Corporate Hedging, Contract Rights, and Basis Risk*

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ABSTRACT

A hedging contract can be terminated by a counterparty if a firm experiences an event of default, such as a credit downgrade or bankruptcy. Counterparties are more likely to terminate contracts if the firm owes them money, leaving the firm exposed to risk at the worst possible time. We build the model and show that although the termination right reduces the hedging cost, it is inefficient because the counterparty does not consider the externality imposed on firms. As a result, firms hedge less, particularly when bankruptcy costs are high, and are more likely to liquidate. Our results help explain why firms in distress reduce their derivative portfolios. Using hand-collected data and textual analysis, we find support for model predictions.

JEL codes: G30, G32

Keywords: hedging, risk management, derivatives, event of default, distress, basis risk, ISDA

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I. Introduction

Derivative contracts are highly standardized and are governed by the International Swaps and Derivatives Association (ISDA) Master Agreements that apply to all over-the-counter (OTC) derivative transactions.[1] To protect a counterparty against a failure to pay and to reduce counterparty risk, a standard agreement contains an "event of default" clause, which may be triggered by a firm's default on its obligations, bankruptcy filing, misrepresentation, credit downgrade, covenant violation, or a merger without full assumption of liabilities. Triggering an event of default gives the counterparty the right, but usually not the obligation, to close its derivative agreement with the firm prior to maturity, and this right is often exercised in practice. In this paper, we examine the exercise policy of such termination rights and study how they affect firms' risk management policies and the probability of liquidation. We show that because both the availability of the termination right to a counterparty and the incentive to exercise it are negatively correlated with firm performance, firms are deprived of their hedging portfolios precisely when hedging has most value.

To determine the optimal exercise policy of the termination right from a counterparty's perspective, we build a theoretical model that incorporates realistic frictions. First, all else equal, the derivative counterparty that originated the contract (usually a large bank) may be reluctant to terminate the contract if it values continuing business with the firm (e.g., because of recontracting costs, the value of relationship banking, or the ability to cross-sell other products). Second, when there is a significant probability of costly firm liquidation following an event of default, the counterparty may prefer to exercise the right and receive the immediate cash payment rather than attempt to recover it from the firm later, when the value of firm's assets and collateral may be reduced. Likewise, in case when the counterparty

[1] A major advantage of OTC derivatives over exchange-traded derivatives is that they are flexible and allow the counterparties to tailor the terms of the contracts to suit their desired risk profiles, take large positions without a significant price impact, or enter into contracts with longer maturities. More than 90% of end-users indicate that they use OTC derivatives (Franzen (2000)), and their notional amount has grown to more than $600 trillion by 2022 (Bank for International Settlements).

is expected to procure a payment with its contract termination notice it may be beneficial to continue with the contract as it may take years to verify and prove the right to payment.[2]

Using the model, we show that the hedging contract is terminated optimally when the fair value of the derivative portfolio to the counterparty is positive and exceeds a certain threshold. More precisely, the counterparty exercises its right when it expects a settlement payment which is higher than the expected value of keeping the contract active. We also show that the value of this option increases in expected bankruptcy costs and in basis risk. Intuitively, the latter is because basis risk increases the likelihood that the firm experiences an event of default at the time when it owes money to the counterparty, which makes it more likely that the exercise threshold is reached.

The implication of this exercise policy is simple. A firm is likely to end up losing its hedging contract in the situations when it needs protection the most. Recall that the termination option becomes active only when the firm already experiences one of the contractual "events of default," which means that the firm is already likely to be in a financial distress. Additionally, the probability of the option exercise is higher when, through the basis risk, the distressed firm owes a payment to the counterparty (instead of expecting a payment, as it would be the case for a perfect hedge). Finally, the termination of the hedging portfolio is also more likely when the bankruptcy is expected to be more costly.

The model shows that the early termination of the derivative portfolio by the counterparty is inefficient in a sense that it benefits the counterparty exercising the right less than it hurts the firm. This is because the benefit to the counterparty accrues mainly because it can claim its contractual payments early, before they are reduced by potential bankruptcy costs. Yet,

[2] In the past, counterparties often relied on Section 2(a)(iii) of the Master Agreement to claim that, when they opt not to terminate the contract, they may refrain from making payments owed to the defaulted entity for as long it remains in default (McNamara and Metrick (2019)). However, the legal interpretations of the applicability of Section 2(a)(iii) vary: several cases in London resulted in a court determination that Section 2(a)(iii) is effective to suspend payment obligations of a non-defaulting party until the default is cured, potentially resulting in an indefinite suspension of such obligations; yet, U.S. bankruptcy court in New York effectively took the opposite view, determining that Section 2(a)(iii) is in violation of the automatic stay provisions.

for the firm, losing the hedging portfolio at a time of distress increases the probability of its liquidation, which taxes *all* assets of the firm. For this reason, even though consenting to the early termination option reduces the cost of derivatives to the firm, the disadvantage of higher ex-post risk outweighs the ex ante cost savings. In turn, the inefficiency of hedging portfolio termination reduces the firm's incentive to enter hedging positions. Somewhat counter-intuitively, the termination right can make a firm want to hedge less when its bankruptcy costs are high. This is because the counterparty is more likely to exercise the termination right with higher bankruptcy costs. Overall, although hedging is still desirable for risk reduction, the inefficiency of the termination right reduces the value of hedging to the firm.

To test the predictions of the model about the exercises of contract termination rights and to see whether these events can contribute to explaining evidence on low corporate hedging in distress, we collect data from several sources. First, we obtain detailed data on the hedging portfolios of firms during the period 1999-2020 for several industries where we can precisely measure risk exposures: crude oil and natural gas hedges by oil and gas producers (SIC 1311), jet fuel hedges by commercial airlines (SIC 4512), and diesel fuel hedges by coal producers (SIC 1220).[3] Second, to broaden our inference beyond firms in these industries, we use textual analysis for all firms in Compustat/SEC universe and calculate their hedging intensity based on the frequency of hedging-related words used in their 10-K forms (e.g., 'risk management', 'derivative', 'hedg', 'swap', and 'collar'). Third, we obtain information on the events of default from the database compiled by Dou, Taylor, Wang, and Wang (2021) and Ma, Tong, and Wang (2022), as well as from the UCLA LoPucki Bankruptcy Research Database that records bankruptcy petitions by large U.S. firms. Finally, we hand-collect the information on derivative terminations by the counterparties around the events of default.

Using our detailed industry sample, we find that counterparties exercise their termination

[3]These industries provide an excellent setting to study risk management practices due to their strong exposures to commodity prices and the existence of well-developed derivative markets. For many other industries, the bulk of hedging focuses on interest rate or foreign exchange risks.

rights in 63% of default cases and are more likely to do so when the fair value of the derivative portfolio is positive. The estimate of the frequency of the exercise is conservative because firms are not obligated to disclose it. Further, consistent with many of the previous studies, we find that corporate hedging using financial derivatives drops substantially when the firm experiences an event of default. For example, controlling for firm and year fixed effects, we find that firms in both the broad Compustat/SEC sample and the detailed industry sample are approximately 16-17% less likely to use derivatives once an event of default clause has been triggered. Similarly, firms' hedge ratios and hedge maturities drop by 16% and 6 months, respectively. All of these effects are significantly more pronounced for the high-cost ("prepackaged/prenegotiated") than the low-cost ("free fall") bankruptcies,[4] which is consistent with the model's prediction that terminating derivatives is more attractive for the counterparties when a prospective bankruptcy is perceived to be more costly.

That derivative contracts can be terminated following an event of default offers a novel complementary explanation for why distressed firms tend to have low hedge ratios (see, e.g., Rampini, Sufi, and Viswanathan (2014) and Almeida, Hankins, and Williams (2021)). Whenever an event of default clause is triggered, the affected contracts are effectively removed from the books, and it appears as if the firm unwinds its hedging positions. Additionally, the continuing event of default, fixed costs, or collateral constraints may impede the company's ability to quickly re-contract to the prior level. Firms state in their disclosures that entering a new contract would be difficult. While it is certainly possible that firms are voluntarily decreasing their use of derivatives in distress (e.g., because of collateral constraints or risk-shifting incentives near default), we also find that the relation between firms' observed hedge ratios and the occurrence of events of default is driven almost entirely by cases with confirmed derivative terminations by the counterparties. These results suggest that derivative

[4]The prenegotiated and prepackaged bankruptcies are generally considered to be less costly because there is a preliminary agreement reached between shareholders and creditors on the terms of a reorganization plan. Such bankruptcies typically allow firms to save on legal fees and tend to settle faster (see, e.g., Tashjian, Lease, and McConnell (1996) and Betker (1997)).

terminations may be one of the reasons why firms do not hedge in distress and provide a complimentary explanation to the one proposed by Rampini and Viswanathan (2010).

To mitigate a potential concern that derivative terminations proxy for a deterioration of firm financial condition, we perform an additional test for firms in the coal industry. The coal industry presents a useful laboratory because coal firms hedge both using financial derivatives, which are governed by the ISDA Master Agreements, and supply agreements, which are not. If derivative terminations simply proxy for worse financial conditions and firms voluntarily unwind their hedging programs once in distress, then both hedging with derivatives and hedging with supply agreements should be affected. In contrast, we find that only hedging with derivatives drops following events of default, while hedging with supply agreements is unaffected, which is consistent with derivative terminations causing a decline in corporate hedging when an event of default is triggered. In addition, these results give further support to the findings by Almeida, Hankins, and Williams (2021), who document that hedging with purchase obligations (PO) does not drop significantly in distress and that firms often substitute purchase obligations for financial derivatives once in distress.

Finally, we identify we use two different sources the variation in the decision of counterparties to terminate their derivative contracts that are plausibly unrelated to firm financial condition. First, we estimate the movements in the moneyness of the derivative portfolio by tracking the movements in the price of the hedged commodity during the one month before an event of default and leverage the fact that exercise is more likely when the portfolio is in-the-money for the counterparty. Consistent with derivative terminations accounting for low hedging in distress, we find that firms experience substantially larger drops in their hedge ratios and maturities when the events of default are triggered following an appreciation in the price of the hedged commodity during a prior month.

Second, we use the Bench Ruling in a *Lehman Brothers* vs. *Metavante* court case, in which the U.S. Bankruptcy Court in New York held that a party to a swap agreement could not rely on Section 2(a)(iii) of the ISDA Master Agreement to withhold payments otherwise due to the bankrupt counterparty if it failed to promptly terminate the contract following the bankrupt's counterparty event of default (see Marchetti (2010)). This ruling has significantly increased the incentive of counterparties to terminate their contracts with the defaulting firm. Using a difference-in-differences setting, we show that the likelihood of derivative terminations indeed increased for firms with New York jurisdications after the Bench Ruling. More importantly, we also show in a triple-difference setting that these firms experienced larger reductions in their hedge ratios upon the events of default associated with bankruptcy filings after the Bench Ruling.

The paper is organized as follows. In the next section, we provide background and a brief overview of the existing literature. We then present a simple model of optimal exercise of the termination option, determine the value of this option, and study the role of the basis risk and moneyness. In the next two sections, we describe our data sources, construction of the main variables, and the procedure for textual search and discuss the empirical results. The last section concludes.

II. Institutional Background

Here we briefly describe the contingencies and consequences of terminating a hedging position under the ISDA Master Agreement. Over-the-counter derivative contracts are governed by the Master Agreements, with the standard being the ISDA Master Agreements of 1992, 2002, or 2012 published by the International Swaps and Derivatives Association (ISDA.org).[5] These contracts serve all OTC derivative transactions, both in the United States and inter-

[5]The main difference between the ISDA Master Agreements of 1992 and 2002 is in the calculation of amounts owed on early termination (see, e.g., Charles (2012) and McNamara and Metrick (2019)). The 1992 agreement allows the non-defaulting counterparty to choose between the "Market Quotation" or "Loss" methods. The "Market Quotation" method requires to procure three quotations from leading dealers on the amounts they would expect to pay or receive to enter into a replacement transaction with the non-defaulting party, whereas the "Loss" method requires the non-defaulting party to make a good faith determination of its total losses or gains stemming from the termination. In contrast, the 2002 agreement uses a hybrid "Close-Out" approach to calculate amounts owed on early termination.

nationally, and help the involved parties to minimize legal uncertainty and contracting costs by avoiding negotiations of the legal terms on a transaction-by-transaction basis. The ISDA Master Agreements describe how parties can enter into bilateral contracts, make payments, and arrange collateral, and they are not product-specific, meaning that parties who signed a bilateral agreement for a particular class of transactions can make all future transactions subject to the same agreement and only need to negotiate the economic terms of the new contract, such as notional amount or maturity.

The agreements also contain termination clauses that are intended to reduce credit exposure of the involved parties and that become active upon an event of default by one of the parties or a termination event (Franzen (2000)). There are eight standard events of default, which allow the non-defaulting party to close the derivative position before maturity, but most agreements include additional events in the attached schedules or credit support annexes. The standard events for the party at fault include: a) failure to pay or deliver under the terms of the contract; b) breach of agreement; c) credit support default (e.g., an unanticipated cessation of a financial guarantee by a third party); d) misrepresentation; e) default under a specified transaction (e.g., a failure to pay when due under the securities lending agreement); f) cross-default (e.g., a default on a loan or a breach of a financial covenant); g) bankruptcy of the firm; and h) merger without full assumption of liabilities. In addition, the parties can specify other events of default in the agreement, and these events are typically credit-related, such as credit downgrades by one or more specified credit rating agencies of a firm's outstanding long-term debt. Finally, there are termination events which, although nobody is at fault, warrant the early termination of the transactions, such as a change in tax law resulting in taxes being imposed on transactions, illegality, or a merger of a party resulting in a deterioration in its credit quality.

Upon an event of default or a termination event with respect to one party (the "defaulting party"), the other party is entitled to terminate all the outstanding transactions or the affected transactions pursuant to the event, value them, and net out amounts owed by the defaulting party from any amounts that may be owed to the defaulting party. Only the party with the greater debt is liable to pay the netted amount. The single agreement concept reduces counterparty credit risk by ensuring that settlement payments, margin payments, and close-out payments only flow from the party who owes the greater amount.

There are two important moments to keep in mind. First, the event of default creates an option, but usually not the requirement, to close the agreement. There are a number of scenarios where a party may not wish to close out an ISDA Master Agreement, even though an event of default has occurred. For example, if the close-out would result in it having to make a sizeable payment to the defaulting party, then the non-defaulting party may not be inclined to exercise its right to terminate. Second, as most other agreements, the derivative agreements typically provide for the "grace period" before they can be closed. Grace periods provide parties with an opportunity to remedy the issue that might otherwise give rise to an event of default. A right to close out is only exercisable for as long as the relevant event of default or termination event is continuing. If the underlying event is remedied or otherwise ceases to exist, then the right to terminate is lost and the transactions continue as before.

Once the qualified event is triggered and the position is to be closed, the parties must decide on how to calculate the final net payment. The ISDA Master Agreement provides that the close-out amount is determined by assessing the amount of the losses or costs incurred (or the gains realized) in replacing the terminated transactions or by providing the economic equivalent of the material terms of the terminated transactions. The early termination amount is a net amount. Where termination values are separately calculated in respect of individual transactions or groups of transactions, they are added to produce the single early termination amount. Close-out netting has advantages from several perspectives. For example, when analyzing the amount of overall financial exposure of a firm to each of its counterparties, credit departments will base the amount on the net exposure when a legally enforceable netting agreement is in place.

In sum, the hedging contracts may be closed after a number of events, including default, bankruptcy, credit downgrade, or a merger. Following such events, the final amount is calculated as a replacement value of the position to be cancelled, and the payments for the multiple positions are netted.

III. Literature

Our paper contributes to the literature on corporate hedging, which examines determinants of risk management policies and channels for firm value creation. Corporate hedging can increase shareholder value by reducing tax liability (Smith and Stulz (1985), Graham and Smith (1999)), increasing debt capacity (Leland (1998), Haushalter (2000), Graham and Rogers (2002)), reducing financing costs and improving access to finance (Bolton, Chen, and Wang (2011), Cornaggia (2013)), increasing corporate investment and international trade (Froot, Scharfstein, and Stein (1993), Campello, Lin, Ma, and Zou (2011), Jung (2021)), reducing costs of financial distress (Fehle and Tsyplakov (2005), Purnanandam (2008), Gilje and Taillard (2017), Ellul and Yerramilli (2013)), improving contract terms with firm customers, creditors, and managers (Bessembinder (1991)), and alleviating information asymmetries (DeMarzo and Duffie (1995), Manconi, Massa, and Zhang (2018)).

Several papers examine determinants of hedging policies related to managerial risk-aversion and compensation contracts (Stulz (1984), Tufano (1996), Knopf, Nam, and Thornton (2002), Bodnar, Giambona, Graham, and Harvey (2019)), lender interests and binding covenants (Babenko, Bessembinder, and Tserlukevich (2023)), and economies of scale (Mian (1996), Nance, Smith, and Smithson (1993), Geczy, Minton, and Schrand (1997)). We contribute to this literature by showing that derivative contract terminations have significant explanatory power for firms' observed hedging outcomes and may impede firms from realizing the full benefits of hedging.

The topic that we study is closely related to the recent studies examining the preferential treatment of derivatives in bankruptcy (see, e.g., Roe (2011) and Bolton and Oehmke (2015)). Specifically, Bolton and Oehmke (2015) model priority conflicts in bankruptcy between debtholders and derivative counterparties by comparing the cases when the derivatives have priority in bankruptcy over all other senior claims and when they do not. Their work shows that the privileged status of derivatives effectively transfers default risk to debtholders, thereby increasing the cost of borrowing, while the positive effect of the privileged status of derivatives comes from cross-netting benefits for derivative writers who serve as counterparties to many firms with imperfectly correlated defaults. Our work differs from Bolton and Oehmke (2015) in that we focus on the optimal exercise policy of contract termination rights prior to costly firm liquidation and consider the effect of termination rights on firm hedging policy and survival.

The literature pioneered by Rampini and Viswanathan (2010) focuses on the role of collateral constraints for hedging by constrained firms. Their insight is that the opportunity cost of engaging in risk management is forgone current investment and therefore constrained firms hedge less. Subsequently, Rampini, Sufi, and Viswanathan (2014) test the theory predictions using a sample of 23 U.S. commercial airlines and find that more financially constrained airlines, i.e., those that have lower net worth and lower credit ratings, are less likely to hedge fuel costs.[6] They also find that fuel hedging drops when airlines enter distress, i.e., when their credit ratings decrease to CCC+ or below or they enter bankruptcy. Bretscher, Schmid, and Vedolin (2018) argue that risk management through swaps is inherently risky for constrained firms and show that although constrained firms hedge more, they are left more exposed to risk even after hedging. Consistent with findings by Rampini, Sufi, and Viswanathan (2014), we find that firms' hedge ratios decrease significantly following

[6] Rampini, Viswanathan, and Vuillemey (2020) and Vuillemey (2019) also provide evidence that higher net worth by banks and financial institutions is associated with more hedging using data on interest rate and foreign exchange risk hedging.

bankruptcy filings, but we also find that these changes in the hedge ratios are explained by derivative contract terminations by firm counterparties.

Our study also contributes to the literature on containing cash flow risk by means other than OTC derivatives. For example, (Phillips and Moon (2020)) find that firms' use of outside purchase contracts is related to a reduction in cash flow volatility, implying that such contracts partially substitute for hedging. More generally, firms can reduce financial hedging while increasing operational hedging (Hoberg and Moon (2017)). Recent papers by Almeida, Hankins, and Williams (2017) and Almeida, Hankins, and Williams (2021) show that purchase obligations (POs), which are the forward contracts with suppliers, are used by many firms as a risk management tool. Almeida, Hankins, and Williams (2021) build a model where POs relax the firm liquidity constraints and find that firms in distress shift away from derivatives and use more POs. We argue that the important difference between POs and derivatives is that the former are not subject to the ISDA Master Agreements, which allows firms that use them to stay hedged following an event of default. Consistent with this argument, we find that counterparty derivative terminations have no significant explanatory power for the dynamics of POs in distress, while they can explain the dynamics of hedging with derivatives.

Another strand of literature focuses on the question how hedging is affected by supply of derivatives. Giambona and Wang (2020) use for identification a regulatory change in treatment of derivatives in bankruptcy that allowed derivative counterparties to circumvent the automatic stay provision of the U.S. Bankruptcy Code: The Safe Harbor Reform of 2005. They find that following the reform, fuel hedging by airlines has increased, especially for financially distressed airlines that are affected more by the reform. In a related paper, Hu and Shan (2022) find, however, that firms that use derivatives borrow less and pay higher loan spreads following the 2005 reform, which is consistent with priority conflicts between debtholders and derivative counterparties.

IV. Model

To examine how the derivative termination rights affect firms' hedging policies, we build a simple model. The firm has risky cash flows and fixed liabilities and holds a portfolio of derivatives that partially hedges its cash flow risk. When the cash flows are sufficiently low, the firm experiences an event of default, which gives its derivative counterparties a right to terminate their contracts with the firm early. After the event of default, the firm may either recover or be liquidated, depending on further cash flow realizations, performance of the derivative portfolio, and the counterparty's decision to terminate or continue the contract.

A. Preliminaries

There are three dates: 0, 1, and 2. The firm has random cash flows at dates 1 and 2, $C_1 \in \{C_1^L, C_1^H\}$ and $C_2 \in \{C_2^L, C_2^H\}$, with the corresponding probability p_t of a low cash flow realization at date t. The firm also has fixed liabilities D_1 and D_2 due at dates 1 and 2, respectively (see Figure 1). These liabilities could come from employee wages, fixed production costs, or a firm's outstanding debt.

Unless stated otherwise, we assume that the counterparty issuing derivatives is safe (i.e., it has a zero probability of default), and we refer to it as a bank. A standard hedging contract is signed between the firm and the bank at date 0. The contract matures and settles at date 2, unless there is an event of default prior to contract maturity. Specifically, if the firm experiences an event of default at date 1, the bank has the right to terminate the contract by settling it at the current fair value V_1. A positive value of V_1 means that the firm owes money to the bank, and a negative value means that the bank owes money to the firm.[7]

The value of the firm's derivative portfolio can take two values at date 1: $V_1 \in \{V_1^L, V_1^H\}$, $V_1^L < 0, V_1^H > 0$. Following Bolton and Oehmke (2015), we assume that this value is linked to some underlying asset, such as a commodity price, which is imperfectly correlated with

[7]Throughout the paper, we denote by V_t a value of the derivative to the bank, implying that the value of the derivative to the firm is $-V_t$.

the firm's cash flows. Specifically, we assume

$$P[V_1^H|C_1^H] = P[V_1^L|C_1^L] = \rho, \tag{1}$$

$$P[V_1^H|C_1^L] = P[V_1^L|C_1^H] = 1 - \rho, \tag{2}$$

where $\rho \in [\frac{1}{2}, 1]$ captures the fact that the derivative portfolio is a hedging asset, with a higher value of ρ implying a lower *basis risk*.

To model the decision of the bank to terminate the derivative contract at date 1, we need to specify when an event of default can occur. In practice, the event of default is more likely when the firm has low cash flows and can be triggered, among other things, by a firm's credit downgrade, covenant violation, misrepresentation, or a missed interest payment. For simplicity, we assume that the event of default is triggered by a firm's net worth covenant violation, i.e., the default occurs when a firm's cash flow net of the liabilities and the value of the derivative portfolio is negative

$$C_1 - D_1 - V_1 < 0. \tag{3}$$

Further, we assume that the above condition is satisfied only if both the firm's cash flow is low and the value of the derivative portfolio moves against the firm, $C_1 = C_1^L$ and $V_1 = V_1^H$.

Given an event of default, the bank has the right to continue the contract with the firm until maturity or to terminate it early; in the latter case, the bank recovers from the firm the current value of the contract V_1.[8] We assume that continuing the contract with the firm, as opposed to terminating it, has benefits for the bank, $\theta > 0$, which are realized only if the firm is not liquidated. These benefits could capture the value of the ongoing relationship between the firm and the bank (e.g., the bank can cross-sell other products to the firm or has an informational advantage over other market participants).

Finally, if by the time of liquidation there is an outstanding derivative contract of value V_2 (either because there was no event of default at date 1 or because the bank chose not to

[8]For simplicity, we assume the cash flow at date 1 is sufficient to pay to the terminating counterparty, $C_1^L > V_1^H$.

terminate the contract), the final netted payment is subject to bankruptcy costs. Specifically, if either the firm or the bank owes a payment at date 2, we assume that this payment is reduced by a proportional cost, α, which we refer to as bankruptcy costs. Bankruptcy costs are levied on the total firm's cash flows at date 2. These costs can capture the delays in obtaining payments from a liquidated firm or the fact that the payment owed to the bankrupt firm is often postponed, sometimes by several years in case of complex bankruptcies, and it could be negotiated down (see, e.g., Roe (2011) and McNamara and Metrick (2019)).[9]

We model the evolution of the derivative portfolio from date 1 to date 2 in a binomial way, $V_2 \in \{V_1 + \Delta_H, V_1 + \Delta_L\}$, $\Delta_H > 0$, $\Delta_L < 0$, and assume that the innovations in the derivative value are positively correlated with the firm's cash flows

$$P(\Delta_H|C_2^H) = P(\Delta_L|C_2^L) = \rho, \tag{4}$$

$$P(\Delta_L|C_2^H) = P(\Delta_H|C_2^L) = 1 - \rho. \tag{5}$$

We assume the derivative value is a martingale, $V_1 = E(V_2)$, which implies the following joint restriction on the probabilities and the innovations in the value of the derivative portfolio

$$(1 - p_2)(\rho\Delta_H + (1 - \rho)\Delta_L) + p_2((1 - \rho)\Delta_H + \rho\Delta_L) = 0. \tag{6}$$

For example, if the high and low cash flows are equally likely, $p_2 = \frac{1}{2}$, this condition implies that the hedging portfolio value can increase or decrease by the same amount, $\Delta_H = -\Delta_L$.

The firm can only be liquidated at $t = 2$. Whether it is liquidated depends on firm's cash flows and the performance of its derivative portfolio. Specifically, the firm is liquidated if

$$C_1 + C_2 - D_1 - D_2 - V_2 < 0. \tag{7}$$

We assume (7) can only be satisfied if the firm experiences two low cash flow realizations, C_1^L and C_2^L. Further, condition (7) is satisfied at $V_2 = 0$ (firm is liquidated after low cash

[9]The model could be easily extended to acommodate the asymmetric cost levied on the positive and negative contract payments.

flows if it did not hedge) and at $V_2 = V_1^L + \Delta_H$ (firm that did not default may be liquidated later if the derivative portfolio moves against the firm), but not at $V_2 = V_1^H + \Delta_L$ (defaulted firm is not liquidated if the derivative portfolio performs well). These assumptions imply, in particular, that hedging is valuable and that firms that continue to hedge beyond date 1 have better chances of avoiding costly liquidation.[10]

We also make the following simplifying assumption.

Assumption 1. $\rho(C_1^L + C_2^L) > V_1^H$

This assumption is always satisfied when there is no basis risk, $\rho = 1$, because $C_1^L > V_1^H$. When basis risk is the highest, $\rho = 1/2$, this assumption implies that the average cash flow over two periods is larger than the portfolio that hedges these cash flows.

B. Optimal Exercise Policy

We now examine the exercise policy of the right to terminate the derivative contract early from the bank's perspective. Recall that the option is only available to the bank if the firm experiences an event of default, i.e., if $C_1 = C_1^L$ and $V_1 = V_1^H$. The bank terminates the derivative contract at date 1 if it receives an immediate payment which is greater than the expected continuation value

$$\begin{aligned} V_1^H \quad &> \quad (1-p_2)(V_1^H + \rho\Delta_H + (1-\rho)\Delta_L + \theta) + p_2\rho(V_1^H + \Delta_L + \theta) \\ &\quad +p_2(1-\rho)\big(V_1^H + \Delta_H\big)\,(1-\alpha). \end{aligned} \tag{8}$$

The first two terms in (8) reflect the expected value to the bank if the firm recovers, either because firm cash flows improve (the first term) or because the hedging portfolio offsets the low cash flows (the second term), whereas the last term represents the payoff to the bank in case of firm liquidation.

[10]When the shareholders make decisions, they would also want to retain their hedging porfolio, i.e., they will not have incentives to "shift risk" by not hedging. This is because we assume that hedging offsets cash flow risk and allows to avoid liquidation in at least one state of the world where a firm would otherwise have to liquidate without payments to shareholders.

Using condition (6), we can rewrite (8) as

$$V_1^H \quad > \quad \frac{\theta(1-p_2+\rho p_2)}{\alpha p_2(1-\rho)} - \Delta_H \equiv V^*. \tag{9}$$

Intuitively, the bank terminates the contract early when its expected losses in case of firm liquidation are higher than the expected value of continuing business with the firm in case of recovery. First, the contract is more likely to be terminated if the value of the derivative to the bank is high at date 1. This is because a higher portfolio value exposes the bank to higher expected bankruptcy costs. Second, higher bankruptcy costs, α, and higher basis risk, $1-\rho$, make the termination of the contract more attractive for the bank. Finally, the higher benefits of contract continuation, θ, naturally imply the lower incentive to terminate the contract early.

C. The Value of Termination Right

If the termination right is optimally exercised by the bank at V_1^H, then the date 0 value of the termination right is

$$R_0 = p_1(1-\rho)\left(\alpha p_2(1-\rho)(V_1^H+\Delta_H) - \theta(1-p_2+p_2\rho)\right). \tag{10}$$

The first term in (10) is the gain to the bank from the reduction in expected bankruptcy costs in case of firm liquidation, and the second term is the loss of benefits of continuing business with the firm in case of firm recovery. Both terms are multiplied by $p_1(1-\rho)$, which is the ex ante probability of the termination right exercise.

The value of the termination right decreases in the value of continuing business, θ, and increases in bankruptcy costs, α, and the basis risk of the hedging portfolio. Naturally, the right has no value if the bank never exercises it, $V_1^H < V^*$. Assuming that the derivative contract is priced competitively, the termination right makes the contract cheaper for the firm by amount R_0.

D. Termination Right Inefficiency

Although the termination right makes the derivatives cheaper for the firm, it has a negative effect on the probability of firm survival, which in turn increases expected bankruptcy costs and can affect the prices of all other claims on the firm's assets.

Proposition 1. *Suppose $V_1^H < V^*$. Then:*

1. *The termination right increases the expected bankruptcy costs by*

$$\Delta BC = p_1 p_2 (1-\rho)\alpha \left(\rho(C_1^L + C_2^L) - V_1^H\right) > 0, \tag{11}$$

2. *The termination right is inefficient, i.e.,*

$$L = p_1(1-\rho)\left(p_2\alpha\rho(C_1^L + C_2^L) - p_2\alpha V_1^H + \theta(1 - p_2 + p_2\rho)\right) > 0. \tag{12}$$

The intuition for the increase in expected bankruptcy costs is that the firm has a higher probability of liquidation after the termination of the derivative contract. A partially offsetting effect is that by paying amount V_1^H to the terminating counterparty at date 1, the firm removes some of its assets prior to liquidation and hence reduces bankruptcy costs. The second part of the proposition shows that the termination right is inefficient, in a sense that there are *net* expected losses to firm claimholders because of the increased probability of firm liquidation and the loss of the relationship benefits.

E. The Incentive to Hedge and Bankruptcy Costs

Here we consider the benefits of hedging to the firm, with and without the termination right, and examine how the firm's incentive to hedge depends on bankruptcy costs. Perhaps somewhat surprisingly, we find that when the bank has the termination right, higher bankruptcy costs can lower a firm's incentive to hedge. Define the threshold bankruptcy cost parameter α^* as $V_1^H = V^*(\alpha^*)$

Corrolary 1. *The termination right reduces a firm's incentive to hedge. With the termination right, the firm's expected benefits from hedging are given by*

$$H_N = \alpha p_1 p_2 \rho (C_1^L + C_2^L), \quad \textit{if } \alpha < \alpha^* \tag{13}$$

$$H_T = \alpha p_1 p_2 \left(\rho^2 (C_1^L + C_2^L) + (1 - \rho) V_1^H \right), \quad \textit{if } \alpha > \alpha^*, \tag{14}$$

and they are non-monotonic in bankruptcy costs α*.*

The corrolary shows that, all else equal, firms with higher bankruptcy costs will not necessarily have a higher incentive to hedge. As the Corrolary shows, the benefits to hedging drop discountinuously at α^*. The intuition is that the termination right is more likely to be exercised by the bank when the bankruptcy costs are higher, and the exercise of the termination right deprives the firm of hedging precisely when hedging has most value to the firm and could reduce the likelihood of firm liquidation.

F. Discussion: Derivative Collateralization

So far we have assumed that the derivatives obligations cannot be collaterized. This assumption is reasonable for many firms where collateral is scarce or where lending agreements prohibit the firm to post any collateral to derivative counterparties (Babenko, Bessembinder, and Tserlukevich (2023)).[11] Further, as pointed out by Bolton and Oehmke (2015), full collaterization of all claims means that the firm is never in default and there is never a conflict of interest between firm owners and derivative counterparties. Nevertheless, derivative contracts may be partially collateralized in some firms or industries (e.g., firms in the airline industry frequently post collateral to derivative counterparties).

Here we consider an extension of the model and examine the role of derivative collateralization for the exercise policy of the derivative termination right. To model collateral, we assume that part of cash flow, C_0, is realized early at $t = 0$ and can be used to post collateral

[11] Typically, the lending agreement would not allow the firm to collateralize its derivative contracts unless the contract's counterparty is the lender.

to derivative counterparties.[12] To keep the model consistent with our prior assumptions, we reduce the cash flow at $t = 1$ by amount C_0, i.e., $C_1 \in \{C_1^L - C_0, C_1^H - C_0\}$.

Collateral is insuffient to guarantee payments to the bank in all states of the world. We assume $C_0 < V_1^H$. We continue to assume that the termination payment at $t = 1$ can be made out of cash flows C_1 and therefore collateral only matters at liquidation. Any unused part of collateral is returned to the firm.

The posted collateral affects the payoff to the counterparty in case of firm liquidation, and hence it affects the decision of the counterparty to exercise its termination right. If, by the time of liquidation, there is an outstanding derivative contract with value $V_2 > 0$, then the final netted payment to the bank is $C_0 + (1-\alpha)(V_2 - C_0)$. The collateral captures the priority of derivatives in bankruptcy and allocates the amount C_0 to a counterparty before the bankruptcy costs are levied on all assets. The condition for exercising the termination right by the counterparty at $V_1 = V_1^H$ is

$$\begin{aligned} V_1^H &> (1-p_2)(V_1^H + \rho\Delta_H + (1-\rho)\Delta_L + \theta) + p_2\rho(V_1^H + \Delta_L + \theta) \\ &\quad + p_2(1-\rho)\left(C_0 + (1-\alpha)(V_1^H + \Delta_H - C_0)\right), \end{aligned} \tag{15}$$

which can be simplified further using the fair-pricing condition

$$V_1^H > \frac{(1-p_2+\rho p_2)\theta}{\alpha p_2(1-\rho)} - \Delta_H + C_0 = V^* + C_0. \tag{16}$$

This condition implies that the posted collateral, C_0, increases the threshold for the exercise of the termination right, and that when the posted collateral is sufficiently large, the right is never exercised by the counterparty and has zero value. If the right is exercised at V_1^H, i.e., $V_1^H > V^* + C_0$, then the value of the right is

$$\begin{aligned} \tilde{R}_0 &= p_1(1-\rho)\left(\alpha p_2(1-\rho)(V_1^H + \Delta_H - C_0) - \theta(1-p_2+\rho p_2)\right) \\ &= R_0 - \alpha C_0 p_1 p_2 (1-\rho)^2. \end{aligned} \tag{17}$$

[12] To keep the discussion short, we omit modeling the endogenous liquidity constraint that limits the pledgeable amount (see, e.g., Almeida, Hankins, and Williams (2021)).

Thus the posted collateral not only reduces the incentive of the counterparty to exercise the termination right, but also reduces the value of the right whenever exercise is optimal. We continue to assume that the bankruptcy costs are levied on all firm's assets, which are now reduced by the amount of collateral, $C_1^L + C_2^L - C_0$. Given this assumption, the bondholders receive all assets, net of the derivative payments and bankruptcy costs.

Proposition 2. *If $V_1^H > V^* + C_0$ and collateral C_0 is posted to the derivative counterparty, then:*

1. *The termination right increases the expected bankruptcy costs by*

$$\Delta \tilde{BC} = \alpha p_1 p_2 (1-\rho)(\rho(C_1^L + C_2^L) - V_1^H + C_0(1-\rho)) > \Delta BC > 0, \tag{18}$$

2. *The termination right is inefficient, i.e.,*

$$\tilde{L} \ = p_1(1-\rho)\left(\alpha p_2(\rho(C_1^L + C_2^L) - V_1^H + C_0(1-\rho)) + \theta(1-p_2+p_2\rho)\right) > L > 0. \tag{19}$$

The proposition mirrors the main case without derivative collateralization. It shows that if the bank still finds it optimal to exercise the termination right when the firm posts collateral C_0, the termination right becomes more inefficient. Intuitively, the posted collateral reduces the expected bankuptcy costs for the firm that uses derivatives.

V. Empirical Analysis

In the empirical analysis, we focus on several key predictions of the model. First, we show that firms' hedge ratios drop significantly after the events of default. We also show that the drops in hedge ratios are larger in those instances when the perceived bankruptcy costs are higher, as would be predicted by the model. Second, we examine the frequency of derivative terminations by the counterparties in the detailed sample of oil and gas producers, scheduled airlines, and coal producers and show that firms' hedge ratios drop in distress more when there are derivative terminations. Third, we address a potential issue that derivative terminations may not necessarily cause lower firm hedging, but instead proxy for worse financial performance.

We address the last point in several ways. We start by presenting a placebo test for the coal industry, in which firms hedge both with financial derivatives (that can be terminated under the ISDA agreements) and with physical delivery contracts (that are not covered by the ISDA agreements). The results suggest that, in contrast to hedging with derivatives, hedging with physical delivery contracts is largerly unaffected by firm distress and is not explained by derivative terminations. We then present two additional tests that exploit different sources of variation in derivative terminations, one related to changes in the moneyness of derivative portfolios for oil and gas firms because of recent movements in the oil price and another one related to the unanticipated decision by the U.S. Bankruptcy Court in New York which required counterparties to continue payments to a defaulted firm if they did not promptly terminate the contract.

A. Data Sources

Our analysis requires data on firms' events of default and outstanding derivative portfolios, as well as information on whether firms' counterparties terminate any derivative contracts in response to events of default. For a smaller sample of commodity producers and airlines, these data are hand-collected from the firm's financial statements. For a broad sample of publicly-traded firms, these data are from the textual search and from the Compustat.

A.1. Events of Default

We obtain information on firms' events of default from several sources. A number of events come from the sample of Chapter 11 and Chapter 7 bankruptcy filings contained in the Florida-UCLA-LoPucki Bankruptcy Research Database. The advantage of this dataset is that it has information on the exact timing of bankruptcies, their types (e.g., "free fall," "prenegotiated," or "prepackaged"), bankruptcy jurisdiction courts, and the information on case resolution. The disadvantage, however, is that the database does not cover smaller firms (i.e., those firms that have assets of $100 million or less, measured in 1980 dollars). We therefore extend this dataset using events of default from the database compiled by Dou, Taylor, Wang, and Wang (2021) and Ma, Tong, and Wang (2022).[13]

We also use the standard textual analysis tools to read the firm's annual statements and search for the additional default events.[14] We examine the annual statements of all Compustat firms with the available CIK identifier, over the period 1999-2020. The annual (10-K) statements are retrieved from the SEC's EDGAR, ignoring any subsequently filed restatements. Before proceeding with the main analysis, we search the header for the firm name, identifier, the date of the report, and the stated end-of-fiscal-year date. A firm-year observation is dropped if we are unable to find the name of the firm, the date of the report, or the end of the fiscal year in the statement. To identify events of default, we search for keywords ("default", "event of default", "bankrupt", "defaulted", "bankruptcy"). For normalization, we also count the total number of whole words in the annual statement. Appendix Table B provides the summary of variables and keywords used in the textual search.

Finally, we hand-collect additional events of default for the sample of firms where we have detailed hedging data: oil and gas producers, coal producers, and scheduled airlines. We obtain this information by searching firms' 10-K and 10-Q statements for the keywords associated with default on any obligations. For cases when multiple events of default are

[13]This database merges the information on bankruptcies filed by public, nonfinancial U.S. firms from 1981 to 2012 using New Generation Research's Bankruptcydata.com, Public Access to Court Electronic Records (PACER), National Archives at various locations, and U.S. Bankruptcy Courts for various districts. See the data description and applications in Chen, Dou, Guo, and Ji (2020), Ma, Tong, and Wang (2022), and Liu, Schmid, and Yaron (2020). We are grateful to Winston Dou and Wei Wang for kindly sharing their data with us.

[14]Tools used in textual analysis (see Loughran and McDonald (2016) for the survey) have been used to identify financing constraints (Hoberg and Maksimovic (2015) and Bodnaruk, Loughran, and McDonald (2015)), the firm-level degree of innovation (e.g., Hoberg, Phillips, and Prabhala (2014)), competition within or between the industries (e.g., Ball, Hoberg, and Maksimovic (2015), Hoberg and Phillips (2016)), or the role of financial regulators (Lowry, Michaely, and Volkova (2020)). Many studies used the textual analysis tools to measure the similarities or differences in statements; for example, Cohen, Malloy, and Nguyen (2020) measure the similarity of the consecutive statements by the same firm concluding that this similarity is positively associated with the realized stock returns.

triggered, we identify the date of the first event of default. We search only for the events leading to default, because tracing other types of events listed in the ISDA Master Agreements (e.g., credit downgrades, misrepresentation, or covenant violations) is substantially more complicated.[15]

A.2. Hedging Portfolios

The basic information on the extent of firm risk management for all firms is obtained from derivative gains and losses in Compustat and the textual analysis of firms' financial statements for hedging-related words. The detailed information on firms' hedging portfolios, for certain industries, is collected from their annual financial statements.

Specifically, we follow previous literature, e.g., Almeida, Hankins, and Williams (2021), to construct an indicator variable, *Derivative User*, whereby we classify a firm as a derivative user if the firm posts (positive or negative) unrealized gains or losses (variable AOCIDERGL, "Accumulated Other Comprehensive Income - Derivative Unrealized Gain/Loss") or if it has non-zero derivative gains/losses reported after net income (CIDERGL, "Comprehensive Income - Derivative Gains/Losses"). The data availability starts in January 2001. When one or both variables are different from zero, we infer that the company uses derivatives during the year.

Our analysis uses an alternative continuous measure of the derivative use in the broad sample based on the textual search. An advantage of this alternative measure is that it is available for a longer period. The measure also discounts the casual use of derivatives because it normalizes the keyword counts by the total number of words in the document. To identify and quantify the derivative use, we run a simple wordcount in the text, looking for the words, including the wildcards ("collar", "derivative", "hedg", "risk management", "forwards", "forward contract", "futures", "swap").

[15] For example, not all credit downgrades and covenant violations may result in an event of default because the thresholds may be defined privately in the schedules to the ISDA Master Agreements and may be different for the secured and unsecured debt, or because covenants may be waived.

Finally, for a sample of commodity producers and airlines, we construct the hedge ratios by building and expanding on the methodology in Babenko, Bessembinder, and Tserlukevich (2023). For each firm, we download the annual statements (10-K or 10-KSB) from SEC EDGAR for the period 1999-2020. For the U.S. oil and gas producing firms (SIC Code 1311 'Crude Petroleum and Natural Gas Extraction'), we drop observations with no reported production of oil or natural gas and firm-years for which no corresponding annual reports are available. Oil and gas firms typically enter into swaps, collars, and option positions to hedge crude oil and natural gas prices, and we calculate their hedge ratio as the number of barrels of oil equivalent hedged for the next year, divided by the number of barrels of oil equivalent produced next year. A barrel of oil equivalent (BOE) is the amount of energy that is equivalent to the amount of energy in one barrel of crude oil and is deemed to have the same amount of energy content as 6,000 cubic feet of natural gas.

Airlines mostly hedge the prices of jet fuel, which is a major input to their production and accounts for approximately 20% of operating costs. They typically hedge by using derivative instruments linked to prices of heating oil, crude oil, petroleum, diesel, and jet fuel, and we use as a measure of hedge ratio the percentage of next year anticipated fuel needs hedged.

For coal firms, we also consider hedging of their important input to production – diesel price – which is typically hedged using derivatives such as swaps, futures, and options. In addition, we also record the percentage of anticipated coal production hedged by these firms, which almost invariably is done through long-term delivery contracts and supply agreements. Importantly for our purposes, these contracts are not considered derivatives and therefore are not regulated by the ISDA Master Agreements. The counterparty (buyer of coal) cannot terminate the agreement if the firm (supplier of coal) experiences an event of default, but there are provisions for penalties ("liquidated damages") if the supplier breaches the agreement and fails to supply the contracted quantities at a specified time.

A.3. Additional Data

Additional sources of data are necessary to estimate moneyness of the portfolios. For the detailed sample of four industries, we collect the fair value of derivatives reported at the last fiscal year-end prior to the event of default in firms' financial statements. For consistency, we collect the fair values only for commodity hedging and ignore interest rate swaps and currency derivatives. For the sample of oil and gas producers, we also estimate the moneyness of derivative portoflios based on the movements of WTI crude oil spot prices during the one month before the firm experiences an event of default.

To search for the termination events in the detailed dataset of the commodity producers, we manually read the parts of the financial statements that discusses hedging portfolios. For the broad sample, we parse the document and search for the fragments that satisfy the following conditions. The fragment must contain any keyword (including wildcards) that indicates that that the contract has ended ("cancel", "terminat", "liquidat", "unwound"), any of the keywords pointing to the nature of the contract ("deriv", "hedg", "swap", "position") and any of keywords pointing to the reason for termination or a governing document ("event of default", "master agreement", "master contract", "ISDA", "hedging agreement"). Text fragments that satisfy conditions are automatically extracted to be read manually. Our procedure for the event search is conservative, in a sense that it can undercount but not overcount the events.

B. Empirical Results

We start by showing how firms' hedging portfolios change around events of default. For this purpose, we focus on the detailed sample because it allows us to measure more precisely firms' exposures to commodity prices and their corresponding hedge ratios. We keep in the sample only those firms that have hedging data for both year -1 and 0 relative to the event of default and that have non-zero hedging in year -1. Figure 2 shows the dynamics of average hedge ratios (top panel) and the fraction of firms hedging (bottom panel) around events of default. Overall, there is a sharp decline in both the hedge ratios (from 55% to 29%) and the fraction of firms hedging (from 100% to 57%) in the year when an event of default is triggered. Further, the decline is partly reversed the following year. For example, the average hedge ratio comes back to 43% in year 1.

Figure 3 shows the dynamics of corporate hedging by the type of bankruptcy, where we classify all bankruptcies into "prenegotiated/prepackaged" and "free fall" categories. The model predicts that, all else being equal, the counterparty is more likely to terminate the derivative contract once an event of default has been triggered if it expects larger bankruptcy costs. The prenegotiated and prepackaged bankruptcies are generally considered to be less costly because there is a preliminary agreement reached between firm shareholders and significant creditors on the terms of a reorganization plan prior to the filing of the bankruptcy petition with the Court. Such bankruptcies may allow firms to save on legal and professional fees and tend to settle faster in the Court (see, e.g., Tashjian, Lease, and McConnell (1996) and Betker (1997)). In our sample, the average time spent in bankruptcy is 172 days for prenegotiated/prepackaged bankruptcies, whereas it is 614 days for free fall bankruptcies. Consistent with the predictions of the model, Figure 3 shows that the average hedge ratios and the fraction of firms hedging drop more sharply when an event of default is associated with free fall bankruptcies. For example, the fraction of firms hedging decreases from one year prior to the year of the event of default by approximately 8% for prenegotiated/prepackaged bankruptcy cases, and it decreases by approximately 42% for free fall bankruptcy cases.

In Panel A of Table 1, we report summary statistics for the main variables in the Compustat/SEC sample. According to the Compustat-based measure, derivatives are used by approximately 19.8% of sample firms. Hedging intensity, measured by the number of hedging-related words mentioned in a firm's 10-K filing divided by the total number of words in the 10-K, averages 0.096%. Notably, the correlation between the two measures of hedging is 33%

despite significant differences in variable construction. We also report that firms in the sample spend, on average, 0.6% of firm-years in bankruptcy, with 0.2% of firm-years associated with high-cost (free fall) bankruptcies. Relatedly, the average frequency of default-related words is 0.044% in the sample, and this variable is positively correlated with the bankruptcy indicator, with a correlation of 46%. Finally, the table also reports statistics for several firm characteristics that we use as control variables in our tests.

Panels B and Panel C provide summary statistics for the detailed sample that consists of firms in three industries: oil and gas producers (SIC 1311), scheduled airlines (SIC 4512), and coal producers (SIC 1220). We focus on these industries because firms operating in them have a clear and measurable exposure to commodity prices, which allows us to measure their hedge ratios more precisely.

Perhaps not surprisingly, we find that firms in the detailed sample hedge more aggressively than firms in the broad Compustat/SEC sample. In fact, 67.3% of firms in the detailed sample use derivatives and 59.3% of firms use derivatives to hedge commodity prices. Notably, information in the detailed sample allows to glean the details of firms' hedging portfolios. Specifically, the hedge ratio for this sample averages 31.7% and maturity of derivative contracts averages 15.4 months. We also observe that firms in this sample spend more time in bankruptcy, with 3.4% of firm-years having a bankruptcy, of which 1.8% are "prepackaged/prenegotiated" bankruptcies and 1.5% are "free-fall" bankruptcies. Firms in the detailed sample have similar median net worth as firms in the Compustat/SEC sample, but have substantially higher asset tangibility and leverage and lower market-to-book ratios.

Table 1 also provides statistics for the sample of bankrupt firms that are also part of the detailed sample. As expected, these firms have higher leverage ratios, averaging 58.9%, and lower market-to-book ratios and firm net worth, averaging 1.159 and -0.105, respectively. The average fair value of derivatives at the last fiscal year-end before bankruptcy is positive at $39.6 million, indicating that hedging is at least partly effective. In fact, only in 24.0%

of cases, firms report negative fair value of derivatives the year before bankruptcy, whereas it is positive for 53.7% of firms. For those firms that have some derivatives prior to the bankruptcy, we also search their SEC filings for any of the events associated with derivative terminations. Specifically, we set derivative terminations equal to one if either in the year directly prior to the bankruptcy filing, the year of bankruptcy filing, or the year following the firms mention in their 10-K or 10-Q forms that the counterparties terminated derivatives following an event of default. In cases when we find no such statements, but the firm has SEC filings at least in the year of bankruptcy, we set derivative terminations to zero. Thus, to the extent that some firms experience derivative terminations but do not disclose such facts in their financial statements, our measure of derivative terminations may be biased downward. Nevertheless, we find that 63.2% of firms explicitly mention in the annual statements that all or some their outstanding derivative positions have been terminated by the counterparty.

We next examine the relation between a firm's bankruptcy filing and its hedging policy in the broad Compustat/SEC sample. Table 2 gives the results of OLS regressions with firm and year or firm and industry-year fixed effects, where the dependent variable in Panel A is derivative user (based on reported derivative gains and loses) and in Panel B it is hedging intensity (based on the number of hedging-related words in a firm's 10-K). As the results indicate, the incidence of bankruptcy has a negative and significant effect on the use of derivatives. The fraction of firms using derivatives drops by 16.3% during firm-years with bankruptcies, and this effect is significantly more pronounced for high-cost than low-cost bankruptcies (22.7% vs. 11.3%). The latter finding is consistent with the view that terminating derivatives is more attractive for the counterparties when a bankruptcy is perceived by them to be more costly.

Since derivative terminations can be triggered by any event of default (even if no bankruptcy petition was filed), we also examine how hedging changes when the frequency of default-related words in a firm's 10-K increases. Here too we find that hedging decreases when the firm starts to report more words related to default, although the economic magnitude of the effect is smaller. The results in Panel B focus on a continuous measure of hedging which is obtained through the textual search of firms' 10-Ks. In line with other results, we find that hedging intensity decreases by approximately 0.033%, which is approximately 75.0% of the mean value. We also find that the decrease in hedging intensity at the incidence of bankruptcy is more pronounced for high-cost rather than low-cost bankruptcies, with the coefficients corresponding to 143.2% and 27.3% decrease relative to the mean.

In Table 3 we report the corresponding results for the detailed sample, where we have better information on the hedging portfolios. The dependent variables are the hedge ratio (columns 1-2), the hedge maturity (columns 3-4), and an indicator variable equal to one if the firm hedges commodity price exposure (columns 5-6). Similar to the previously reported results for the broad Compustat/SEC sample, we find that bankruptcy has a significant negative effect on hedging. For example, as columns 1 and 2 show, a bankruptcy-related event of default is associated with 16.3 to 18.6% decrease in hedge ratios. Similarly, Panel B shows that high-cost free fall bankruptcies are associated with a larger decrease in hedge ratios and hedge maturies compared to the low-cost (prepackaged/prenegotiated) bankruptcies.

While the results in Table 2 and 3 are consistent with our explanation that bankruptcies trigger events of default and result in substantial derivative terminations by the counterparties, they can also be consistent with other explanations. For example, firms may be voluntarily decreasing their use of derivatives because shareholders benefit from risk-shifting near default or because a combination of collateral constraints and worsening financing conditions causes firms to voluntarily unwind their hedging programs to save cash for other needs. To address these concerns, we leverage our detailed sample, where we observe whether the firm experienced any derivative terminations by the counterparties around a particular bankruptcy petition filing or other event of default.

Figure 4 illustrates the dynamics of firms' hedge ratios around the year of an event of default for cases with confirmed derivative terminations and without. As is evident from the figure, the decrease in both hedge ratios and the fraction of firms hedging commodity prices is more pronounced for firms that experience derivative terminations. For example, the fraction of firms hedging decreases from 100% (only firms that hedged are included in the sample) to approximately 44% for cases with derivative terminations and to 81% for firms without confirmed terminations. Interestingly, hedge ratios and the fraction of firms hedging rebound rather quickly and are similar for cases with confirmed derivative terminations and without two years after an event of default has been triggered.

Table 4 examines the relation between hedging policies and bankruptcies with confirmed derivative terminations and without in a multivariate regression setting with firm and year (or industry-year) fixed effects. The results convey similar intuition to Figure 4, with hedge ratios, hedge maturities, and fraction of firms hedging commodity prices decreasing significantly more when bankruptcy filing is associated with derivative terminations by the counterparties. These results help to allay the concerns that a decrease in corporate hedging at the incidence of bankruptcy is driven by firms' voluntary decisions to hedge less because of the changing incentives of shareholders, collateral constraints, or some other reasons.

To further mitigate these concerns and to address a specific issue that derivative terminations may also proxy for a more severe deterioration of firm financial condition, we consider an additional test from the coal industry. As mentioned previously, the coal industry presents a useful laboratory because it hedges both using diesel derivatives, which are governed by the ISDA Master Agreements, and using coal supply agreements, which are not. If derivative terminations simply proxy for worse financial conditions and firms voluntarily wind down their hedging programs, then we should see that both hedging with derivatives and hedging with supply agreements are affected. In contrast, if firms hedging drops because of counterparties exercising their right to terminate the derivatives, we should see that only hedging with derivatives is affected, while hedging with supply agreements is not. This is indeed what we see in Table 5. For example, the hedge ratios calculated using diesel derivatives used to hedge the anticipated diesel fuel needs decrease by approximately 30.2% at the onset of bankruptcies with confirmed derivative terminations. In contrast, the hedge ratios calculated using the fraction of coal hedged through supply agreements are not significantly affected by bankruptcies with confirmed derivative terminatiojns and show a small positive coefficient. Overall, these results are consistent with derivative terminations causing a decline in corporate hedging when an event of default is triggered and the firm hedges using derivatives and do not support a story that derivative terminations simply proxy for greater incentive of the firm to voluntary decrease its hedging. In addition, these results also may help explain the findings by Almeida, Hankins, and Williams (2021), who find that hedging with purchase obligations (PO) does not drop significantly in distress and that firms often substitute purchase obligations for financial derivatives when they are in distress.

In Table 6 we present an additional test that helps to further distinguish alternative explanations to low corporate hedging in distress. In this test, we limit the sample of firms to oil and gas producers and construct the return to oil based on movements in West Texas Intermediate (WTI) crude oil spot price during the one month prior to an event of default. The idea is that when an oil and gas firm defaults following an increase in oil prices, its hedging portfolio is more likely to be in-the-money for the counterparty and therefore it is more likely to experience derivative terminations. Importantly, here we do not consider whether and how much the firm actually hedges (since it may be endogenous) and simply rely on the fact that oil and gas firms on average hedge low oil prices. The results in Table 8 show that indeed the negative effect of bankruptcy on firm hedging policies is more pronounced for firms that defaulted following an increase in the spot price of crude oil. For example, hedge ratios decrease by 32.1% after bankruptcies that follow high oil returns, whereas they decrease by 13.2% for bankruptcies that follow low oil returns.

Finally, in Table 7 we explore the change in policy which affected the bank's incentives to terminate the contracts. We use the Bench Ruling in a *Lehman Brothers* vs. *Metavante* court case, in which the U.S. Bankruptcy Court in New York held that a party to a swap agreement could not rely on Section 2(a)(iii) of the ISDA Master Agreement to withhold payments otherwise due to the bankrupt counterparty if it failed to promptly terminate the contract following the bankrupt's counterparty event of default (see Marchetti (2010)). This ruling has significantly increased the incentive of counterparties to terminate their contracts with the defaulting firm. Using a difference-in-differences setting, we show that the likelihood of derivative terminations indeed increased for firms with New York jurisdications after the Bench Ruling. More importantly, we also show in a triple-difference setting that these firms experienced larger reductions in their hedge ratios upon the events of default associated with bankruptcy filings after the Bench Ruling.

VI. Conclusion

A derivative contract may be terminated by the issuing counterparty when a firm experiences an event of default, and we document that counterparties exercise their termination rights in approximately 63% of default events associated with bankruptcy petitions. We build a simple theoretical model to examine the optimal exercise policy and value of the termination right. Counterparties are more likely to exercise their termination rights when they expect to receive a net payment from the other party. The value of the termination right increases in basis risk and bankruptcy costs, and it decreases in the value to the counterparty of business continuation with a firm and a greater ability to postpone or negotiate payments in default.

Intuitively, the exercise of the option depends on the incentive of the counterparty and the value of the hedging portfolio. First, the decision to exercise presents a simple trade-off: on the one hand, an immediate payment that can be obtained from the defaulted firm upon closing the contract, but on the other hand the contract closure means a loss of continuing business because the defaulted counterparty can recover. Second, the "fair value" of the derivative portfolio plays a crucial role. When a defaulted party has a high-value portfolio (and is expected to pay), the counterparty prefers to sever the contract avoiding recovery of the payment from a bankrupt firm. However, when the defaulted party has a negative fair value portfolio (i.e., expecting a payment), the incentive of the counterparty is the opposite: it finds optimal to keep the contract alive so that the ambiguity about the payment amount, the time value of money, and the possibility that the derivative value reverses, all reduces the expected payment.

Using detailed data on hedging portfolios, we show that hedge ratios, hedge maturities, and the fraction of firm hedging commodity prices decrease significantly when the firm experiences an event of default, but that most of this decrease is attributed to derivative terminations by the counterparties. We also show that hedging using supply agreements, which are governed by different contractual terms and do not have standard event of default clauses, does not show any decrease when firms experience bankruptcies and derivative terminations. Overall, our results provide a novel explanation to low observed corporate hedging using derivatives in distress.

Appendix A. Treatment of Hedging Contracts in Default

1. *"On October 1, 2008, we received a notice of early termination from BNP Paribas ("BNP") with respect to our natural gas and interest rate swap derivatives" (Aurora Oil & Gas Corp., 2008-12-31, in default with lenders).*

"The Company's Bankruptcy Petition in July 2015 represented an event of default under Sabine's existing derivative agreements resulting in a termination right by counterparties on all derivative positions at July 15, 2015. Additionally, certain of the Company's derivative positions were terminated prior to July 15, 2015 as a result of defaults under Sabine's derivative agreements that occurred prior to the filing of the Bankruptcy Petition." (Forest Oil Group, 10-K report for 2015, in Chapter 11 bankruptcy)

2. *"On June 14, 2018, the Company's hedging counterparty, Koch Supply & Trading LP, terminated the only outstanding hedge contract resulting in a settlement of $0.5 million."* (PetroQuest Energy Inc., 2019, in Chapter 11 bankruptcy)

3. *"The convertible note hedging transactions have since been terminated in connection with our Chapter 11 proceedings."* (Stone Energy Corp. 2016-12-31, in Ch. 11 bankruptcy)

4. *"In February 2010, the administrative agent under our credit facilities liquidated all of our existing hedge contracts and applied the proceeds thereof to amounts owed under the facilities. As a result, our production is currently unhedged."* (Saratoga Resources Inc., 10-K report for 2010, in Chapter 11 bankruptcy)

Forced liquidation of derivative positions. *"Pursuant to ARP's restructuring support agreement, ARP completed the sale of substantially all of its commodity hedge positions on July 25, 2016 and July 26, 2016 and used the proceeds to repay $233.5 million of borrowings outstanding under the ARP's first lien credit facility"* (Atlas Energy Group, LLC, 2017-12-31, referring to a defaulted Subsidiary "ARP")

5. *"Our hedging arrangements contain standard events of default, including cross default provisions, that, upon a default, provide for (i) the delivery of additional collateral, (ii) the*

termination and acceleration of the hedge, (iii) the suspension of the lenders' obligations under the hedging arrangement" (ATP Oil and Gas, 10-K report for 2010)

6. *"The filing of the Chapter 11 Petitions triggered an event of default under each of the agreements governing our derivative transactions ("ISDA Agreements")... As a result, our counterparties were permitted to terminate, and did terminate, all outstanding transactions governed by the ISDA Agreements."* (Breitburn Energy Partners, 10-K report for 2016)

7. *"our ability to enter into new commodity ... will be dependent upon either entering into unsecured hedges or obtaining Bankruptcy Court approval to enter into secured hedges. As a result, we may not be able to enter into additional commodity derivatives covering our production in future periods on favorable terms or at all."* (Blue Ridge Mountain Resources 2015-12-31, in Ch. 11 bankruptcy)

8. (sample language in ISDA schedule) *"The following shall constitute Additional Termination Events...a "Ratings Event I" shall occur with respect to Party A if the long-term and short-term senior unsecured deposit ratings of Party A cease to be rated at least A and A-1 by Standard & Poor's Ratings Service... "Ratings Event II" shall occur with respect to Party A if the long-term senior unsecured deposit rating of Party A ceases to be rated higher than BBB-..."* (Schedule of ISDA Master Agreement 2007-02-21 between Credit Suisse as a counterparty (Party A), and the World Omni Auto Receivables)

References

Almeida, Heitor, Kristine Watson Hankins, and Ryan Williams, 2017, Risk management with supply contracts, *Review of Financial Studies* 30, 4179–4215.

——— , 2021, Do firms hedge during distress?, *SSRN Working Paper 3393020*.

Babenko, Ilona, Hendrik Bessembinder, and Yuri Tserlukevich, 2023, Risk hedging and loan covenants, forthcoming in *Management Science*.

Ball, Christopher, Gerard Hoberg, and Vojislav Maksimovic, 2015, Disclosure, business change and earnings quality, *SSRN Working Paper 2260371*.

Bessembinder, Hank, 1991, Forward contracts and firm value: Investment incentive and contracting effects, *Journal of Financial and Quantitative Analysis* 26, 519–532.

Betker, Brian L., 1997, The administrative costs of debt restructurings: Some recent evidence, *Financial Management* pp. 56–68.

Bodnar, Gordon M., Erasmo Giambona, John R. Graham, and Campbell R. Harvey, 2019, A view inside corporate risk management, *Management Science* 65, 5001–5026.

Bodnaruk, Andriy, Tim Loughran, and Bill McDonald, 2015, Using 10-K text to gauge financial constraints, *Journal of Financial and Quantitative Analysis* 50, 623–646.

Bolton, Patrick, Hui Chen, and Neng Wang, 2011, A unified theory of Tobin's q, corporate investment, financing, and risk management, *Journal of Finance* 66, 1545–1578.

Bolton, Patrick, and Martin Oehmke, 2015, Should derivatives be privileged in bankruptcy?, *Journal of Finance* 70, 2353–2394.

Bretscher, Lorenzo, Lukas Schmid, and Andrea Vedolin, 2018, Interest rate risk management in uncertain times, *Review of Financial Studies* 31, 3019–3060.

Campello, Murillo, Chen Lin, Yue Ma, and Hong Zou, 2011, The real and financial implications of corporate hedging, *Journal of Finance* 66, 1615–1647.

Charles, GuyLaine, 2012, The ISDA Master Agreement–part II: Negotiated provisions, *Practical Compliance and Risk Management for the Securities Industry* May-June, 33–42.

Chen, Hui, Winston Dou, Hongye Guo, and Yan Ji, 2020, Feedback and contagion through distressed competition, *The Rodney L. White Center Working Papers Series at the Wharton School*.

Cohen, Lauren, Christopher Malloy, and Quoc Nguyen, 2020, Lazy prices, *Journal of Finance* 75, 1371–1415.

Cornaggia, Jess, 2013, Does risk management matter? Evidence from the U.S. agricultural industry, *Journal of Financial Economics* 109, 419–440.

DeMarzo, Peter M., and Darrell Duffie, 1995, Corporate incentives for hedging and hedge accounting, *Review of Financial Studies* 8, 743–771.

Dou, Winston Wei, Lucian A. Taylor, Wei Wang, and Wenyu Wang, 2021, Dissecting bankruptcy frictions, *Journal of Financial Economics* 142, 975–1000.

Ellul, Andrew, and Vijay Yerramilli, 2013, Stronger risk controls, lower risk: Evidence from U.S. bank holding companies, *Journal of Finance* 68, 1757–1803.

Fehle, Frank, and Sergey Tsyplakov, 2005, Dynamic risk management: Theory and evidence, *Journal of Financial Economics* 78, 3–47.

Franzen, Dietmar, 2000, *Design of Master Agreements for OTC Derivatives* (Springer Science & Business Media).

Froot, Kenneth A., David S. Scharfstein, and Jeremy C. Stein, 1993, Risk management: Coordinating corporate investment and financing policies, *Journal of Finance* 48, 1629–1658.

Geczy, Christopher, Bernadette A. Minton, and Catherine Schrand, 1997, Why firms use currency derivatives, *Journal of Finance* 52, 1323–1354.

Giambona, Erasmo, and Ye Wang, 2020, Derivatives supply and corporate hedging: Evidence from the Safe Harbor Reform of 2005, *Review of Financial Studies* 33, 5015–5050.

Gilje, Erik P., and Jérôme P. Taillard, 2017, Does hedging affect firm value? evidence from a natural experiment, *Review of Financial Studies* 30, 4083–4132.

Graham, John R., and Daniel A. Rogers, 2002, Do firms hedge in response to tax incentives?, *Journal of Finance* 57, 815–838.

Graham, John R., and Clifford W. Smith, 1999, Tax incentives to hedge, *Journal of Finance* 54, 2441–2262.

Haushalter, David G., 2000, Financing policy, basis risk, and corporate hedging: Evidence from oil and gas producers, *Journal of Finance* 55, 107–152.

Hoberg, Gerard, and Vojislav Maksimovic, 2015, Redefining financial constraints: A text-based analysis, *Review of Financial Studies* 28, 1312–1352.

Hoberg, Gerard, and S. Katie Moon, 2017, Offshore activities and financial vs operational hedging, *Journal of Financial Economics* 125, 217–244.

Hoberg, Gerard, and Gordon Phillips, 2016, Text-based network industries and endogenous product differentiation, *Journal of Political Economy* 124, 1423–1465.

——— , and Nagpurnanand Prabhala, 2014, Product market threats, payouts, and financial flexibility, *Journal of Finance* 69, 293–324.

Hu, Maggie, and Chenyu Shan, 2022, The dark side of 2005 Bankruptcy Code Reform —Does derivatives privilege affect corporate borrowing?, *SSRN Working Paper 3031595.*

Jung, Hyeyoon, 2021, Real consequences of foreign exchange derivatives hedging, .

Knopf, John D., Jouahn Nam, and John H. Thornton, 2002, The volatility and price sensitivities of managerial stock option portfolios and corporate hedging, *Journal of Finance* 57, 801–813.

Leland, Hayne, 1998, Agency costs, risk management, and capital structure, *Journal of Finance* 53, 1213–1243.

Liu, Yang, Lukas Schmid, and Amir Yaron, 2020, The risks of safe assets, *SSRN Working Paper 3699618.*

Loughran, Tim, and Bill McDonald, 2016, Textual analysis in accounting and finance: A survey, *Journal of Accounting Research* 54, 1187–1230.

Lowry, Michelle, Roni Michaely, and Ekaterina Volkova, 2020, Information revealed through the regulatory process: Interactions between the SEC and companies ahead of their IPO, *Review of Financial Studies* 33, 5510–5554.

Ma, Song, Joy Tianjiao Tong, and Wei Wang, 2022, Bankrupt innovative firms, *Management Science* 68, 6971–6992.

Manconi, Alberto, Massimo Massa, and Lei Zhang, 2018, The informational role of corporate hedging, *Management Science* 64, 3843–3867.

Marchetti, Peter, 2010, The Bankruptcy Court's ruling in the Lehman-Metavante matter–has the ticking time bomb of Enron vs. TXU exploded or been defused?, *Futures and Derivatives Law Report* 30.

McNamara, Christian M., and Andrew Metrick, 2019, The Lehman Brothers bankruptcy F: Introduction to the ISDA Master Agreement, *Journal of Financial Crises* 1, 137–150.

Mian, Shehzad L., 1996, Evidence on corporate hedging policy, *Journal of Financial and Quantitative Analysis* 31, 419–439.

Nance, Deana R., Clifford W. Smith, and Charles W. Smithson, 1993, On the determinants of corporate hedging, *Journal of Finance* 48, 267–284.

Phillips, Gordon M., and S. Katie Moon, 2020, Outsourcing through purchase contracts and firm capital structure, *Management Science* 67, 363–387.

Purnanandam, Amiyatosh, 2008, Financial distress and corporate risk management: Theory and evidence, *Journal of Financial Economics* 87, 706–739.

Rampini, Andriano A., Amir Sufi, and S. Viswanathan, 2014, Dynamic risk management, *Journal of Financial Economics* 111, 271–296.

Rampini, Andriano A., and S. Viswanathan, 2010, Collateral, risk management, and the distribution of debt capacity, *Journal of Finance* 65, 2293–2322.

Rampini, Adriano A., S. Viswanathan, and Guillaume Vuillemey, 2020, Risk management in financial institutions, *Working Paper, Duke University*.

Roe, Mark J., 2011, The derivatives players' payment priorities as financial crisis accelerator, *Stanford Law Review* 63, 539–590.

Smith, Clifford W., and Rene Stulz, 1985, The determinants of firms' hedging policies, *Journal of Financial and Quantitative Analysis* 20, 391–405.

Stulz, René M, 1984, Optimal hedging policies, *Journal of Financial and Quantitative Analysis* 19, 127–140.

Tashjian, Elizabeth, Ronald C. Lease, and John J. McConnell, 1996, An empirical analysis of prepackaged bankruptcies, *Journal of Financial Economics* 40, 135–162.

Tufano, Peter, 1996, Who manages risk? An empirical examination of risk management practices in the gold mining industry, *Journal of Finance* 51, 1097–1137.

Vuillemey, Guillaume, 2019, Bank interest rate risk management, *Management Science* 65, 5449–5956.

Figure 1. Model Diagram

The figure shows the evolution of a firm's cash flows, C_t, fixed liabilities, D_t, and the value of the derivative portfolio to the bank, V_t, over time and across states. Parameter α represents bankruptcy costs levied in the event of firm liquidation, and parameter θ captures the value to the counterparty of continuing business if the firm is not liquidated.

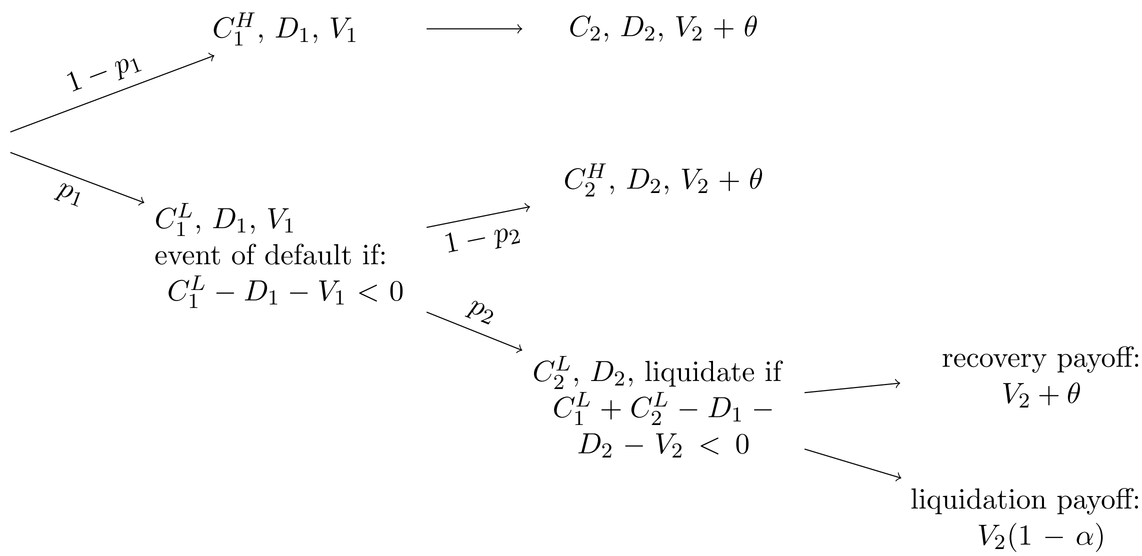


Figure 2. Events of Default and Risk Management

The figure shows the evolution of the average hedge ratios and the fraction of firms hedging the commodity prices around the event of defaults. The sample consists of oil and gas firms (SIC 1311), coal firms (SIC 1220), and scheduled airlines (SIC 4512) during the period 1999-2020. Year 0 indicates the year during which the bankruptcy petition was first filed. Firms are included in the sample only if they have non-missing data both in Year -1 and Year 0 and have positive hedge ratio in Year -1. All variables are defined in Appendix C.

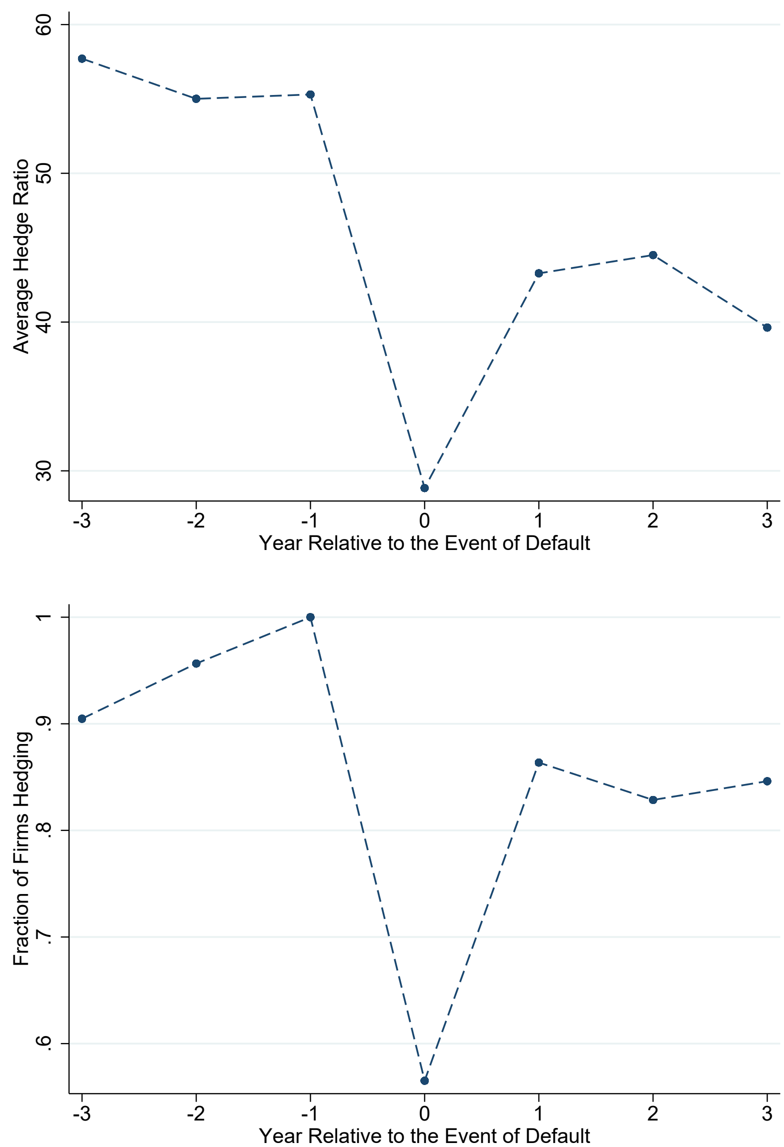


Figure 3. Type of Bankruptcy

The figure shows the evolution of the average hedge ratio and the average fraction of firms hedging the commodity prices around events of default, separately for firms that experience a prenegotiated or prepackaged bankruptcy and for firms that experience a "free fall" bankruptcy. The sample consists of oil and gas firms (SIC 1311), coal firms (SIC 1220), and scheduled airlines (SIC 4512) during the period 1999-2020. Year 0 indicates the year during which the bankruptcy petition was first filed. Firms are included in the sample only if they have non-missing data both in Year -1 and Year 0 and have positive hedge ratio in Year -1. All variables are defined in Appendix C.

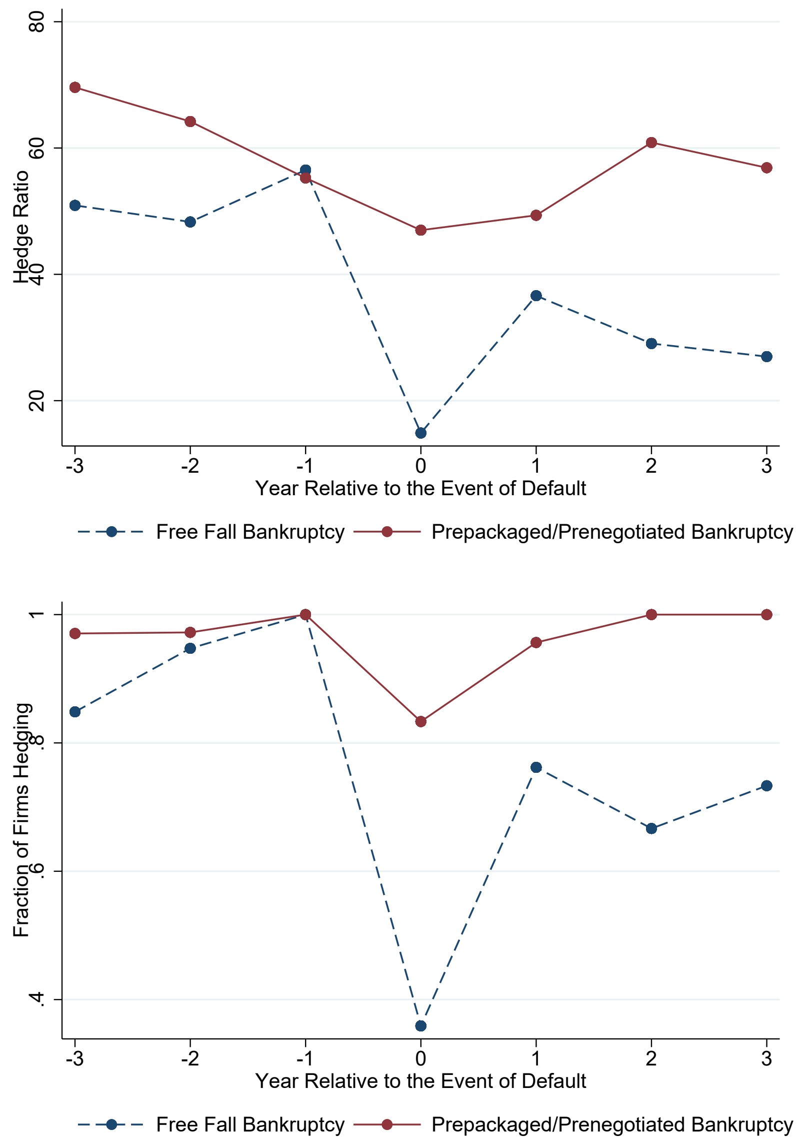
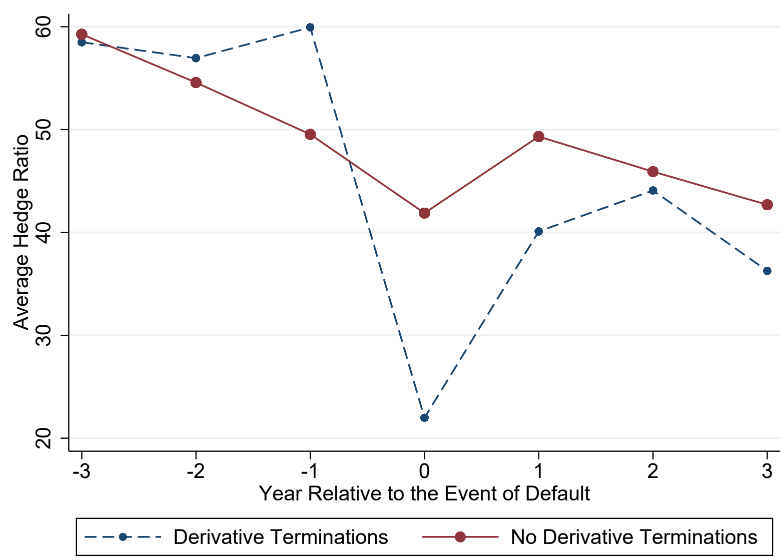
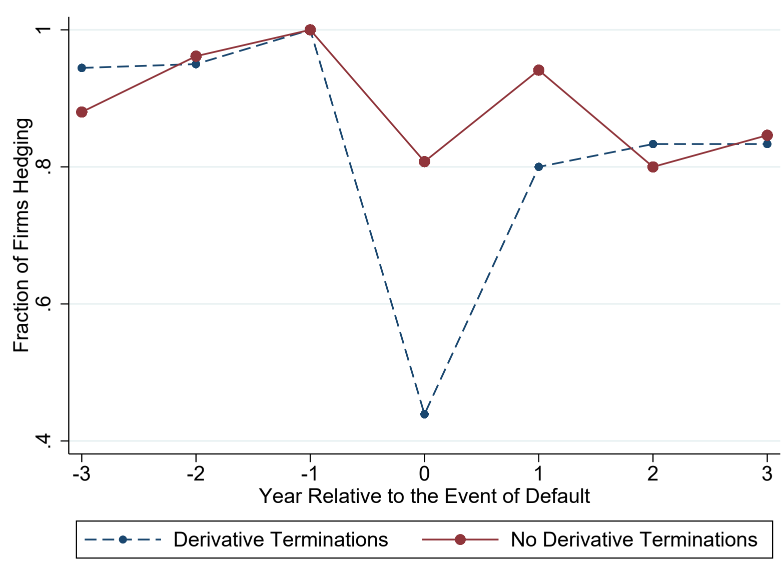


Figure 4. Derivative Terminations and Risk Management

The figure shows the average hedge ratio and the average fraction of firms hedging the commodity prices around events of default, separately for the cases with the derivative terminations by the counterparties reported in firms' 10-K forms and without such reported terminations. The sample consists of oil and gas firms (SIC 1311), coal firms (SIC 1220), and scheduled airlines (SIC 4512) during the period 1999-2020. Year 0 indicates the year during which the bankruptcy petition is first filed.Firms are included in the sample only if they have non-missing data both in Year -1 and Year 0 and have positive hedge ratio in Year -1. All variables are defined in Appendix C.





Appendix B. Proofs

Proof of Proposition 1. The expected bankruptcy costs of a firm that hedges with a contract that does not have a termination right are

$$BC_N = \alpha p_1 p_2 (C_1^L + C_2^L)((1-\rho)^2 + \rho(1-\rho)) = \alpha p_1 p_2 (1-\rho)(C_1^L + C_2^L), \tag{20}$$

Similarly, the expected bankruptcy costs of a firm that hedges with a contract that has a termination right are

$$BC_T = \alpha p_1 p_2 \rho (1-\rho)(C_1^L + C_2^L) + \alpha p_1 p_2 (1-\rho)(C_1^L + C_2^L - V_1^H), \tag{21}$$

Taking the difference between BC_T and BC_N produces (11). □

Proof of Corrolary 1. Take as a benchmark the expected bankruptcy costs of an unhedged firm which is liquidated after two low cash flows

$$BC_0 = p_1 p_2 \alpha (C_1^L + C_2^L). \tag{22}$$

The benefits from hedging when there is no derivative termination, i.e., when $\alpha < \alpha^*$, are

$$H_N = BC_N - BC_0 = \alpha p_1 p_2 \rho (C_1^L + C_2^L), \tag{23}$$

Similarly, the benefits from hedging with derivative terminations, i.e., when $\alpha > \alpha^*$, are

$$H_T = BC_T - BC_0 = \alpha p_1 p_2 \left(\rho^2 (C_1^L + C_2^L) + (1-\rho) V_1^H \right), \tag{24}$$

Using Assumption 1, it is straightforward to show that $H' < H$, meaning that the firm's benefit from hedging is reduced when the bankruptcy costs parameter α increases from below to above the threshold α^*. □

Proof of Proposition 2. The expected bankruptcy costs of a firm that hedges with a contract that does not have a termination right and posts collateral C_0 are

$$\tilde{BC}_N = \alpha p_1 p_2((1-\rho)^2(C_1^L + C_2^L - C_0) + \rho(1-\rho)(C_1^L + C_2^L - V_1^L - \Delta_L)), \tag{25}$$

Similarly, the expected bankruptcy costs of a firm that hedges with a contract that has a termination right and posts collateral C_0 are

$$\tilde{BC}_T = \alpha p_1 p_2((1-\rho)(C_1^L + C_2^L - V_1^H) + \rho(1-\rho)(C_1^L + C_2^L - V_1^L - \Delta_L)), \tag{26}$$

$$\tilde{BC}_T - \tilde{BC}_N = \alpha p_1 p_2(1-\rho)(\rho(C_1^L + C_2^L) - V_1^H + C_0(1-\rho)) \tag{27}$$

Taking the difference between (26) and (25) produces (18).

□

Appendix C. Variable Definitions

Variable	Definition
Derivative user	An indicator variable equal to one if the firm has non-zero unrealized gains or losses (AOCIDERGL, "Accumulated Other Comprehensive Income - Derivative Unrealized Gain/Loss") or non-zero derivative gains/losses reported after net income (CIDERGL, "Comprehensive Income - Derivative Gains/Losses"), and it is equal to zero otherwise (Compustat).
Hedging intensity	The number of hedging-related words in a firm's 10-K divided by the total word count (keywords: hedging, hedge(s), hedged, derivative(s), swap(s), collar(s), risk management, futures, forward contract, and forwards) (SEC EDGAR).
Commodity hedger	An indicator variable equal to one if the firm hedges commodity prices during the year (detailed sample).
Hedge ratio	Oil and gas firms: The sum of the outstanding notional amounts of oil and gas derivatives for the next fiscal year, divided by the next year oil and gas production (%). We use the universal MMcfe energy units, with one barrel of oil being equivalent to six thousand cubic feet of natural gas. Airlines: the percentage of fuel expenses hedged. Coal firms: the percentage of expected diesel expenses hedged (detailed sample).
Hedge maturity	Maximum maturity of outstanding commodity hedges (detailed sample).
Bankruptcy	Chapter 11 or Chapter 7 bankruptcy during the fiscal year (UCLA-LoPucki BRD, supplemented with additional data, as explained in the text).
Low-cost bankruptcy (prepackaged)	Chapter 11 or Chapter 7 bankruptcy during the fiscal year that is classified as prepackaged or prenegotiated (UCLA-LoPucki BRD).
High-cost bankruptcy (free fall)	Chapter 11 or Chapter 7 bankruptcy during the fiscal year that is NOT classified as prepackaged or prenegotiated (UCLA-LoPucki BRD).
Default-related words frequency	The number of default-related words in a firm's 10-K form divided by the total word count (keywords: default(ed), event of default, bankrupt, bankruptcy, and Chapter 11) (SEC EDGAR).
Firm size	The logarithm of the book value of assets.
Market-to-book ratio	The sum of long-term and short-term debt and the market value of equity, divided by the book value of assets.
Book leverage	The sum of long- and short-term debt, divided by the book value of assets.
Firm networth	Total stockholders equity, divided by the book value of assets.
Asset tangibility	Net plant, property and equipment, divided by the book value of assets.

Table 1. Summary Statistics The table reports the summary statistics. The sample in Panel A (Compustat/SEC Sample) consists of all US-incorporated firms during the period 2001-2020 that have non-missing accounting informatio. The sample in Panel B (Detailed Sample) consists of all US-incorporated oil and gas producing firms (SIC Code 1311), commercial airlines (SIC 4512), and coal producing firms (SIC 1220) during the period 1999-2020 that have non-missing accounting information in Compustat and non-missing hedging data in 10-K or 10-KSB public filings. All variables are defined in Appendix A.

Panel A: Compustat/SEC Sample	*N*	*Mean*	*Std. Dev.*	*p25*	*p50*	*p75*
Derivative user	128,920	0.198	0.399	0	0	0
Book assets	158,476	8,671	85,278	26	197	1,204
Firm size	158,476	5.105	2.935	3.261	5.285	7.094
Asset tangibility	158,476	0.235	0.270	0.025	0.119	0.360
Firm networth	158,476	0.035	2.418	0.174	0.468	0.716
Market-to-book ratio	158,476	4.177	13.489	0.678	1.150	2.322
Book leverage	158,476	0.153	0.183	0.003	0.086	0.233
Bankruptcy	158,476	0.006	0.077	0	0	0
High-cost bankruptcy (free fall)	158,476	0.002	0.040	0	0	0
Low-cost bankruptcy (prepackaged)	158,476	0.004	0.066	0	0	0
Hedging intensity (%)	96,822	0.096	0.144	0.007	0.032	0.123
Default-related words frequency (%)	96,822	0.044	0.069	0.005	0.020	0.048

Panel B: Detailed Sample	*N*	*Mean*	*Std. Dev.*	*p25*	*p50*	*p75*
Derivative user	3,280	0.673	0.469	0	1	1
Commodity hedger	3,254	0.593	0.491	0	1	1
Hedge ratio (%)	3,254	31.67	43.06	0	16.27	54.80
Hedge maturity (months)	3,285	15.44	18.41	0	12	24
Log hedge maturity	3,285	1.856	1.599	0	2.565	3.219
Bankruptcy	3,285	0.034	0.180	0	0	0
High-cost bankruptcy (free fall)	3,285	0.015	0.122	0	0	0
Low-cost bankruptcy (prepackaged)	3,285	0.018	0.134	0	0	0
Asset tangibility	3,285	0.718	0.220	0.625	0.790	0.879
Firm size	3,285	6.072	2.510	4.361	6.233	7.898
Firm networth	3,285	0.312	1.078	0.241	0.435	0.602
Market-to-book ratio	3,285	1.751	5.394	0.743	1.050	1.567
Book leverage	3,285	0.255	0.212	0.083	0.215	0.385

Panel C: Bankruptcy Sample	*N*	*Mean*	*Std. Dev.*	*p25*	*p50*	*p75*
Hedge ratio (%), t-1	122	41.685	47.650	5.318	36.310	63.799
Hedge ratio (%), t	117	26.693	30.839	0	14.286	51.275
Hedge ratio (%), t+1	41	45.530	34.870	12.378	52.316	69.849
Commodity hedger, t-1	122	0.787	0.411	1	1	1
Commodity hedger, t	117	0.590	0.494	0	1	1
Commodity hedger, t+1	41	0.829	0.381	1	1	1
Hedge maturity (months), t-1	122	18.098	16.214	6	12	24
Hedge maturity (months), t	118	13.508	14.744	0	12	24
Hedge maturity (months), t+1	42	18.500	12.553	12	19.500	24
Derivative fair value ($M), t-1	121	44.490	182.246	0	0.198	22.100
Negative derivative fair value, t-1	121	0.240	0.429	0	0	0
Positive derivative fair value, t-1	121	0.537	0.501	0	1	1
Derivative termination	87	0.632	0.485	0	1	1
Asset tangibility	120	0.774	0.163	0.694	0.832	0.896
Firm size	120	6.634	1.813	5.543	6.863	7.859
Firm networth	120	-0.105	0.682	-0.189	0.050	0.283
Market-to-book ratio	118	1.159	2.009	0.625	0.819	1.084
Book leverage	118	0.589	0.206	0.473	0.643	0.782

Table 2. Events of Default and Risk Management (Compustat/SEC Sample)

The table reports the estimates of the OLS regressions. The sample in Panel A consists of firms in Compustat (except utilities) during the period 2001-2020. The sample in Panel B consists of firms covered by Compustat and SEC EDGAR (except utilities) during the period 1999-2020. The dependent variable in Panel A is equal to one if the firm has non-zero unrealized gains or losses or has non-zero derivative gains/losses reported after net income in Compustat and it is equal to zero otherwise. The dependent variable in Panel B is the number of hedging-related words in a firm's 10-K divided by the total word count (%). Default-related words frequency is the number of default-related words in a firm's 10-K divided by the total word count (%). Other variables are defined in Appendix A. T-statistics based on heteroskedasticity-consistent standard errors clustered by the firm are reported in brackets. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A.	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:			*Derivative User*			
Bankruptcy	-0.163***	-0.128***				
	[-5.99]	[-4.84]				
High-cost bankruptcy			-0.227***	-0.199***		
(free fall) (a)			[-4.40]	[-4.04]		
Low-cost bankruptcy			-0.113***	-0.075***		
(prepackaged) (b)			[-4.33]	[-2.88]		
Default-related words					-0.067***	-0.068***
frequency					[-2.87]	[-2.97]
Firm size	0.031***	0.034***	0.031***	0.034***	0.036***	0.035***
	[16.07]	[14.24]	[16.14]	[14.30]	[12.49]	[12.33]
Market-to-book ratio	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	[15.08]	[13.56]	[15.08]	[13.55]	[12.73]	[12.35]
Asset tangibility	-0.023***	-0.008	-0.023***	-0.008	-0.011	0.006
	[-2.86]	[-0.66]	[-2.86]	[-0.67]	[-0.78]	[0.40]
Firm networth	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***
	[-7.31]	[-6.36]	[-7.40]	[-6.44]	[-6.59]	[-5.92]
Book leverage	0.090***	0.138***	0.090***	0.137***	0.116***	0.152***
	[7.09]	[9.38]	[7.06]	[9.34]	[6.70]	[8.93]
Constant	0.030***	0.018	0.029***	0.017	0.011	0.011
	[2.96]	[1.32]	[2.91]	[1.26]	[0.68]	[0.68]
Observations	126,864	104,622	126,864	104,622	78,657	76,779
R-squared	0.699	0.710	0.699	0.710	0.693	0.708
t-stat for $(a) - (b)$	n/a	n/a	-1.97**	-2.23**	n/a	n/a
Year FE	Yes	No	Yes	No	Yes	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry×Year FE	No	Yes	No	Yes	No	Yes

Panel B.	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:			*Hedging Intensity*			
Bankruptcy	-0.033***	-0.030***				
	[-5.11]	[-4.48]				
High-cost bankruptcy (free fall) (a)			-0.063***	-0.057***		
			[-5.53]	[-4.94]		
Low-cost bankruptcy (prepackaged) (b)			-0.012*	-0.010		
			[-1.90]	[-1.58]		
Default-related words frequency					-0.099***	-0.104***
					[-13.55]	[-14.23]
Firm size	0.013***	0.012***	0.013***	0.012***	0.013***	0.011***
	[14.42]	[13.12]	[14.49]	[13.20]	[14.16]	[12.85]
Market-to-book ratio	0.000**	0.000**	0.000**	0.000**	0.000**	0.000*
	[2.47]	[2.03]	[2.46]	[2.02]	[2.25]	[1.74]
Asset tangibility	-0.005	-0.003	-0.005	-0.003	-0.005	-0.003
	[-1.16]	[-0.68]	[-1.14]	[-0.66]	[-1.05]	[-0.61]
Firm networth	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***
	[-11.00]	[-10.40]	[-11.05]	[-10.45]	[-11.24]	[-10.69]
Book leverage	0.025***	0.033***	0.024***	0.033***	0.029***	0.038***
	[5.09]	[6.96]	[5.02]	[6.88]	[5.98]	[7.90]
Constant	0.026***	0.032***	0.026***	0.032***	0.031***	0.037***
	[5.54]	[6.76]	[5.49]	[6.71]	[6.43]	[7.74]
Observations	95,054	92,160	95,054	92,160	95,054	92,160
R-squared	0.675	0.689	0.675	0.690	0.676	0.691
t-stat for (a) $-$ (b)	n/a	n/a	-3.92***	-3.57***	n/a	n/a
Year FE	Yes	No	Yes	No	Yes	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry×Year FE	No	Yes	No	Yes	No	Yes

Table 3. Events of Default and Risk Management (Detailed Sample)

The table reports the estimates of the OLS regressions. The dependent variable in columns 1-2 is the hedge ratio (%); the dependent variable in columns 3-4 is the hedge maturity, measured as the logarithm of one plus the number of months till expiration of the contract with the longest maturity; and the dependent variable in columns 5-6 is an indicator equal to one if the firm hedges commodity price exposure and is equal to zero otherwise. The sample consists of all US-incorporated oil and gas producing firms (SIC Code 1311), commercial airlines (SIC 4512), coal producing firms (SIC 1220), and steel producing firms (SIC 3310-3320) during the period 1999-2020 that have non-missing accounting information in COMPUSTAT and non-missing hedging data in 10-K or 10-KSB public filings. All variables are defined in Appendix A. T-statistics based on heteroskedasticity-consistent standard errors clustered by the firm are reported in brackets. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A.	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	*Hedge Ratio*		*Hedge Maturity*		*Commodity Hedger*	
Bankruptcy	-16.314***	-18.596***	-0.525***	-0.622***	-0.168***	-0.203***
	[-3.16]	[-3.47]	[-3.27]	[-3.92]	[-3.43]	[-4.13]
Firm size	5.244***	5.117***	0.226***	0.239***	0.063***	0.067***
	[2.93]	[2.83]	[4.43]	[4.70]	[4.10]	[4.35]
Market-to-book ratio	0.290	0.337*	0.010	0.012*	0.004*	0.005**
	[1.63]	[1.93]	[1.61]	[1.91]	[1.80]	[2.04]
Asset tangibility	-0.021	0.354	0.282	0.301	0.056	0.071
	[-0.00]	[0.03]	[1.15]	[1.25]	[0.68]	[0.88]
Firm networth	0.540	0.824	0.009	0.015	0.001	0.004
	[0.54]	[0.84]	[0.28]	[0.48]	[0.08]	[0.34]
Book leverage	2.045	1.872	0.513***	0.458**	0.176***	0.157***
	[0.34]	[0.30]	[2.98]	[2.55]	[3.27]	[2.85]
Constant	-0.822	-0.345	0.148	0.067	0.123	0.095
	[-0.08]	[-0.03]	[0.48]	[0.22]	[1.23]	[0.98]
Observations	3,245	3,242	3,276	3,273	3,245	3,242
R-squared	0.537	0.542	0.749	0.757	0.714	0.724
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No	Yes	No
Industry*Year	No	Yes	No	Yes	No	Yes

Panel B.	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	*Hedge Ratio*		*Hedge Maturity*		*Commodity Hedger*	
High-cost bankruptcy	-25.735***	-29.313***	-0.819***	-0.939***	-0.235***	-0.269***
(free fall) (a)	[-2.84]	[-3.00]	[-3.15]	[-3.56]	[-2.91]	[-3.18]
Low-cost bankruptcy	-8.253	-10.105*	-0.275	-0.374**	-0.111**	-0.150***
(prepackaged) (b)	[-1.54]	[-1.97]	[-1.48]	[-2.09]	[-2.03]	[-2.83]
Firm size	5.365***	5.267***	0.229***	0.243***	0.064***	0.068***
	[3.02]	[2.94]	[4.51]	[4.78]	[4.17]	[4.41]
Market-to-book ratio	0.294*	0.341**	0.010*	0.012*	0.004*	0.005**
	[1.68]	[1.98]	[1.66]	[1.95]	[1.81]	[2.04]
Asset tangibility	0.143	0.611	0.288	0.309	0.057	0.073
	[0.01]	[0.06]	[1.17]	[1.29]	[0.70]	[0.90]
Firm networth	0.308	0.580	0.002	0.008	-0.001	0.002
	[0.32]	[0.61]	[0.05]	[0.26]	[-0.08]	[0.20]
Book leverage	1.861	1.330	0.507***	0.442**	0.175***	0.154***
	[0.32]	[0.21]	[2.98]	[2.48]	[3.28]	[2.81]
Constant	-1.563	-1.221	0.126	0.043	0.118	0.090
	[-0.16]	[-0.12]	[0.41]	[0.14]	[1.18]	[0.92]
Observations	3,245	3,242	3,276	3,273	3,245	3,242
R-squared	0.538	0.543	0.750	0.758	0.715	0.725
t-stat for $(a) - (b)$	-1.66*	-1.74*	-1.70*	-1.77*	-1.27	-1.19
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No	Yes	No
Industry*Year	No	Yes	No	Yes	No	Yes

Table 4. Bankruptcies with Derivative Terminations and Without (Detailed Sample)

The table reports the estimates of the OLS regressions. The dependent variable in column 1 is the hedge ratio (%); the dependent variable in column 2 is the hedge maturity, measured as the logarithm of one plus the number of months till expiration of the contract with the longest maturity; and the dependent variable in column 3 is an indicator variable equal to one if the firm hedges commodity price exposure and is equal to zero otherwise. The sample consists of all US-incorporated oil and gas producing firms (SIC Code 1311), commercial airlines (SIC 4512), coal producing firms (SIC 1220), and steel producing firms (SIC 3310-3320) during the period 1999-2020 that have non-missing accounting information in COMPUSTAT and non-missing hedging data in 10-K or 10-KSB public filings. All variables are defined in Appendix A. T-statistics based on heteroskedasticity-consistent standard errors clustered by the firm are reported in brackets. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	*Hedge Ratio*		*Hedge Maturity*		*Commodity Hedger*	
Bankruptcy with derivative	-31.621***	-34.711***	-1.183***	-1.313***	-0.427***	-0.469***
terminations (a)	[-3.88]	[-4.20]	[-4.70]	[-5.10]	[-5.82]	[-6.13]
Bankruptcy without	-8.918*	-10.714**	-0.208	-0.287*	-0.043	-0.072
derivative terminations (b)	[-1.77]	[-2.10]	[-1.16]	[-1.67]	[-0.77]	[-1.33]
Firm size	5.305***	5.163***	0.228***	0.241***	0.064***	0.067***
	[2.94]	[2.83]	[4.45]	[4.70]	[4.12]	[4.34]
Market-to-book ratio	0.262	0.304*	0.009	0.011*	0.003*	0.004*
	[1.57]	[1.86]	[1.49]	[1.77]	[1.71]	[1.94]
Asset tangibility	0.264	0.658	0.295	0.315	0.060	0.076
	[0.03]	[0.06]	[1.19]	[1.30]	[0.74]	[0.94]
Firm networth	0.529	0.821	0.008	0.015	0.001	0.004
	[0.55]	[0.86]	[0.28]	[0.50]	[0.07]	[0.36]
Book leverage	2.037	2.001	0.512***	0.464***	0.176***	0.160***
	[0.35]	[0.33]	[3.08]	[2.64]	[3.37]	[2.93]
Constant	-1.333	-0.811	0.127	0.048	0.114	0.088
	[-0.14]	[-0.08]	[0.41]	[0.16]	[1.13]	[0.89]
Observations	3,245	3,242	3,276	3,273	3,245	3,242
R-squared	0.538	0.544	0.751	0.760	0.718	0.728
t-stat for $(a)-(b)$	-2.37**	-2.47**	-3.15***	-3.31***	-4.16***	-4.24***
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No	Yes	No
Industry*Year	No	Yes	No	Yes	No	Yes

Table 5. Placebo Test: Hedging with Derivatives and Hedging with Supply Agreements

The table reports the estimates of the OLS regressions. The sample consists of coal producing firms (SIC 1220) during the period 1999-2020 that have non-missing accounting information in COMPUSTAT and non-missing hedging data in 10-K or 10-KSB public filings. In columns 1-3 we consider hedging using derivatives (coal firms hedge input, diesel fuel, using derivatives). In columns 4-6, we consider hedging using supply agreements, which are physical delivery contracts that do not involve derivatives (coal firms hedge output, coal, using supply agreements). The dependent variable in columns 1 and 4 is the hedge ratio (%); the dependent variable in columns 2 and 5 is the hedge maturity, measured as the logarithm of one plus the number of months till the expiration of the contract with the longest maturity; and the dependent variable in columns 3 and 6 is an indicator variable equal to one if the firm hedges commodity price exposure and is equal to zero otherwise. All variables are defined in Appendix A. T-statistics based on heteroskedasticity-consistent standard errors clustered by the firm are reported in brackets. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable:	(1) *Hedge Ratio*	(2) *Hedge Maturity*	(3) *Commodity Hedger*	(4) *Hedge Ratio*	(5) *Hedge Maturity*	(6) *Commodity Hedger*
Bankruptcy with derivative terminations (a)	-30.199***	-1.473***	-0.518***	0.324	0.055	-0.057
	[-8.26]	[-5.00]	[-5.34]	[0.12]	[0.32]	[-1.50]
Bankruptcy without derivative terminations (b)	0.536	-0.273	-0.064	-15.729	-0.476	-0.185
	[0.06]	[-1.11]	[-0.62]	[-1.10]	[-0.74]	[-1.06]
Firm size	2.627	-0.070	-0.001	0.186	0.074	0.049
	[0.38]	[-0.22]	[-0.01]	[0.06]	[0.53]	[1.48]
Market-to-book ratio	0.101	0.002	0.001	-0.076	-0.001	-0.000
	[0.98]	[0.51]	[0.95]	[-0.84]	[-0.71]	[-0.32]
Asset tangibility	8.197	0.610	0.056	6.227	-0.368	0.085
	[0.61]	[0.94]	[0.33]	[0.58]	[-1.25]	[0.67]
Firm networth	-0.193	0.015	0.006	-0.972	-0.009	-0.023
	[-0.15]	[0.26]	[0.29]	[-0.67]	[-0.34]	[-1.23]
Book leverage	32.594***	1.579**	0.384*	-6.084	0.111	-0.131
	[3.00]	[2.62]	[1.90]	[-0.54]	[0.21]	[-1.62]
Constant	-20.934	0.310	0.040	70.710***	2.532***	0.493*
	[-0.54]	[0.17]	[0.07]	[3.24]	[2.84]	[1.94]
Observations	202	220	202	209	195	209
R-squared	0.746	0.738	0.750	0.928	0.954	0.961
t-stat for $(a) - (b)$	-3.18***	-3.13***	-3.21***	1.10	0.80	0.72
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Hedging type	Diesel Derivatives			Coal Supply Agreements		

Table 6. Oil Price Movements Before Bankruptcy and Effect of Bankruptcy on Hedging (Oil & Gas Firms)

The table reports the estimates of the OLS regressions. The dependent variable in column 1 is the hedge ratio (%); the dependent variable in column 2 is the hedge maturity, measured as the logarithm of one plus the number of months till expiration of the contract with the longest maturity; and the dependent variable in column 3 is an indicator variable equal to one if the firm hedges commodity price exposure and is equal to zero otherwise. *Positive Oil Return* is equal to one if during the one-month prior to a firm's bankruptcy the spot price of crude oil increased and is equal to zero otherwise. *Negative Oil Return* is equal to one minus *Positive Oil Return*. The sample consists of all US-incorporated oil and gas producing firms (SIC Code 1311) during the period 1999-2020 that have non-missing accounting information in COMPUSTAT and non-missing hedging data in 10-K or 10-KSB public filings. All variables are defined in Appendix A. T-statistics based on heteroskedasticity-consistent standard errors clustered by the firm are reported in brackets. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
Dependent Variable:	*Hedge Ratio*	*Hedge Maturity*	*Commodity Hedger*
Bankruptcy×Positive 1-Month	-32.064***	-0.825***	-0.261***
Oil Return	[-3.14]	[-3.25]	[-3.70]
Bankruptcy×Negative 1-Month	-13.198	-0.482**	-0.169***
Oil Return	[-1.46]	[-2.05]	[-2.74]
Firm size	5.059***	0.234***	0.065***
	[2.69]	[4.50]	[4.21]
Market-to-book ratio	0.440*	0.015*	0.004
	[1.73]	[1.74]	[1.63]
Asset tangibility	0.814	0.460*	0.124
	[0.07]	[1.71]	[1.40]
Firm networth	2.159	0.067	0.020
	[1.41]	[1.46]	[1.41]
Book leverage	2.336	0.544***	0.188***
	[0.33]	[2.83]	[3.32]
Constant	4.869	0.178	0.116
	[0.46]	[0.56]	[1.15]
Observations	2,613	2,626	2,613
R-squared	0.518	0.751	0.726
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes

Table 7. Metavante NY Court Case: Derivative Terminations and Hedging

The table reports the estimates of the OLS regressions. The dependent variable in columns 1-2 is an indicator variable of derivative determinations by the counterparties based on the textual search; the dependent variable in columns 3-4 is equal to one if the firm has non-zero unrealized gains or losses or has non-zero derivative gains/losses reported after net income in Compustat, and it is equal to zero otherwise. The sample consists of firms in Compustat (except utilities) during the period 2005-2014. *Post* is an indicator equal to one if fiscal year is after Metavante Court Case (after September 30, 2009). *NY* is equal to one if the firm's court jurisdiction is in the U.S. Bankruptcy Court for the Southern District of New York. All variables are defined in Appendix A. T-statistics based on heteroskedasticity-consistent standard errors clustered by the firm are reported in brackets. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Dependent Variable:	*Derivative Terminations*		*Derivative user*	
NY×Post	0.009*	0.009**	-0.011	-0.009
	[1.89]	[2.04]	[-0.74]	[-0.60]
Bankruptcy			-0.118**	-0.109*
			[-2.00]	[-1.83]
Bankruptcy×Post			-0.005	0.001
			[-0.12]	[0.03]
Bankruptcy×NY			0.181**	0.186*
			[2.06]	[1.96]
Bankruptcy×NY×Post			-0.332***	-0.372***
			[-2.97]	[-3.15]
Firm size	0.001	0.001	0.024***	0.031***
	[1.25]	[1.08]	[11.40]	[10.97]
Market-to-book ratio	0.000	0.000	0.001***	0.001***
	[1.23]	[1.55]	[11.66]	[10.45]
Asset tangibility	0.002	0.004	-0.018**	0.005
	[0.54]	[0.88]	[-2.06]	[0.39]
Firm networth	-0.000	0.000	-0.001***	-0.002***
	[-0.25]	[0.37]	[-3.41]	[-3.99]
Book leverage	0.003	0.005	0.094***	0.136***
	[0.57]	[0.82]	[6.25]	[7.52]
Observations	45,501	45,130	67,593	54,863
R-squared	0.326	0.336	0.735	0.749
Industry*Year FE	No	Yes	No	Yes
Year	Yes	No	Yes	No
Firm FE	Yes	Yes	Yes	Yes

Appendix D. Additional Tables and Robustness Tests

Table D.1. Derivative Terminations and Fair Value at Default

The dependent variable is equal to one if there are derivative terminations by the counterparties reported in firm's 10-K forms during the year when there is an event of default or the year following, and is equal to zero otherwise. Specifications 1-2 and 4-5 are estimated using the OLS regressions, specifications 2 and 4 are estimated using logit model. All independent variables are measured at the last fiscal year-end before the event of default. The sample consists of bankrutcies by oil and gas producing firms (SIC Code 1311), commercial airlines (SIC 4512), and coal producing firms (SIC 1220) during the period 1999-2020 that have non-missing accounting information in COMPUSTAT and non-missing hedging data in 10-K or 10-KSB public filings. All variables are defined in Appendix A. T-statistics based on heteroskedasticity-consistent standard errors clustered by the firm are reported in brackets. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Derivative fair value ($000's)	-0.544***	-0.753***	-9.514***			
	[-3.34]	[-3.24]	[-2.89]			
Negative derivative fair value				0.272***	0.339***	1.900**
				[2.71]	[3.08]	[2.52]
Hedge ratio		0.001*	0.010		0.001	0.003
		[1.80]	[1.48]		[0.71]	[0.64]
Firm size		0.036	0.323		0.019	0.138
		[0.78]	[1.34]		[0.42]	[0.62]
Market-to-book ratio		0.273*	2.236		0.209	2.137
		[1.69]	[1.62]		[1.37]	[1.42]
Asset tangibility		-1.135**	-8.676**		-0.931	-4.832*
		[-2.13]	[-2.56]		[-1.67]	[-1.69]
Firm networth		0.405**	2.911**		0.392**	2.916*
		[2.33]	[2.02]		[2.21]	[1.81]
Book leverage		-0.195	-1.197		-0.100	-1.030
		[-0.54]	[-0.65]		[-0.31]	[-0.60]
Observations	86	82	82	86	82	82
(Pseudo) R-squared	0.070	0.150		0.087	0.166	
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Estimation	OLS	OLS	Logit	OLS	OLS	Logit

Table D.2. Strength of Relationship and Effect of Bankruptcy on Hedging

The table reports the estimates of the OLS regressions. The dependent variable in column 1 is the hedge ratio (%); the dependent variable in column 2 is the hedge maturity, measured as the logarithm of one plus the number of months till expiration of the contract with the longest maturity; and the dependent variable in column 3 is an indicator variable equal to one if the firm hedges commodity price exposure and is equal to zero otherwise. *Strength of Relationship* is the number of years the firm existed in COMPUSTAT until the year of observation. The sample consists of all US-incorporated oil and gas producing firms (SIC Code 1311), commercial airlines (SIC 4512), coal producing firms (SIC 1220), and steel producing firms (SIC 3310-3320) during the period 1999-2020 that have non-missing accounting information in COMPUSTAT and non-missing hedging data in 10-K or 10-KSB public filings. All variables are defined in Appendix A. T-statistics based on heteroskedasticity-consistent standard errors clustered by the firm are reported in brackets. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable:	(1) *Hedge Ratio*	(2) *Hedge Maturity*	(3) *Commodity Hedger*
Bankruptcy	-36.437***	-1.263***	-0.359***
	[-3.45]	[-3.63]	[-3.55]
Bankruptcy×Strength of Relationship	1.585**	0.058***	0.015**
	[2.40]	[2.59]	[2.24]
Strength of Relationship	24.033	1.040	0.384
	[1.27]	[1.09]	[1.21]
Firm size	5.336***	0.229***	0.064***
	[2.98]	[4.54]	[4.19]
Market-to-book ratio	0.293	0.010	0.004*
	[1.65]	[1.62]	[1.78]
Asset tangibility	0.641	0.307	0.063
	[0.07]	[1.28]	[0.79]
Firm networth	0.370	0.003	-0.001
	[0.38]	[0.08]	[-0.07]
Book leverage	1.684	0.499***	0.172***
	[0.29]	[2.93]	[3.23]
Constant	-235.536	-9.996	-3.622
	[-1.28]	[-1.08]	[-1.17]
Observations	3,245	3,276	3,245
R-squared	0.538	0.751	0.716
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes