7
N	446,378	229,547	446,517	229,560	446,376	229,546
Controls and fixed effects:						
PD	✓	✓	✓	✓	✓	✓
Trade date	✓	-	✓	-	✓	-
Bank × collateral × trade week	✓	-	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓	-	✓
Counterparty	-	-	✓	✓	✓	✓

- Accounting for tradeoff: “rate vs. haircut”.
- Controlling for unobservable hedge fund characteristics.

The effect of bargaining power on haircuts across collateral type: rating

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Sample split by rating category						
	High grade		Medium to low investment grade		Speculative and not rated	
Bargaining power high	-0.15*** (-2.61)	-0.16** (-2.10)	-0.87*** (-3.25)	-0.94*** (-2.81)	-1.99** (-2.51)	-2.11** (-2.23)
R^2 (%)	99.1	98.2	98.1	96.7	96.0	92.4
N	137,015	65,075	199,959	100,794	108,358	63,620
Controls & fixed effects:						
PD	✓	✓	✓	✓	✓	✓
Trade date	✓	-	✓	-	✓	-
Bank × collateral × trade week	✓	-	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓	-	✓

The effect of bargaining power on haircuts across collateral type: maturity

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)	(5)	(6)
Panel B: Sample split by bonds' maturity remaining (in years)						
	maturity < 5		5 ≤ maturity < 10		10 ≤ maturity	
Bargaining power high	-1.07** (-2.19)	-1.14* (-1.90)	-0.41* (-1.88)	-0.46* (-1.75)	-2.09*** (-3.66)	-2.38*** (-3.30)
R^2 (%)	97.4	95.4	98.1	96.7	98.7	97.7
N	152,333	79,643	132,065	64,441	146,687	78,360
Controls & fixed effects:						
PD	✓	✓	✓	✓	✓	✓
Trade date	✓	-	✓	-	✓	-
Bank × collateral × trade week	✓	-	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓	-	✓

The effect of bargaining power on haircuts across collateral type: issuer type

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)	(5)	(6)
Panel C: Sample split by issuer sector						
	Sovereign		Financial		Non-financial	
Bargaining power high	-1.13*** (-5.19)	-1.19*** (-4.51)	-0.22 (-0.22)	-0.30 (-0.22)	-1.69 (-1.45)	-2.07 (-1.26)
R^2 (%)	98.1	97.5	96.9	91.7	96.8	88.6
N	316,067	173,444	90,737	42,442	38,288	13,121
Controls & fixed effects:						
PD	✓	✓	✓	✓	✓	✓
Trade date	✓	-	✓	-	✓	-
Bank × collateral × trade week	✓	-	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓	-	✓

Back

Controlling for net exposure within bank and hedge fund relationship

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)
	Net exposure:			
	EUR amount		signed log of absolute amount	
Bargaining power high	-1.07*** (-3.64)	-1.16*** (-3.15)	-1.04*** (-3.65)	-1.13*** (-3.18)
R^2 (%)	98.2	96.8	98.2	96.8
N	446,519	229,561	446,519	229,561
Controls & fixed effects:				
PD	✓	✓	✓	✓
Net exposure	✓	✓	✓	✓
Trade date	✓	-	✓	-
Bank × collateral × trade week	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓

Zero vs. positive haircuts

	(1)	(2)	(3)	(4)
Dep. Variable:	1(Haircut = 0)		Haircut	
<i>Sample:</i>	<i>full</i>		<i>Haircut > 0</i>	
Bargaining power high	0.12*** (4.08)	0.13*** (3.54)	-1.31*** (-3.39)	-1.42*** (-2.94)
Constant	0.31*** (13.01)	0.30*** (10.93)	6.23*** (21.96)	6.63*** (20.38)
R^2 (%)	95.4	91.7	97.8	95.8
N	446,519	229,561	300,210	153,342
Controls & fixed effects:				
PD	✓	✓	✓	✓
Trade date	✓	-	✓	-
Bank × collateral × trade week	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓

Extended sample of all repo maturities

Dep. variable: Haircut (%)	(1)	(2)	(3)
Bargaining power high	-0.76*** (-3.48)	-0.93*** (-3.09)	-0.93*** (-3.06)
R^2 (%)	99.2	98.0	98.0
N	603,752	313,826	305,192
Controls & fixed effects:			
PD	✓	✓	✓
Trade date	✓	-	-
Bank × collateral × trade week × maturity bucket	✓	-	-
Bank × collateral × trade date × maturity bucket	-	✓	-
Bank × collateral × trade date × settlement date × maturity date	-	-	✓

Back

Filtered overnight transactions (excl. potential open repos)

Dep. variable: Haircut (%)	(1)	(2)
Bargaining power high	-1.35*** (-3.54)	-1.44*** (-3.09)
R^2 (%)	97.5	95.6
N	227,544	133,738
Controls & fixed effects:		
PD	✓	✓
Trade date	✓	-
Bank × collateral × trade week	✓	-
Bank × collateral × trade date	-	✓

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Robustness using alternative PD measures

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)	(5)	(6)
	Mean PD		Mean PD (exl. lender)		Max PD	
Bargaining power high	-0.91*** (-3.43)	-0.99*** (-2.97)	-0.61** (-2.09)	-0.78* (-1.86)	-0.95*** (-3.17)	-1.03*** (-2.74)
PD	27.00** (2.11)	28.41* (1.79)	0.82 (0.20)	0.50 (0.10)	-0.73 (-0.24)	-0.18 (-0.05)
R^2 (%)	98.2	96.8	98.6	97.4	98.2	96.8
N	446,519	229,561	342,675	163,053	446,519	229,561
Controls & fixed effects:						
Trade date	✓	-	✓	-	✓	-
Bank × collateral × trade week	✓	-	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓	-	✓

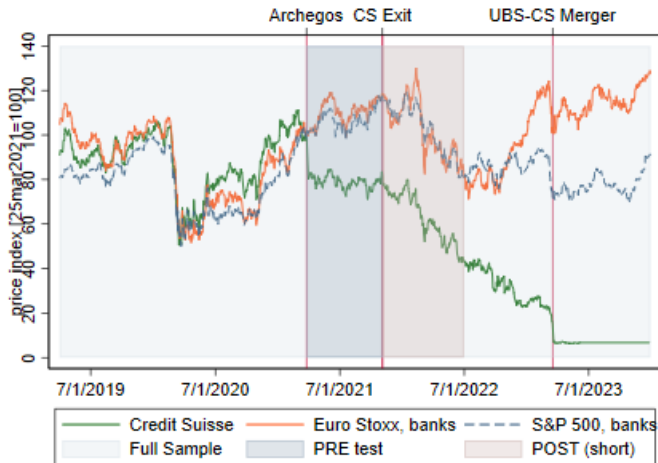
Alternative clustering

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)
	Clustering:			
	Bank, counterparty, collateral		Counterparty, date	
Bargaining power high	-1.06*** (-4.50)	-1.16*** (-5.04)	-1.06*** (-2.84)	-1.16*** (-3.07)
PD	29.09* (2.08)	30.93* (2.11)	29.09* (1.93)	30.93** (2.15)
R^2 (%)	98.2	96.8	98.2	96.8
N	446,519	229,561	446,519	229,561
Controls & fixed effects:				
Trade date	✓	-	✓	-
Bank × collateral × trade week	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓

Broker relationship growth and Credit Suisse

Dep. variable: Relationship Growth	(1)	(2)	(3)	(4)	(5)
	in-sample		external validity		
$POST \times CS$	-0.09** (-2.03)	-0.08* (-1.79)	-0.07*** (-7.98)	-0.07*** (-5.77)	
$PRE_{2017 \rightarrow 2019} \times CS$		0.01 (0.28)		0.00 (0.26)	
$2017 \times CS$					0.03 (1.60)
$2018 \times CS$					0.00 (0.28)
$2019 \times CS$					-0.01 (-1.08)
$2021 \times CS$					-0.05*** (-3.23)
$2022 \times CS$					-0.03** (-2.53)
$2023 \times CS$					-0.13*** (-9.16)
R^2 (%)	26.9	26.9	21.2	21.2	21.3
N	733	733	40,667	40,667	40,667
Fixed effects:					
Fund FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓

Development of banks' stock prices during the sample period



Differential effect depending on existing broker relationships

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)
	Bargaining power (# brokers):			
	low		high	
<i>POST</i> × <i>CS</i>	3.11*** (6.53)	3.20*** (7.15)	0.34 (1.49)	0.44 (1.56)
<i>R</i> ² (%)	97.1	96.9	98.8	98.7
N	154,448	85,774	201,586	72,161
Controls & fixed effects:				
PD	✓	✓	✓	✓
Bank × counterparty × collateral	✓	✓	✓	✓
Collateral × trade date	✓	-	✓	-
Bank × trade date	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓

Differential effect depending on existing lending relationships

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)
	Bargaining power (# lenders):			
	low		high	
<i>POST</i> × <i>CS</i>	2.73*** (16.60)	2.73*** (16.75)	0.05 (0.86)	0.08 (1.49)
<i>R</i> ² (%)	97.7	97.6	97.2	97.0
N	163,219	83,577	192,818	71,686
Controls & fixed effects:				
PD	✓	✓	✓	✓
Bank × counterparty × collateral	✓	✓	✓	✓
Collateral × trade date	✓	-	✓	-
Bank × trade date	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓

Controlling for repo rates

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)
<i>POST</i> × <i>CS</i>	0.48** (2.36)	0.32** (2.40)	0.38** (2.46)	0.47** (2.44)
<i>R</i> ² (%)	97.4	98.3	98.3	98.1
N	355,830	204,984	204,289	167,279
Controls & fixed effects:				
PD	✓	✓	✓	✓
Rate	✓	✓	✓	✓
Bank × counterparty × collateral	✓	✓	✓	✓
Collateral × trade date	–	✓	✓	–
Bank × trade date	–	–	✓	–
Bank × collateral × trade date	–	–	–	✓

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Controlling for net exposure within bank and hedge fund relationship

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)
	Net exposure:			
	EUR amount		signed log of absolute amount	
<i>POST</i> × <i>CS</i>	0.25** (2.27)	0.30** (2.11)	0.27** (2.57)	0.25** (1.72)
<i>R</i> ² (%)	98.2	98.0	97.9	97.7
N	256,488	208,099	201,007	156,570
Controls & fixed effects:				
PD	✓	✓	✓	✓
Net exposure	✓	✓	✓	✓
Bank × counterparty × collateral	✓	✓	✓	✓
Collateral × trade date	✓	–	✓	–
Bank × trade date	✓	–	✓	–
Bank × collateral × trade date	–	✓	–	✓

Zero vs. positive haircuts

	(1)	(2)	(3)	(4)
Dep. Variable:	1(Haircut = 0)		Haircut	
<i>Sample:</i>	<i>full</i>		<i>Haircut > 0</i>	
<i>POST</i> × <i>CS</i>	-0.16** (-2.29)	-0.19** (-2.26)	0.44* (1.77)	0.51* (1.70)
Constant	0.45*** (6.82)	0.41*** (4.42)	7.05*** (43.74)	7.64*** (34.23)
<i>R</i> ² (%)	97.2	96.9	97.7	97.5
N	204,299	167,289	137,187	123,071
Controls & fixed effects:				
PD	✓	✓	✓	✓
Bank × counterparty × collateral	✓	✓	✓	✓
Collateral × trade date	✓	-	✓	-
Bank × trade date	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓

Extended sample of all repo maturities

Dep. variable: Haircut (%)	(1)	(2)	(3)
<i>POST</i> × <i>CS</i>	0.37** (2.09)	0.39** (2.12)	0.39** (2.12)
<i>R</i> ² (%)	98.5	98.4	98.5
N	258,655	238,675	232,947
Controls & fixed effects:			
PD	✓	✓	✓
Bank × counterparty × collateral	✓	✓	✓
Bank × collateral × trade date	✓	–	–
Bank × collateral × week × maturity bucket	✓	–	–
Bank × collateral × trade date × maturity bucket	–	✓	–
Bank × collateral × trade date × settlement date × maturity date	–	–	✓

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Filtered overnight transactions (excl. potential open repos)

Dep. variable: Haircut (%)	(1)	(2)
<i>POST</i> × <i>CS</i>	0.52** (2.06)	0.52** (2.06)
<i>R</i> ² (%)	97.4	97.4
N	115,075	114,522
Controls & fixed effects:		
PD	✓	✓
Bank × counterparty × collateral	✓	✓
Collateral × trade date	✓	–
Bank × trade date	✓	–
Bank × collateral × trade date	–	✓

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Robustness using alternative PD measures

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)	(5)	(6)
	Mean PD		Mean PD (exl. lender)		Max PD	
<i>POST</i> × <i>CS</i>	0.24** (2.27)	0.29** (2.12)	0.26** (2.46)	0.26* (1.75)	0.25** (2.26)	0.29** (2.10)
PD	6.01 (1.02)	10.14 (1.42)	8.76 (1.53)	9.54 (1.38)	2.83 (1.10)	4.42 (1.26)
<i>R</i> ² (%)	98.4	98.2	97.8	97.6	98.4	98.2
N	288,478	233,915	214,089	164,988	288,478	233,915
Controls & fixed effects:						
Bank × counterparty × collateral	✓	✓	✓	✓	✓	✓
Collateral × trade date	✓	–	✓	–	✓	–
Bank × trade date	✓	–	✓	–	✓	–
Bank × collateral × trade date	–	✓	–	✓	–	✓

Alternative clustering

Dep. variable: Haircut (%)	(1)	(2)	(3)	(4)
	Clustering:			
	Bank, counterparty, collateral		Counterparty, date	
<i>POST</i> × <i>CS</i>	0.34** (3.02)	0.42** (4.24)	0.34** (2.05)	0.42** (2.01)
<i>R</i> ² (%)	98.3	98.1	98.3	98.1
N	204,299	167,289	204,299	167,289
Controls & fixed effects:				
PD	✓	✓	✓	✓
Bank × counterparty × collateral	✓	✓	✓	✓
Collateral × trade date	✓	-	✓	-
Bank × trade date	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓

Adequacy of haircuts: results, VaR 1%

	(1)	(2)	(3)	(4)	(5)	(6)
	Historical		EWMA		GARCH	
Dep. variable: Insufficient haircut (VaR 1%)						
Bargaining power high	0.11*** (4.14)	0.12*** (3.59)	0.13*** (3.69)	0.14*** (3.20)	0.14*** (4.36)	0.15*** (3.81)
R^2 (%)	96.7	94.6	95.8	94.4	94.4	94.3
N	297,584	153,535	298,071	153,547	317,078	164,528
Controls & fixed effects:						
PD	✓	✓	✓	✓	✓	✓
Trade date	✓	-	✓	-	✓	-
Bank × collateral × trade week	✓	-	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓	-	✓

Adequacy of haircuts: results, VaR 10%

	(1)	(2)	(3)	(4)	(5)	(6)
	Historical		EWMA		GARCH	
Dep. variable: Insufficient haircut (VaR 10%)						
Bargaining power high	0.14*** (3.71)	0.15*** (3.20)	0.13*** (3.58)	0.14*** (3.10)	0.14*** (3.97)	0.15*** (3.46)
R^2 (%)	96.0	92.9	95.4	92.8	94.6	93.0
N	297,584	153,535	298,071	153,547	317,239	164,534
Controls & fixed effects:						
PD	✓	✓	✓	✓	✓	✓
Trade date	✓	-	✓	-	✓	-
Bank × collateral × trade week	✓	-	✓	-	✓	-
Bank × collateral × trade date	-	✓	-	✓	-	✓

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