Balance Sheet Constraints of Prime Brokers on Hedge Fund Performance: Evidence from GSIB Surcharge

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Abstract

Hedge funds often use leverage provided by prime brokers to enhance their investment returns. We investigate how prime brokers' capital constraints impact the performance of connected hedge funds. At the hedge fund level, we construct a measure for prime brokers' balance sheet constraints using the capital requirements under the Basel III framework. We document that tighter balance sheet constraints of prime brokers lead to lower future return, alpha, volatility, Sharpe ratio, and information ratio of the hedge funds. These findings are consistent with an analytical model in which prime brokers respond to balance sheet constraints by increasing leverage cost or decreasing leverage provision to hedge funds. The effects are generally stronger for smaller hedge funds and during more capital binding times. Our results reveal the real effects of bank regulation on connected financial institutions via the services of prime brokers.

Motivation and Contribution

Motivation

- Regulators impose more stringent requirement on banks in post-crisis period, make them more balance sheet constrained
- In addition to providing liquidity, broker-dealers also provide direct financing to connected leveraged institutions, a role that has been less studied in the literature
- Few empirical studies examine the direct impact of broker/dealer balance sheet constraint on connected leveraged institutions

Research Question: How do the balance sheet constraints of prime brokers impact hedge fund performance?

Contribution

- We document a balance sheet cost transmission channel from GSIB brokers to connected hedge funds
- Basel III regulation has real effect on connected leveraged financial institutions

Prime Brokerage Business

- Hedge funds require intensive use of prime brokers (intermediary) balance sheet space
- Majority of hedge funds (∼89% in the sample) use at least one large bank-affiliated prime brokers
- Hedge funds and prime brokers relationships are relatively sticky, ∼ 13% in the sample change pair-wise relationship

What is the balance sheet constraint of a prime broker?

- Limited capacity to use their capital to serve hedge funds (provide financing service)

How leveraged hedge funds consume prime brokers' balance sheets?

- Hedge funds take leverage to enhance their returns; the funds use financing arrangements, which consume brokers' balance sheets

Data

- ***TASS database***: Monthly, Jan. 2013 - Nov. 2021
- ***Form ADV***: yearly hedge funds and prime broker relationships
- ***Financial Stability Board*** and ***10-K***: GSIB surcharge

Theoretical Framework

- Hedge fund: a mean-variance investor, use leverage to enhance return
- Prime broker: determine two parameters: per unit leverage cost c and maximum leverage provision $\bar{\delta}$

Leveraged hedge fund return and variance:

$$E(R) = (1+\delta)E(r) - \delta c,$$
$$\text{var}(R) = (1+\delta)^2\sigma_r^2.$$

Leveraged hedge fund utility function:

$$\max_{\delta} \quad E(R) - \frac{\gamma}{2}\text{var}(R)$$
$$\text{s.t.} \quad \delta \le \bar{\delta},$$

When the prime broker is balance sheet constrained, we suppose two channels:

- Increasing fee channel: c ↑
- Reducing leverage provision channel: $\bar{\delta}$ ↓

	Nonbinding: $\frac{\mu_r-c}{\sigma_r^2(1+\bar{\delta})} \le \gamma \le \frac{\mu_r-c}{\sigma_r^2}$		Binding: $\gamma \le \frac{\mu_r-c}{\sigma_r^2(1+\bar{\delta})}$	
Channels	Increasing c	Decreasing $\bar{\delta}$	Increasing c	Decreasing $\bar{\delta}$
$\mathsf{E}(R^*)$	↓	N/A	↓	↓
$\text{var}(R^*)$	↓	N/A	N/A	↓
$S(R^*)$	↓ if $\gamma \le \frac{(\mu_r-c)^2}{\sigma_r^2\mu_r}$	N/A	↓	↑

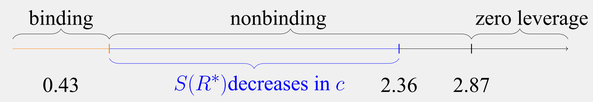


Figure 1. Range of risk aversion γ for the three cases of optimal leverage δ^*

We estimate the risk aversion γ using empirically observed leverage levels, assuming they are already set at the optimal level by the hedge funds. The estimated γ ranges from $[0.43, 2.87]$, resulting in a nonbinding constraint $\delta^* < \bar{\delta}$. Notably, γ is often below 2.36, indicating that the Sharpe ratio decreases with leverage costs.

GSIB Surcharge

$$\frac{\text{Regulatory capital}}{\text{Risk-weighted Assets}} \ge \text{Minimum capital ratio} + \text{GSIB surcharge}$$

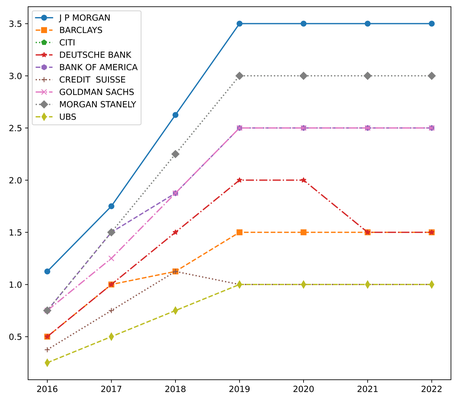


Figure 2. GSIB Surcharge of selected banks

- Hedge funds mainly use repo financing and margin loan to get leverage from prime brokers, both of which are counted as banks' RWA
- Higher capital requirement ⇒ higher implicit cost to increase $1 of RWA ⇒ higher balance sheet constraint
- Surcharge is additional capital requirement on GSIBs, more likely to bind

Key Measure: Average GSIB surcharge

For fund i, month t, prime broker j

$$AvgSurcharge_{i,t} = \frac{1}{N_{i,t}} \sum_j Surcharge_{j,t} \times \text{phase-in ratio}$$

The measure is built on three blocks:
(1) Yearly hedge fund and prime broker relationship
(2) GSIB-affiliated broker surcharges, for non-GSIB broker surcharge is zero
(3) Phase-in ratio

Main Empirical Results

Portfolio Sort

	return (monthly %)				alpha (monthly %)			
	1m	3m	6m	12m	1m	3m	6m	12m
P1 (Low)	0.814***	0.820***	0.821***	0.831***	0.260**	0.275**	0.280***	0.284**
	(2.69)	(2.71)	(2.72)	(2.75)	(2.49)	(2.64)	(2.71)	(2.62)
P2	0.179	0.190	0.225	0.277	-0.131	-0.127	-0.089	-0.030
	(0.97)	(1.02)	(1.20)	(1.46)	(-1.25)	(-1.23)	(-0.83)	(-0.31)
P3 (High)	0.153	0.165	0.180	0.246	-0.164	-0.138	-0.121	-0.034
	(0.78)	(0.85)	(0.93)	(1.37)	(-1.03)	(-0.86)	(-0.75)	(-0.25)
P3-P1	-0.661***	-0.655***	-0.641***	-0.585***	-0.424**	-0.413**	-0.401**	-0.318**
	(-3.60)	(-3.57)	(-3.48)	(-3.26)	(-2.55)	(-2.49)	(-2.41)	(-2.12)

Panel Regressions

$$y_{i,t+1,t+12} = \beta_1 AvgSurcharge_{i,t} + \gamma X_{i,t} + \alpha_i + \alpha_s \times \alpha_t + \varepsilon_{i,t}$$

Panel A: Average excess return

	(1)	(2)	(3)
AvgSurcharge	-0.314***	-0.313***	-0.293**
	(-4.54)	(-4.29)	(-2.52)
Fund FE	No	No	Yes
Style × Month FE	Yes	Yes	Yes
Controls	No	Yes	Yes
Observations	17500	17500	17483
Adjusted R^2	0.235	0.246	0.365

Panel B: Average alpha

	(1)	(2)	(3)
AvgSurcharge	-0.338***	-0.349***	-0.297**
	(-4.73)	(-4.66)	(-2.39)
Fund FE	No	No	Yes
Style × Month FE	Yes	Yes	Yes
Controls	No	Yes	Yes
Observations	17500	17500	17483
Adjusted R^2	0.128	0.136	0.323

Panel C: Volatility of excess return

	(1)	(2)	(3)
AvgSurcharge	-0.605**	-0.565**	-0.558***
	(-2.31)	(-2.30)	(-3.70)
Fund FE	No	No	Yes
Style × Month FE	Yes	Yes	Yes
Controls	No	Yes	Yes
Observations	17500	17500	17483
Adjusted R^2	0.218	0.264	0.737

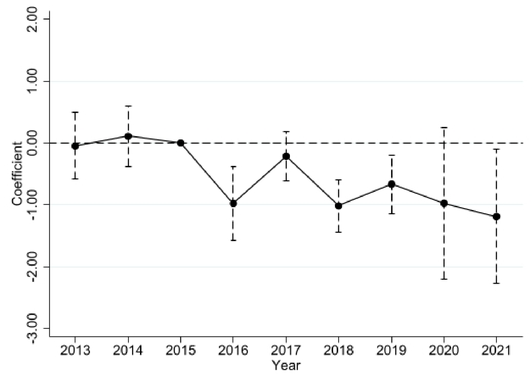
Panel D: Sharpe ratio

	(1)	(2)	(3)
AvgSurcharge	-0.074***	-0.077***	-0.069
	(-4.97)	(-4.31)	(-1.54)
Fund FE	No	No	Yes
Style × Month FE	Yes	Yes	Yes
Controls	No	Yes	Yes
Observations	17500	17500	17483
Adjusted R^2	0.328	0.350	0.528

DID design

$\text{Treat}_{i,t}$ takes value of one if a hedge fund's GSIB-affiliated prime brokers ratio are greater than cross-sectional median.

$$y_{i,t+1} = \beta_0 + \beta_1 \times Treat_{i,t} \times Post_t + \beta_2' X_{i,t} + \alpha_i + \eta_{s,t} + \varepsilon_{i,t}$$



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