Corporate Hedging, Contract Rights, and Basis Risk

Ilona Babenko
Arizona State University

Yuri Tserlukevich
Arizona State University

Overview

- Evidence that firms in distress hedge less:
  - Theoretical explanations are based on binding collateral constraints (Rampini and Vishwanathan, 2010; Rampini, Sufi, and Viswanathan, 2014), asset substitution (Jensen and Meckling, 1976) or firm inattention
- This paper: A standard OTC derivative contract can be terminated conditional on certain events of default. Questions we pursue:
  - When/why do counterparties terminate?
  - Show negative effect on intensity of hedging.
  - How does the option affect incentives to hedge ex ante?

Background: ISDA Master Agreements

- OTC derivative contracts are governed by the ISDA Master Agreements
- The ISDA Master Agreement contains eight standard events of default, when the derivative position can be closed before maturity, plus additional events
  - failure to pay or deliver under the terms of the contract
  - breach of agreement
  - credit support default (e.g., a cessation of a financial guarantee)
  - misrepresentation
  - default under a specified transaction (e.g., a failure to pay under the securities lending agreement)
  - cross-default (e.g., default on a loan, breach of a covenant)
  - bankruptcy of the firm
  - merger without full assumption of liabilities
  - Common additional event: credit rating downgrade

Examples

- "the interest rate swap transactions were terminated due to an event of default relating to the Company's **non compliance with certain covenants**" *Sun Healthcare Group Inc.*
- "existing derivative contracts were involuntarily terminated **as a result of cross default provisions** between the Credit Facility and ISDA Master Agreements." *Safety Kleen Corp*
- "certain of the Company's derivative positions were terminated as a result of **defaults** under Sabine's derivative agreements that occurred **prior to the filing of the Bankruptcy Petition**." *Forest Oil Group*
- "the company has completely terminated its hedge portfolio and therefore is no longer party to any agreement whereby the counterparty financial institution can terminate a financial instrument **due solely to unfavorable changes in the company s credit ratings.**" *Baxter International Inc.*

Model Assumptions $t = \{0, 1, 2\}$

- Firm has fixed liabilities, D_1 and D_2, risky cash flows, C_1 and C_2, and can enter into a derivative contract that pays at $t = 2$
- At $t = 1$, the firm cash flow is C_1^H with probability $1 - p_1$ or C_1^L with probability p_1.
- A hedging contract is signed at $t = 0$ at fair value. Portfolio value V_t is imperfectly correlated with firm performance, i.e., there is basis risk.

$$P[V_1^H | C_1^H] \quad = \quad P[V_1^L | C_1^L] = \rho$$

$\rho > 1/2$ captures the fact that the derivative is a hedging asset.

Model Assumptions:

- If cash flow C_1 is low, **an event of default** is triggered whenever

$$C_1 - D_1 - V_1 < 0.$$

- The value of the derivative, V_1, is payable to the counterparty if the contract is terminated at $t = 1$.
- If the counterparty chooses not to terminate, the firm may recover, $C_2 = C_2^H$, or get further into distress, $C_2 = C_2^L$. The firm is liquidated if it receives another low cash flow and bad derivative outcome.
- The derivative portfolio value $V_2 \in \{V_1 + \delta_H, V_1 + \delta_L\}$,

$$P(\delta_H | C_2^H) = P(\delta_L | C_2^L) = \rho$$

- Continuing the contract with the firm has benefits for the counterparty, θ, if the firm is not liquidated.

Model Solution: Optimal Exercise Policy

- The option to terminate contract is only available conditional on default, i.e., with C_1^L and V_1^H.
- The counterparty (bank) terminates the derivative contract at $t = 1$ if its immediate payoff V_1 is greater than the expected continuation value

$$\begin{aligned} V_1^H \;>\; & (1-p_2)(V_1^H + \rho\delta_H + (1-\rho)\delta_L + \theta) \\ & + p_2\rho(V_1^H + \delta_L + \theta) \\ & + p_2(1-\rho)\left(V_1^H + \delta_H\right)(1-\alpha) \end{aligned}$$

$$V_1^H \;>\; \frac{\theta(1-p_2+\rho p_2)}{\alpha p_2(1-\rho)} - \delta_H = V^*$$

Ex-Post Effects of Derivative Terminations

Proposition

Suppose $V_1^H > V^*$. Then derivative terminations result in:

1. *The ex post change in the value of debt of*

$$\begin{aligned}\Delta D &= -p_2\rho\left(D_1 + D_2 + V_1^H - C_1^L - C_2^L\right) + p_2\left(1-\rho\right)\left(1-\alpha\right)\delta_H \\ &\quad -\alpha p_2\rho\left(C_1^L + C_2^L - V_1^H\right),\end{aligned}$$

2. *The ex post change in the value of equity of*

$$\Delta E = p_2\left(\rho\left(D_1 + D_2 + V_1^H - C_1^L - C_2^L\right) - (1-\rho)\delta_H\right),$$

3. *The ex post change in the value of firm of*

$$\Delta V = \Delta E + \Delta D = -\alpha p_2\left(\rho\left(C_1^L + C_2^L - V_1^H\right) + \left(1-\rho\right)\delta_H\right) < 0.$$

Firm's Incentive to Hedge

Corrolary

1. *With the termination right, the firm's expected benefits of hedging are non-monotonic in* α.
2. *The termination right reduces a firm's ex ante incentive to hedge.*

- The intuition is that an increase in bankruptcy costs can lead to a higher probability of exercising the termination right and becoming unhedged.

Extensions

- **Multiple Counterparties**
  - Collateral
  - When there are multiple counterparties, there may be incentives to "run" to terminate Mulltiple
- **Lenders**
  - Lenders partly internalize higher probability of liquidation, may exercise less Lender Counterparties
- **Contract Settlements**
  - Higher frequency of contract settlements may mitigate incentive to terminate

Sample and Data

- **Detailed Sample of Commodity Producers/Airlines**
  - Collect events of default and hedging data for oil and gas producers, coal producers, and airlines for the period 1996-2021
  - Main benefits: (i) can quantify hedging (hedge ratios, maturity) (ii) can better identify derivative termination events
- **Broad SEC/Compustat Sample**
  - For derivative terminations, we parse 10-Ks for any keywords ('cancel', 'terminat', 'liquidat', 'unwound'), any keywords pointing to the nature of the contract ('deriv', 'hedg', 'swap', 'position') and any keywords pointing to the reason for termination or a governing document ('event of default', 'master agreement', 'master contract', 'ISDA', 'hedging agreement').
  - Events of default keywords ('default', 'event of default', 'bankrupt', 'defaulted', 'bankruptcy')
  - Hedging is measured by a dummy of gains and losses
  - Hedging keywords ('collar', 'derivative', 'hedg', 'risk management', 'forwards', 'forward contract', 'swap').

Summary Statistics: Compustat/SEC Sample

Compustat/SEC Sample	*N*	*Mean*
Derivative user	135,413	0.211
Event of default (bankruptcy), %	191,045	0.318
High-cost bankruptcy (free fall), %	191,045	0.199
Low-cost bankruptcy (prepackaged), %	191,045	0.119
Credit downgrade, %	159,237	1.619
Accounting restatement (fraud-related), %	191,045	0.371
Use of exchange-traded futures	116,802	0.132
Derivative terminations, %	191,045	0.401

Reasons for Derivative Terminations	%
Firm bankruptcy	5.3
Merger	4.8
Default, cross-default	1.2
Credit rating, covenant violation	0.8
Contract breach, misrepresentation	0.4
Unspecified	87.5

Summary Statistics: Detailed Sample

Detailed Sample	*N*	*Mean*	*SD*
Commodity hedger	3,399	0.592	0.492
Hedge ratio, %	3,399	31.2	42.7
Hedge maturity, months	3,430	15.3	18.4
Event of default	3,433	0.031	0.173
High-cost bankruptcy (free fall)	3,433	0.017	0.128
Low-cost bankruptcy (prepackaged)	3,433	0.014	0.119
Hedge ratio based on supply agreements	225	73.5	35.2

Detailed Sample: Bankruptcies	*N*	*Mean*	*SD*
Hedge ratio, %	121	41.9	47.8
Hedge maturity (months)	121	18.2	16.3
May be required to post collateral	105	0.181	0.387
Number of counterparties	70	3	4
Counterparties are lenders	88	0.566	0.460
Derivative fair value, $M	121	44.5	182.2
Negative derivative fair value	121	0.240	0.429
Positive derivative fair value	121	0.537	0.501
Derivative terminations	97	0.598	0.493

Exercise Strategy of Contract Termination Rights

- How does exercise vary conditional on different events of default, firm performance (ROA), and collateral (asset tangibility)?
  - Consider three types of events of default: bankruptcy, credit downgrade, accounting restatement

Exercise Strategy of Contract Termination Rights

Dependent Variable:	*Derivative Terminations, %*			
Bankruptcy	5.308***	5.255***		
	[4.49]	[4.39]		
Credit downgrade	0.786***	0.784***		
	[2.73]	[2.63]		
Accounting restatement	1.141**	1.187**		
(fraud-related)	[2.09]	[2.13]		
Default-related words			2.721***	2.604***
frequency			[4.59]	[4.37]
Firm size	0.130***	0.173***	0.171***	0.183***
	[4.56]	[4.89]	[3.91]	[4.22]
Market-to-book ratio	0.001	0.000	0.001	-0.002
	[0.58]	[0.18]	[0.53]	[-0.68]
Asset tangibility	0.085	0.243	0.140	0.334
	[0.59]	[1.14]	[0.47]	[1.06]
Firm ROA	-0.233**	-0.283***	-0.266**	-0.285**
	[-2.55]	[-2.65]	[-1.99]	[-2.14]
Book leverage	0.135**	0.155**	0.110	0.100
	[2.35]	[2.33]	[1.30]	[1.14]
Observations	144,850	122,842	105,133	101,908
R-squared	0.123	0.133	0.124	0.138
Firm/Year/Ind×Year FE	Y/Y/N	N/Y/Y	Y/Y/N	N/Y/Y

Contract Moneyness and Exercise Strategy

- How does exercise strategy vary with the costs of bankruptcy, contract moneyness, lenders as counterparties?
- Use the detailed sample since it allows us to observe moneyness of derivative contracts, also better quality of derivative terminations data

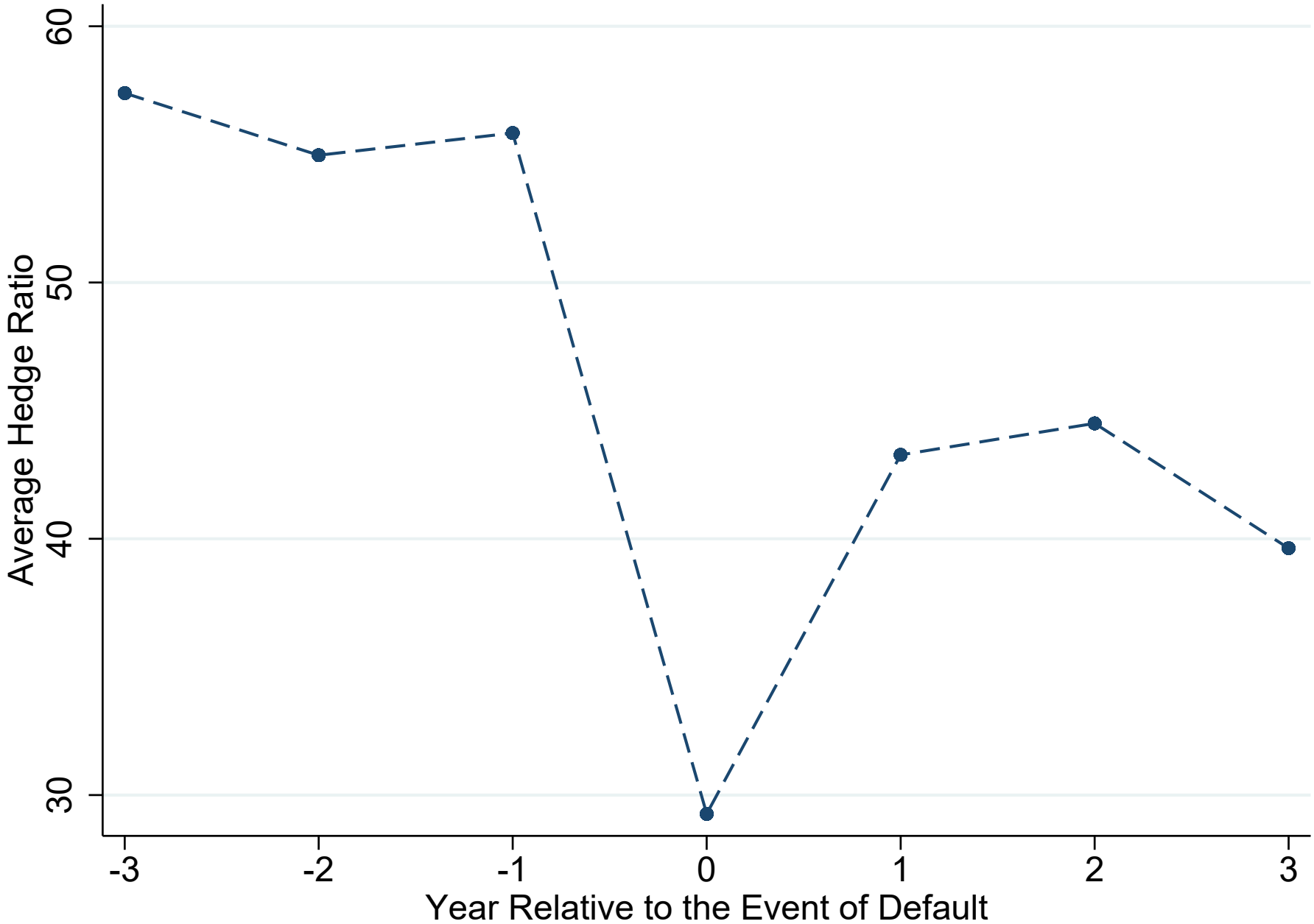
Contract Moneyness and Exercise Strategy

Dependent Variable:	(1)	(2)	(3)	(4)
	Derivative Terminations			
Derivative fair value ($000s)	-0.448***	-0.350***	-0.587***	
	[-2.93]	[-2.91]	[-3.97]	
High-cost bankruptcy (free fall)	0.297***	0.312***	0.231**	0.231**
	[3.04]	[3.05]	[2.25]	[2.25]
Counterparties are lenders		-0.270**		
		[-2.39]		
Negative derivative fair value				0.251**
				[2.29]
Hedge ratio			0.002*	0.001
			[1.89]	[1.52]
Observations	96	65	91	91
R-squared	0.166	0.226	0.198	0.195
Industry FE	Y	Y	Y	Y

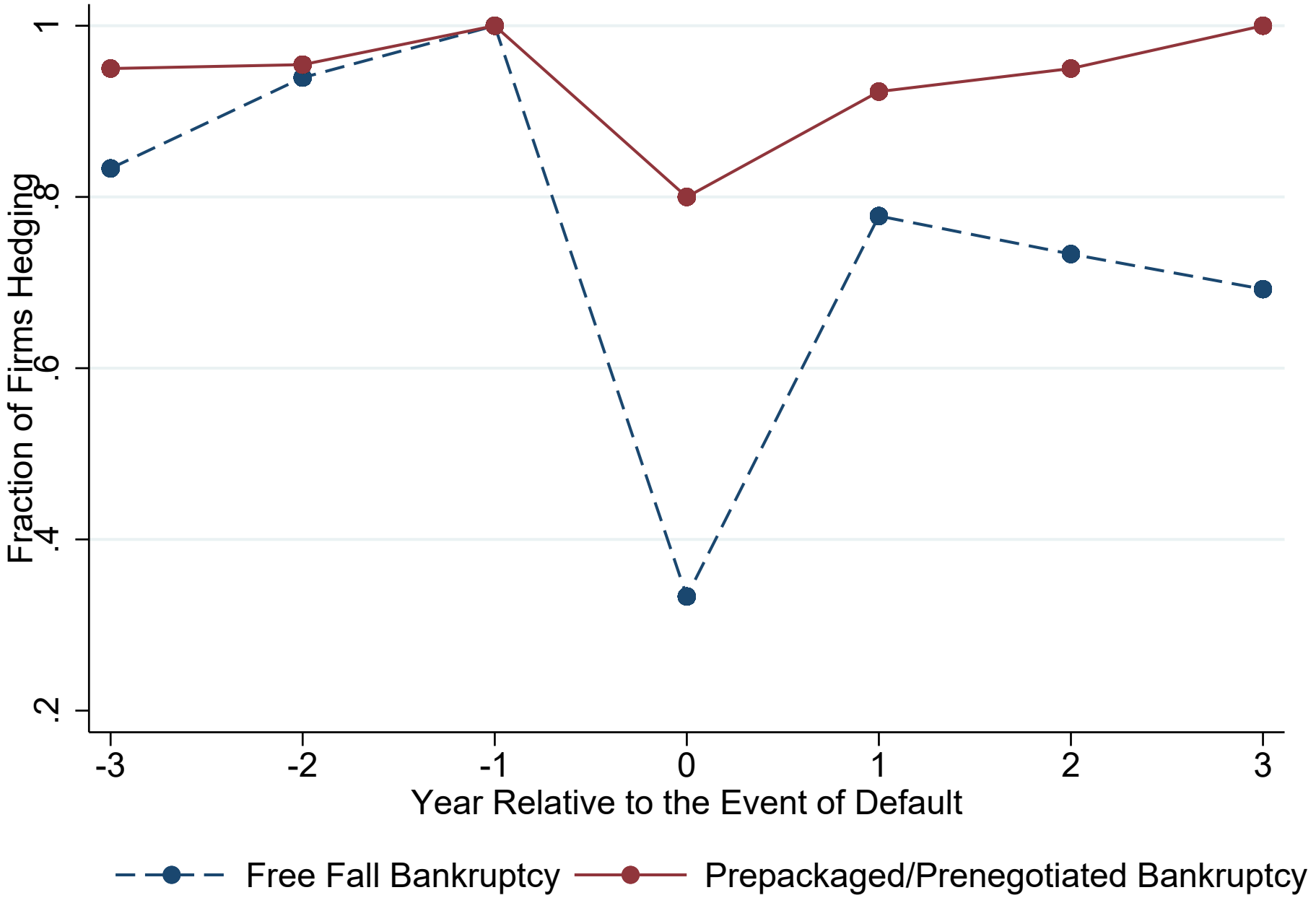
Effect of Derivative Terminations on Hedging Outcomes

- How does hedging policy change conditional on events of default?
- Are contract exercises responsible for lower hedging of firms in distress?
- Consider placebo tests: coal firms and hedging with exchange-traded futures
- Better identification: *Metavante v. Lehman Brothers* Court Case

Events of Default and Hedge Ratio



Type of Bankruptcy and Fraction of Firms Hedging



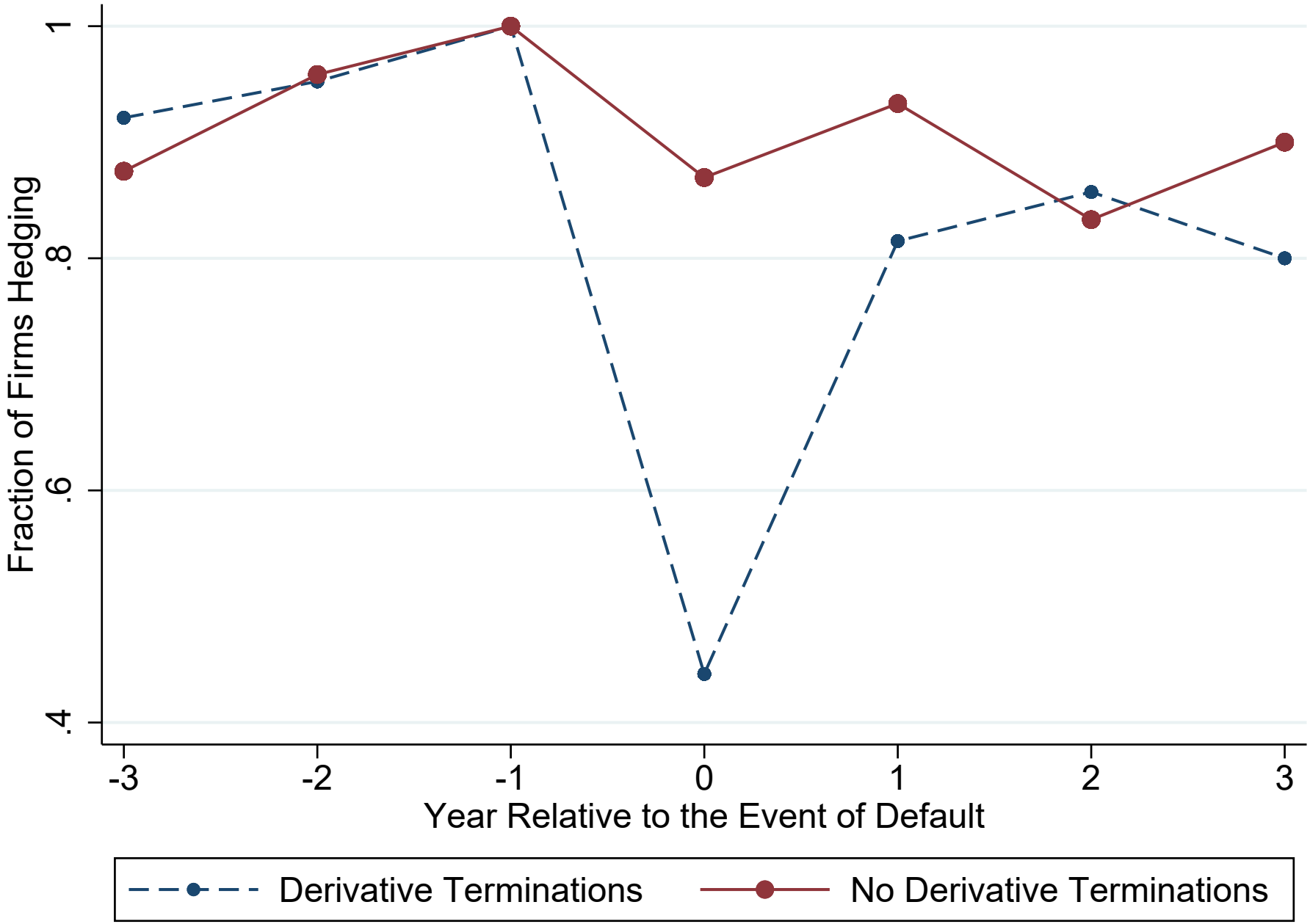
Detailed Sample: Events of Default and Risk Management

Dep. variable:	*Hedge Ratio*		*Hedge Maturity*		*Commodity Hedger*	
Bankruptcy	-18.83***		-0.62***		-0.19***	
	[-3.42]		[-3.42]		[-3.38]	
High-cost bankruptcy		-23.55***		-0.80***		-0.25***
		[-2.72]		[-3.05]		[-2.89]
Low-cost bankruptcy		-13.71**		-0.42*		-0.13*
		[-2.14]		[-1.81]		[-1.89]
Observations	3,298	3,298	3,330	3,330	3,298	3,298
R-squared	0.537	0.538	0.750	0.750	0.715	0.715
Year FE	Y	Y	Y	Y	Y	Y
Ind×Year FE	Y	Y	Y	Y	Y	Y

Broad Sample: Events of Default and Risk Management

Dep. variable:	*Derivative User*			*Hedging Intensity*		
Bankruptcy	-0.08***			-0.03***		
	[-2.75]			[-4.24]		
High-cost		-0.14***			-0.04***	
bankruptcy		[-3.39]			[-5.13]	
Low-cost		-0.01			-0.01	
bankruptcy		[-0.27]			[-1.30]	
Default-related			-0.04*			-0.09***
words			[-1.71]			[-16.38]
Observations	95,577	95,577	70,080	102,704	102,704	102,704
R-squared	0.728	0.728	0.723	0.671	0.671	0.672
Controls	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Ind×Year FE	Y	Y	Y	Y	Y	Y

Do Terminations Explain Low Hedging in Distress?



Do Terminations Explain Low Hedging in Distress?

Dependent Variable:	*Hedge Ratio*	*Hedge Maturity*	*Commodity Hedger*
Bankruptcy with derivative terminations	-38.66*** [-4.59]	-1.52*** [-5.27]	-0.53*** [-6.26]
Bankruptcy without derivative terminations	-11.59** [-2.04]	-0.23 [-0.78]	-0.05 [-0.44]
Observations	3,204	3,236	3,204
R-squared	0.545	0.757	0.723
t-stat	-2.66***	-3.99***	-4.86***
Controls	Y	Y	Y
Firm FE	Y	Y	Y
Industry×Year FE	Y	Y	Y

Form of Hedging May Matter

- If a firm hedges not with OTC derivatives, but with physical delivery contracts (also called supply agreements), the option to terminate upon an event of default does not apply.
  - Firm default is non-event. But, in case firm fails to deliver according to contract, there are penalties and other conditions.
  - Almeida, Hankins, and Williams (2021) show that hedging with purchase obligations does not subside as much in distress (attribute to greater pledgeability)

Placebo Test: Hedging with Derivatives vs. Supply Agreements in Coal Industry

Dep. variable:	(1) *Hedge Ratio*	(2) *Hedge Maturity*	(3) *Commodity Hedger*	(4) *Hedge Ratio*	(5) *Hedge Maturity*	(6) *Commodity Hedger*
Default with deriv. termin.	-33.65*** [-11.44]	-1.48*** [-5.39]	-0.49*** [-6.87]	1.66 [0.72]	0.09 [0.64]	-0.01 [-0.29]
Default w/o deriv. termin.	2.93 [0.26]	-0.16 [-0.48]	-0.06 [-0.48]	-15.55 [-1.10]	-0.46 [-0.68]	-0.18 [-1.03]
Observations	209	229	209	217	204	217
R-squared	0.728	0.713	0.748	0.935	0.940	0.953
t-stat	-3.14***	-3.12***	-3.21***	1.20	0.80	0.96
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Hedging type	Diesel Derivatives			Coal Supply Agreements		

Hedging with Exchange-Traded Futures (No Terminations)

Dependent Variable:	*Use of Exchange-Traded Futures*			
Bankruptcy	0.044**			
	[2.00]			
Credit downgrade	0.002			
	[0.27]			
Accounting restatement (fraud)	0.028**			
	[2.35]			
High-cost bankruptcy (free fall)		0.039		
		[1.35]		
Low-cost bankruptcy (prepack)		0.062**		
		[2.26]		
Default-related words frequency			0.339***	
			[18.52]	
Event of default with derivative termin.				0.129**
				[2.11]
Event of default w/o derivative termin.				0.038*
				[1.74]
Observations	92,588	105,133	105,133	105,133
R-squared	0.619	0.618	0.621	0.618
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

Conclusion

- The option to terminate the OTC derivative contract is valuable and explains the observed under-hedging in distressed firms.
  - The exercise probability increases in bankruptcy costs, but decreases in recontracting costs. The ex-ante value of the option increases in basis risk.
  - We document that the termination right is exercised in 59% of default cases.
  - Additional Result. Derivative terminations drive low hedge ratios: rely on Lehman Brothers vs. Metavante court case, which resulted in a larger number of early contract terminations of NY-based firms post the ruling.

Oil Price Movements Before Bankruptcy and Effect of Bankruptcy on Hedging

Dependent Variable:	(1) *Hedge Ratio*	(2) *Hedge Maturity*	(3) *Commodity Hedger*
Bankruptcy×Positive 1-month	-39.852***	-0.927***	-0.295***
oil return	[-3.96]	[-3.59]	[-3.92]
Bankruptcy×Negative 1-month	-8.750	-0.251	-0.065
oil return	[-0.82]	[-0.71]	[-0.69]
	[-0.73]	[2.64]	[3.15]
Observations	2,584	2,598	2,584
R-squared	0.520	0.747	0.718
t-stat for $(a) - (b)$	-2.15**	-1.54	-1.91*

Better Identification: Metavante v. Lehman Brothers Court Case

- To identify exogenous variation in derivative terminations, we rely on the Bench Ruling issued by the U.S. Bankruptcy Court in New York on September 15, 2009.
- Metavante entered into an interest rate swap with LBSF in 2007. In October 2008, LBSF has filed for Chapter 11, which qualified as an event of default.
- Metavante did not terminate the swap and did not make the next 3 quarterly payments it owed to LBSF under the interest rate swap contract.
- US Bankruptcy Court in NY ruled that a party to a swap agreement could not withhold payments othewise due to the bankrupt counterparty. Further, a party to an ISDA Master Agreement waives it right to terminate the agreement if it fails to do it "promptly" following the event of default.
- As a summary, we find that Metavante case outcome significantly increased the option exercise probability and

Lenders as Counterparties

- Lenders may require that the firm hedges with the lender's specialized derivatives desk or with the lender's affiliates.

Proposition

If the counterparty holds fraction κ of the firm's debt claim, then:

1. *The termination right is exercised if*

$$V_1^H > V^* + \frac{\kappa(-\Delta D)}{\alpha p_2(1-\rho)},$$

2. *If, in addition, ΔD is negative, then there exists a minimum stake κ^* in the debt claim, which, when bundled with the counterparty's claim, guarantees that the right is optimally abandoned.*

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Multiple Counterparties

- Firms can have multiple/heterogeneous derivative counterparties
- Consider sequential-move and simultaneous move games.
- In sequential game, the exercise of the first counterparty lowers the threshold for exercise by the second counterparty.

Suppose B would not exercise the right had it owned the entire portfolio,

$$V^*(\theta_B) > V_1^H > V^*(\theta_A), \tag{1}$$

Proposition

Counterparty B exercises its termination right if $V_1^H > \widehat{V}(\theta_B)$, *where*

$$\widehat{V}(\theta_B) \equiv \frac{(1-p_2)\theta_B}{\alpha p_2(1-\rho)} - \delta_H < V^*(\theta_B). \tag{2}$$

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