Efficiency or resiliency?

Corporate choice between operational and financial hedging

Viral V. Acharya,[1] Heitor Almeida,[2] Yakov Amihud,[1] and Ping Liu[3]

[1]NYU Stern School of Business,

[2]UIUC Gies College of Business,

[3]Purdue Univ, Krannert School of Management

The effects of New Geopolitical Risks on Financial Markets and Firms

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The paper in a nutshell:

We usually study the **risk** of **financial default** on **debt contracts** with **lenders.**

We add:

There is **risk** of **default** on **delivery contracts** of goods and services to **customers**.

We study how the firm manages these **two commitments** and **default risks,** taking as given their borrowing and their delivery contracts.

We propose a **tradeoff** between **financial hedging** and **operational hedging** for **financially constrained** firms.

Corporate activities can be **disrupted** by exogenous **shocks**.

For example, during the **Covid-19** pandemic…

- … **inventories** were **depleted**
- … **supply chains did not function.**

→Firms **could not deliver** the merchandise that they had **committed** to supply.

Questions:

1. Is the firm's **resiliency** – its ability to withstand shocks and **deliver the goods** – affected by its **capital structure and likelihood of default**?
2. How does **access to liquidity** (**cash**) affect corporate **resiliency**?

The firm's **tradeoff**:

> **Use cash** to **hedge against operational default**—**failure to deliver** on customers' **contracts**—by investing in excess **inventory,** spending on **supply chain diversification**, maintaining **backup capacity**, or

> **Hoard cash** as **hedge against financial default** in case of a **negative** cashflow shock.

We propose:

Higher financial default risk (**higher credit spread**) ➔ **Lower operational hedging.**

The shifts **cash** to avert **financial default,** depending on the **cost of operational default**.

Main testable result:

➔ A **higher credit spread** (on debt) → a **higher operational spread,** measured by **Markup** = [**price – marginal cost (MC)]**, because **MC rises** with **operational hedging.**

This **tradeoff may not hold** if the firm **can pledge** its **future cashflows** (from delivering goods).

Then, **it can borrow** (get a "bridge loan") thus **lowering default risk**.

This enables the firm to **spend** on **operational hedging,**

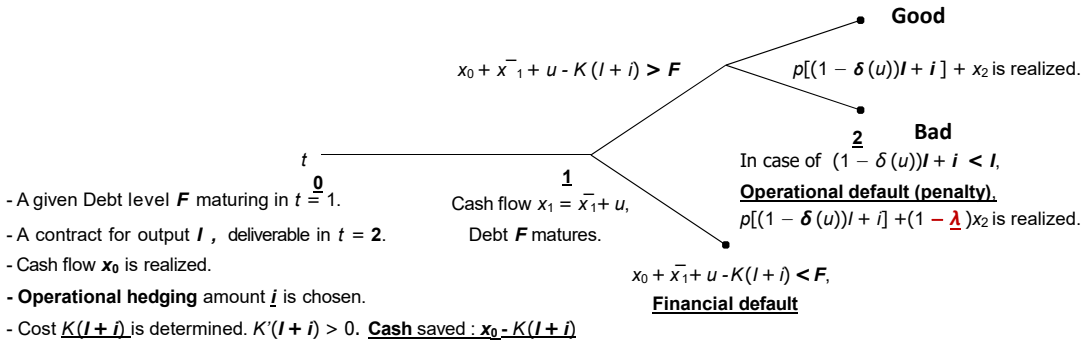
which in turn **increases pledgeability** and **facilitates borrowing** with lower risk.

Result:

Lower pledgeability (= greater financial constraint),

➔ **stronger tradeoff** between **credit spread** and **operational spread.**

(Operational spread rises when operational hedging is lower.)



The timeline of the model

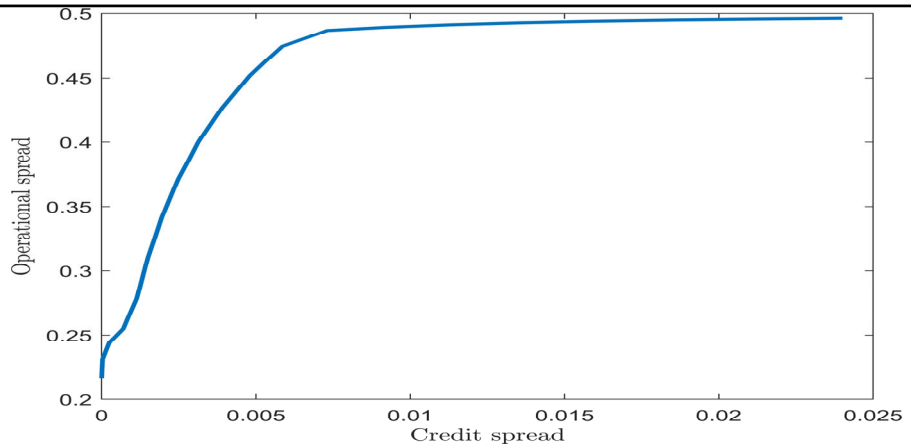
A shock, u, to cash flow at $t=1$ and **production** capacity at $t=2$ (e.g., Covid-19.)

$\delta(u)$ represents **operational risk**, decreasing ($\delta'(u) < 0$) and convex in u.

It **reduces productive capacity** in case of a shock that **lowers** u and reduces output $I \rightarrow (1 - \delta(u))\, I$

$\lambda \in (0, 1)$ is the **loss** in franchise value when the firm fails to deliver.

The firm **maximizes expected shareholder value** after considering the loss from **operational** and **financial** defaults.



Model-implied relationship between **credit spread** and **markup**

Credit spread = (***F*** / Market value of debt) -1, = bond promised yield (benchmark = 0)

Operational spread or **Markup** = [***p – K'(I + i)***]. **Decreases** in ***i*** since $K'(I + i) > 0$.

➔ **Higher Credit risk & spread ➔ lower operational hedging *i*** ,

➔ **higher Markup**.

If the firm can **pledge** to creditors at ***t* = 1** a **fraction *τ*** from period-**2** cash flow from contract settlement,

it will **borrow** in Period **1** if there is a **shortfall**.

➔ **lowers financial default** risk,

➔ **operational hedging more valuable.**

➔ **Lower pledgeability** (low ***τ***) ➔ **lower operational hedging** ➔ **higher Markup** (price – marg. cost)

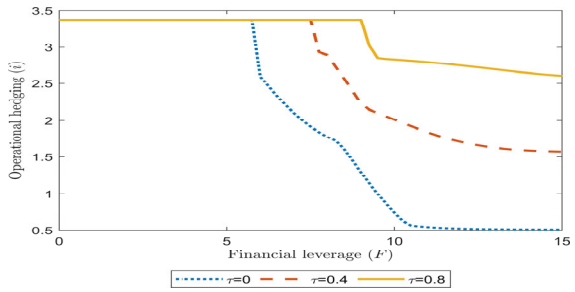
➔ **Greater effect of Credit spread on Markup** (operational spread).

Empirically: **lower** pledgeability (***τ***) = **higher** financial **constraint**.

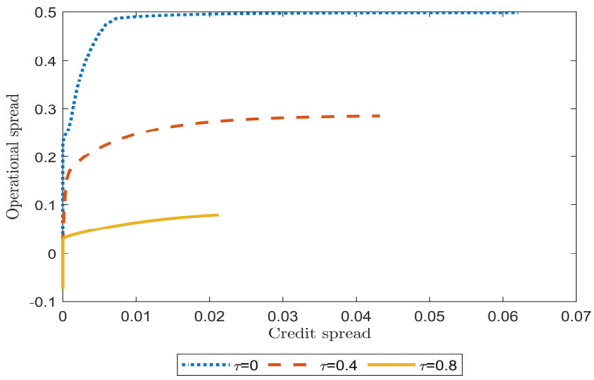
Prediction: **Greater financial constraint ➔ stronger effect** of **Credit Spread** on **Markup**.

The effect of **pledgeability** – **higher** ***τ*** – on optimal **operational hedging**, ***i***, and on the relationship between **Credit spread** and **Operational spread** (employing numerical analysis)

(a) *Optimal* ***i*** and ***F***



(b) Credit spread & operational spread



For **lower pledgeability** (***τ***)...

- Operational hedging ***i*** **decreases more** with **debt** level ***F***
- **Operational spread** (Markup) **increases more** with **credit spread.**

Empirical tests: Two testable research questions:

(1) Does **higher credit risk & spread → higher operational spread** (**lower operational hedging**)?

(2) Is the relationship in (1) **stronger** for financially **constrained** firms?

Or in times of **illiquid markets?**

Credit risk & spread is proxied by **–(Z-score)**, following Altman (1968).

(We also use Debt/Assets, particularly Short-Term Debt. Results are qualitatively similar.)

Operational spread, [***p – K'(I, i)***], is proxied by **Markup** = (Sales-Cost of Goods Sold) / Sales.

Lower *i* → lower *K'(I, i)* → **higher operational spread.**

Hypothesis:

(1) **Markup** increases in **–(Z-score)**

(2) A stronger (1) for **financially-constrained** firms, and when **markets** are **illiquid**.

Data: From **COMPUSTAT. Quarterly** data from 1973 to April 2020.

- Exclude firms in the financial and utilities industries (SIC codes 6000-6999, 4900-4949).
- Exclude firm-quarters for firms involved in major mergers (COMPUSTAT footnote code AB).

We calculate **Z-score** and the **control variables**: (1) Q, (2) cash holdings, (3) cash flow, (4) tangible assets, (5) size, (6, 7) two **market power** measures — top 3 industry seller dummy, and the ratio sales/Industry sales.

Supply chain data:

From **Factset** revere relationship database: **relationship-level data** between firms, starting from 4-**2003**.

For each relationship, it contains… - Identities of the related parties, - Type of the relationship

- Firms' geographic origins (country and state/province combination)

We use **two measures** of **operational hedging activity**:

1) **Inventory**, using Inventory/Sales ratio. (Data from 1973)

2) **Supply chains hedging** that include the following variables: (Data from 4-2003)

(i) ln(1 + number of **suppliers**)

(ii) ln(1 + number of supplier **regions**)

(iii) ln(1 + number of **out-of-region** suppliers).

For each firm & quarter, we use…

… the first **principal component score** from a **PCA** using the three measures, and

… the **Supply Chain Hedge Ranking** = the average ranking across the three measures (multiplied by -1, scaled by number of non-missing variables)

Question: Does **Markup = (Sales-CGS)/Sales**, which measures **Operational Spread,** [$p - K'(I + i)$], **decline** in the firm's **operational hedging activity?** (Because marginal cost declines.)

Validation test:

Does **Markup decline** in our measures of **operational hedging**? –**Yes**.

	Markup	
Supply chain hedging **index**	-0.0070 (2.69)	
Supply chain hedging **rank**		-0.0041 (2.73)
Inventory/Sales	-0.043 (2.87)	-0.043 (2.87)
Control variables	Yes	
Firm FE	Yes	
Year-qtr FE	Yes	
Number of observations	116,068	116,068
R^2	0.739	0.739

Tha

Markup declines with **higher** spending on **supply chain hedging** and **inventory**.

Markup is a reasonable **summary measure** of **firms' operational hedging activities**.
We also find that **CGS**/Assets **increase** in Supply chain index and Inventory.

Main test:

Does **operational spread, Markup, increase in** the **Credit spread** or **–(Z-score)**? – **Yes.**

Our prediction: Greater cash needs → lower operational hedging → higher $[p - K'(I + i)]$.

	Markup	
-(Z-score)	0.0038 (6.67)	0.0039 (6.29)
Short-term **debt,** maturing in less than 2 years		0.041 (2.41)
Remaining Debt		0.0081 (0.67)
Control variables	Yes	
Firm FE	Yes	
Year-qtr FE	Yes	
Number of observations	571,388	477,938
R^2	0.614	0.631

We also test the effect of –(Z-score) directly on **CGS**/Assets

CGS/Assets =	–0.00054* -(Z-score) +	0.75*Sales/Assets + Control variables + FEs
(t =)	(6.84)	(138.9)

Does **financial constraint increases** the **tradeoff** between **credit spread** and **operational spread? YES**.

Cash levels indicate the manager's view about future cash needs and the firm's potential financing constraints.

Riddick and Whited (2009): Cash/Assets is the most strongly related to textual analysis indicating financial constraints.

By our model, firms with lower pledgeability hold more cash.

We use lagged **residual cash** from a quarterly cross-section regression of Cash/Assets on the **Std.Dev.** of 12-quarters Cash Flows/Assets and on the **industry** average **Std.Dev**. (following Opler et al. (1999) – the uncertainty motive.)

We divide firms in each quarter above\below the median. (Separate estimation as in Fazzari et al. 1988)

	Markup	
	High residual cash	**Low residual cash**
-(Z-score)	0.0040 (4.39) **>**	0.00091 (1.08)
Excluding big firms (top 10%)		
-(Z-score)	0.0040 (4.20) **>**	0.00055 (0.69)
The model includes Control variables, Firm FE, Yr-Qtr FE.		

An **alternative** theory: (AN ADDITION)

Firms with **market power** **raise prices** & **Markup** when **credit spread rises**

They prefer immediate cash flows, sacrificing future market share.

(Chevalier and Scharfstein (1994), Gilchrist (2017), Dou and Ji (2020).)

	Markup	
	MP = 1 Top 3 industry seller	**MP** = Sales/Industry sales
-(Z-score)*MP	**-0.0030 (2.31)**	**-0.071 (3.74)**
-(Z-score)	**0.0033 (6.11)**	**0.0034 (6.30)**
MP	0.0008 (0.12)	-0.799 (5.92)
Included: control variables, Fixed Effects		

By this theory, the coefficients should be **positive**, but they are **negative**.

And, since **CGS**/Assets **rises** in **–Z** → the effect of –Z on **Markup** comes (at least partially) from **lowering CGS**.

The effect of economic shocks:

The effects of six **NBER recessions** since 1973.

Predictions for firms with **higher –(Z-score)**:

(1) Increase in Markup, (2) decrease in Inventory

	Markup	Inventory/Sales
-(Z-score)*Recession	0.002**	-0.002***
-(Z-score)	0.004***	-0.003***
Included: control variables and Fixed Effects		

(The RHS variables are fixed for the duration of each recession.

Does an **exogenous rise** in **financial constraint** affect **operational hedging? – YES.**

The **2008** crisis → **negative** shock to τ *(*pledgeability*)* → **stronger Markup-Credit spread relationship**

Following Chodorow-Reich (2014), we use **firms' exposure to lenders** affected by the crisis.

Data on bank lenders of our sample firms: from the LPC-Dealscan database.

The impact of the subprime mortgage crisis on lenders' abilities to extend credit to the borrowers:

(1) Changes in loan supply for a firm's lenders between the 9-month period from 10-2008 to 6-2009, and average of the 18-month period containing 10-2005 to 6-2006 and 10-2006 to 6-2007.

(2) Bank's **exposure to Lehman** Brothers through the **fraction** of a bank's syndication portfolio where Lehman Brothers had a lead role.

(3) Banks' **exposure to toxic mortgage-backed securities**: the **correlation** between banks' daily stock return and the return on the ABX AAA 2006-H1 index.

Average crisis exposure measure over all lenders of the firm, weighted by loan size.

Was there a **stronger Markup-Credit spread relationship**

for **firms** that became **financially constrained** in the **2008 Great Financial Crisis?** – **YES.**

Data: **two** years **before** & **after** the **Lehman crisis**: Q3-2006—Q2-2008, and Q1-2009—Q4-2010.

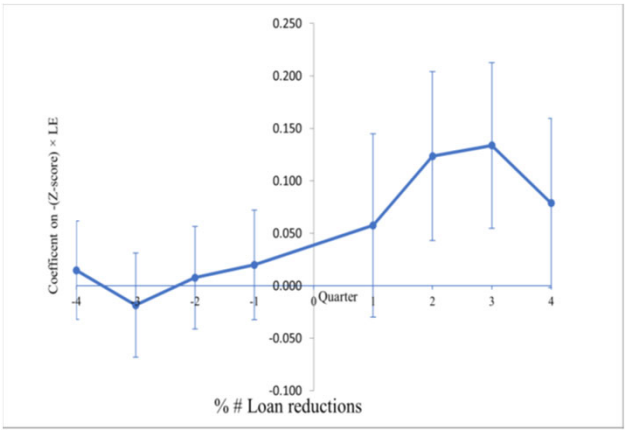
The -(**Z**-score) is fixed at the end of **2007**. Using Chodorow-Reich (2017) data.

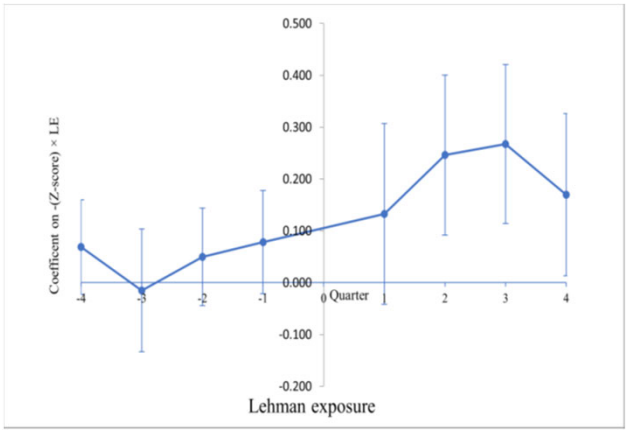
	Markup		
Lender's financial exposure→	%# loan reduction	Lehman exposure	ABX exposure
-(Z-score)*Lender exposure	**0.085*****	**0.157*****	**0.080*****
Lender exposure	-0.067	-0.072	-0.329
Including: Control variables, Control variables***Lender exposure**, Fixed Effects. -(Z-score) is fixed at the end of 2007.			

Similar results when **Leverage** replaces –(Z-score).

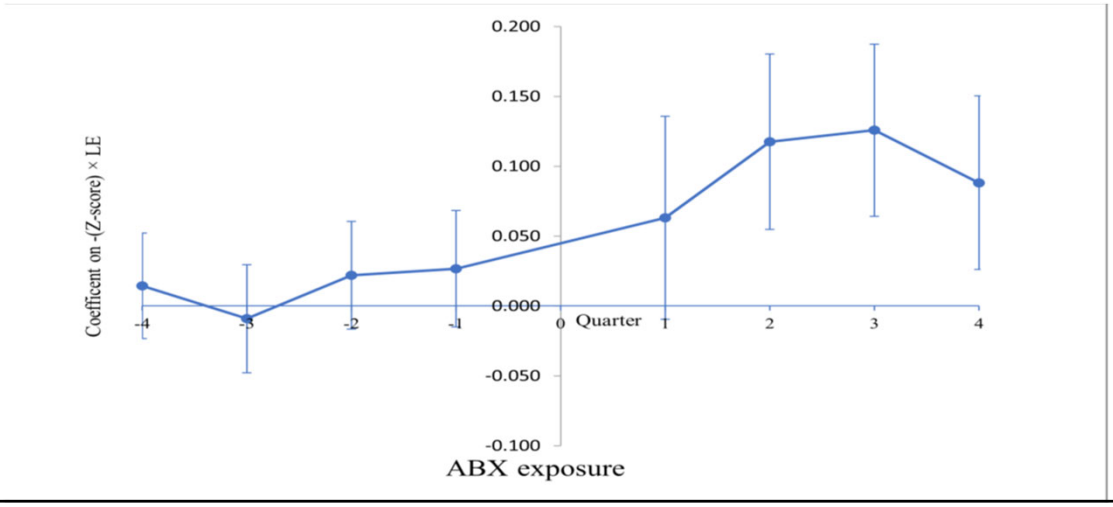
Conclusion: The **positive** Markup-Credit spread relationship became **stronger** for firms that became financially **constrained**.

Drawing of the quarterly coefficients of **–Z**





Drawing of the quarterly coefficients



Conclusion

We study the **allocation** of **corporate liquidity** associated with the **tradeoff** between the reduction of **financial risk** and of **operational risk**.

Theoretically, this tradeoff is manifested in a **positive** relationship between **credit spread** and **operational spread**, especially for **financially-constrained** firms.

Our **empirical** evidence **supports this tradeoff**:

Greater default risk reduces operational hedging, especially

- In episodes of low market liquidity (recessions)
- For financially-constrained firms.

Macroeconomic takeaway:

A **liquid**, well functioning capital market enables **higher** pledgeability, **weaker** (or no) **tradeoff**.

Macroeconomic takeaways:

1. Overleveraging reduces the economy's **resilience** to operational shocks.

2. Over-leveraging and **constrained capital → lower operational resiliency.**

3. A **liquid**, well functioning capital market → **higher** pledgeability, **weaker** (or no) **tradeoff,**

→ greater resilience.

Indeed, the **increase in liquidity** during the **Covid-19** shock was a wise policy.

Future extension: Study the effects on **stock returns**.