Derivatives Supply and Corporate Hedging: Evidence from the Safe Harbor Reform of 2005

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Abstract

This paper analyzes the importance of supply-side frictions for corporate hedging. To identify this relationship, we exploit a regulatory change that allows derivatives counterparties to circumvent the Bankruptcy Code's automatic stay and preference rules: The Safe Harbor Reform of 2005. Following the reform-induced expansion in the availability of derivatives, fuel hedging of airlines near financial distress (those that benefited the most from the reform) increased significantly relative to financially sound airlines. Similarly, we find that hedging propensity increased for a general sample of non-financial firms. In line with theory, we also find that firm's value and performance increased after the 2005 reform for the affected firms. Our analysis provides also evidence consistent with unsecured creditor "runs".

Keywords*:* supply-side frictions, safe harbor reform, fuel hedging, airlines, firm's value, unsecured creditor runs.

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1. Introduction

Economic theory suggests that firms hedge to mitigate credit rationing (Froot, Scharfstein, and Stein, 1993; Holmström and Tirole, 2000), to reduce information asymmetry (DeMarzo and Duffie, 1991, 1995; Breeden and Viswanathan, 2016), or to alleviate the risk of financial distress (Smith and Stulz, 1985; Stulz, 2013). Over the last two decades, these theories have motivated numerous empirical studies. The underlying assumption of these studies (both theoretical and empirical) is that the supply of hedging instruments is infinitely elastic. Under this assumption, hedging levels are determined exclusively by a company's "demand" for hedging. Yet, evidence suggests that the supply of hedging instruments is not frictionless. For example, according to the International Swaps and Derivatives Association (ISDA, 2009), 80% of the financial counterparties in the over-the-counter (OTC) derivatives market require collateral from corporate end-users because of concerns with counterparty risk.

The objective of this paper is to study the effect of supply-side frictions on corporate risk management, firm's value, and financing policies. Empirically, establishing a causal link between supply frictions and hedging is challenging because it requires an exogenous shock to derivatives supply. In this study, we exploit a regulatory change that significantly strengthened the protection granted to non-defaulting derivatives counterparties in bankruptcy, essentially allowing them to circumvent the Bankruptcy Code's automatic stay and preference rules (Schwarcz and Sharon, 2013). These regulatory innovations – which we dub as the "Safe Harbor Reform of 2005" – were introduced with the **Bankruptcy** Abuse Prevention and Consumer Protection **Act of 2005** (BAPCPA) (Pub.L. 109–8, 119 Stat. 23, enacted April 20, **2005**) and have been embraced by numerous bankruptcy court decisions (Levin, 2015).[1]

We predict the corporate response to this derivatives supply expansion to depend on the risk that a firm could face financial distress (Altman's 1968 z-score). In particular, we expect hedging to increase for low z-score firms (treated firms) relative to high z-score firms (control firms) after the Safe Harbor Reform of 2005. This increase should occur because non-defaulting derivatives counterparties are granted much stronger protection in Chapter 11 after 2005 – in terms of both the right to terminate a derivatives contract and take the collateral if the other side of the derivatives contract files for bankruptcy – and hence are willing to "supply" hedging instruments also to firms that could face financial distress (low z-score firms).

[1] See Section 2 for a discussion of some of these bankruptcy decisions.

We start our analysis by focusing on scheduled airlines (SIC 4512).[2] This industry provides an ideal setting to study corporate risk management for the following reasons. First, jet fuel is one of the main production factors for airlines. For example, fuel expenses were 31.5% of operating expenses in 2008, compared to 20.3% for labor expenses (the second largest operating expense). On average, for the period 2003-2008 (the six year period centered on the safe harbor reform of 2005), jet fuel expenses were 22.5% compared to 26.7% for labor expenses. Second, airline companies report detailed information on fuel hedging in their 10-K's (Item 7(A) – "Quantitative and Qualitative Disclosures about Market Risk"), which we hand collect. Similar hedging information is not available for other industries. Third, about 63% of the airlines in our sample have a low z-score (and hence could face financial distress) compared to about 35% of non-financial firms. Because the safe harbor reform facilitates access to derivatives to firms that could potentially face financial distress, we should expect the effect of the reform to be particularly strong in the airline industry. Fourth, focusing on one industry makes it less likely that differences in economic fundamentals across industries explain changes in risk management policies.[3]

Using a difference-in-difference approach, we find that fuel hedging for low z-score airlines (those that benefitted the most from the 2005 reform) in the three years after the Safe Harbor Reform of 2005 increased by 19.2 percentage points compared to high z-score firms (control group). These findings pass a large number of robustness tests. We find that our results hold if we add leased capital to assets, if we use alternative proxies of financial distress (e.g., distance-to-default), if we exclude regional airlines that rely on pass-through agreements with national carriers for their fuel supply, when we perform tests to rule out the violation of the parallel trend assumption or alternative channels (i.e., the effect of jet fuel price increases and the change in the treatment of leases in bankruptcy after 2005), if we exclude one airline at a time from the sample (to mitigate concerns with outliers), and if we focus on airlines with consistently low or high z-score in the post reform period.

As we have discussed, focusing on the airline industry to study risk management has several advantages. However, one concern with any single-industry studies is that it is not possible to know whether results are generalizable to other industries. To investigate the external validity of our findings, we replicate all our results for a large sample of non-financial firms from COMPUSTAT. Although detailed information on

[2] We are not the first to use airline data to study corporate hedging (e.g., Carter, Rogers, and Simkins, 2006a, b; and Rampini, Sufi, and Viswanathan, 2014).

[3] Theoretically, Adam, Dasgupta, and Titman (2007) are one of the first papers to analyze the relationship between industry characteristics and hedging incentives.

hedging is not available for such sample, COMPUSTAT reports information on gains/losses associated to the use of derivatives. Following Adams-Bonaimé, Watson-Hankins, and Harford (2014), we use this information to build an indicator for whether or not firms hedge.

Using a logit difference-in-difference approach, we find that the propensity to hedge for low z-score firms (treated group) increased by 8.3 percentage points in the three year after the reform relative to (otherwise similar) high z-score firms. These findings are robust to controlling for industry-fixed effects, the interaction of industry and year fixed effects, firms-fixed effects, alternative measures of financial distress, potential violation of parallel trends, and matching treated firms to untreated firms on the basis of relevant characteristics.

Purnanandam (2008) develops a model in which optimal ex-post hedging is determined by a trade-off between the costs of financial distress and the benefits from risk shifting. This author shows that in a dynamic setting it is optimal for firms near financial distress to hedge ex-post (even without a pre-commitment to do so) because by hedging such firms stabilize their financial situation and therefore are able to preserve their market share.[4],[5] Therefore, the predictions from this model are that firm's value and operating performance will increase for low z-score airlines after the Safe Harbor Reform of 2005.

In line with Purnanadam (2008), we find a significantly large increase in the value of low z-score airlines (treated firms) in the years after the 2005 reform. We also find operating performance and passengers' revenues to increase significantly for low z-score airlines relative to control firms after 2005.[6] We also

[4] When a firm financial situation deteriorates, competitors might take actions to gain market share from the troubled firm. For example, following the recent financial difficulties of Italian airline company Alitalia (and rumors that the company could lose its New York City slots, which account for 15% of its worldwide revenue), United Airlines announced that it will starts serving Rome year-around from its Newark hub. Some industry experts have considered this decision be part of a United Airlines' plan to bankrupt Alitalia: http://liveandletsfly.boardingarea.com/2017/07/07/united-airlines-bankrupt-alitalia/). In the airline industry, many specialized blogs warn passengers of the risks of flying with distressed airlines: these airlines might change schedules, cancel flights, or discontinue routes (e.g., https://hasbrouck.org/articles/bankruptcy.html). Clearly, this can also affect a firm's ability to preserve it market share. In the academic literature, Ciliberto and Schenone (2012a, b) find that tickets of airlines in financial distress sell at a significant discount. Using a general sample of non-financial firms, Opler and Titman (1994) show that firms in financial distress lose market share during industry downturns. Similarly, for the supermarket industry, Chevalier (1995a, b) finds that high leverage deteriorates a firm's competitive position.

[5] In Purnanandam (2008), it is beneficial for a firm to shift risk to debtholders by not hedging only when its financial situation has already deteriorated substantially and, as a result, the firms has already lost most of its market share and is unable to realize the full upside potential of its investments going forward.

[6] These findings are in line with evidence in Adam and Fernando (2006) who find that risk management leads to higher cash flows, Adam (2006) and Campello, Lin, Ma, and Zou (2011) who show that hedging helps firms increase investment, respectively, by increasing a firm's access to internal resources and by lowering borrowing costs, Cornaggia (2013) who finds that the introduction of a new-crop insurance has a positive effect on the productivity

find covenant violations to decrease for the treated firms. In line with Smith and Stulz (1985) and Purnanandam (2008), these findings suggests that by hedging low z-score firms reduce the risk of financial distress, which, in turn, leads to a higher firm's value and less covenant violations. We also find the compensation of CFOs to increase after the reform, suggesting that the beneficial effects of hedging on firm's value and performance have also positive consequences for executives' compensation.[7] We obtain very similar results for the general sample of non-financial sample.

Bolton and Oehmke (2015) show that the safe-harbor (super-priority) status granted to derivatives in bankruptcy could lead to unsecured creditor "runs" because such status effectively means that "loss given default" is higher for debtholders in the event of bankruptcy.[8] In line with this prediction, we find that affected airlines reduced debt outstanding significantly after the reform, while the issuance of new debt remained unchanged. We also find that the proportion of (safer) secured debt increased after the reform for the affected airlines. Similarly, for the general sample of non-financial firms, we find a significant increase in the proportion of secured debt, which these firms achieved by reducing (unsecured) debt issuance. For the general sample, we are also able to study CDS spreads around the passage of the safe-harbor reform by the U.S. Congress on April 14, 2005.[9] If the super-seniority of derivatives in bankruptcy implies that loss given default is larger for debtholders in bankruptcy, then we should expect CDS spreads to increase. In line with this additional prediction, we find that CDS spreads increased for the treated firms (relative to control firms) around April 14, 2005. Overall, our findings support the prediction in Bolton and Oehmke (2015) that a stronger protection of derivatives in bankruptcy could lead to (unsecured) creditor runs.[10]

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of agricultural-sector firms, and, more recently, with the findings in Almansour, Megginson, and Pugachev (2016) that Delta Air Lines stocks experienced positive abnormal returns after the company announced the acquisition of an oil refinery to reduce its fuel cost variability.

[7] Tufano (1996) is one of the first papers to document a relationship between executive compensation and corporate hedging. Other studies include Petersen and Thiagarajan (2000), Knopf, Nam, and Thornton (2002), Graham and Rogers (2002), and more recently, Chernenko and Faulkender (2011), and Bakke, Mahmudi, Fernando, and Salas (2016). Relatedly, Adam, Fernando, Golubeva (2015) show that managerial overconfidence affects corporate hedging decisions.

[8] In fact, safe harbor makes the claims of (non-defaulting) existing derivatives counterparties stronger, while also increasing a firm's access to derivatives. These both reduce the assets against which debtholders can file a claim in case the firm defaults.

[9] We cannot perform such analysis for the airlines because CDS spreads are only available for five firms.

[10] As we document in the paper, corporate hedging reduces the risk of financial distress (Smith and Stulz, 1985; and Purnanadam, 2008) and boosts firm's value and performance (Purnanadam, 2008). These effects are likely to mitigate the severity of (unsecured) creditor runs for firms that use derivatives for hedging purposes.

Our paper belongs to the literature on the role of supply-side frictions for corporate policies. In the capital structure literature, Faulkender and Petersen (2006), Leary (2009), and Lemmon and Roberts (2010) show that credit market frictions affect corporate borrowing. While there are numerous empirical studies on corporate risk management (e.g., Bessembinder, 1991; Nance, Smith, and Smithson, 1993; Tufano, 1996; Mian, 1996; Gay and Nam, 1998; Geczy, Minton, and Schrand, 1997; Graham and Rogers, 2002; and more recently, Adam, 2009; Bartram, Brown, and Conrad, 2011; and Rampini, Sufi, and Viswanathan, 2014), their focus is on corporate **demand** for hedging. To our knowledge, our paper is the first to study the nexus between derivatives **supply** and corporate hedging.

Our findings can also help inform the current policy debate on "derivatives margin requirements". Uncollateralized derivatives are considered to have played an important role in the global financial crisis. For example, selling uncollateralized CDS is considered to have contributed to the collapse of AIG in 2008. As a result, the Dodd-Frank Act of 2010 required the five U.S. prudential regulators[11] to adopt rules requiring derivatives markets participants to collect margins. Imposing more stringent margin requirements implies limiting the availability of hedging instruments to firms that will not be able to post collateral. While this might improve the stability of financial markets, our findings can shed light on the extent to which limiting the supply of hedging instruments affects corporate hedging and firm's value. Ultimately, our paper can help inform the current policy debate by highlighting the necessity to balance market stability with the consequences that limiting hedging by imposing more stringent margin requirements might have for corporate risk management and firm's value.[12]

The rest of the paper is organized as follows. Section 2 describes institutional setting, empirical design, and data. The discussion of the main results and robustness tests for the airline sample are in section 3. Section 4 discusses the hedging results for a general sample of non-financial firms. The results on the effects of hedging on firm's value, operating performance, and financing are in section 5. Section 6 concludes.

2. Empirical Design and Data

[11] Office of the Comptroller of the Currency, U.S. Department of the Treasury (OCC), the Board of Governors of the Federal Reserve System (Fed), the Federal Deposit Insurance Corporation (FDIC), the Farm Credit Administration (FCA), and the Federal Housing Finance Agency (FHFA).

[12] See Stulz (2004) for an early discussion on the nexus between derivatives and systemic risk.

To study the relation between supply-side frictions and corporate hedging, we rely on several important changes in the Bankruptcy Code's treatment of derivatives introduced with the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 (BAPCPA) (Pub.L. 109–8, 119 Stat. 23). We dub these changes collectively as the "Safe Harbor Reform of 2005". It took nearly 10 years for the reform to be passed. The Act was first drafted in 1997 and introduced in Congress in 1998. Although it was approved in the year 2000 as the "Bankruptcy Reform Act of 2000", President Bill Clinton vetoed it. During the first George W. Bush administration (which started on January 20, 2001) the bill was again introduced in Congress, but it was repeatedly shelved because Republicans did not have a 60-vote super-majority in the Senate necessary to break a filibuster. The Act was re-introduced in the Senate by Senator Chuck Grassley on February 1, 2005, following the increase in the Republican majorities in both the House and the Senate with the elections of November 2, 2004 and the reelection (on the same day) of George W. Bush (a big supporter of the reform). The BAPCPA passed the Senate a bit more than a month later (on March 10, 2005) and the House on April 14, 2005. It was enacted on April 20, 2005, when President George W. Bush signed it into law and went into effect on October 17, 2005.

There are several provisions in the Bankruptcy Code to allow the debtor to continue to operate as a going concern and protect creditors from other creditors. Perhaps the most important of these provisions is the *automatic stay*, which halts actions by creditors to collect debts from a debtor who has filed for Chapter 11. In addition, the Bankruptcy Code gives the debtor the *power to assume (and reject) contracts* (e.g., leases) that are necessary (unnecessary) for the continuation of the business. To avoid the preferential treatment of some creditors, the *avoidance powers* requires that any property transferred prior to insolvency must be returned to the debtor's estate, when such transfer constitutes preference (or fraudulent conveyance). Further, the Bankruptcy Code states that creditors cannot enforce an ipso facto provision to terminate a contract with the debtor because of bankruptcy (*unenforceability of ipso facto clauses*).

Every creditor, including secured creditors and lessors, are subject to the automatic stay and the other provisions of the Bankruptcy Code. Derivative counterparties are one important exception: they have been exempted from some of the core provisions of the Bankruptcy Code since the early 1980's. However, there was significant uncertainty prior to 2005 on the extent of the protection the Bankruptcy Code granted to derivative counterparties in bankruptcy. In particular, courts were split on the extent to which non-defaulting derivative counterparties could terminate a contract with a debtor in Chapter 11 and seize the underlying collateral. There was also uncertainty on whether newly designed derivative

securities and certain types of new financial market participants would fit the categories listed in the Bankruptcy Code and hence, whether they should be granted safe harbor protection (Vasser, 2005).

The Safe Harbor Reform of 2005 resolved this uncertainty by clarifying the extent of the applicability of the safe harbor provisions and by broadening their scope. First of all, the 2005 reform explicitly allowed the foreclosure on derivatives margin collateral. Prior to 2005 it was not clear whether such foreclosure was exempted from automatic stay. *In re Weisberg* 1998, the U.S. Court of Appeals for the 9th Circuit argued that margin calls are not subject to automatic stay. However, *In re Mirant* 2004, the Bankruptcy Court for the Northern District of Texas argued the contrary by stating that reversal of a wire transfer, after the amount was deposited into the debtor's account, violated the automatic stay. The 2005 reform resolved the courts' split on this issue by clarifying that the automatic stay does not apply to pledged collateral in derivative contracts (Vasser, 2005; and Speiser, Olsen, and Rae, 2005). Second, the new regulation expanded the list of "safe harbor securities" to include practically all current and yet-to-be-developed derivatives. This change was made to resolve a financial industry's concern that the law would always be a step behind and thus that yet-to-be-developed derivatives could be affected by automatic stay in Chapter 11.[13] Third, the reform added "master netting agreements" – an agreement between two derivative counterparties who have multiple contracts with each other to execute netting of all contracts – to the list of contracts exempted from automatic stay. Fourth, the Act expands the type of setoffs exempted from automatic stay, extends the protection from avoidance to financial participants, strengthens ipso facto clauses applied to swap agreements, and introduced several other safe harbor provisions (see, Speiser, Olsen, and Rae, 2005). The Financial Netting Improvements Act of 2006 (Pub.L. 109-390) further strengthened early termination and close-out netting provisions.

Fifth, the 2005 Act expanded the list of financial counterparties that can be granted safe harbor protection to include practically all systemically important institutions. Prior to the 2005 reform only the types of institutions explicitly listed in the Bankruptcy Code were granted safe harbor status in Chapter 11. The BAPCPA created a general definition of "market participant" eligible for safe harbor protection to include any entity that at the time it enters the derivatives contract holds a total of $1 billion in notional amount of derivatives transactions or gross mark-to-market positions of not less than $100,000,000, in one or more agreements with the debtor on any day in the 15 months prior to

[13] For example, the Act expanded the definition of "swap agreement" to include equity swaps, total return swaps, credit swaps, weather swaps, commodity indexes, and commodity swaps, options, futures, and forward agreements (e.g., Morrison and Riegel, 2005). Similarly, the definition of forward contracts was expanded by adding to the list of forward securities "any other similar agreement" (e.g., Speiser, Olsen, and Rae, 2005).

bankruptcy. Finally, the 2005 reform clarified that entities (not just persons) are also eligible to be "forward contract merchants" entitled to safe harbor protection. This change addressed the controversial *In re Mirant Corp.* 2003 bankruptcy court decision, in which government entities were not considered to be "persons" under the Bankruptcy Code and hence were not considered to be entitled to safe harbor protection (e.g., Speiser, Olsen, and Rae, 2005; Vasser, 2005).

In sum, the 2005 reform clarified that non-defaulting derivative counterparties can terminate or liquidate a contract, set-off and net out mutual debts and claims, and liquidate and realize upon any collateral held by the defaulting counterparty. The Act also clarified that properties transferred to a non-debtor counterparty prior to Chapter 11 in connection with a derivatives contract do not have to be returned to the bankruptcy's estate (unless such transfer was done with fraud). Further, the Act substantially expanded the type of securities and market participants that are granted safe harbor protection in Chapter 11.

Several derivatives bankruptcy experts (academics and lawyers) have echoed the importance of the Safe Harbor Reform of 2005: "BAPCA gave free rein to derivatives counterparties to completely circumscribe the Bankruptcy Code's automatic stay and preference rules" (Schwarcz and Sharon, 2013). According to Vasser (2005), "the 2005 amendments to the Bankruptcy Code" have given "significant expansion in protections and special treatment to derivative type transactions". In a blog interview of 2010,[14] Professor Stephen J. Lubben considered the Safe Harbor Reform of 2005 responsible for the jump in the over-the counter derivatives market after 2005 (see Figure 1). Recent court decisions have also embraced the stronger protection of derivative contracts in bankruptcy introduced with the 2005 reform. For instance, *In re Lehman Bros. Holdings Inc.* (Bankr. S.D.N.Y. 2013), the court decided that the method used by the non-defaulting counterparty to liquidate the position and realize upon the collateral in a swap contract cannot limit the exemption form *automatic stay*. *In re MBS Mgmt. Servs.*, 430 B.R. 750 (Bankr. E.D. La. 2010), and 432 B.R. 570 (Bankr. E.D. La. 2010), the bankruptcy court stated that a contract that fixes energy price qualifies as a forward contract (and hence is protected by safe harbor) even if it does not fix quantity. This decision fully embraces a general principle of the 2005 reform that "any other similar agreement" – that is, any agreement that resembles a forward contract – qualifies as a forward contract. Courts have also been clearly against the *avoidance power* for derivatives after the

[14] "An Interview About the End User Exemption with Stephen Lubben" by Mike Konczal: (https://rortybomb.wordpress.com/2010/05/06/an-interview-about-the-end-user-exemption-with-stephen-lubben/).

reform. *In re Derivium Cap. LLC* 2013, the 4th Circuit Court stated that accrued interests on margin accounts are margin payments and therefore are not subject to the *avoidance power*.[15]

[Figure 1]

In our identification strategy, we argue that after 2005 derivative market participants are willing to "supply" more derivatives to firms near financial distress because derivative counterparties are granted a much stronger protection in Chapter 11 with the 2005 reform. Hence, we expect hedging to increase for low Altman's (1968) z-score firms relative to high z-score firms after the Safe Harbor Reform of 2005.

Figure 2 illustrates the way hedging is expected to change for low and high z-score firms after the reform. The figure displays price-quantity hedging (P-H) equilibrium for low z-score firms (red curves) and high z-score firms (black curves) before (Panel A) and after (Panel B) an increase in the supply of hedging instruments to low z-score firms (dashed red curve) associated with the reform. In the graph, we assume the demand of hedging instruments to be perfectly elastic for low z-score firms (horizontal red line), while demand of hedging instruments is elastic for high z-score firms (downward sloping black line). We also assume the supply of hedging instruments to be elastic for both low and high z-score firms (upward sloping red and black curves, respectively). The supply curve of hedging for low z-score firms is more northwest compared to the supply curve for high z-score firms to indicate that there is a lower availability of hedging instruments at any given price for riskier low z-score firms.

[Figure 2]

We note that the 2005 reform is the outcome of derivatives industry lobbying that started with the near collapse of LTCM in August 1998. Following the LTCM event, the Working Group on Financial Markets issued a report on the LTCM crisis urging Congress to expand the safe harbor provisions in the Bankruptcy Code in order to improve market stability[16] (which led to the BAPCPA of 2005). This is important for our identification strategy because it suggests that the reform is not a response to an

[15] Several other decisions clearly show that courts have fully embraced the stronger safe harbor protection of derivatives in bankruptcy: *In re Bernard L. Madoff Inv. Secs. LLC* (2nd Cir. 2014), *In re TMST, Inc.* (Bankr. D. Md. 2014), *In re Enron Corp.* (Bankr. S.D.N.Y. 2006), in *Grede v. FCStone, LLC* (7th Cir. 2014), in *Enron Creditors Recovery Corp. v. Alfa, S.A.V. de C.V.*, (2nd Cir. 2011), *In re Casa de Cambio Majapara S.A. de C.V.* (Bankr. N.D. Ill. 2008), *In re Am. Home Mortgage Holdings, Inc.* (Bankr. D. Del. 2008), in *Crescent Resources Litigation Trust v. Duke Energy Corp.* (W.D. Tex. 2013), and in *U.S. Bank Nat'l Assoc. v. Verizon Commc'ns Inc.* (N.D. Tex. Sept. 14, 2012).

[16] Reducing systemic risk (the fear that even the default of a small dealer or fund could halt the entire derivatives market) has been historically the official policy justification for derivative safe harbor. For a discussion on the relationship between safe harbor and systemic risk see, among others, Edwards and Morrison (2005), Lubben (2009), Adams (2013), and Schwarcz (2015) – in the law and finance literature – and Stulz (2004), Duffie and Skeel (2012), and Bolton and Oehmke (2015) – in the finance literature.

anticipated increase in the **demand** of hedging instruments by non-financial end users (which would have been problematic), but rather a change implemented to increase the stability of the derivatives market.

To test the effect of the 2005 reform on hedging, we hand-collected fuel hedging data for the passenger airline industry (SIC 4512). In Section 4, we discuss the external validity of our findings for a general sample of non-financial firms. The airline industry provides an ideal setting for our tests for the following reasons. First, airlines report the percentage of next year fuel expenses hedged in Item 7(A), 10-K SEC filings, section entitled "Quantitative and Qualitative Disclosure about Market Risk". Second, jet fuel is one of the main operating expenses for airlines. As Panel A, Figure 3 shows, fuel expenses represent 31.5% of operating expenses in 2008, compared to 20.3% for labor expenses (the second largest operating expense). On average, for the period 2003-2008 (the six year period centered on the safe harbor reform of 2005), jet fuel expenses are 22.5% compared to 26.7% for labor expenses (Panel B). To our knowledge similar hedging information is not available for other industries during our sample period.[17] Third, about 63% of the airlines in our sample have a low z-score compared to about 35% of non-financial firms. Because the safe harbor reform is expected to facilitate access to derivatives to low z-score firms (those more likely to face financial distress), the safe harbor reform should have a stronger effect in the airline industry. Fourth, focusing on one industry makes it less likely that differences in economic fundamentals across industries are the reason why risk management changes. Table A.1 in the Appendix contains the list of the 23 airlines in our sample, their average fuel hedged and fuel expenses during the period 2003-2008, information on whether the airline obtains fuel through a pass-through agreement, and information on the first and last year the airline is in the sample during period 2003-2008.

[Figure 3]

We combine hand-collected data on fuel hedging with data from several commercial data sources. We gather stock return and accounting data from CRSP and COMPUSTAT. Airline segment data are from COMPUSTAT Industry Specific Annual. Airline cost structure data are from "Airlines 4 America", aggregate derivatives data are from Office of the Comptroller of the Currency, and jet fuel prices ($/gallon) are obtained from the U.S. Energy Information Administration. Compensation data are from

[17] Tufano (1996) and, more recently, Adam (2002) and Adam and Fernando (2006), rely on survey data from gold-mining firms to study corporate hedging. Unfortunately, these surveys have either been discontinued in the late 1990's or no longer provide the information necessary to build a measure of the extent to which firms hedge.

Execucomp (and for airlines only hand-collected from Proxy Statement DEF 14A when missing in Execucomp). Covenant violation data is from Michael R. Roberts' website (Roberts and Sufi, 2009). CDS Spreads are from Markit.

To test whether low z-score airlines hedge fuel expenses more intensively after 2005, we estimate the following difference-in-difference model:

$$NextYearFuelExpensesHedged_{i,t} = \beta_1(Zscore < 1.81 \times Post2005)_{i,t} + \beta_2 Zscore < 1.81_{i,t} + \boldsymbol{Controls}_{i,t}\gamma + y_i + z_t + \varepsilon_{i,t} \quad (1)$$

Where ***NextYearFuelExpensesHedged$_{i,t}$*** is the fraction of next year fuel expenses hedged by airline ***i*** in year ***t***. ***Zscore < 1.81*** is an indicator for airlines with Altman's z-score < 1.81 (distress zone firms). ***Post2005*** is an indicator equal to 1 for the fiscal years after 2005, and ***y_i*** and ***z_t*** are respectively firm and year fixed-effects. In our main analysis, we focus on the sample period 2003-2008: a six-year time window centered on the year 2005 (the year of the reform). This time window ensures that sufficient time has elapsed for the reform to be fully operative, while at the same time keeping out the peak years of the subprime crisis when all financial markets (including derivative markets) was severely affected (see Figure 1). In our robustness tests, we also perform our analysis for the sample periods 2002-2009 and 2004-2007. The focus of our analysis is ***Zscore < 1.81 × Post2005*** (our difference-in-difference estimator), which we expect to enter the estimation with a significantly positive coefficient.

Our basic set of control variables includes the following company characteristics: (1) Size is the natural logarithm of sales; (2) Fuel Expenses is the ratio of fuel expenses to total operating expenses; (3) Tobin's *q* is the ratio of market value of total assets to book assets; (4) Profitability is the ratio of operating income before depreciation and amortization to book assets; (5) Cash is the ratio of cash and cash equivalents to book assets; (6) Tangibility is the ratio of property, plant, & equipment to book assets; and (7) Net Worth is the ratio of stockholders' equity to book assets. These control variables are defined following the standard practice in risk management studies. See Table A.2 in the Appendix for a detailed definition of all the variables used in the paper.

Table 1 reports basic descriptive statistics of fuel hedging and control variables for low z-score (i.e., treated firms) and high z-score airlines (control firms). The table shows that low z-score airlines hedge significantly less than control firms (74.7% vs. 27.2%). Table 1 also shows that low z-score airlines and control firms are similar in terms of size, fuel expenses, and Tobin's *q*, but differ with respect to

profitability and other firm characteristics. To mitigate the concern that some of these differences could bias our results, we: (1) control for firm characteristics throughout all regressions; (2) perform within-firm estimations by including firm-fixed effects in our regressions; (3) assess the robustness of our findings to the so-called parallel trend assumption. Our findings suggest that results are unlikely to be influenced by differences in firm characteristics across treated and control firms. Table A.3 in the Appendix reports detailed descriptive statistics of all the variables used in the paper for the combined sample, as well as for treated and control airlines.

[Table 1]

In addition to hedging, we test several other related predictions. In Purnanandam (2008), it is optimal for firms near financial distress to hedge (even without a pre-commitment to do so) because by hedging firms mitigate the risk that their financial situation could deteriorate further and therefore are able to preserve their market share. This model predicts therefore that value and performance will increase for low z-score airlines after the Safe Harbor Reform of 2005. We will test these additional predictions by estimating a model similar to Eq. (1), but using Tobin's *q* and several measures of performance as dependent variables. If hedging leads to better performance, higher value, and less volatile cash flows, we also expect the risk of default to decrease for the affected firms (Smith and Stulz, 1985; and Purnanandam, 2008). Finally, we can expect executive pay to increase as a result of the effect of hedging on firm's performance and value.

In Bolton and Oehmke (2015), the super-seniority granted to derivatives in bankruptcy means that there are less corporate assets against which debtholders can file a claim in case the firm defaults on its debt (i.e., "loss-given-default" can be higher for debtholders in Chapter 11). Therefore, we expect a firm's access to (unsecured) credit – which is less protected than secured credit in Chapter 11 – to decrease and credit spreads to increase because of the Safe Harbor Reform of 2005: (unsecured) creditor "runs". However, (unsecured) creditor runs are likely to be mitigated by the extent to which the reform also leads to more hedging and higher performance and firm's value, which reduce the "risk of default".

3. Results: Fuel Hedging for Low Z-Score Airlines after the Safe Harbor Reform of 2005

In this section, we examine the effect of the Safe Harbor Reform of 2005 on corporate hedging for low z-score airlines (treated firms) relative to high z-score airlines (control firms) using a difference-in-difference approach – Eq. (1) (e.g., Bertrand, Duo, and Mullainathan, 2004). Our prediction is that

hedging for low z-score airlines will increase after 2005 because of the stronger protection granted to non-defaulting derivative counterparties in case of bankruptcy. In section 4, we study the effect of the reform on hedging for a general sample of non-financial firms

Table 2 shows that the coefficient on Z-score<1.81 × Post-2005 is positive and statistically significant at the 1% level across all seven estimations. Focusing on column 7 (estimation with all control variables), the coefficient of 0.192 suggests that low z-score airlines increased the fraction of fuel expenses hedged by 19.2 percentage points (p.p.) relative to control firms following the 2005 reform. In line with our prediction, this finding indicates that the stronger protection granted to derivatives counterparties in Chapter 11 after 2005 led to an increase in fuel hedging for less financially sound airlines.

Turning to the control variables, we note that the coefficient on the Z-score<1.81 indicator is significantly negative in all but the estimation in column 7 (where the coefficient is negative but insignificant). This finding suggests that firms near financial distress either do have less access to hedging or might prefer to pledge their "limited" collateral to raise external debt instead of hedging (in line with theory and evidence in Rampini, Sufi, and Viswanathan, 2014). Several other control variables in Table 2, column 7 stand out. The coefficient on Tobin's *q* is significantly positive. In line with the credit rationing hypothesis of risk management (Froot, Scharfstein, and Stein, 1993), this finding suggests that high growth airlines hedge more intensively to ensure that they have sufficient internal funds to finance their investment. We also find that profitability and cash enter the hedging regression, respectively, with a significantly negative and a negative, but insignificant, coefficient. In line with Froot, Scharfstein, and Stein (1993) and Holmström and Tirole (2000), these findings suggests that firms use internal resources as a substitute for hedging in mitigating credit rationing. The coefficient on size is positive, economically small, and statistically insignificant. Hence, we do not find support for the additional prediction of the credit rationing hypothesis of risk management that smaller firms (those more likely to be affected by credit rationing) hedge more. Overall, the support for the credit rationing hypothesis in our study is similar to the evidence of earlier studies (e.g., Nance, Smith, and Smithson, 1993; Mian, 1996; Gay and Nam, 1998; Geczy, Minton, and Schrand, 1997; Graham and Rogers, 2002). We also find that firms with more net worth hedge more intensively. However, we do not find any significant relation between tangibility and hedging. In line with Rampini, Sufi, and Viswanathan (2014), these findings suggest that high net worth firms (not necessarily firms with more tangible assets) hedge more because presumably their net worth can be pledged to derivative counterparties. Finally, we also find that fuel expenses have

no significant effect on hedging. The insignificant coefficient for fuel expenses is perhaps unsurprising given that our dependent variable measures hedging in percentage of fuel expenses.

[Table 2]

3.1. Robustness Analysis

In this section, we discuss tests performed to assess the robustness of the main results in Table 2. Our first set of robustness tests consider different variable definitions and sample selections. Table 3 presents these robustness tests. In column 2, we add leased capital to book assets in the definition of our control variables. We do so because airlines lease a significant portion of their airplanes. To the extent that there is heterogeneity in the leasing policy across airlines, this could distort the ability of our control variable to capture differences across firms and bias our results (Rampini, Sufi, and Viswanathan, 2014). As column 2 shows, the coefficient on Z-score<1.81 × Post-2005 is significantly positive and economically large, although somewhat smaller compared to the coefficient for the interaction term of the base model in column 1 (16.4 p.p. versus 19.2 p.p.). In columns 3 and 4, we use Altman's (1983) non-manufacturing z-score and Merton's distance-to-default (Vassalou and Xing, 2004) instead of Altman's 1968 z-score to assess financial distress. The evidence in columns 3 and 4 show that our findings are robust to these alternative measures of financial distress. In particular, the coefficients on Non-Manufacturing Z-score<1.10 × Post-2005 and Distance-to-Default<1st 1/10 × Post-2005 are, respectively, 22.6 and 43.9 p.p. (both statistically significant at the 5% level), compared to 19.2 p.p. for the base estimation in column 1.

Our main airline sample includes all passenger airlines (SIC 4512), including regional airlines that obtain their fuel supply from major airlines through fuel pass-through agreements. Following Rampini, Sufi, and Viswanathan (2014), we treat the regional airlines with pass-through agreements as hedging 100 percent of their fuel expenses. In column 5, we re-estimate our main hedging model after dropping regional airlines with pass-through agreements. The coefficient on Z-score<1.81 × Post-2005 in the sample without pass-through airlines is 19.8 p.p. (statistically significant at the 1% level) compared to 19.2 p.p. for the base model. Finally, in columns 6 and 7, we present results from the estimation of our main hedging model, respectively, for the sample period 2002 – 2009 and 2004 – 2007 (instead of the main sample period 2003 – 2008). We find that the coefficients on the interaction terms of interest are

both significantly positive, albeit economically smaller compared to the base estimation (i.e., 13.7 and 10.8 p.p., respectively, compared to 19.2).

[Table 3]

A key assumption of any difference-in-difference estimations is that the outcome variable for treated and control firms follows a parallel trend prior to the treatment. In our setting, the "parallel-trend assumption" requires that fuel hedging for low and high z-score airlines follows a parallel trend prior to the 2005 reform. A violation of this assumption could be problematic because it would suggest that a trend specific to low z-score firms rather than the reform is the reason that hedging increased for treated firms. To test this assumption formally, in Table 4, column 2 we control for a treated-specific trend by adding Z-score<1.81 × Trend to the set of control variables (where Trend is a linear-time trend variable). As column 2 shows, the coefficient on Z-score<1.81 × Trend is positive, but economically small and statistically insignificant. This finding suggests that there was no trend in the hedging practice of low z-score airlines prior to the reform. Most importantly, the coefficient on Z-score<1.81 × Post-2005 remains significantly positive in this specification, although somewhat economically smaller compared to the base model in Table 4, column 1 (16.8 p.p. versus 19.2 p.p.).

As an additional check, we hand-collected additional fuel hedging data and re-estimated our base hedging model over the following six-year windows: 1999 – 2004, 2000 – 2005, 2001 – 2006, and 2002 – 2007. If there was a trend in hedging specific to low z-score airlines prior to 2005, then we should find these effects to be economically sizable in these "placebo" pre-reform windows. We find that the coefficients on the interaction terms are negative and insignificant in all these four-placebo estimations (Table 4, columns 3 – 6), going from -0.048 for Z-score<1.81 × Post-2001, decreasing further to -0.087 for Z-score<1.81 × Post-2002, and then increasing to -0.044 and -0.013 for Z-score<1.81 × Post-2003 and Z-score<1.81 × Post-2004, where the samples include, respectively, one year and two years after the 2005 reform. Overall, our analysis allows us to rule out the existence of any positive trend in hedging for low z-score airlines prior to the safe harbor reform of 2005.

[Table 4]

Figure 4 shows that the period 2003 – 2008 is characterized by a sustained increase in jet fuel price, which leads to an increase in airline fuel expenses. Can this increase in jet fuel price explain our hedging results? We note that our hedging variable is expressed in percentage of fuel expenses and in all our regressions we use fuel expenses as a control variable. This should mitigate the concern that our

findings are driven by changes in the price of jet fuel in the period after the Safe Harbor Reform of 2005. To control more directly for the effect of jet fuel prices on hedging, we re-estimate our airline hedging model adding as control variables the interaction of fuel expenses with the Post-2005 indicator, as well as the natural logarithm of jet fuel price and its interaction with the Post-2005 dummy. As Table 5, columns 2 – 6 show, none of these control variables are statistically significant. Most importantly, the coefficient on Z-score<1.81 × Post-2005 remains economically sizable (and always statistically significant at the 1% level) after adding these control variables, ranging from 18.9 p.p. (in column 5) to 20.6 (in column 2), compared to 19.2 p.p. in the base estimation (in column 1).

[Figure 4]

[Table 5]

The Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) of 2005 set to 210 days the time that a debtor-tenant in Chapter 11 has to decide whether to keep ("assume") or abandon ("reject") a commercial real estate lease. To the extent that this new regulation changed the protection that real estate lessors receive in bankruptcy (Ayotte, 2015), then it could have a differential impact on fuel hedging of airlines that lease a significant part of their real estate (e.g., headquarters, terminals, and gates) relative to those that own such real estate. To address this issue, we re-estimate our hedging model controlling for leasing exposure (the ratio of operating and capital leases to assets – see Table A.2 in the Appendix) and the interaction of leasing exposure with the Post-2005 indicator. Table 6, columns 2 and 3 show that adding these control variables has no noticeable implications for the coefficient on Z-score<1.81 × Post-2005, which remains statistically significant at the 1% level and economically large (respectively, 20.3 p.p. and 22.1 p.p. in columns 2 and 3, relative to 19.2 p.p. for the base model in column 1).

Although the BAPCPA of 2005 did not directly affect equipment leases, the revised § 365(b)(2)(D) made it mandatory that all nonmonetary defaults (for example, failure to insure an equipment) must be cured in order for the debtor to assume an agreement. This revision was put in place to resolve a split among certain circuit courts on whether nonmonetary defaults needed to be cured (Top and Tetro, 2015). To assess the effect of this legislative revision on our findings, we re-estimate our base hedging model controlling for the leased airplane (the ratio of leased airplane to the sum of leased and owned airplanes) and the interaction of this variable with the Post-2005 indicator. Table 6, columns 4 and 5 show that the coefficient on Z-score<1.81 × Post-2005 remains economically large (16.1 p.p. and 17.3

p.p., respectively, compared to 19.2 p.p. for the base mode) and statistically significant at the 1% level when we add these control variables. Overall, the evidence is Table 6 suggests that changes in the treatment of leases in bankruptcy after 2005 are unlikely to explain our hedging results.

[Table 6]

To assess whether our results are driven by the unusual hedging practice of one or few airlines in our sample or by measurement errors, we re-estimate our basic model in Table 2, by excluding one airline at the time. Table 7 reports results for the three sub-samples with the lowest estimates and the three sub-samples with the largest estimates on Z-score<1.81 × Post-2005. As Table 7 shows, the coefficient of interest is remarkably stable ranging from 0.149 (for the sample excluding Southwest Airlines) to 0.204 (for the sample excluding Republic Airways Holdings Inc.) and always statistically significant at the 1% level.

[Table 7]

Rampini, Sufi, and Viswanathan (2014) find that hedging for airlines drops in the year they enter financial distress and partially recover in the two following years. We exclude that such reversals are the reason for the increase in hedging for the low z-score airlines documented in the paper. We note that in our empirical design if an airline is in the treated group (Z-score < 1.81), for example, in 2006 (the first year after the reform) and its z-score increases above 1.81 in 2007 and 2008, it becomes part of the control group for the years 2007 and 2008. That means that, if hedging increases because of reversals for this airline, then this effect will be captured by the control group and (by design) cannot explain why after 2005 hedging increased for low z-score airlines. Further, we notice that if the interaction of Z-score<1.81 with the Post-2005 indicator was capturing the effect of hedging reversal, then we should have found a similar positive effect in Table 4, columns 3 – 6, where we interact Z-score<1.81 with Post-2001, Post-2002, Post-2003, and Post-2004 (while we find these interactions to be all negative and statistically insignificant). To further investigate this issue, we re-estimate our base specifications in Table 2 keeping in the sample only firms with the z-score either consistently below or consistently above 1.81 throughout 2005 – 2008. Because of this restriction, we lose 10 out of the 23 airlines in the sample and we are left with 68 firm-year observations in our regressions. Table 8 shows that our results are remarkably robust. Focusing on column 7 (specification with all control variables), the coefficient on Z-

score<1.81 × Post-2005 (statistically significant at the 5% level) suggests that in the post reform period treated firms increased fuel hedging by 12.5 p.p. relative to control firms.

[Table 8]

4. External Validity: Hedging Propensity for a General Sample of Non-Financial Firms after the Safe Harbor Reform of 2005

Although focusing on the airline industry to study corporate hedging has several advantages, one concern with any single-industry study is whether results are generalizable to other industries. To assess the external validity of our results, we test the hedging propensity for a general sample of non-financial firms from COMPUSTAT after the Safe Harbor Reform of 2005. We do so by estimating the following difference-in-difference logit model:

$$Hedging_{i,t} = \beta_1 (Zscore < 1.81 \times Post2005)_{i,t} + \beta_2 Zscore < 1.81_{i,t} + \boldsymbol{Controls}_{i,t}\gamma + z_t + \varepsilon_{i,t} \quad (2)$$

Where ***Hedging*$_{i,t}$** is an indicator equal to 1 if firm ***i*** hedges in year ***t*** and zero otherwise. Following Adams-Bonaimé, Watson-Hankins, and Harford (2014), we categorize a firm as a hedging firm if either COMPUSTAT'S item aocidergl – "Accumulated Other Comprehensive Income - Derivative Unrealized Gain/Loss" – or cidergl – "Comprehensive Income - Derivative Gains/Losses" – are greater than zero. ***Zscore < 1.81*** is an indicator for firms with Altman's z-score < 1.81 (distress zone firms). ***Post2005*** is an indicator equal to 1 for the fiscal years 2006 – 2008, and zero for the years 2003 – 2005, $\boldsymbol{z_t}$ are year fixed-effects. The set of control variables is the same as the one for the airline sample with the addition of rating[18] (an indicator for firm with a bond and/or commercial paper ratings) and the exclusion of fuel expenses.

Table 9, column 1 shows that the coefficient on Z-score<1.81 × Post-2005 (our variable of interest) is positive and statistically significant at the 1% level with an associated marginal effect of 0.083 (also statistically significant at the 1% level). In line with our main prediction, this finding suggests that following the expansion in the supply of derivatives associated with the Safe Harbor Reform of 2005, the propensity to hedge for low z-score firms (treated group) increased by 8.3 percentage points (p.p.) compared to high z-score firms (control group).

[18] The rating indicator does not vary within firm for our sample of airlines during 2003 – 2008. Hence, we cannot use it as a control variable in our firm-fixed effect estimation – Eq. (1).

Because the industry in which a firm operates is an important driver of hedging, in columns 2 and 3, we report, respectively, estimations of Eq. (2) after adding industry-fixed effects (1-digit SIC) and interactions of industry and year-fixed effects to the set of control variables. The coefficients on the interaction term of interest and the associated marginal effects in columns 2 and 3 are very similar to those in the base estimation in column 1 (i.e., 8.4 and 8.7 p.p. in columns 2 and 3, respectively, compared to 8.3 p.p. in column 1). Similarly, the interaction term of interest is positive and statistically significant (at the 5% level) with a marginal effect of 11.1 percentage points if we estimate Eq. (2) using a conditional logit approach (column 4). This conditional logit analysis can be performed exclusively on firms that change hedging policy at least once during the sample period 2003 – 2008 (which explains why the sample size goes down from 14,189 firm-year observations (4,166 firms) in column 1 to 2,807 firm-year observations (622 firms) in column 4). We note that the conditional logit approach is equivalent to using a within-firm estimator. As such, it minimizes the concern that results could be biased by differences in the characteristics of treated and control firms.

[Table 9]

In Table 10, we test the robustness of the main results in Table 9 using Altman's (1983) non-manufacturing z-score and Merton's distance-to-default (Vassalou and Xing, 2004) to assess financial distress (columns 2 and 3), for the sample periods 2002 – 2009 and 2004 – 2008 (columns 4 and 5), and controlling for whether the parallel-trend assumption holds (column 6). Across these estimations, we find the coefficients on the interaction term of interest to be statistically significant either at the 5% or 1% level with associated marginal effects ranging from 6.0 p.p. to 9.3 p.p. compared to 8.3 p.p. for the base estimation in column 1. Overall, the evidence in Tables 9 – 10 suggests that our hedging results are generalizable to all industries.

In Tables 9 and 10, the control firms are the "universe" of firms with high z-score. The advantage of including all firms is that one overcomes possible concerns about the generality of the findings. However, by considering the universe of firms, inevitably, treated and control firms will be different in some important characteristics (which could be problematic if there are reasons to believe that these characteristics might influence corporate policies in the post treatment period). To deal with this concern, in the fiscal year 2005 (the year of the safe harbor reform) we match each treated firm (Z-score<1.81: Yes) to its closest control firm (Z-score<1.81: No) identified based on Size, Tobin's *q*, Cash, Tangibility, and exact match on the rating indicator. We perform our matching using the Abadie and Imbens' (2006) bias-corrected matching estimator. We do not match on profitability and net worth

because these two variables are directly used in the estimation of the Altman's (1968) z-score (our treatment variable). However, all our results hold is we add profitability and net worth to the set of control variables.

Table A.5 in the Appendix presents the mean difference *t*-test and the Kolmogorov-Smirnov distributional test for treated and control firms in the case of the full sample (Panel A) and the matched sample (Panel B). In the full sample (Panel A), the *p*-values for the mean difference *t*-tests and the Kolmogorov-Smirnov distributional tests are lower than 0.001 for the continuous variables, while for the rating indicator the *p*-value is 0.012 for the mean difference *t*-test and just above the 10% threshold for the Kolmogorov-Smirnov distributional test. Clearly, this evidence suggests that we can reject the null hypotheses that treated and control firms are similar in terms of average characteristics and distributional assumptions. However, in the matched sample (Panel B), the *p*-values (for the mean difference *t*-tests and the Kolmogorov-Smirnov distributional tests) are all largely above the 10% threshold. This suggests that treated and control firms are similar in terms of characteristics and distributional assumptions in the matched samples. Figure A.1 displays the kerned density function of Size, Tobin's *q*, Cash, and Tangibility for treated firms and control firms. The comparison of column 1 (full sample) with column 2 (matched sample) shows visually that the density functions of the firm characteristics become very similar in the matched sample (in line with the evidence in Table A.5, Panel B).

Table 11 presents results from the estimation of our difference-in-difference logit model for the matched sample with year-fixed effects (column 1), year and industry-fixed effects (column 2), the interactions of year and industry-fixed effects (column 3), conditional logit (column 4), sample period 2002 – 2009 (column 5), and sample period 2004 – 2007 (column 6). Across all six estimations, the coefficient on Z-score<1.81 × Post-2005 is significantly positive and with a marginal effect similar or larger (ranging from 8.1 p.p. to 17.8 p.p.) than the marginal effect of 8.3 p.p. for the base estimation in Table 9, column 1.

[Table 11]

5. The Effect of the Safe Harbor Reform of 2005 on Firm's Value, Performance, and Financing

In this section, we study how the increase in hedging after the 2005 reform affected value, performance, and financing of low z-score firms (airlines and non-financial firms).

Purnanadam (2008) shows that hedging allows firms near financial distress to preserve their market share by mitigating the risk that their financial condition would deteriorate further. Therefore, the predictions from this model are that value and performance should increase for the affected firms after 2005. In line with these predictions, Table 12, column 1 shows a significant increase in Tobin's *q* for low z-score airlines (relative to control firms) after 2005. Relatedly, we also find that operating performance and passenger revenues increased for treated airlines (columns 2 and 3). In line with Smith and Stulz (1985) and Purnanandam (2008), we also find that the propensity to violate covenants decreased for the affected airlines after 2005 (column 4), but there is no evidence of a reduction in cash flow volatility (column 5). We also find the compensation of CFOs to increase after the 2005 reform (column 7), which suggests that hedging is "personally" beneficial to financial executives. We do not find a statistically significant increase in the compensation of CEOs (column 6).

[Table 12]

Table 13 shows similar results for the general sample of non-financial firms. We find that Tobin's *q* and operating performance increased for the treated firms after the reform. We also find significant evidence that CEO and CFO compensation increased for the low z-score firms. Finally, the coefficient on Z-score<1.81 × Post-2005 for the covenant violation logit regression is negative, although insignificant in the general sample. However, we do a significant decrease in cash flow volatility for the treated firms after 2005, in line with similar evidence in Bartram, Brown, and Minton (2010) and Bartram (2015).

[Table 13]

5.1. The Safe Harbor Reform of 2005 and Unsecured Creditor Runs

The Safe Harbor Reform passed by the U.S. Congress on April 14, 2005 granted stronger protection to derivatives in bankruptcy. Effectively, this reduces the assets against which debtholders can file a claim in case a firm defaults on a loan and files for Chapter 11 and could lead to (unsecured) creditor runs and an increase in credit spreads (Bolton and Oehmke, 2015).

Table 14 shows that debt reduction for treated airlines increased by 9.2 percentage points after 2005 (statistically significant at the 10% level). We do not find any significant change in debt issuance or equity (dividend payout or equity issuance). Importantly, we find that the proportion of secured debt increased by 19.6 p.p. (statistically significant at the 5% level) for the treated airlines after the reform. In

line with Bolton and Oehmke (2015), these findings suggests that the super-priority status granted to derivatives in bankruptcy led to unsecured creditor "runs". As we have shown in Tables 12, hedging boosted value and performance for airlines (Purnanadam, 2008), while also reducing the propensity of covenant violation (Smith and Stulz, 1985; and Purnanadam, 2008). These effects are likely to mitigate the severity of (unsecured) creditor runs.

[Table 14]

We find evidence consistent with (unsecured) creditor runs also for the general sample of non-financial firms. Table 15, column 6 shows that the proportion of secured debt increased for treated firms by 5.1 p.p. (statistically significant at the 1% level), which these firms achieved by reducing (unsecured) debt issuance (column 1) by 1.5 p.p. (statistically significant at the 10% level). We do not find any significant effect in debt reduction, dividend payouts, and equity issuance.

[Table 15]

5.1.2. The Effect of the Safe Harbor Reform on CDS Spreads

As we have discussed, the super-seniority granted to derivatives in bankruptcy could also lead to an increase in credit spreads. To test this prediction, we perform a credit default swap (CDS) event study in the sixty days [-30, +30] around April 14, 2005: the event date. We obtain annual spreads on the 5-year maturity CDS (the most liquid CDS) from Markit (e.g., Jorion and Zhang, 2007).

Our CDS event study consists of the following steps. First, we calculate daily CDS spread changes:

$$Spread\ Change(SC)_{it} = Spread_{it} - Spread_{it-1} \quad (3)$$

Where $Spread_{it}$ is the 5-year maturity spread of CDS i on day t. Next, we build a Benchmark CDS Spread Change. The purpose of this benchmark is to provide an estimate of what the daily CDS spread changes would have been in the absence of the safe harbor reform. Following Hull, Predescu, and White (2004) and Lee, Naranjo, and Velioglu (2017), we first calculate the mean CDS spread change for each CDS in Markit in the time window from -90 days to -60 days prior to the reform. We then generate portfolios of CDS according to the following eight rating categories: (i.e., AAA, AA, A, BBB, BB, B, CCC, and D). Finally, we calculate the median CDS spread change within each rating category and use this median CDS spread change as the Benchmark CDS Spread Change to estimate the Adjusted ("Abnormal") CDS Spread Change for each day in the event window [-30, +30]:

$$Adjusted\ Spread\ Change(ASC)_{it}^{r} = Spread\ Change_{it}^{r} - Benchmark\ Spread\ Change^{r} \quad (4)$$

Where $Spread\ Change_{it}^{r}$ is the spread change of CDS i with rating r on day t; and $Benchmark\ Spread\ Change^{r}$ is the benchmark CDS spread change for the rating category r. The last step in our CDS event study is to calculate the CDS Cumulative Average Adjusted Spread Change (CAASC) using the following formula:

$$CAASC_{I,[t_1,t_2]} = \frac{\sum_{i \in I} \sum_{t_1}^{t_2} ASC_{it}}{N_I} \quad (5)$$

Where I is either the treated group or the control group, *i* is CDS *i*, N_I is the number of CDS in each group, and $[t_1, t_2]$ are time windows within the event window [-30, +30].

Table 16 reports CAASC for treated firms (column 1), control firms (column 2), and the difference in CAASC (column 3) between treated and control firms. The sample includes 147 CDS (72 for the treated group and 75 for the control group) with information in Markit in the period around April 14, 2005.[19]

Columns 1 and 2 show that CAASCs are significantly positive for both treated and control firms for each of the time windows considered in the study. Most importantly, the difference in CAASCs between treated and control firms is significantly positive and economically large for all but the [0, 0] time window. For example, the difference in CAASCs is 13.5 basis points (bps) in the window [+1, +1], it increases to 23.4 bps in the window [+1, +5], and further to 54.7 bps and 80.5 bps in the windows [+1, +15] and [+1, +30], respectively. All these differences are statistically significant at the 1% level. Figure 6 displays CAASCs for treated and control firms over the entire time window [-30, +30]. We obtain very similar results if we estimate the Benchmark Spread Change over the time window [-320, -60] (refer to Table A.6 and Figure A.2 in the appendix).

[Table 16]

[Figure 6]

In line with Bolton and Oehmke (2015), these findings suggest that because of the stronger protection granted to derivatives in bankruptcy with the reform (and the associated reduced protection to debtholders), CDS sellers (who are required to compensate debtholders in case the firm defaults on its

[19] We note that CDS information is available only for some of the firms with access to the bond market, which are only about 32% of the firms in our general sample of non-financial firms (see Table A.4). We also note that our event date is prior to the boom in the CDS market that started in 2006 (see, for example, Augustin, Subrahmanyam, Tang, and Wang, 2014). These explain why we have overall only 147 CDS with usable information in Markit.

bonds) require a significantly higher spread especially for the case of treaded firms (whose debtholders are most affected by the safe harbor reform).

6. Conclusion

Over the last 30 years researchers have focused on why firms "demand" hedging. However, frictions in the "supply" of hedging instruments can prevent firms from achieving their optimal hedging policy. In this paper, we study the effect of supply-side frictions on corporate hedging, firm's value, performance, and financing by exploiting a regulatory change that allows non-defaulting derivatives counterparties to circumvent the Bankruptcy Code's automatic stay and preference rules.

In line with Purnanadam (2008), we find that low z-score airlines hedge more intensively after the Safe Harbor Reform of 2005. Similarly, we find that hedging propensity increased for a general sample of non-financial firms. In line with theory, we also find that value and performance increased for the affected firms after the 2005 reform. Our findings are also consistent with (unsecured) creditor runs (Bolton and Oehmke, 2015). To our knowledge, our study is the first to uncover the effects of supply-side frictions on corporate hedging and valuation, and to identify how the super-seniority of derivatives in bankruptcy could hinder a firm's access to (unsecured) credit and lead to higher credit spreads (unsecured creditor runs).

Our findings can help inform the current policy debate on "margin requirements". In response to the global financial crisis, policymakers around the globe have adopted measures to limit access to derivatives products and increase financial markets stability (e.g., the Dodd-Frank Act of 2010 in the U.S. or the European Markets and Infrastructure Regulation of 2012 in Europe). Our study highlights that policymakers need to balance the necessity to stabilize financial markets with the implications that restricting the supply of hedging instruments has for corporate hedging and firm's value.

Our study can also contribute to the debate on whether derivatives should be granted super seniority in bankruptcy. Bolton and Oehmke (2015) show that the privileged treatment of derivatives in Chapter 11 makes lenders reluctant to provide financing to firms that hedge. Moreover, in their setting, hedging is detrimental to debtholders because derivatives counterparties require collateral that the firm could dedicate to more productive uses (Bolton and Oehmke, 2015; and Rampini and Viswanathan, 2010, 2013). However, theory also suggests that hedging creates value for shareholders (e.g., Stulz; Smith and Stulz, 1985; Froot, Scharfstein, and Stein, 1993; DeMarzo and Duffie, 1991, 1995; Holmström and Tirole,

2000; Purnanandam, 2008). Future theoretical and empirical research should focus on the combined effect of derivatives super seniority in bankruptcy and the role of hedging for firm's value.

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Table 1 – Descriptive Statistics

The table reports descriptive statistics for the airline firms in our sample for the period 2003 – 2008. The sample includes all firms with SIC 4512 (scheduled airlines). Fuel Hedged is the fraction of next year fuel expenses hedged. Z-score<1.81 is an indicator for firms with Altmans's (1968) z-score less than 1.81. Fuel Expenses is the ratio of fuel expenses to total operating expenses. Size is the natural logarithm of sales. Tobin's *q* is the ratio of market value of total assets to book assets. Profitability is the ratio of operating income before depreciation and amortization to book assets. Cash if the ratio of cash and marketable securities to book assets. Tangibility is the ratio of property, plant, & equipment to book assets. Net Worth is the ratio of stockholders' equity to book assets. Fuel Hedged and Fuel Expenses are hand-collected from 10-K filings, Item 7(A) – "Quantitative and Qualitative Disclosures about Market Risk". Other firm level data are obtained from COMPUSTAT. Refer to Table A.2 for detailed variable definitions. Standard errors are in parentheses.

Mean	Fuel Hedged	Size	Fuel Expenses	Tobin's *q*	Profitability	Cash	Tangibility	Net Worth	Obs.
Combined Sample	0.445	7.314	0.243	2.048	-0.024	0.220	0.548	0.136	104
Treated: Z-score<1.81: Yes	0.272	7.527	0.253	2.355	-0.109	0.157	0.600	0.011	66
Control: Z-score<1.81: No	0.747	6.933	0.225	1.511	0.129	0.333	0.455	0.360	38
Treated – Control	-0.476*** (0.071)	0.594 (0.420)	0.028 (0.019)	0.844 (1.205)	-0.238* (0.141)	-0.175*** (0.021)	0.145*** (0.038)	-0.349*** (0.047)	

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 2 – Fuel Hedging for Low Z-score Airlines after the Safe Harbor Reform Act of 2005

This table presents estimations from hedging regressions. The sample includes all firms with SIC 4512 (scheduled airlines). The dependent variable is Fuel Hedged, which is defined as the fraction of next year fuel expenses hedged. Z-score<1.8 is an indicator equal to 1 if the Altman's (1968) z-score for an airline in a given year is less than 1.81, and zero otherwise. Post-2005 is an indicator equal to 1 for the years 2006, 2007, and 2008, and zero for the years 2003, 2004, and 2005. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the airline level.

Dependent variable:	Fuel Hedged						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Z-score<1.81 × Post-2005	0.183***	0.185***	0.182***	0.219***	0.219***	0.204***	0.192***
	(0.058)	(0.054)	(0.047)	(0.048)	(0.052)	(0.053)	(0.046)
Z-score<1.81	-0.089**	-0.088**	-0.087**	-0.112**	-0.112**	-0.102**	-0.079
	(0.037)	(0.037)	(0.038)	(0.040)	(0.048)	(0.047)	(0.046)
Size	-0.055	-0.052	-0.051	-0.027	-0.027	-0.019	0.009
	(0.035)	(0.033)	(0.034)	(0.033)	(0.035)	(0.034)	(0.034)
Fuel Expenses		-0.353	-0.394	-0.244	-0.243	-0.317	-0.272
		(0.311)	(0.382)	(0.330)	(0.371)	(0.373)	(0.319)
Tobin's *q*			0.010	0.023	0.023	0.040	0.128*
			(0.031)	(0.034)	(0.034)	(0.035)	(0.073)
Profitability				-0.287**	-0.288**	-0.274*	-0.408**
				(0.121)	(0.112)	(0.137)	(0.161)
Cash					0.003	-0.333	-0.229
					(0.210)	(0.313)	(0.291)
Tangibility						-0.384	-0.169
						(0.225)	(0.194)
Net Worth							0.180*
							(0.092)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Airline Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	104	104	102	102	102	102	102
N. of Airlines	23	23	22	22	22	22	22
R-2 (within)	0.177	0.185	0.198	0.220	0.220	0.239	0.272

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 3 – Fuel Hedging for Low Z-score Airlines after the Safe Harbor Reform Act of 2005: Robustness Tests

This table presents estimations from hedging regressions. The sample includes all firms with SIC 4512 (scheduled airlines) over the period 2003-2008 (columns 1-5), 2002-2009 (column 6), and 2004-2007 (column 7). The dependent variable is Fuel Hedged, which is defined as the fraction of next year fuel expenses hedged. Z-score<1.81 is an indicator equal to 1 if the Altman's (1968) z-score for an airline in a given year is less than 1.81, and zero otherwise. In columns 1-5 (6; 7), Post-2005 is an indicator equal to 1 for the years 2006-2008 (2006-2009; 2006-2007), and zero for the years 2003-2005 (2002-2005; 2004-2005). Assets with capitalized leases are obtained by adding 10×leases (COMPUSTAT's item xrent) to book assets (COMPUSTAT's item at) in the computation of Tobin's *q*, Profitability, Cash, Tangibility, and Net Worth. 1983's Z-score<1.1 is an indicator equal to 1 if the Altman's (1983) z-score for an airline in a given year is less than 1.1, and zero otherwise. Distance-to-Default<1st 1/10 is an indicator equal to 1 if distance-to-default (Vassalou and Xing, 2004) for an airline in a given year is less than the sample first decile, and zero otherwise. Pass-Through Airlines are those airlines (generally regional carriers) with a fuel pass through agreement to obtain jet fuel from a major carrier. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the airline level.

Dependent Variable:	Fuel Hedged						
	Base Model	**Adding Capitalized Leases to Assets**	**Using Altman's (1983) Z-score to Identify Airlines in "Distress Zone"**	**Using Distance-to-Default to Identify Airlines in "Distress Zone"**	**Excluding Pass Through Airlines**	**Period 2002 – 2009**	**Period 2004 – 2007**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Z-score<1.81 × Post-2005	0.192***	0.163***			0.198***	0.137***	0.108**
	(0.046)	(0.036)			(0.064)	(0.049)	(0.048)
Z-score<1.81	-0.079	-0.062			-0.054	-0.027	0.006
	(0.046)	(0.055)			(0.083)	(0.032)	(0.024)
1983's Z-score<1.10 × Post-2005			0.226**				
			(0.088)				
1983's Z-score<1.10			-0.001				
			(0.060)				
Distance-to-Default<1st 1/10 × Post-2005				0.439**			
				(0.179)			
Distance-to-Default<1st 1/10				-0.440**			
				(0.173)			
Size	0.009	-0.034	0.054*	-0.194	-0.291**	0.006	0.015
	(0.034)	(0.082)	(0.030)	(0.133)	(0.118)	(0.034)	(0.024)
Fuel Expenses	-0.272	-0.238	-0.510	-0.389	0.892	-0.249	0.463
	(0.319)	(0.247)	(0.423)	(0.436)	(1.635)	(0.283)	(0.434)
Tobin's *q*	0.128*	0.446**	0.200**	0.330*	0.132	0.104	0.036
	(0.073)	(0.188)	(0.093)	(0.185)	(0.135)	(0.064)	(0.055)
Profitability	-0.408**	-0.789	-0.337*	-0.373	-0.942	-0.239	-0.204
	(0.161)	(0.717)	(0.176)	(0.390)	(0.771)	(0.179)	(0.152)
Cash	-0.229	-1.182*	-0.292	-1.377	-0.809	-0.118	0.323
	(0.291)	(0.676)	(0.399)	(0.939)	(0.880)	(0.257)	(0.295)
Tangibility	-0.169	-0.256	-0.177	-0.944	-0.521	-0.194	0.161
	(0.194)	(0.348)	(0.205)	(0.589)	(0.481)	(0.176)	(0.308)
Net Worth	0.180*	0.450**	0.299**	0.364	0.131	0.184	0.060
	(0.092)	(0.209)	(0.136)	(0.429)	(0.251)	(0.112)	(0.098)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Airline Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	102	98	102	78	70	137	69
N. of Airlines	22	21	22	20	14	23	22
R-2 (within)	0.272	0.303	0.310	0.341	0.368	0.236	0.291

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 4 – Fuel Hedging for Low Z-score Airlines after the Safe Harbor Reform Act of 2005: Testing for Low Z-score-Specific Trend

This table presents estimations from hedging regressions. The sample includes all firms with SIC 4512 (scheduled airlines) over different sample periods. The dependent variable is Fuel Hedged, which is defined as the fraction of next year fuel expenses hedged. Z-score<1.81 is an indicator equal to 1 if the Altman's (1968) z-score for an airline in a given year is less than 1.81, and zero otherwise. Post-2005 is an indicator equal to 1 for the years 2006-2008, and zero for the years 2003-2005. Post-2001 to Post-2004 are defined similarly. Trend is a linear trend variable. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the airline level.

Dependent Variable:	Fuel Hedged					
	Base Model					
	(1)	(2)	(3)	(4)	(5)	(6)
Z-score<1.81 × Post-2005	0.192***	0.168***				
	(0.046)	(0.043)				
Z-score<1.81 × Trend		0.007				
		(0.004)				
Z-score<1.81 × Post-2001			-0.048			
(**Period**: 1999 – 2004)			(0.098)			
Z-score<1.81 × Post-2002				-0.087		
(**Period**: 2000 – 2005)				(0.059)		
Z-score<1.81 × Post-2003					-0.044	
(**Period**: 2001 – 2006)					(0.065)	
Z-score<1.81 × Post-2004						-0.013
(**Period**: 2002 – 2007)						(0.052)
Z-score<1.81	-0.079	-0.176**	-0.047	0.004	0.030	0.011
	(0.046)	(0.084)	(0.080)	(0.055)	(0.065)	(0.047)
Size	0.009	0.013	0.197	0.018	0.028	0.024
	(0.034)	(0.033)	(0.143)	(0.080)	(0.027)	(0.026)
Fuel Expenses	-0.272	-0.265	0.559	0.088	0.057	0.205
	(0.319)	(0.298)	(1.157)	(0.630)	(0.411)	(0.357)
Tobin's *q*	0.128*	0.121	0.009	0.021	0.018	0.054
	(0.073)	(0.071)	(0.087)	(0.036)	(0.028)	(0.048)
Profitability	-0.408**	-0.398**	-0.134	-0.095	0.001	-0.087
	(0.161)	(0.155)	(0.255)	(0.167)	(0.189)	(0.123)
Cash	-0.229	-0.260	0.049	0.083	-0.133	-0.044
	(0.291)	(0.294)	(0.376)	(0.235)	(0.281)	(0.284)
Tangibility	-0.169	-0.159	-0.142	-0.090	-0.237	-0.293
	(0.194)	(0.196)	(0.219)	(0.170)	(0.234)	(0.253)
Net Worth	0.180*	0.178*	0.054	0.032	0.034	0.079
	(0.092)	(0.091)	(0.151)	(0.083)	(0.081)	(0.093)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Airline Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	102	102	117	115	114	109
N. of Airlines	22	22	25	24	24	23
R-2 (within)	0.272	0.283	0.146	0.197	0.159	0.204

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 5 – Fuel Hedging for Low Z-score Airlines after the Safe Harbor Reform Act of 2005: Controlling for Jet Fuel Price Effects

This table presents estimations from hedging regressions. The sample includes all firms with SIC 4512 (scheduled airlines) over the period 2003-2008. The dependent variable is Fuel Hedged, which is defined as the fraction of next year fuel expenses hedged. Z-score<1.81 is an indicator equal to 1 if the Altman's (1968) z-score for an airline in a given year is less than 1.81, and zero otherwise. Post-2005 is an indicator equal to 1 for the years 2006-2008, and zero for the years 2003-2005. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the airline level.

Dependent Variable:	Fuel Hedged					
	Base Model					
	(1)	(2)	(3)	(4)	(5)	(6)
Z-score<1.81 × Post-2005	0.192***	0.206***	0.191***	0.204***	0.189***	0.204***
	(0.046)	(0.053)	(0.045)	(0.053)	(0.047)	(0.055)
Z-score<1.81	-0.079	-0.078*	-0.079	-0.078	-0.077	-0.077
	(0.046)	(0.045)	(0.047)	(0.046)	(0.050)	(0.050)
Size	0.009	0.028	0.011	0.030	0.013	0.030
	(0.034)	(0.037)	(0.039)	(0.043)	(0.041)	(0.044)
Fuel Expenses × Post-2005		-0.457		-0.464		-0.463
		(0.306)		(0.315)		(0.336)
Fuel Expenses	-0.272	0.033	-0.281	0.026	-0.288	0.025
	(0.319)	(0.358)	(0.350)	(0.373)	(0.352)	(0.388)
Log of Jet Fuel Price × Post-2005					-0.094	-0.007
					(0.197)	(0.247)
Log of Jet Fuel Price			0.027	0.034	0.113	0.040
			(0.120)	(0.122)	(0.246)	(0.283)
Tobin's *q*	0.128*	0.120	0.129	0.122	0.131	0.122
	(0.073)	(0.075)	(0.079)	(0.080)	(0.081)	(0.083)
Profitability	-0.408**	-0.394**	-0.411**	-0.398**	-0.414**	-0.398**
	(0.161)	(0.151)	(0.170)	(0.160)	(0.175)	(0.164)
Cash	-0.229	-0.189	-0.223	-0.180	-0.225	-0.180
	(0.291)	(0.277)	(0.285)	(0.270)	(0.287)	(0.274)
Tangibility	-0.169	-0.140	-0.166	-0.136	-0.173	-0.136
	(0.194)	(0.189)	(0.194)	(0.188)	(0.203)	(0.204)
Net Worth	0.180*	0.167*	0.183*	0.170	0.184*	0.171
	(0.092)	(0.093)	(0.102)	(0.102)	(0.103)	(0.104)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Airline Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	102	102	102	102	102	102
N. of Airlines	22	22	22	22	22	22
R-2 (within)	0.272	0.280	0.273	0.281	0.273	0.281

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 6 – Fuel Hedging for Low Z-score Airlines after the Safe Harbor Reform Act of 2005: Controlling for Leasing Effects

This table presents estimations from hedging regressions. The sample includes all firms with SIC 4512 (scheduled airlines) over the period 2002-2009. The dependent variable is Fuel Hedged, which is defined as the fraction of next year fuel expenses hedged. Z-score<1.81 is an indicator equal to 1 if the Altman's (1968) z-score for an airline in a given year is less than 1.81, and zero otherwise. Post-2005 is an indicator equal to 1 for the years 2006-2008, and zero for the years 2003-2005. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the airline level.

Dependent Variable:	Fuel Hedged				
	Base Model				
	(1)	(2)	(3)	(4)	(5)
Z-score<1.81 × Post-2005	0.192***	0.203***	0.221***	0.161***	0.173***
	(0.046)	(0.051)	(0.049)	(0.038)	(0.035)
Z-score<1.81	-0.079	-0.081	-0.090	-0.053	-0.055
	(0.046)	(0.055)	(0.057)	(0.051)	(0.053)
Size	0.009	0.014	0.012	0.034	0.041
	(0.034)	(0.071)	(0.073)	(0.038)	(0.043)
Leasing Exposure × Post-2005			0.179		
			(0.136)		
Leasing Exposure		-0.081	-0.190		
		(0.314)	(0.310)		
Leased Airplanes × Post-2005					0.106
					(0.097)
Leased Airplanes				-0.244	-0.353
				(0.248)	(0.226)
Fuel Expenses	-0.272	-0.310	-0.245	-0.318	-0.320
	(0.319)	(0.328)	(0.313)	(0.352)	(0.327)
Tobin's *q*	0.128*	0.126	0.122	0.209*	0.205*
	(0.073)	(0.074)	(0.074)	(0.106)	(0.101)
Profitability	-0.408**	-0.412**	-0.354*	-0.508**	-0.455**
	(0.161)	(0.194)	(0.185)	(0.190)	(0.168)
Cash	-0.229	-0.253	-0.244	-0.289	-0.296
	(0.291)	(0.330)	(0.325)	(0.333)	(0.311)
Tangibility	-0.169	-0.139	-0.203	-0.279	-0.384
	(0.194)	(0.204)	(0.212)	(0.276)	(0.282)
Net Worth	0.180*	0.186*	0.171*	0.254**	0.240**
	(0.092)	(0.092)	(0.091)	(0.114)	(0.108)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Airline Fixed Effects	Yes	Yes	Yes	Yes	Yes
Obs.	102	97	97	95	95
N. of Airlines	22	21	21	20	20
R-2 (within)	0.272	0.269	0.278	0.304	0.314

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 7 – Fuel Hedging for Low Z-score Airlines after the Safe Harbor Reform Act of 2005: Excluding One Airline at the Time

This table presents estimations from hedging regressions. In each estimation, we include all firms with SIC 4512 (scheduled airlines) (column 1) or leave out one firm at the time (column 2 – 7). To conserve space, we report only the three estimations with the lowest coefficients for Z-score<1.81 × Post-2005 (columns 2 – 4) and the three estimations with the highest coefficients for Z-score<1.81 × Post-2005 (columns 5 – 7). The dependent variable is Fuel Hedged, which is defined as the fraction of next year fuel expenses hedged. Z-score<1.8 is an indicator equal to 1 if the Altman's (1968) z-score for an airline in a given year is less than 1.81, and zero otherwise. Post-2005 is an indicator equal to 1 for the years 2006-2008, and zero for the years 2003-2005. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the airline level.

Dependent variable:	Fuel Hedged						
	Base Model	Three Lowest Estimates			Three Highest Estimates		
		Excluding Southwest Airlines	**Excluding Northwest Airlines Corp.**	**Excluding Pinnacle Airlines Corp.**	**Excluding United Continental Hldgs Inc.**	**Excluding Mesa Air Group Inc.**	**Excluding Republic Airways Hldgs Inc.**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Z-score<1.81 × Post-2005	0.192***	0.149***	0.159***	0.174***	0.202***	0.202***	0.204***
	(0.046)	(0.048)	(0.035)	(0.042)	(0.048)	(0.046)	(0.049)
Z-score<1.81	-0.079	-0.080*	-0.065	-0.066	-0.071	-0.091	-0.083*
	(0.046)	(0.045)	(0.043)	(0.050)	(0.044)	(0.059)	(0.047)
Size	0.009	-0.006	0.021	0.023	0.017	0.007	0.015
	(0.034)	(0.032)	(0.030)	(0.039)	(0.033)	(0.036)	(0.033)
Fuel Expenses	-0.272	-0.020	-0.294	-0.250	-0.200	-0.293	-0.385
	(0.319)	(0.288)	(0.315)	(0.340)	(0.308)	(0.341)	(0.547)
Tobin's *q*	0.128*	0.069	0.149*	0.200*	0.126*	0.126	0.131*
	(0.073)	(0.050)	(0.074)	(0.097)	(0.072)	(0.079)	(0.075)
Profitability	-0.408**	-0.268**	-0.448**	-0.490**	-0.426**	-0.409**	-0.421**
	(0.161)	(0.113)	(0.168)	(0.184)	(0.172)	(0.164)	(0.182)
Cash	-0.229	-0.089	-0.287	-0.336	-0.178	-0.319	-0.223
	(0.291)	(0.266)	(0.303)	(0.330)	(0.304)	(0.293)	(0.310)
Tangibility	-0.169	-0.182	-0.230	-0.177	-0.166	-0.212	-0.158
	(0.194)	(0.213)	(0.198)	(0.219)	(0.235)	(0.204)	(0.196)
Net Worth	0.180*	0.102	0.224**	0.243**	0.205*	0.175*	0.179*
	(0.092)	(0.072)	(0.085)	(0.108)	(0.118)	(0.095)	(0.095)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Airline Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	102	96	98	98	96	96	97
N. of Airlines	22	21	21	21	21	21	21
R-2 (within)	0.272	0.243	0.276	0.292	0.288	0.277	0.285

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 8 – Fuel Hedging for Low Z-score Airlines after the Safe Harbor Reform Act of 2005: Focusing on Airlines with Consistently Low/High Z-score over the Period 2005-2008

This table presents estimations from hedging regressions. The sample includes firms with SIC 4512 (scheduled airlines) with consistently low or high Altman's (1968) z-score over the period 2005-2008. The dependent variable is Fuel Hedged, which is defined as the fraction of next year fuel expenses hedged. Z-score<1.8 is an indicator equal to 1 if the Altman's (1968) z-score for an airline in a given year is less than 1.81, and zero otherwise. Post-2005 is an indicator equal to 1 for the years 2006-2008, and zero for the years 2003-2005. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the airline level.

Dependent variable:	Fuel Hedged						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Z-score<1.81 × Post-2005	0.174**	0.173**	0.170***	0.214***	0.213***	0.166***	0.125**
	(0.070)	(0.059)	(0.050)	(0.052)	(0.052)	(0.045)	(0.045)
Z-score<1.81	-0.085	-0.078	-0.075	-0.084	-0.078	-0.021	0.005
	(0.062)	(0.068)	(0.069)	(0.062)	(0.069)	(0.071)	(0.070)
Size	-0.051	-0.049	-0.048	-0.017	-0.014	0.029	0.069
	(0.036)	(0.034)	(0.035)	(0.043)	(0.042)	(0.054)	(0.062)
Fuel Expenses		-0.559	-0.584	-0.419	-0.391	-0.694	-0.619
		(0.492)	(0.601)	(0.507)	(0.561)	(0.637)	(0.506)
Tobin's *q*			0.008	0.056	0.056	0.154	0.312*
			(0.052)	(0.074)	(0.074)	(0.102)	(0.162)
Profitability				-0.419**	-0.436**	-0.689*	-0.869*
				(0.192)	(0.183)	(0.318)	(0.407)
Cash					0.082	-0.557	-0.620
					(0.324)	(0.444)	(0.466)
Tangibility						-1.006**	-0.670*
						(0.433)	(0.366)
Net Worth							0.297**
							(0.130)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Airline Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	68	68	68	68	68	68	68
N. of Airlines	13	13	13	13	13	13	13
R-2 (within)	0.152	0.171	0.171	0.203	0.203	0.288	0.351

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 9 – Hedging for Low Z-score Non-Financial Firms after the Safe Harbor Reform Act of 2005

This table presents logit estimations from hedging regressions. The sample includes all non-financial firms from COMPUSTAT over the period 2003-2008. The dependent variable is Hedging, which is an indicator equal to 1 if either COMPUSTAT'S item aocidergl – "Accumulated Other Comprehensive Income - Derivative Unrealized Gain/Loss" – or cidergl – "Comprehensive Income - Derivative Gains/Losses" – are greater than zero. Z-score<1.8 is an indicator equal to 1 if the Altman's (1968) z-score for a firm in a given year is less than 1.81, and zero otherwise. Post-2005 is an indicator equal to 1 for the years 2006-2008, and zero for the years 2003-2005. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variable:	Hedging (Yes=1)			
	(1)	(2)	(3)	(4)
Z-score<1.81 × Post-2005	0.526***	0.543***	0.577***	0.525**
	(0.105)	(0.107)	(0.115)	(0.267)
[Marginal Effect]	**[0.083]*** **	**[0.084]*** **	**[0.087]*** **	**[0.111]*** **
	(0.017)	**(0.017)**	**(0.017)**	**(0.055)**
Z-score<1.81	-0.249**	-0.292**	-0.301**	-0.266
	(0.112)	(0.116)	(0.120)	(0.260)
Size	0.492***	0.537***	0.538***	0.750***
	(0.029)	(0.030)	(0.030)	(0.260)
Tobin's *q*	-0.056	-0.066*	-0.065*	-0.253*
	(0.035)	(0.036)	(0.036)	(0.130)
Profitability	1.374***	1.325***	1.313***	2.437**
	(0.326)	(0.324)	(0.328)	(1.018)
Cash	-1.976***	-2.107***	-2.118***	-1.499*
	(0.326)	(0.331)	(0.332)	(0.912)
Tangibility	0.772***	0.646***	0.661***	-1.633
	(0.166)	(0.193)	(0.194)	(1.163)
Rating (Yes=1)	0.476***	0.339***	0.342***	0.401
	(0.092)	(0.094)	(0.094)	(0.346)
Net Worth	0.128	0.034	0.048	-1.490***
	(0.124)	(0.117)	(0.118)	(0.532)
Year Fixed Effects	Yes	Yes	No	Yes
Industry Fixed Effects (1-digit SIC)	No	Yes	No	No
Year × Industry Fixed Effects (1-digit SIC)	No	No	Yes	No
Firm Fixed Effects (Conditional Logit)	No	No	No	Yes
Obs.	14,189	14,189	14,180	2,807
N. of Firms	4,166	4,166	4,165	622
Pseudo R-2	0.233	0.249	0.251	0.074

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 10 – Hedging for Low Z-score Non-Financial Firms after the Safe Harbor Reform Act of 2005: Robustness Tests

This table presents logit estimations from hedging regressions. The sample includes all non-financial firms from COMPUSTAT over the period 2003-2008 (columns 1-3, and 6), 2002-2009 (column 4), and 2004-2007 (column 5). The dependent variable is Hedging, which is an indicator equal to 1 if either COMPUSTAT'S item aocidergl – "Accumulated Other Comprehensive Income - Derivative Unrealized Gain/Loss" – or cidergl – "Comprehensive Income - Derivative Gains/Losses" – are greater than zero. Z-score<1.8 is an indicator equal to 1 if the Altman's (1968) z-score for a firm in a given year is less than 1.81, and zero otherwise. 1983's Z-score<1.1 is an indicator equal to 1 if the Altman's (1983) z-score for a firm in a given year is less than 1.1, and zero otherwise. Distance-to-Default<1st 1/10 is an indicator equal to 1 if distance-to-default (Vassalou and Xing, 2004) for a firm in a given year is less than the sample first decile, and zero otherwise. In columns 1-3, and 6 (4; 5), Post-2005 is an indicator equal to 1 for the years 2006-2008 (2006-2009; 2006-2007), and zero for the years 2003-2005 (2002-2005; 2004-2005). Trend is a linear trend variable. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent Variable:	Hedging (Yes=1)					
	Base Model	**Using Altman's (1983) Z-score to Identify Airlines in "Distress Zone"**	**Using Distance-to-Default to Identify Airlines in "Distress Zone"**	**Period 2002 – 2009**	**Period 2004 – 2007**	**Controlling for Low Z-score-Specific Trend**
	(1)	(2)	(3)	(4)	(5)	(6)
Z-score<1.81 × Post-2005	0.526***			0.493***	0.385***	0.526***
	(0.105)			(0.104)	(0.106)	(0.105)
[Marginal Effect]	**[0.083]*** **			**0.081*** **	**0.062*** **	**0.083*** **
	(0.017)			**(0.017)**	**(0.017)**	**(0.017)**
1983's Z-score<1.10 × Post-2005		0.574**				
		(0.248)				
[Marginal Effect]		**0.060*** **				
		(0.018)				
Distance-to-Default<1st 1/10 × Post-2005			0.498**			
			(0.240)			
[Marginal Effect]			**0.093** **			
			(0.039)			
Z-score<1.81 × Trend						0.001
						(0.008)
Z-score<1.81	-0.249**			-0.232**	-0.158	-0.258
	(0.112)			(0.103)	(0.123)	(0.175)
1983's Z-score<1.10		-1.559***				
		(0.244)				
Distance-to-Default<1st 1/10			-0.680***			
			(0.235)			
Size	0.492***	0.467***	0.432***	0.514***	0.469***	0.492***
	(0.029)	(0.029)	(0.031)	(0.027)	(0.031)	(0.029)
Tobin's *q*	-0.056	-0.033	-0.056	-0.053	-0.073*	-0.056
	(0.035)	(0.032)	(0.041)	(0.033)	(0.042)	(0.035)
Profitability	1.374***	0.846***	1.239***	1.412***	1.436***	1.374***
	(0.326)	(0.316)	(0.359)	(0.296)	(0.397)	(0.326)
Cash	-1.976***	-1.847***	-2.309***	-1.954***	-1.986***	-1.976***
	(0.326)	(0.321)	(0.349)	(0.294)	(0.361)	(0.326)
Tangibility	0.772***	0.795***	0.703***	0.660***	0.999***	0.771***
	(0.166)	(0.164)	(0.166)	(0.159)	(0.179)	(0.166)
Rating (Yes=1)	0.476***	0.455***	0.435***	0.464***	0.491***	0.476***
	(0.092)	(0.092)	(0.095)	(0.087)	(0.099)	(0.092)
Net Worth	0.128	-0.331***	-0.253	0.167	0.148	0.127
	(0.124)	(0.118)	(0.162)	(0.110)	(0.140)	(0.124)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	14,189	14,189	11,456	18,282	10,145	14,189
N. of Firms	4,166	4,166	3,502	4,597	3,648	4,166
Pseudo R-2	0.233	0.239	0.206	0.238	0.226	0.233

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 11 – Hedging for Low Z-score Non-Financial Firms after the Safe Harbor Reform Act of 2005: Matched-Sample Analysis

This table presents logit estimations from hedging regressions. The sample includes treated firms (Z-score<1.81: Yes) and control firms (Z-score<1.81: No) identified in 2005 from the universe of non-financial firms in COMPUSTAT based on Size, Tobin's *q*, Cash Tangibility, and Rating (exact matching) using the Abadie and Imbens' (2006) bias-corrected matching estimator. The sample periods are 2003-2008 (columns 1-4), 2002-2009 (column 5), and 2004-2007 (column 6). The dependent variable is Hedging, which is an indicator equal to 1 if either COMPUSTAT'S item aocidergl – "Accumulated Other Comprehensive Income - Derivative Unrealized Gain/Loss" – or cidergl – "Comprehensive Income - Derivative Gains/Losses" – are greater than zero. Z-score<1.8 is an indicator equal to 1 if the Altman's (1968) z-score for a firm in a given year is less than 1.81, and zero otherwise. In columns 1-4 (5; 6), Post-2005 is an indicator equal to 1 for the years 2006-2008 (2006-2009; 2006-2007), and zero for the years 2003-2005 (2002-2005; 2004-2005). Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variable:	Hedging (Yes=1)					
					Period 2002 – 2009	**Period 2004 – 2007**
	(1)	(2)	(3)	(4)	(5)	(6)
Z-score<1.81 × Post-2005	0.706***	0.757***	0.757***	0.671*	0.715***	0.561***
	(0.137)	(0.139)	(0.144)	(0.387)	(0.135)	(0.161)
[Marginal Effect]	**[0.108]*** **	**[0.114]*** **	**[0.110]*** **	**[0.178]** **	**[0.102]*** **	**[0.081]*** **
	(0.021)	**(0.021)**	**(0.021)**	**(0.083)**	**(0.020)**	**(0.0238)**
Z-score<1.81	-0.171	-0.318**	-0.322**	-0.307	-0.283**	-0.194
	(0.130)	(0.134)	(0.137)	(0.380)	(0.123)	(0.156)
Size	0.499***	0.530***	0.534***	0.368	0.556***	0.530***
	(0.036)	(0.037)	(0.038)	(0.337)	(0.034)	(0.044)
Tobin's *q*	-0.087	-0.116	-0.133*	0.068	-0.083	-0.162*
	(0.074)	(0.074)	(0.078)	(0.368)	(0.061)	(0.094)
Profitability	0.839**	0.851**	0.754*	6.400**	1.102***	0.726
	(0.419)	(0.409)	(0.404)	(2.576)	(0.381)	(0.572)
Cash	-2.348***	-2.279***	-2.297***	-0.515	-2.359***	-1.987***
	(0.563)	(0.548)	(0.555)	(2.025)	(0.476)	(0.700)
Tangibility	0.547***	0.546***	0.584***	-4.504**	0.438**	0.897***
	(0.118)	(0.211)	(0.214)	(1.816)	(0.195)	(0.261)
Rating (Yes=1)	1.103***	0.410***	0.418***	0.668	0.371***	0.459***
	(0.187)	(0.120)	(0.121)	(0.580)	(0.110)	(0.144)
Net Worth	0.599***	0.473***	0.478**	0.654	0.433***	0.679***
	(0.186)	(0.182)	(0.187)	(0.726)	(0.153)	(0.233)
Year Fixed Effects	Yes	Yes	No	Yes	No	No
Industry Fixed Effects (1-digit SIC)	No	Yes	No	No	No	No
Year × Industry Fixed Effects (1-digit SIC)	No	No	Yes	No	Yes	Yes
Firm Fixed Effects (Conditional Logit)	No	No	No	Yes	No	No
Obs.	6,313	6,313	6,303	783	8,649	4,026
N. of Firms	3,356	3,356	3,351	225	4,138	2,397
Pseudo R-2	0.279	0.295	0.302	0.086	0.301	0.315

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 12 – Value, Performance, Revenue, Covenant Violations, Cash Flow Volatility, and CFO and CEO Compensation for Low Z-score Airlines after the Safe Harbor Reform Act of 2005

This table presents estimations from firm-fixed effect (columns 1-3 and 5-7) and logit regressions (column 4). The sample includes all firms with SIC 4512 (scheduled airlines) over the period 2003-2008. Z-score<1.8 is an indicator equal to 1 if the Altman's (1986) z-score for an airline in a given year is less than 1.81, and zero otherwise. Post-2005 is an indicator equal to 1 for the years 2006-2008, and zero for the years 2003-2005. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the airline level.

Dependent variables:	Tobin's *q*	Operating Income/ Sales	Passenger Revenue/ Assets	Covenant Violation (Yes=1)	Cash Flow Volatility	Log of CEO Compensation	Log of CFO Compensation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Z-score<1.81 × Post-2005	0.412***	0.095***	0.043**	-3.692*	0.024	0.092	0.710**
	(0.110)	(0.022)	(0.018)	(1.954)	(0.022)	(0.340)	(0.298)
[Marginal Effect]				**-0.294****			
				(0.120)			
Z-score<1.81	-0.351***	-0.077**	-0.040**	4.097	-0.031*	0.148	-0.217
	(0.105)	(0.034)	(0.017)	(2.732)	(0.017)	(0.196)	(0.163)
Size	-0.217***	0.177***	0.018	-0.663**	-0.024**	0.370**	0.097
	(0.073)	(0.020)	(0.039)	(0.295)	(0.011)	(0.137)	(0.078)
Fuel Expenses	2.383*	0.096	0.271	-2.225	0.028	1.619	0.953
	(1.197)	(0.187)	(0.215)	(5.763)	(0.068)	(2.325)	(2.112)
Cash	0.794	0.561**	0.091	-6.236	-0.124	5.392*	0.542
	(0.745)	(0.245)	(0.335)	(5.139)	(0.088)	(2.879)	(1.608)
Tangibility	-0.323	0.262	-0.154	-2.817	0.068	-0.584	-0.749
	(0.479)	(0.242)	(0.230)	(3.525)	(0.088)	(2.446)	(1.583)
Net Worth	-1.078***	0.040	-0.051	-3.476**	0.009	0.833	0.874*
	(0.142)	(0.035)	(0.051)	(1.360)	(0.010)	(0.554)	(0.490)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Airline Fixed Effects	Yes	Yes	Yes	No	No	Yes	Yes
Obs.	102	104	95	104	103	93	86
N. of Airlines	22	23	22	23	23	21	21
R-2 (within)	0.721	0.738	0.617	N.A.	0.426	0.274	0.350
Pseudo R-2	N.A.	N.A.	N.A.	0.418	N.A	N.A.	N.A.

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 13 – Value, Performance, Covenant Violations, Cash Flow Volatility, and CFO and CEO Compensation for Low Z-score Firms after the Safe Harbor Reform Act of 2005

This table presents estimations from firm-fixed effect (columns 1-2 and 5-6) and logit regressions (column 4). The sample includes all non-financial firms from COMPUSTAT over the period 2003-2008. Z-score<1.8 is an indicator equal to 1 if the Altman's (1986) z-score for a firm in a given year is less than 1.81, and zero otherwise. Post-2005 is an indicator equal to 1 for the years 2006-2008, and zero for the years 2003-2005. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variables:	Tobin's *q*	Operating Income/ Sales	Covenant Violation (Yes=1)	Cash Flow Volatility	Log of CEO Compensation	Log of CFO Compensation
	(1)	(2)	(3)	(4)	(5)	(6)
Z-score<1.81 × Post-2005	0.169***	0.100***	-0.090	-0.016***	0.155***	0.081*
	(0.053)	(0.029)	(0.156)	(0.004)	(0.054)	(0.044)
[Marginal Effect]			**-0.015**			
			(0.010)			
Z-score<1.81	-0.736***	-0.119***	0.578***	0.011***	-0.166***	-0.144***
	(0.066)	(0.028)	(0.125)	(0.004)	(0.056)	(0.045)
Size	-0.202***	0.348***	-0.314***	-0.008**	0.282***	0.234***
	(0.061)	(0.076)	(0.032)	(0.004)	(0.046)	(0.039)
Cash	1.799***	-0.006	-3.354***	0.068***	0.322*	-0.014
	(0.453)	(0.054)	(0.292)	(0.018)	(0.167)	(0.127)
Tangibility	0.172	-0.094	-0.847***	0.006	-0.988***	-0.843***
	(0.214)	(0.118)	(0.219)	(0.016)	(0.208)	(0.181)
Rating (Yes=1)	-0.090	-0.091**	-1.210***	-0.001	0.053	0.068
	(0.067)	(0.040)	(0.189)	(0.005)	(0.059)	(0.056)
Net Worth	-1.407***	-0.073	-0.028	0.017*	0.332**	0.250***
	(0.401)	(0.048)	(0.077)	(0.010)	(0.164)	(0.085)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	No	Yes	Yes	Yes
Obs.	17,070	17,815	17,825	17,430	7,500	6,983
N. of Firms	4,394	4,448	4,450	4,326	1,776	1,754
R-2 (within)	0.146	0.097	N.A.	0.029	0.062	0.081
Pseudo R-2	N.A.	N.A.	0.114	N.A.	N.A.	N.A.

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 14 – Financial Policies for Low Z-score Airlines after the Safe Harbor Reform Act of 2005

This table presents estimations from various financial policy regressions. The sample includes all firms with SIC 4512 (scheduled airlines) over the period 2003-2008. Z-score<1.8 is an indicator equal to 1 if the Altman's (1986) z-score for an airline in a given year is less than 1.81, and zero otherwise. Post-2005 is an indicator equal to 1 for the years 2006-2008, and zero for the years 2003-2005. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the airline level.

Dependent variables:	LT Debt Reduction/ Assets	LT Debt Issuance/ Assets	Payouts/ Assets	Stock Issuance/Assets	Secured Debt/Total Debt
	(1)	(2)	(3)	(4)	(5)
Z-score<1.81 × Post-2005	0.092*	0.032	-0.024	0.021	0.196**
	(0.045)	(0.056)	(0.020)	(0.028)	(0.087)
Z-score<1.81	-0.025	0.026	0.017	-0.015	-0.356***
	(0.020)	(0.035)	(0.021)	(0.016)	(0.091)
Size	0.022	-0.019	-0.071***	-0.018	-0.059
	(0.029)	(0.018)	(0.011)	(0.018)	(0.089)
Fuel Expenses	0.366*	0.017	0.257	0.211**	-0.989
	(0.183)	(0.243)	(0.189)	(0.082)	(1.857)
Tobin's *q*	-0.032	-0.031	0.075***	-0.016	0.113
	(0.053)	(0.081)	(0.024)	(0.016)	(0.153)
Profitability	0.097	0.051	0.037	-0.045	0.336
	(0.109)	(0.128)	(0.063)	(0.052)	(0.458)
Cash	0.201	0.214	-0.181	0.026	-2.716***
	(0.534)	(0.422)	(0.132)	(0.056)	(0.771)
Tangibility	0.180	0.140	-0.028	-0.092	-0.975
	(0.288)	(0.296)	(0.086)	(0.062)	(0.852)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Airline Fixed Effects	Yes	Yes	Yes	No	Yes
Obs.	99	102	94	101	88
N. of Airlines	22	22	22	22	20
R-2 (within)	0.237	0.111	0.603	0.204	0.327

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 15 – Financial Policies for Low Z-score Non-Financial Firms after the Safe Harbor Reform Act of 2005

This table presents estimations from various financial policy regressions. The sample includes all non-financial firms from COMPUSTAT over the period 2003-2008. Z-score<1.8 is an indicator equal to 1 if the Altman's (1986) z-score for a firm in a given year is less than 1.81, and zero otherwise. Post-2005 is an indicator equal to 1 for the years 2006-2008, and zero for the years 2003-2005. Refer to Table A.2 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variables:	LT Debt Reduction/ Assets	LT Debt Issuance/ Assets	Payouts/ Assets	Stock Issuance/Assets	Secured Debt/Total Debt
	(1)	(2)	(3)	(4)	(5)
Z-score<1.81 × Post-2005	-0.001	-0.015*	-0.014***	0.001	0.052***
	(0.008)	(0.009)	(0.002)	(0.004)	(0.014)
Z-score<1.81	0.008	0.067***	0.007***	-0.031***	-0.034**
	(0.007)	(0.008)	(0.002)	(0.005)	(0.013)
Size	-0.004	0.000	-0.011***	-0.022***	-0.012
	(0.006)	(0.007)	(0.002)	(0.005)	(0.012)
Tobin's *q*	0.004**	-0.001	0.003***	0.009***	-0.001
	(0.002)	(0.002)	(0.001)	(0.003)	(0.002)
Profitability	-0.026	-0.089***	0.035***	-0.047	0.044
	(0.021)	(0.029)	(0.007)	(0.030)	(0.031)
Cash	-0.082***	-0.082***	-0.019**	0.234***	-0.045
	(0.017)	(0.022)	(0.009)	(0.022)	(0.044)
Tangibility	0.067**	-0.069**	0.027***	-0.060***	0.129*
	(0.030)	(0.034)	(0.009)	(0.020)	(0.069)
Rating (Yes=1)	0.016	0.065***	-0.007*	-0.001	-0.042
	(0.013)	(0.014)	(0.004)	(0.007)	(0.028)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	No	Yes
Obs.	16,733	16,383	15,663	16,795	15,543
N. of Firms	4,376	4,357	4,221	4,376	4,190
R-2 (within)	0.006	0.023	0.032	0.099	0.005

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 16 – CDS Spreads around the Passage of the Safe Harbor Reform of April 14, 2005

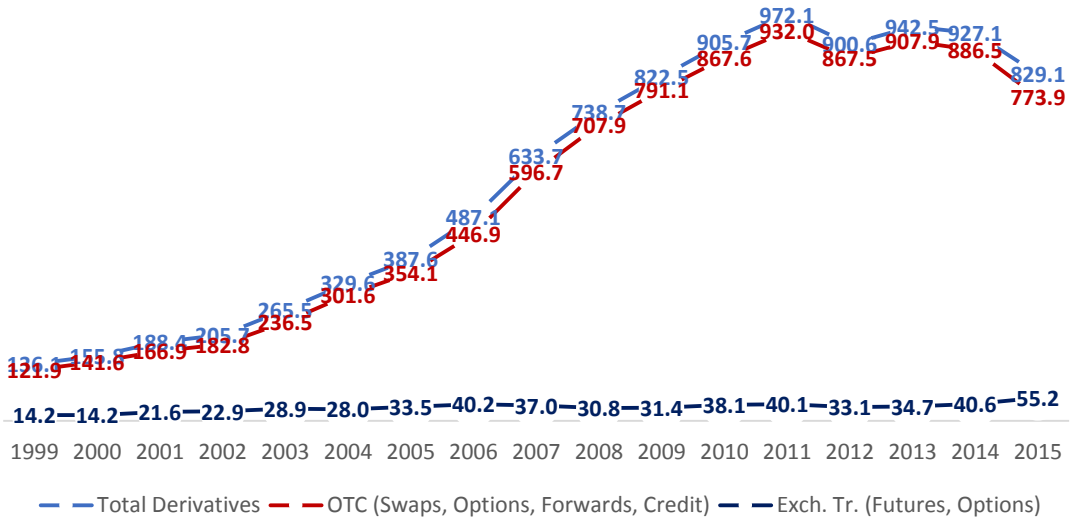
This table reports Cumulative Average Adjusted Spread Changes (CAASCs) around the passage of the Safe Harbor Reform on April 14, 2005 ("event date"). Refer to the text for a description of the methodology used to calculate CAASCs. The sample includes non-financial firms with sales exceeding $10 million and 5-year CDS spread data available in Markit in the period around April 14, 2005. The overall sample includes 147 firms with CDS spread data available in Markit, of which 72 are treated firms and 75 control firms. Refer to Table A.2 for detailed variable definitions. *t*-statistics are reported in parentheses.

Cumulative Average Adjusted Spread Change (CAASC) [time windows in days]	Treated: Z-score<1.81: Yes (1)	Control: Z-score<1.81: No (2)	Treated – Control (3)
[0, 0]	0.068%***	0.053%***	0.016%
	(2.92)	(6.31)	(0.64)
[+1, +1]	0.212%***	0.077%***	0.135%***
	(5.55)	(8.52)	(3.50)
[-1, +1]	0.314%***	0.164%***	0.150%**
	(5.73)	(7.44)	(2.57)
[-3, +3]	0.432%***	0.228%***	0.204%**
	(5.89)	(6.90)	(2.57)
[+1, 3]	0.266%***	0.104%***	0.162%***
	(5.32)	(7.47)	(3.18)
[-5, +5]	0.476%***	0.181%***	0.295%***
	(5.56)	(6.61)	(3.34)
[+1, +5]	0.288%***	0.054%***	0.234%***
	(4.53)	(2.74)	(3.58)
[-10, +10]	0.718%***	0.257%***	0.462%***
	(4.56)	(6.11)	(2.88)
[+1, +10]	0.455%***	0.078%***	0.377%***
	(3.77)	(3.76)	(3.14)
[-15, +15]	1.012%***	0.366%***	0.647%***
	(5.43)	(6.44)	(3.38)
[+1, +15]	0.668%***	0.121%***	0.547%***
	(4.12)	(4.81)	(3.40)
[-30, +30]	1.746%***	0.488%***	1.258%***
	(4.47)	(5.76)	(3.20)
[+1, +30]	0.943%***	0.168%***	0.805%***
	(3.67)	(4.91)	(3.08)

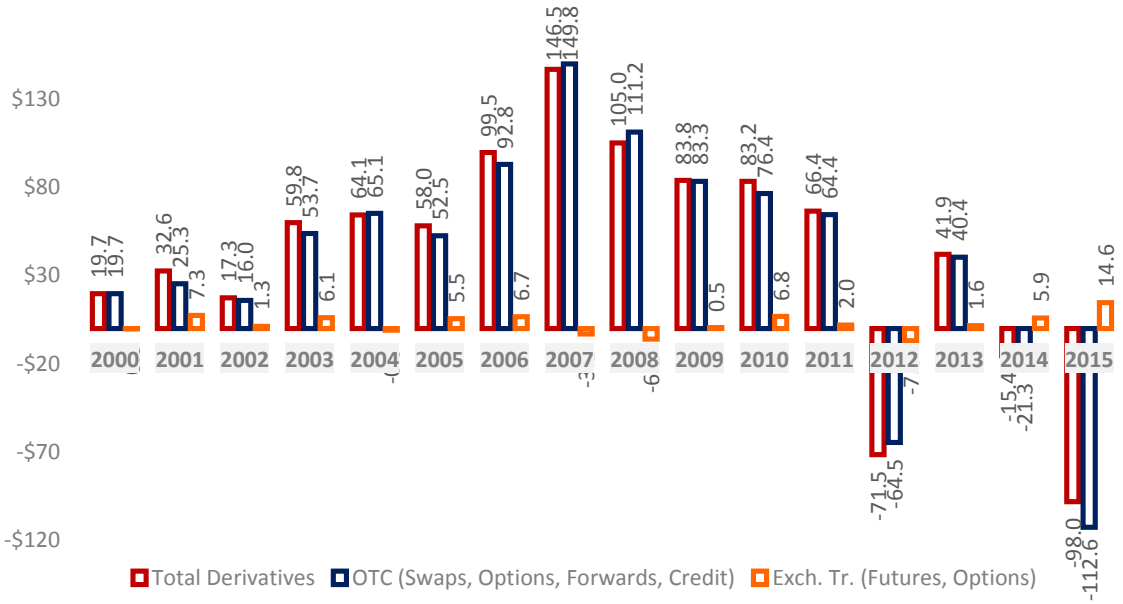
Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Figure 1 – Notional Amount of Derivatives Contracts by U.S. Commercial Banks

This figure displays the notional amount of derivatives contracts (Panel A) and the year-to-year growth of the notional amount of derivatives contracts (Panel B) ($ trillions) of U.S. insured commercial banks and trust companies. The information is presented for total derivatives, as well as for OTC derivatives (swaps, options, forwards, and credit) and exchange traded derivatives (futures and options). The data is from Office of the Comptroller of the Currency (derivatives quarterly reports).



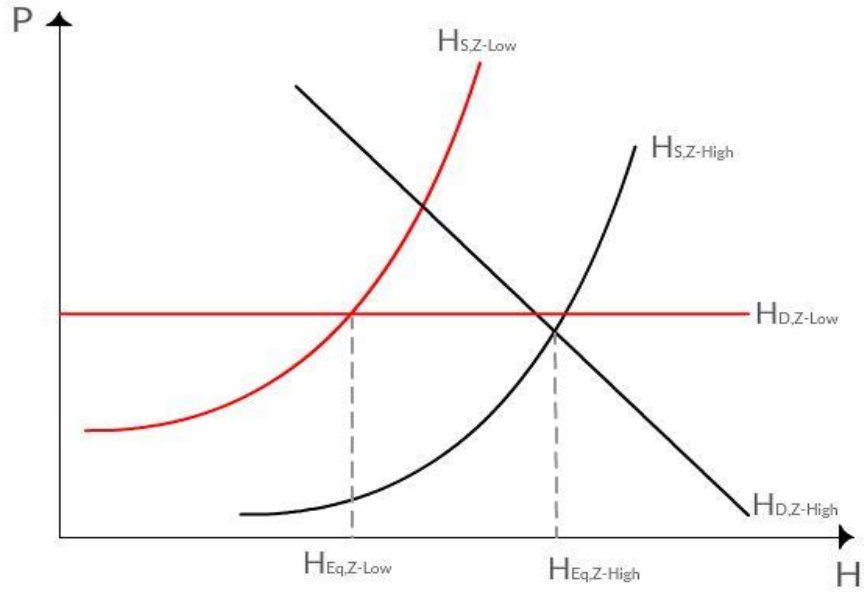
Panel A: Notional Amount of Derivatives Contracts by U.S. Commercial Banks



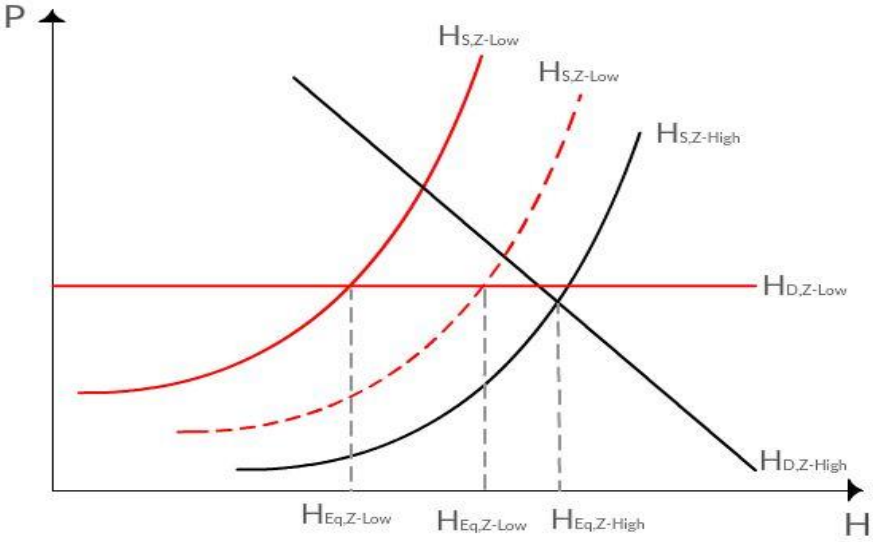
Panel B: Year-to-Year Change in Notional Amount of Derivatives Contracts by U.S. Commercial Banks

Figure 2 – Supply and Demand of Hedging by Z-score: Conceptual Framework

This figure displays price-quantity hedging (P-H) equilibrium for low Altman's (1968) z-score firms (red curves) and high z-score firms (black curves) before (Panel A) and after (Panel B) an increase in the supply of hedging instruments to low z-score firms (dashed red curve) associated to the Safe Harbor Reform. In the graph, we assume the demand of hedging instruments to be perfectly elastic for low z-score firms (horizontal red line), while demand of hedging instruments is elastic for high z-score firms (downward sloping black line). We assume the supply of hedging instruments to be elastic for both low and high z-score firms (upward sloping red and black curves, respectively). The supply curve of hedging for low z-score firms is more northwest compared to the supply curve for high z-score firms to indicate that there is a lower availability of hedging instruments at any given price for riskier low z-score firms.



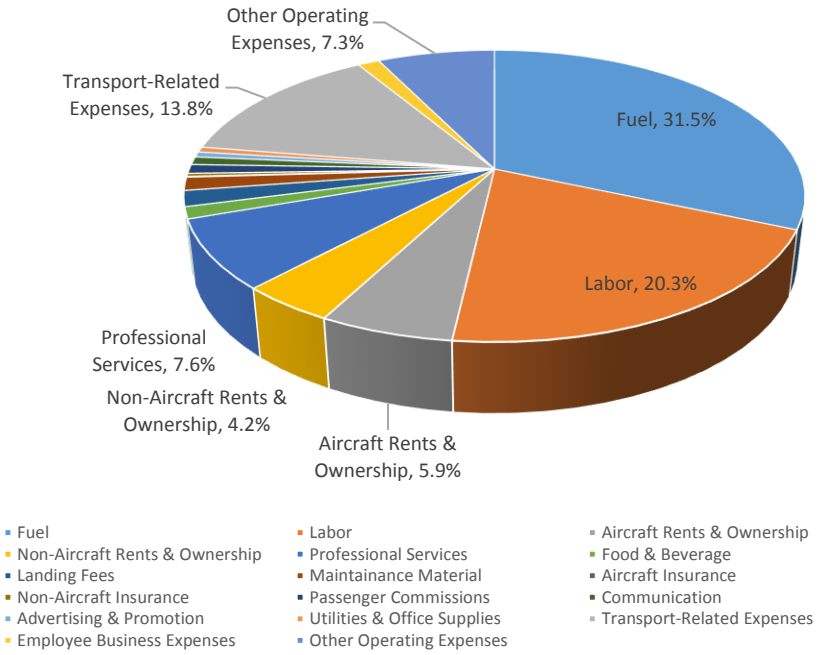
Panel A: Equilibrium Supply (S) and Demand (D) of Hedging (H) for low z-score (Z-Low) and high z-score (Z-High) Airlines Prior to the Safe Harbor Reform



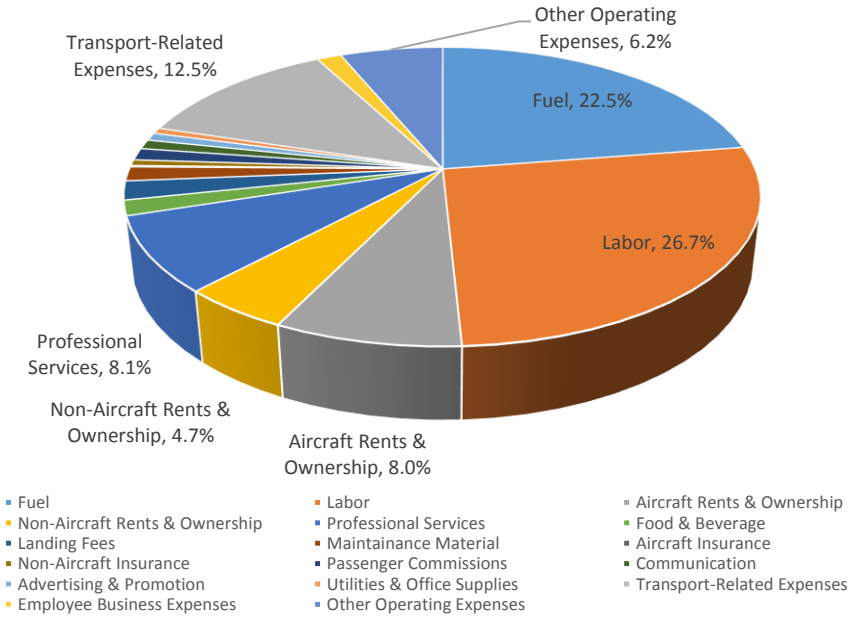
Panel B: Equilibrium Supply (S) and Demand (D) of Hedging (H) for low z-score (Z-Low) and high z-score (Z-High) Airlines After the Safe Harbor Reform

Figure 3 – Operating Expenses in the Airline Industry

This figure displays jet fuel expenses and other operating expenses as a percentage of total operating expenses for scheduled-airline firms (SIC 4512) for 2008 (Panel A) and the averages for the period 2003 – 2008 (Panel B). The data source is Airlines for America.



Panel A: Airline Industry Operating Expenses in 2008



Panel B: Airline Industry Operating Expenses 2003 – 2008 (Average)

Figure 5 – Fuel Hedging for Low Z-score Airlines after the Safe Harbor Reform Act of 200

This figure reports the coefficients (in percentage points) on Z-score<1.81 × Post-2005 from Table 2 (column 7), Table 3 (columns 2-3, and columns 5-7), Table 4 (column 2), Table 5 (column 6), Table 6 (column 5), Table 7 (columns 2 and 7), and Table 8 (column 7). The sample includes scheduled-airline (SIC 4512). Refer to Table A. 2 for detailed variable definitions.

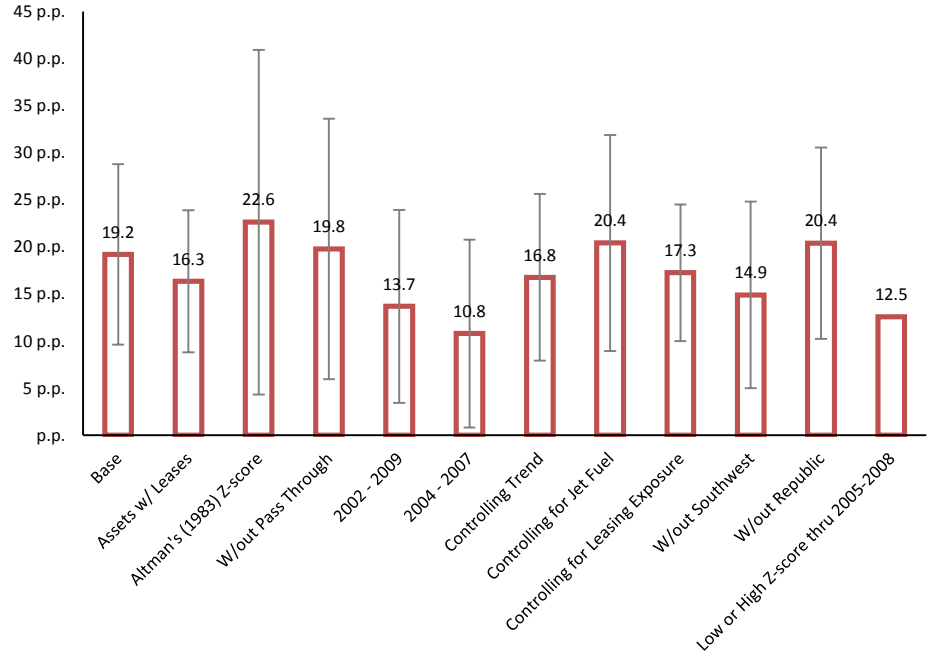


Figure 4 – Jet Fuel Spot Price and Fuel Expenses: Period 2000 – 2011

This figure shows monthly jet fuel prices ($/gallon – left y-axis) and fuel expenses as a percentage of operation expenses (annual data) for our sample of airline firms (right y-axis). Jet fuel price data are from the U.S. Energy Information Administration. Fuel expense data are hand-collected from 10-K filings, Item 7(A) – "Quantitative and Qualitative Disclosures about Market Risk".

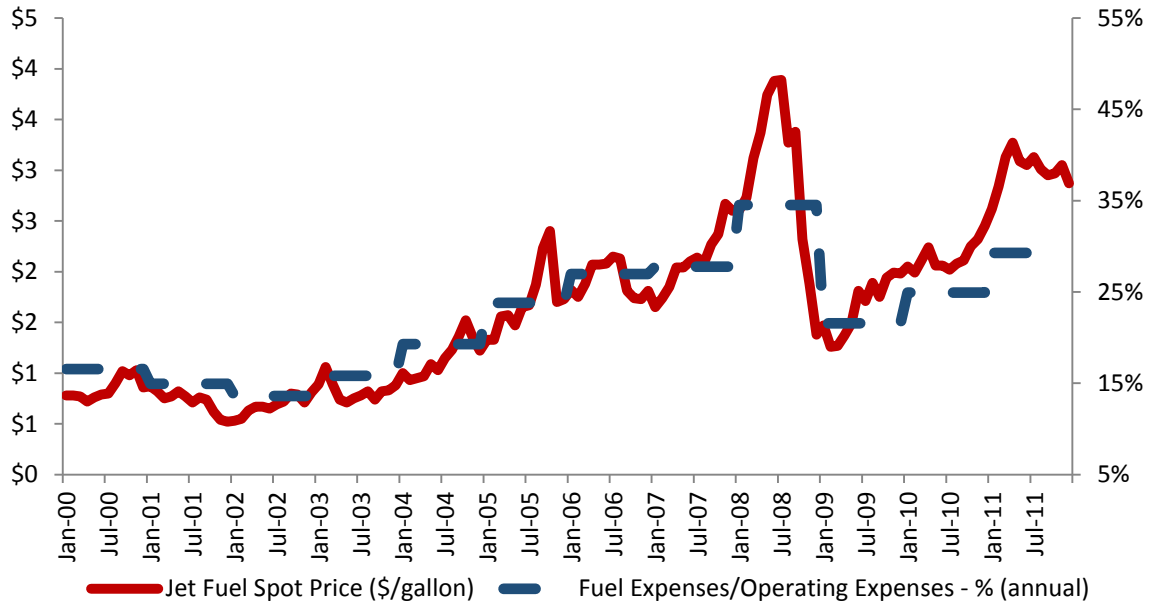
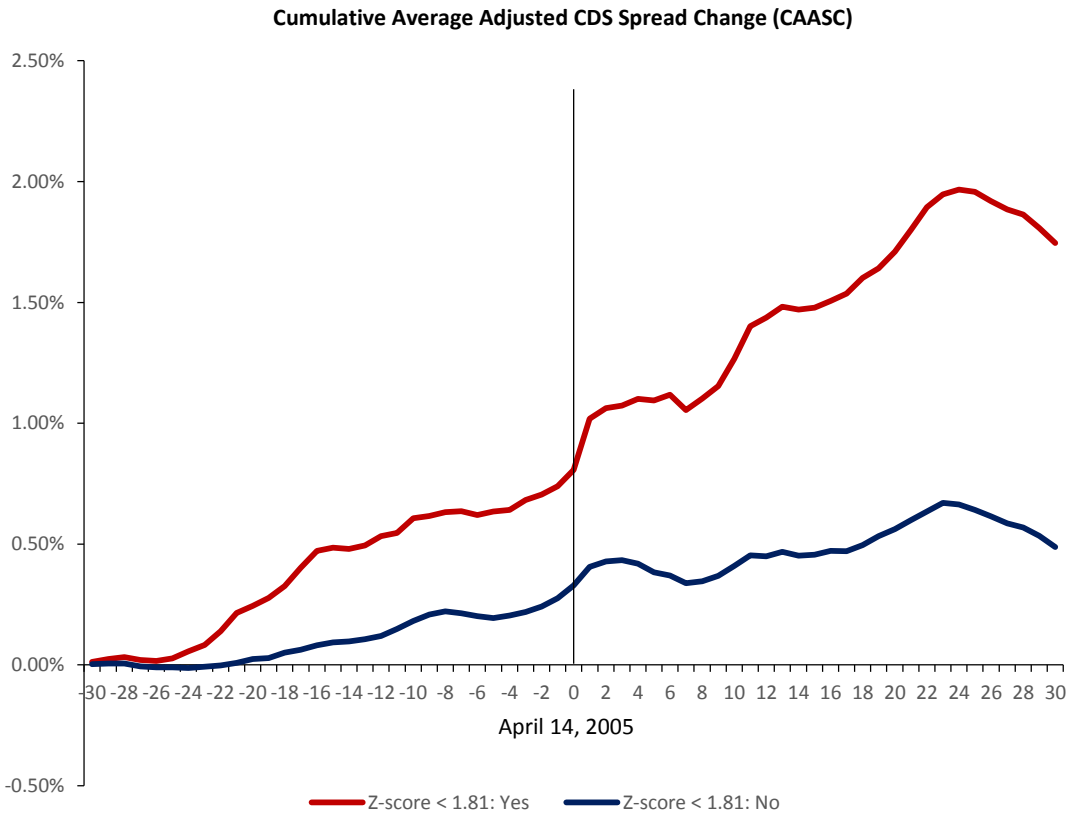


Figure 6 – CDS Spreads in the 30 Days around the Passage of the Safe Harbor Reform of April 14, 2005

This figure displays Cumulative Average Adjusted Spread Changes (CAASCs) for treated firms (Z-score<1.81: Yes) and control firms (Z-score<1.81: No) around the passage of the Safe Harbor Reform on April 14, 2005 ("event date"). Refer to the text for a description of the methodology used to calculate CAASCs. The sample includes non-financial firms with sales exceeding $10 million and 5-year CDS spread data available in Markit in the period around April 14, 2005. The overall sample includes 147 firms with CDS spread data available in Markit, of which 72 are treated firms and 75 control firms. Refer to Table A.2 for detailed variable definitions.



Appendix to

Derivatives Supply and Corporate Hedging: Evidence from the Safe Harbor Reform of 2005

Table A.1 – The Sample of Airline Firms

The table lists the airline firms in our sample for the period 2003 – 2008. The sample includes all firms with SIC 4512 (scheduled airlines). Fuel Hedged is the fraction of next year fuel expenses hedged. Fuel Expenses is the ratio of fuel expenses to total operating expenses. Fuel Pass Through Agreement is an indicator for airlines (generally regional airlines) that obtain jet fuel from a major carrier. Fuel Hedged, Fuel Expenses, and Pass Through Agreement data items are hand-collected from 10-K filings, Item 7(A) – "Quantitative and Qualitative Disclosures about Market Risk".

Firm	Fuel Hedged	Fuel Expenses	Fuel Pass Through Agreement	First Year in Sample	Last Year in Sample
Airtran Holdings Inc.	0.210	0.330	0	2003	2008
Alaska Air Group Inc.	0.438	0.243	0	2003	2008
Allegiant Travel Co.	1.000	0.484	1	2006	2008
American Airlines Group Inc.	0.178	0.264	0	2003	2008
Continental Airls Inc. –Cl B	0.065	0.221	0	2003	2008
Delta Air Lines Inc.	0.103	0.196	0	2003	2006
Expressjet Holdings Inc.	1.000	0.151	1	2003	2008
Flyi Inc.	1.000	0.189	1	2003	2004
Frontier Airlines Holdings	0.025	0.279	0	2003	2008
Global Aviation Holdings Inc.	0.000	0.209	0	2003	2004
Great Lakes Aviation Ltd.	0.000	0.244	0	2003	2008
Jetblue Airways Corp.	0.248	0.298	0	2003	2008
Mair Holdings Inc.	1.000	0.062	1	2003	2006
Mesa Air Group Inc.	1.000	0.305	1	2003	2008
Midwest Air Group Inc.	0.130	0.271	0	2003	2006
Northwest Airlines Corp.	0.115	0.217	0	2003	2006
Pinnacle Airlines Corp.	1.000	0.146	1	2003	2006
Republic Airways Hldgs Inc.	1.000	0.305	1	2004	2008
Skywest Inc.	1.000	0.221	1	2003	2004
Southwest Airlines	0.687	0.235	0	2003	2008
United Continental Hldgs Inc.	0.112	0.240	0	2003	2008
Us Airways Group Inc./ America West Holdings Corp.	0.265	0.201	0	2003	2004
Us Airways Group Inc.-Old	0.150	0.132	0	2003	2004

Table A.2 – Variable Definitions

This table provides the definitions of the variables used in the paper.

Main firm's level variables:	**Definition:**
Fuel Hedged	Fraction of next year fuel expenses hedged. Hand-collected from 10-K filings, Item 7(A) – "Quantitative and Qualitative Disclosures about Market Risk". We treat airlines with a pass-through agreement as hedging 100% of their fuel expenses (Rampini, Sufi, and Viswanathan, 2014). The variable is available only for our scheduled-airline sample (SIC 4512). Base sample period 2003 – 2008.
Pass-Through Agreement	Indicator for airlines (generally regional airlines) that obtain jet fuel from a major carrier. Hand-collected from 10-K filings, Item 7(A) – "Quantitative and Qualitative Disclosures about Market Risk". The variable is available only for our scheduled-airline sample (SIC 4512). Base sample period 2003 – 2008.
Hedging (Yes=1)	Hedging is an indicator equal to 1 if either COMPUSTAT'S item aocidergl – "Accumulated Other Comprehensive Income – Derivative Unrealized Gain/Loss" – or cidergl – "Comprehensive Income – Derivative Gains/Losses" – are greater than zero. The variable is defined for our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Z-score (Altman, 1968)	Z-score is the Altman's Z-score (Altman, 1968), computed as follows: $(1.2\times X_1 + 1.4\times X_2 + 3.3\times X_3 + 0.6\times X_4 + 1.0\times X_5)$, where X_1 is equal to the ratio of working capital (COMPUSTAT's item wcap) to total assets (COMPUSTAT's item at), X_2 is equal to the ratio of retained earnings (COMPUSTAT's item re) to total assets, X_3 is equal to the ratio of earnings before interest and taxes (COMPUSTAT's item ebit) to total assets, X_4 is the ratio of market value of equity (COMPUSTAT's items prcc_c×csho) to book value of total debt (COMPUSTAT's items dlc + dltt), X_5 is the ratio of sale (COMPUSTAT's item sale) to total assets. The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Z-score<1.81	Indicator for firms with Altman's Z-score less than 1.81. The sample includes all firms with SIC 4512 (scheduled airlines). Sample period 1996 – 2011.
Size	Size is the natural logarithm of firm's sales (COMPUSTAT's item *sale*). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Fuel Expenses	Fuel Expenses is the ratio of fuel expenses to total operating expenses. Hand-collected from 10-K filings, Item 7(A) – "Quantitative and Qualitative Disclosures about Market Risk". The variable is available only for our scheduled-airline sample (SIC 4512). Base sample period 2003 – 2008.
Tobin's *q*	Tobin's *q* is the ratio of market value of total assets (COMPUSTAT's items at – ceq + prcc_f×csho – txditc) to book assets (COMPUSTAT's item at). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT

	sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Profitability	Profitability is the ratio of operating income before depreciation and amortization (COMPUSTAT's item oibdp) to book assets (COMPUSTAT's item at). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Cash	Cash is the ratio of cash and marketable securities (COMPUSTAT's item che) to book assets (COMPUSTAT's item at).The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Tangibility	Tangibility is the ratio of property, plant, & equipment (COMPUSTAT's item ppent) to book assets (COMPUSTAT's item at). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Rating (Yes=1)	Rating is an indicator equal to 1 if the firm has either a bond rating (COMPUSTAT's item splticrm) or a commercial paper rating (COMPUSTAT's item spsticrm). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Net Worth	Net Worth is the ratio of stockholders' equity (seq) to book assets (COMPUSTAT's item at). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Additional firm's level variables:	**Definition:**
Tobin's *q* (w/ leases)	Tobin's *q* is the ratio of market value of total assets with leases (COMPUSTAT's items at + 10×xrent – ceq + prcc_f×csho – txditc) to book assets with leases (COMPUSTAT's item at + 10×xrent). The variable is defined only for our scheduled-airline sample (SIC 4512). Base sample period 2003 – 2008.
Profitability (w/ leases)	Profitability is the ratio of operating income before depreciation and amortization (COMPUSTAT's item oibdp) to book assets with leases (COMPUSTAT's item at + 10×xrent). The variable is defined only for our scheduled-airline sample (SIC 4512). Base sample period 2003 – 2008.
Cash (w/ leases)	Cash is the ratio of cash and marketable securities (COMPUSTAT's item che) to book assets with leases (COMPUSTAT's item at + 10×xrent). The variable is defined only for our scheduled-airline sample (SIC 4512). Base sample period 2003 – 2008.
Tangibility (w/ leases)	Tangibility is the ratio of property, plant, & equipment (COMPUSTAT's item ppent) to book assets with leases (COMPUSTAT's items at + 10×xrent). The variable is defined only for our scheduled-airline sample (SIC 4512). Base sample period 2003 – 2008.

Net Worth (w/ leases)	Net Worth is the ratio of stockholders' equity (seq) to book assets with lease (COMPUSTAT's items at + 10×xrent). The variable is defined only for our scheduled-airline sample (SIC 4512). Base sample period 2003 – 2008.
Altman's 1983 Z-score	Altman's 1983 Z-score (Altman, 1983) is computed as follows: (3.25 + $6.56\times X_1$ + $3.26\times X_2$ + $6.72\times X_3$ + $1.05\times X_4$), where X_1 is equal to the ratio of working capital (COMPUSTAT's item wcap) to total assets (COMPUSTAT's item at), X_2 is equal to the ratio of retained earnings (COMPUSTAT's item re) to total assets, X_3 is equal to the ratio of earnings before interest and taxes (COMPUSTAT's item ebit) to total assets, X_4 is the ratio of book value of equity (COMPUSTAT's item seq) to book value of total debt (COMPUSTAT's items dlc + dltt). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Altman's 1983 Z-score<1.10	Indicator for firms with Altman's 1983 Z-score less than 1.10. The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Distance-to-Default	Distance-to-Default is Merton's (1974) distance to default calculated following Vassalou and Xing (2004). In Merton's (1974), equity is viewed as a call option on the firm's assets with a strike price equal to the book value of the firms' liabilities (a firm defaults when its assets' value falls below the book value of debt). Distance-to-Default is the ratio of the difference between the estimated market value of the firm and the face value of the firm's debt to the estimated volatility of the market value of the firm. See Vassalou and Xing (2004) equations (1) to (9) for details. The inputs for the calculation are the stock market price and the number of shares outstanding from CRSP (items prc and shrout) and current liabilities and long-term debt items from COMPUSTAT (items dlc and dltt). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Distance-to-Default<1st 1/10	Indicator for firms with Distance-to-Default below the sample first decile. The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Jet Fuel Price	Jet Fuel Price ($/gallon) is obtained from the website of the U.S. Energy Information Administration. Base sample period 2003 – 2008.
Leasing Exposure	Leasing Exposure is the ratio of the sum of operating and capital leases (COMPUSTAT's items 10×xrent + dclo) to the sum of book assets with leases (COMPUSTAT's items at + 10×xrent). The variable is defined only for our scheduled-airline sample (SIC 4512). Base sample period 2003 – 2008.
Leased Airplanes	Leases Airplanes is the ratio of leased airplanes (COMPUSTAT Airline Segment item's airtl) to the sum of leased and owned airplanes (COMPUSTAT Airline Segment items airtl + airto).The variable is defined only for our scheduled-airline sample (SIC 4512). Base sample period 2003 – 2008.
Operating Income/Sales	Operating Income/Sales is the ratio of operating income (COMPUSTAT's items oibdp) to sales (COMPUSTAT's item sale). The variable is defined for

	both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Passenger Revenue/Assets (w/ leases)	Passenger Revenue/Assets is the ratio of passenger revenue (COMPUSTAT Airline Segment item's ariprev) to book assets with leases (COMPUSTAT's items at + 10×xrent). The variable is defined only for our scheduled-airline sample (SIC 4512). Base sample period 2003 – 2008.
Covenant Violation	Indicator for firms violating debt covenants obtained from Michael R. Roberts' website (http://finance.wharton.upenn.edu/~mrrobert/styled-9/styled-11/index.html) (Roberts and Sufi, 2009). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and non-financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Cash Flow Volatility	Cash Flow Volatility is the ratio of the standard deviation of earnings before interest, taxes, depreciation and amortization (COMPUSTAT's item oibdp) using 4 years of consecutive observations to the average book value of total assets (COMPUSTAT's item at) estimated over the same time period. For example, Cash Flow Volatility in 2008 for any given firm is the ratio of the standard deviation of "oibdp" using data from 2004 to 2007 to the average "at" over the same time period. Base sample period 2003 – 2008.
Log of CEO Compensation	Log of CEO Compensation is the natural logarithm of total CEO compensation from Execucomp (item tdc1). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. For the airline sample we hand-collect data from Proxy Statement DEF 14A when compensation information is missing in Execucomp. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Log of CFO Compensation	Log of CFO Compensation is the natural logarithm of total CFO compensation from Execucomp (item tdc1). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. For the airline sample we hand-collect data from Proxy Statement DEF 14A when compensation information is missing in Execucomp. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
LT Debt Reduction/Assets	LT Debt Reduction/Assets is the ratio of long-term debt reduction (COMPUSTAT's items dltr) to book assets (COMPUSTAT's item at). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
LT Debt Issuance/Assets	LT Debt Issuance/Assets is the ratio of long-term debt issuance (COMPUSTAT's item dltis) to book assets (COMPUSTAT's item at). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Payouts/Assets	Payouts/Assets is the ratio of sum of dividends and repurchases (COMPUSTAT's items dvt + prstkc) to book assets (COMPUSTAT's item at). The variable is defined for both our scheduled-airline sample (SIC 4512)

	and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Stock Issuances/Assets	Stock Issuances/Assets is the ratio of stock issuances (COMPUSTAT's item sstk) to book assets (COMPUSTAT's item at). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
Secured Debt/Total Debt	Secured Debt/Total Debt is the ratio of secured debt (COMPUSTAT's item dm) to total debt (COMPUSTAT's items dlc + dltt). The variable is defined for both our scheduled-airline sample (SIC 4512) and our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999). Base sample period 2003 – 2008.
CDS Spreads	CDS Spreads are 5-year CDS spreads from Markit. The variable is defined for our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000 – 6999).
Bond Yields	Bond Yields are from the TRACE corporate bond database in WRDS. The variable is defined for the bonds issued by our general COMPUSTAT sample. We exclude from our general COMPUSTAT sample firms with sales lower than or equal to $10 million and financial firms (SICs 6000-6999).
Airline Cost Structure Data	Operating expenses data in the airline industry (aggregate) used in Figure 3 are from the Airlines 4 America database. Sample period 2003 – 2008.
Notional Amount of Derivative Contracts	Notional Amount of Derivative Contracts by U.S. Commercial Banks (aggregate) used in Figure 1 are from the Office of the Comptroller of the Currency (derivatives quarterly reports). Sample period 1999 – 2015.

Table A.3 – Descriptive Statistics: Airline Sample

This table reports descriptive statistics for the variables used in the paper for the combined airline-sample (Panel A), Z-score<1.81: Yes airlines (Panel B), Z-score<1.81: No airlines (Panel C). The sample includes scheduled airlines (SIC 4512) over the period 2003 – 2008. Refer to Table A.2 for detailed variable definitions.

Panel A: Combined Sample

	Mean	St. Dev.	25th Pctle	Median	75th Pctle	Obs.
Fuel Hedged	0.445	0.416	0.065	0.305	1.000	104
Fuel Hedged (No Pass-Through Airlines)	0.199	0.225	0.000	0.125	0.325	72
Pass-Through Agreement (Yes=1)	0.308	0.464	0.000	0.000	1.000	104
Size	7.314	2.112	6.501	7.319	9.115	109
Fuel Expenses	0.243	0.094	0.168	0.235	0.302	104
Tobin's *q*	2.048	5.983	1.031	1.154	1.431	107
Profitability	-0.024	0.712	0.017	0.065	0.108	109
Cash	0.220	0.135	0.128	0.204	0.289	109
Tangibility	0.548	0.203	0.445	0.579	0.665	109
Net Worth	0.136	0.289	-0.020	0.154	0.314	109
Z-score (Altman's 1968)	5.727	21.916	0.912	1.402	3.135	109
Z-score (Altman's 1983)	5.178	15.459	2.414	3.953	5.469	109
Distance-to-Default	1.697	2.485	-0.066	1.842	3.399	79
Jet Fuel Price	1.547	0.565	1.220	1.380	1.810	108
Leasing Expenses	0.490	0.189	0.346	0.447	0.645	103
Leased Airplanes	0.562	0.276	0.362	0.623	0.752	97
Operating Income/Sales	-0.130	2.066	0.021	0.080	0.123	106
Passenger Revenues/Assets	0.387	0.086	0.317	0.381	0.436	95
Covenant Violation (Yes=1)	0.202	0.403	0.000	0.000	0.000	109
Log of CEO Compensation	7.119	0.990	6.597	6.934	7.478	93
Log of CFO Compensation	6.662	0.823	6.107	6.551	7.001	86
LT Debt Reduction/Assets	0.055	0.060	0.022	0.041	0.070	106
LT Debt Issuance/Assets	0.060	0.087	0.000	0.028	0.084	109
Payout/Assets	0.013	0.052	0.000	0.000	0.005	101
Stock Issuance/Assets	0.013	0.038	0.000	0.001	0.008	107
Total Debt/Assets	0.472	0.487	0.248	0.418	0.562	109
Secured Debt/Total Debt	0.612	0.357	0.226	0.782	0.886	95
Interest Expenses/Total Debt	0.106	0.164	0.047	0.064	0.079	109

Panel B: Treated Firms

	Mean	St. Dev.	25th Pctle	Median	75th Pctle	Obs.
Fuel Hedged	0.272	0.342	0.000	0.125	0.380	66
Fuel Hedged (No Pass-Through Airlines)	0.141	0.157	0.000	0.091	0.270	56
Pass-Through Agreement (Yes=1)	0.152	0.361	0.000	0.000	0.000	66
Size	7.527	2.433	6.903	7.824	9.496	70
Fuel Expenses	0.253	0.078	0.192	0.245	0.304	66
Tobin's *q*	2.355	7.492	1.029	1.122	1.302	68

Profitability	-0.109	0.872	0.008	0.042	0.084	70
Cash	0.157	0.087	0.105	0.160	0.214	70
Tangibility	0.600	0.187	0.542	0.621	0.700	70
Net Worth	0.011	0.235	-0.117	0.089	0.199	70
Z-score (Altman's 1968)	0.591	1.415	0.330	1.005	1.361	70
Z-score (Altman's 1983)	0.377	7.146	0.670	3.074	3.953	70
Distance-to-Default	0.931	2.112	-0.522	0.713	2.498	48
Jet Fuel Price	1.578	0.592	1.220	1.380	1.810	70
Leasing Expenses	0.455	0.155	0.348	0.417	0.603	67
Leased Airplanes	0.504	0.222	0.362	0.500	0.689	63
Operating Income/Sales	-0.255	2.596	0.013	0.062	0.102	67
Passenger Revenues/Assets	0.395	0.082	0.326	0.392	0.440	64
Covenant Violation (Yes=1)	0.286	0.455	0.000	0.000	1.000	70
Log of CEO Compensation	7.307	1.103	6.590	7.237	7.830	56
Log of CFO Compensation	6.943	0.878	6.299	6.732	7.320	50
LT Debt Reduction/Assets	0.052	0.036	0.027	0.047	0.071	70
LT Debt Issuance/Assets	0.057	0.068	0.000	0.032	0.096	70
Payout/Assets	0.003	0.008	0.000	0.000	0.001	65
Stock Issuance/Assets	0.008	0.017	0.000	0.000	0.005	69
Total Debt/Assets	0.562	0.564	0.350	0.496	0.625	70
Secured Debt/Total Debt	0.629	0.362	0.226	0.828	0.882	59
Interest Expenses/Total Debt	0.126	0.200	0.056	0.066	0.081	70

Panel C: Control Firms

	Mean	St. Dev.	25th Pctle	Median	75th Pctle	Obs.
Fuel Hedged	0.747	0.359	0.400	1.000	1.000	38
Fuel Hedged (No Pass-Through Airlines)	0.399	0.307	0.161	0.300	0.700	16
Pass-Through Agreement (Yes=1)	0.579	0.500	0.000	1.000	1.000	38
Size	6.933	1.301	6.261	6.907	7.427	39
Fuel Expenses	0.225	0.116	0.148	0.194	0.302	38
Tobin's *q*	1.511	0.650	1.057	1.342	1.886	39
Profitability	0.129	0.149	0.052	0.097	0.187	39
Cash	0.333	0.134	0.240	0.331	0.431	39
Tangibility	0.455	0.200	0.342	0.484	0.576	39
Net Worth	0.360	0.237	0.217	0.374	0.502	39
Z-score (Altman's 1968)	14.945	35.010	2.863	4.677	6.024	39
Z-score (Altman's 1983)	13.795	21.628	4.916	7.264	8.770	39
Distance-to-Default	2.883	2.585	1.020	2.707	4.975	31
Jet Fuel Price	1.492	0.515	0.950	1.470	1.810	38
Leasing Expenses	0.554	0.228	0.338	0.635	0.791	36
Leased Airplanes	0.669	0.332	0.247	0.767	1.000	34
Operating Income/Sales	0.085	0.131	0.046	0.110	0.155	39
Passenger Revenues/Assets	0.370	0.092	0.304	0.362	0.406	31

Covenant Violation (Yes=1)	0.051	0.223	0.000	0.000	0.000	39
Log of CEO Compensation	6.836	0.716	6.597	6.841	7.290	37
Log of CFO Compensation	6.272	0.544	5.887	6.283	6.618	36
LT Debt Reduction/Assets	0.061	0.092	0.012	0.027	0.060	36
LT Debt Issuance/Assets	0.063	0.115	0.000	0.021	0.078	39
Payout/Assets	0.033	0.083	0.000	0.002	0.015	36
Stock Issuance/Assets	0.023	0.058	0.001	0.005	0.009	38
Total Debt/Assets	0.310	0.233	0.153	0.256	0.407	39
Secured Debt/Total Debt	0.585	0.353	0.244	0.632	0.927	36
Interest Expenses/Total Debt	0.070	0.049	0.046	0.059	0.079	39

Table A.4 – Descriptive Statistics: General Sample of Non-Financial Firms

This table reports descriptive statistics for the variables used in the paper for the combined sample of non-financial firms (Panel A), Z-score<1.81: Yes firms (Panel B), Z-score<1.81: No firms (Panel C). The sample includes all firms in COMPUSTAT with sales exceeding $10 million over the period 2003 – 2008. We exclude from the sample financial firms (SICs 6000 – 6999). Refer to Table A.2 for detailed variable definitions.

Panel A: Combined Sample

	Mean	St. Dev.	25th Pctle	Median	75th Pctle	Obs.
Hedging (Yes=1)	0.375	0.484	0.000	0.000	1.000	14,880
Size	5.901	1.933	4.327	5.896	7.301	17,827
Tobin's *q*	1.893	1.656	1.111	1.471	2.138	17,072
Profitability	0.077	0.202	0.047	0.106	0.161	17,817
Cash	0.150	0.179	0.024	0.080	0.207	17,825
Tangibility	0.273	0.233	0.086	0.199	0.405	17,827
Rating (Yes=1)	0.318	0.466	0.000	0.000	1.000	17,827
Net Worth	0.404	0.409	0.284	0.452	0.615	17,827
Z-score (Altman's 1968)	14.434	23.780	2.037	4.357	10.865	17,827
Z-score (Altman's 1983)	11.050	13.256	4.521	7.392	12.450	17,827
Distance-to-Default	3.944	3.614	1.353	3.796	6.418	13,854
Operating Income/Sales	0.046	0.564	0.034	0.100	0.181	17,817
Covenant Violation (Yes=1)	0.052	0.222	0.000	0.000	0.000	17,827
Log of CEO Compensation	8.009	1.097	7.322	8.046	8.727	7,502
Log of CFO Compensation	7.090	0.841	6.505	7.067	7.635	6,985
LT Debt Reduction/Assets	0.105	0.198	0.003	0.029	0.106	17,474
LT Debt Issuance/Assets	0.123	0.232	0.000	0.020	0.143	17,098
Payout/Assets	0.030	0.061	0.000	0.004	0.029	16,373
Stock Issuance/Assets	0.045	0.124	0.001	0.006	0.020	17,530
Total Debt/Assets	0.276	0.283	0.090	0.228	0.377	17,827
Secured Debt/Total Debt	0.357	0.385	0.000	0.178	0.730	16,231
Interest Expenses/Total Debt	0.144	0.330	0.052	0.072	0.102	16,932

Panel B: Treated Firms

	Mean	St. Dev.	25th Pctle	Median	75th Pctle	Obs.
Hedging (Yes=1)	0.357	0.479	0.000	0.000	1.000	3,250
Size	5.435	1.998	3.703	5.289	6.897	3,937
Tobin's *q*	1.608	1.679	0.994	1.203	1.709	3,803
Profitability	-0.017	0.306	-0.042	0.064	0.106	3,932
Cash	0.121	0.171	0.016	0.054	0.142	3,937
Tangibility	0.346	0.271	0.091	0.294	0.578	3,937
Rating (Yes=1)	0.375	0.484	0.000	0.000	1.000	3,937
Net Worth	0.063	0.636	-0.005	0.207	0.338	3,937
Z-score (Altman's 1968)	0.308	1.200	-0.791	0.734	1.316	3,937
Z-score (Altman's 1983)	-0.325	6.059	-3.633	2.287	4.281	3,937
Distance-to-Default	1.269	2.990	-1.057	1.023	3.151	2,763

Operating Income/Sales	-0.064	0.849	-0.042	0.076	0.196	3,932
Covenant Violation (Yes=1)	0.085	0.279	0.000	0.000	0.000	3,937
Log of CEO Compensation	7.922	1.132	7.204	7.991	8.668	1,129
Log of CFO Compensation	7.049	0.895	6.423	7.017	7.595	1,082
LT Debt Reduction/Assets	0.133	0.214	0.011	0.051	0.155	3,884
LT Debt Issuance/Assets	0.172	0.257	0.000	0.063	0.237	3,850
Payout/Assets	0.018	0.051	0.000	0.000	0.014	3,538
Stock Issuance/Assets	0.040	0.118	0.000	0.001	0.013	3,889
Total Debt/Assets	0.549	0.402	0.335	0.468	0.649	3,937
Secured Debt/Total Debt	0.415	0.379	0.007	0.364	0.779	3,403
Interest Expenses/Total Debt	0.115	0.180	0.060	0.079	0.108	3,870

Panel C: Control Firms

	Mean	St. Dev.	25th Pctle	Median	75th Pctle	Obs.
Hedging (Yes=1)	0.380	0.485	0.000	0.000	1.000	11,630
Size	6.033	1.894	4.553	6.042	7.397	13,890
Tobin's *q*	1.975	1.640	1.174	1.557	2.242	13,269
Profitability	0.104	0.150	0.066	0.119	0.173	13,885
Cash	0.159	0.181	0.027	0.089	0.224	13,888
Tangibility	0.253	0.216	0.085	0.185	0.354	13,890
Rating (Yes=1)	0.302	0.459	0.000	0.000	1.000	13,890
Net Worth	0.500	0.240	0.371	0.510	0.654	13,890
Z-score (Altman's 1968)	18.437	25.550	3.468	6.003	16.846	13,890
Z-score (Altman's 1983)	14.274	12.963	6.327	8.942	16.281	13,890
Distance-to-Default	4.611	3.444	2.110	4.441	6.946	11,091
Operating Income/Sales	0.077	0.446	0.044	0.104	0.178	13,885
Covenant Violation (Yes=1)	0.043	0.202	0.000	0.000	0.000	13,890
Log of CEO Compensation	8.025	1.090	7.342	8.054	8.735	6,373
Log of CFO Compensation	7.098	0.830	6.514	7.072	7.641	5,903
LT Debt Reduction/Assets	0.097	0.193	0.002	0.024	0.092	13,590
LT Debt Issuance/Assets	0.108	0.222	0.000	0.010	0.117	13,248
Payout/Assets	0.033	0.063	0.000	0.006	0.036	12,835
Stock Issuance/Assets	0.046	0.125	0.002	0.007	0.021	13,641
Total Debt/Assets	0.199	0.173	0.060	0.178	0.297	13,890
Secured Debt/Total Debt	0.342	0.385	0.000	0.126	0.709	12,828
Interest Expenses/Total Debt	0.153	0.363	0.049	0.069	0.099	13,062

Table A.5 – Pre-Safe Harbor Reform Mean Difference and Distributional Tests for Treated and Control Firms

This table reports mean difference t-test *p*-value and Kolmogorov-Smirnov distributional test *p*-value of several variables for treated firms (Z-score<1.81: Yes) and control firms (Z-score<1.81: No) in the fiscal year 2005 (the year of the safe harbor reform). Panel A and Panel B reports, respectively, statistics for the full sample of non-financial firms and for the matched sample. In the matched sample, we use the Abadie-Imbens matching estimator to identify the control firms (Abadie and Imbens, 2006). We match firms on Size, Tobin's *q*, Cash, Tangibility, and exact match on Rating and fiscal year. The samples include firms in COMPUSTAT with sales exceeding $10 million. We exclude from the sample financial firms (SICs 6000 – 6999). Refer to Table A.2 for detailed variable definitions.

Panel A: Characteristics of Treated and Control Firms in 2005: Full Sample		Mean	Treated – Control	Mean Difference t-Test p-value	Kolmogorov-Smirnov Test p-value	Obs.
Size	Treated	5.497	-0.600	<0.001	<0.001	511
	Control	6.097				2,083
Tobin's *q*	Treated	1.723	-0.329	<0.001	<0.001	511
	Control	2.053				2,083
Cash	Treated	0.124	-0.037	<0.001	<0.001	511
	Control	0.162				2,083
Tangibility	Treated	0.326	0.071	<0.001	<0.001	511
	Control	0.256				2,083
Rating (Yes=1)	Treated	0.376	0.058	0.012	0.109	511
	Control	0.317				2,083

Panel B: Characteristics of Treated and Control Firms in 2005: Matched Sample		Mean	Treated – Control	Mean Difference t-Test p-value	Kolmogorov-Smirnov Test p-value	Obs.
Size	Treated	5.497	-0.085	0.500	0.520	511
	Control	5.581				514
Tobin's *q*	Treated	1.723	0.077	0.351	0.216	511
	Control	1.646				514
Cash	Treated	0.124	0.006	0.604	0.673	511
	Control	0.119				514
Tangibility	Treated	0.326	0.003	0.863	0.921	511
	Control	0.324				514
Rating (Yes=1)	Treated	0.376	0.015	0.615	0.999	511
	Control	0.391				514

Table A.6 – CDS Spreads around the Passage of the Safe Harbor Reform of April 14, 2005: Using a Benchmark Spread Change Estimated over the Period from -320 to -60 Days Prior to the Reform

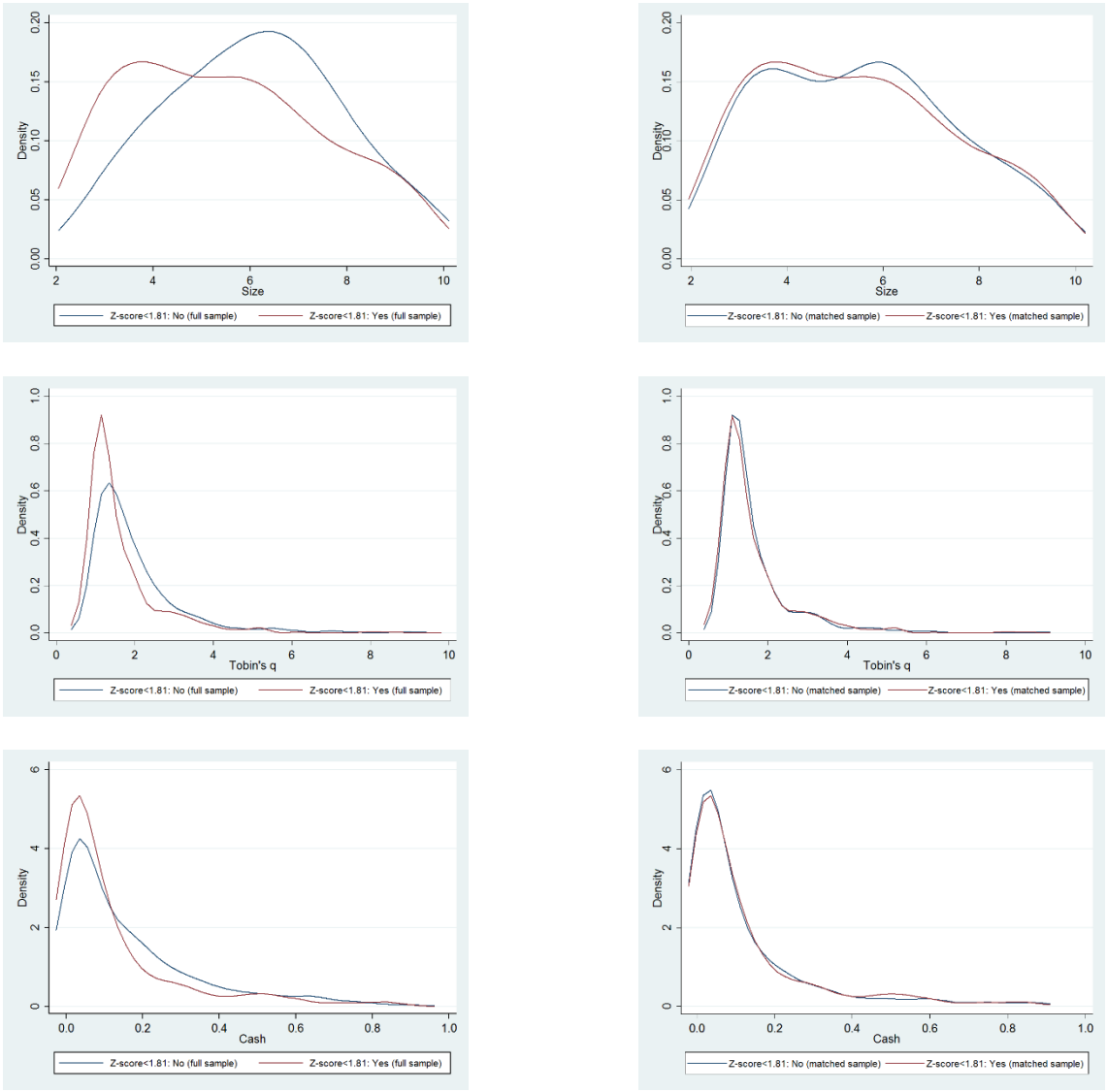
This table reports Cumulative Average Adjusted Spread Changes (CAASCs) around the passage of the Safe Harbor Reform on April 14, 2005 ("event date"). Refer to the text for a description of the methodology used to calculate CAASCs. The sample includes non-financial firms with sales exceeding $10 million and 5-year CDS spread data available in Markit in the period around April 14, 2005. The overall sample includes 147 firms with CDS spread data available in Markit, of which 72 are treated firms and 75 control firms. Refer to Table A.2 for detailed variable definitions. *t*-statistics are reported in parentheses.

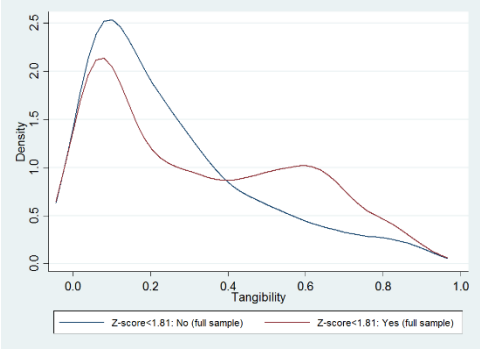
Cumulative Average Adjusted Spread Change (CAASC) [time windows in days]	Treated: Z-score<1.81: Yes (1)	Control: Z-score<1.81: No (2)	Treated – Control (3)
[0, 0]	0.070%***	0.054%***	0.016%
	(2.99)	(6.46)	(0.65)
[+1, +1]	0.214%***	0.079%***	0.135%***
	(5.59)	(8.64)	(3.50)
[-1, +1]	0.319%***	0.168%***	0.150%**
	(5.81)	(7.60)	(2.58)
[-3, +3]	0.444%***	0.238%***	0.206%**
	(6.03)	(7.15)	(2.58)
[+1, 3]	0.271%***	0.108%***	0.163%***
	(5.41)	(7.74)	(3.19)
[-5, +5]	0.494%***	0.196%***	0.298%***
	(5.76)	(7.08)	(3.36)
[+1, +5]	0.296%***	0.061%***	0.235%***
	(4.65)	(3.09)	(3.59)
[-10, +10]	0.753%***	0.286%***	0.467%***
	(4.77)	(6.68)	(2.90)
[+1, +10]	0.472%***	0.092%***	0.380%***
	(3.90)	(4.41)	(3.15)
[-15, +15]	1.063%***	0.409%***	0.654%***
	(5.68)	(7.04)	(3.40)
[+1, +15]	0.693%***	0.142%***	0.551%***
	(4.27)	(5.54)	(3.41)
[-30, +30]	1.844%***	0.572%***	1.272%***
	(4.70)	(6.54)	(3.23)
[+1, +30]	1.022%***	0.209%***	0.813%***
	(3.85)	(5.95)	(3.10)

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Figure A.1 – Pre-Safe Harbor Reform Distribution of Firm Characteristics for Treated and Control Groups

This figure presents the kerned density function of Size, Tobin's *q*, Cash, and Tangibility for treated firms (Z-score<1.81: Yes) and control firms (Z-score<1.81: No) in the fiscal year 2005 (the year of the safe harbor reform) for the full sample (column 1) and the matched sample (column 2). In the matched sample, we use the Abadie-Imbens matching estimator to identify the control firms (Abadie and Imbens, 2006). We match firms on Size, Tobin's *q*, Cash, Tangibility, and exact match on Rating and fiscal year. The samples include firms in COMPUSTAT with sales exceeding $10 million. We exclude from the sample financial firms (SICs 6000 – 6999). Refer to Table A.2 for detailed variable definitions.

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1.0
1.5
2.0
2.5
0.0
0.2
0.4
0.6
0.8
1.0
Tangibility
Z-score<1.81: No (full sample)
Z-score<1.81: Yes (full sample)

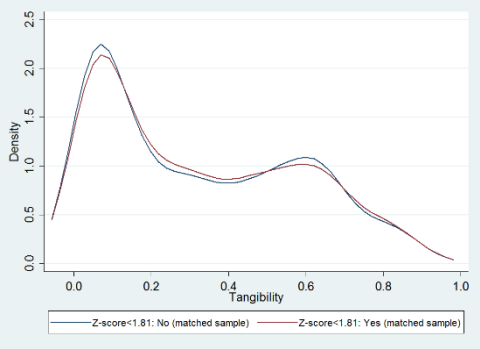
Density
0.0
0.5
1.0
1.5
2.0
2.5
0.0
0.2
0.4
0.6
0.8
1.0
Tangibility
Z-score<1.81: No (matched sample)
Z-score<1.81: Yes (matched sample)

Figure A.2 – CDS Spreads in the 30 Days around the Passage of the Safe Harbor Reform of April 14, 2005: Using a Benchmark Spread Change Estimated over the Period from -320 to -60 Days Prior to the Reform

This figure displays Cumulative Average Adjusted Spread Changes (CAASCs) for treated firms (Z-score<1.81: Yes) and control firms (Z-score<1.81: No) around the passage of the Safe Harbor Reform on April 14, 2005 ("event date"). Refer to the text for a description of the methodology used to calculate CAASCs. The sample includes non-financial firms with sales exceeding $10 million and 5-year CDS spread data available in Markit in the period around April 14, 2005. The overall sample includes 147 firms with CDS spread data available in Markit, of which 72 are treated firms and 75 control firms. Refer to Table A.2 for detailed variable definitions.