Variable Leases under ASC 842: First Evidence on Properties and Consequences

Jonas Heese
Harvard Business School

Albert Shin
Harvard Business School

Charles C.Y. Wang*
Harvard Business School

February 2023

Abstract

The new lease standard (ASC 842) allows firms to keep variable leases off-balance-sheet, on the assumption that future expenses cannot be estimated reliably. We show that variable-lease expenses are common and significant; they are as persistent and predictable as operating-lease expenses, and they are not very responsive to changes in revenues. After adopting ASC 842, firms report 3.5% lower minimum operating lease commitments on average. This decline reflects firms' compliance with ASC 842 rather than a shift of operating leases off-balance-sheet. After adopting ASC 842, firms' leverage increases substantially; equity betas increase modestly and credit ratings decrease modestly, but neither of them reflect potential variable-lease liabilities. Conservative estimates show that recognition of variable-lease liabilities would increase debt by 8% on average. Overall, our findings challenge the assumptions underlying ASC 842's differential treatment of variable leases.

Keywords: ASC 842; Lease Accounting; Reclassification; Variable Leases; Off-balance-sheet liabilities.

JEL: M40; M41

*Heese (jheese@hbs.edu) is the Marvin Bower Associate Professor of Business Administration at Harvard Business School. Shin (ashin@hbs.edu) is a doctoral candidate at Harvard Business School. Wang (charles.cy.wang@hbs.edu) is the Glenn and Mary Jane Creamer Associate Professor of Business Administration at Harvard Business School. We thank Mary Barth, Judson Caskey, Alicia Manders (discussant), Siko Sikochi, Wayne Thomas (discussant), and workshop/conference participants at the 2022 FASB/IASB/AAA Accounting for an Ever-Changing World Conference and Humboldt University Berlin for helpful suggestions on the manuscript. We also thank Philip Baggaley (Managing Director at SP's Ratings Services), Shripad Joshi (Senior Director at SP Global Ratings), Weston Lampe (Senior Manager at Netgain Solutions), Pete Graham (Director of Finance Solutions and Mobility at SAP), Gregg Lemos-Stein (Managing Director and Chief Analytical Officer for Corporate Ratings at SP Global Ratings), Bryan Seck (VP at LeaseAccelerator), David Shebay (Partner at PwC and US Advisory Lease Leader), Jeremy Simons (Partner at EY Technical Accounting Advisory Group), and David Trainer (CEO of New Constructs) for helpful discussions on practitioners' experiences with and perspectives about ASC 842. Finally, we thank Jerry Feng, Grant Fletcher, Henry Lindeman, and Tony Liu for help collecting data, and Li Kuan (Jason) Ni for outstanding research assistance. Comments are welcome.

1. Introduction

Investors and other stakeholders have long criticized the use of different accounting treatments for finance and operating leases, which historically required firms to recognize finance leases on their balance sheets but to keep operating leases off-balance-sheet. The Securities and Exchange Commission (2005) argued that these inconsistent rules had given companies an incentive to strategically structure lease arrangements "to meet various accounting, tax, and other goals." The new lease accounting standard ASU 2016-02, Lease (Topic 842), codified as ASC 842 (hereafter "ASC 842" or "the new standard"), intends to eliminate these differences by requiring firms to recognize both finance and operating leases on their balance sheets. However, the Financial Accounting Standards Board (FASB) made an exception for leases with variable payments, which can still be kept off-balance-sheet, affecting a sizable portion of total lease costs in some industries.[1] The FASB (2016) attributed this decision to the feedback from companies about the difficulty of reliably estimating variable-lease payments, which could vary over time due to changes in the economic activity associated with the leased asset.[2] This study performs several interrelated analyses to examine the properties of variable leases and the consequences of keeping variable-lease costs off-balance-sheet.

In its 2010 Exposure Draft of the new lease standard, the FASB proposed recognizing variable leases on the balance sheet, arguing that "such contingent rentals meet the definition of a liability" and pointing out that lessor and lessee typically have "some level of understanding about the likely amount of payments" (page 105, IASB/FASB (2010)).[3] In their feedback to the FASB, however, companies argued that it is difficult to estimate variable-lease liabilities reliably because they are linked to usage of the leased assets or to revenues generated by the leased assets many years into the future (FASB, 2016). For example, airlines often lease gates and ticket counters at airports, and the

[1] For example, Eaglesham (2019) reports that in 2018 variable leases represent 48% of total lease costs for Delta, 54% for American Airlines, 69% for United Airlines, and 77% for Southwest Airlines.

[2] See https://asc.fasb.org/imageRoot/50/77977550.pdf for a detailed summary of feedback to ASC 842.

[3] In its 2010 Exposure Draft, the FASB noted that "in the board's view, the liability to pay contingent rentals and the right to receive lease payments exist at the date of inception of the lease. Such contingent rentals meet the definition of a liability for the lessee and an asset for the lessor. It is only the amount to be paid that is uncertain" (Section BC123, IASB/FASB (2010)).

lease expenses for these assets typically depend on passenger traffic (i.e., the use of these assets). Similarly, retailers may lease stores in malls, and banks may lease branches, using variable leases in which the lease expenses depend on customer traffic or revenues generated at each location (Eaglesham, 2019; FASB, 2016).[4] The FASB ultimately followed the feedback of preparers and allowed variable leases to be kept off-balance-sheet under the new standard.

Thus, a central assumption underlying the differential treatment of variable leases is that they exhibit very different properties than operating and finance leases. Variable leases are presumed to be less persistent, less predictable, and more variable. Our first set of analyses tests these assumptions. For these analyses, we collect operating-, finance-, and variable-lease expenses from firms' footnotes, as required under ASC 842. Our sample includes U.S. publicly listed firms that belonged to the Russell 3000 index at any time between 2015 and 2021.

Descriptive statistics suggest that variable leases are common and economically significant. On average, more than 40% of firms with operating leases also report variable-lease expenses. This number reaches 51% in 2021 (the most recent year of our sample). Moreover, variable-lease expenses equal about 25% of operating-lease expenses for the average firm.

Next, we document three properties of variable leases. First, variable-lease expenses exhibit a high degree of persistence, very close to that of operating-lease and finance-lease expenses. In two different cross-sectional regression specifications, we obtain a persistence parameter of 0.96 and 0.93 for variable-lease expenses, close to the estimates for operating-lease (0.97 and 0.94) and finance-lease (0.97 and 0.95) expenses. Second, the predictability of expenses from variable leases is similar to those from operating leases. We form random-walk forecasts for each of the three types of lease expenses and do not find evidence that mean squared prediction errors for variable-lease expense forecasts are significantly higher than those for operating-lease expense forecasts. Third, we show that, while variable leases are more responsive to changes in underlying economic conditions,

[4]It is noteworthy that in the examples presented to the FASB, preparers acknowledge that variable leases are often long-term commitments (e.g., a 25-year retail-store lease in which payments depend on the performance or use of the store) (FASB, 2016).

the magnitude of their elasticity to revenues is economically small. For example, a 1% increase in revenues corresponds to a 0.147% increase in variable-lease expenses. At 0.098% and 0.103%, the revenue elasticities for operating-lease and finance-lease expenses are also economically small. Even when firms experience large revenue declines (about 50% on average), variable-lease expenses decline by only about 7% on average. We also exploit the COVID-19 pandemic as an alternative shock to firms' economic activities and focus on industries whose economic activities were severely negatively impacted, including airlines and retail. Surprisingly, we do not find significant declines in variable-lease expenses in these industries during the pandemic.

Overall, our first set of analyses provides robust and consistent evidence suggesting that variable-lease expenses exhibit properties similar to those of operating-lease and finance-lease expenses, contradicting one of the main assumptions underlying the new standard's differential treatment of variable leases. These results support the view that variable-lease payments can be predicted reliably. These findings also suggest that the economic drivers tied to variable-lease payments are persistent and predictable, supporting the views that (1) lessors and lessees typically possess some level of understanding about the likely amount of payments when negotiating leases with contingent rental arrangements, and (2) that both lessees and lessors are probably unwilling to enter into a contractual agreement that involves large and unpredictable changes in lease payments. Given the persistence and predictability of variable-lease expenses, our findings call into question the current practice of keeping variable-lease liabilities off-balance-sheet.

Our second set of analyses focuses on the potential consequences for firms and investors of the new standard's differential treatment of variable leases. A concern raised by standard setters was the possibility that firms could strategically restructure operating leases and classify them as variable leases to reduce their liabilities (IASB/FASB, 2010; Alqamoussi, Muir, Zeyher, and Buchanan, 2014). Anecdotal evidence suggests that some firms indeed engage in such restructuring (Eaglesham, 2019). Using large-sample empirical analysis, two recent academic studies (Ma and Thomas, 2022; Yoon, 2021) argue that firms restructure operating leases to keep them off their

balance sheets.

Following Ma and Thomas (2022) and Yoon (2021), we examine changes in one-year-ahead operating-lease commitments after the adoption of ASC 842. Consistent with Ma and Thomas (2022) and Yoon (2021), we find that these commitments decline by about 4% (relative to prior-period assets or contemporaneous revenues) after the adoption of ASC 842. This finding raises the possibility that some firms restructured operating leases as variable leases ("the incentive hypothesis"). Alternatively, it could mean that compliance with ASC 842 encouraged firms to scrutinize lease contracts more carefully (e.g., due to the digitization of lease contracts or improvements in information systems), leading firms to remove variable components of leases from their disclosures of operating-lease commitments ("the compliance hypothesis").[5] Under this hypothesis, compliance with ASC 842 would lead firms to improve their disclosures of lease commitments by (appropriately) removing expected variable-lease payments.

We do not find evidence in support of the incentive hypothesis. Following prior studies (e.g., Caskey, 2009), we examine whether financially distressed firms, which have stronger incentives to keep operating leases off-balance-sheet, experience a larger decline in minimum operating-lease commitments after the adoption of ASC 842. We show that financially distressed firms, as captured by their pre-adoption Altman (1968) Z-Score or Ohlson (1980) O-Score, do not exhibit larger declines in operating-lease commitments than non-distressed firms.

However, we find evidence in support of the compliance hypothesis. After adopting ASC 842, minimum operating-lease commitments are less sensitive to changes in revenues, consistent with the view that firms removed expected variable-lease payments, which are more sensitive to revenues, from operating-lease commitments.

We also analyze the impact of ASC 842 on firms' equity betas and credit ratings. We find that

[5] A maintained assumption of the compliance hypothesis is that, prior to ASC 842, minimum lease commitments contained measurement errors and may have included variable-lease costs. This assumption is based on conversations with practitioners involved in helping firms to implement ASC 842. These practitioners pointed out that, prior to adopting ASC 842, firms' data collection for and reporting of minimum operating-lease commitments were often not robust and thus could include variable-lease costs. Moreover, compliance with the new lease standard often involved significant updates to firms' internal information systems, including the digitization of lease contracts.

book debt-to-equity ratios increase significantly (about 21-25%) after the adoption of ASC 842 due to the recognition of operating-lease liabilities. The increase in leverage corresponds to a modest increase (1.7-5%) in equity betas and a modest decline in credit ratings (1.5-3.5%). These results suggest that, prior to the adoption of ASC 842, investors had already impounded a large fraction of the off-balance-sheet liabilities associated with operating leases. Nevertheless, our results suggest that ASC 842 did provide new information to investors that led to modest adjustments in their risk assessments.

Of particular interest to our study is the impact of the decision to keep variable leases off-balance-sheet. We analyze whether equity betas and credit ratings in the post-ASC842 period reflect liabilities arising from variable leases. Though the variation in equity betas and credit ratings is significantly associated with variation in the book debt-to-equity ratio, we do not find evidence that equity betas or credit ratings capture variation in the relative importance of variable-lease expenses (and thus the magnitude of off-balance-sheet liabilities). These results suggest that investors and credit rating agencies do not consider variable-lease expenses in their assessment of firms' financial liabilities and risks.

We conclude by offering a simple methodology for obtaining conservative estimates of the off-balance-sheet liabilities associated with variable-lease payments. Our methodology relies on the observation that operating-lease costs represent a useful anchor for variable-lease costs. Indeed, we show that the ratio of variable-to-operating-lease costs is highly persistent (with a persistence parameter of 1) and exhibits little sensitivity to revenues and negative economic shocks. We explain how this ratio, combined with firms' reported operating-lease liabilities, provides conservative estimates of off-balance-sheet variable-lease liabilities.

Our estimates indicate that recognizing variable-lease liabilities on the balance sheet would add approximately $281 billion in debt across our sample firms, increasing total debt by 7.7% for the average firm. These magnitudes vary drastically by industry. For example, recognizing variable leases would increase debt by more than 10% for firms with variable leases in the consumer durables,

food and staples retailing, and transportation industries, and by more than 13% in the retailing and pharmaceuticals industries. Off-balance-sheet liabilities associated with variable leases can therefore be economically important and relevant to users of financial statements.

Our analyses are subject to the following limitations. First, we do not have access to data on actual lease contracts, which could help to more precisely identify the drivers of variable leases and account for new leases. Future research could re-examine the properties of different types of leases by analyzing detailed lease-contract data. Second, our data allows for an empirical examination of only short-horizon properties of different lease costs due to ASC 842's recency. That said, we show that the persistence and predictability of two-year-ahead variable, operating, and finance lease payments remain similar. Moreover, we demonstrate that near-term lease payments play the most important role in explaining the variation in lease liabilities due to the effect of discounting on longer-term payments. In this sense, the properties of near-term lease payments are most relevant for determining the reliability of variable-lease liability measurement.

These limitations notwithstanding, our study makes two primary contributions to the accounting literature and to practice. First, it contributes to the literature on lease accounting by examining the properties of variable leases under the new lease accounting standard and documenting the implications for companies and investors. Prior work has examined market participants' reactions to on- and off-balance-sheet leases (e.g., Altamuro, Johnston, Pandit, and Zhang, 2014; Bratten, Choudhary, and Schipper, 2013; Ely, 1995) and the economic consequences of changes in lease standards (e.g., Hales, Venkataraman, and Wilks, 2012; Imhoff and Thomas, 1988; Imhoff, Lipe, and Wright, 1993). Prior studies have primarily examined these questions in the context of earlier lease accounting standards. However, much less is known about the consequences of ASC 842. Two notable exceptions are the studies by Ma and Thomas (2022) and Yoon (2021), which provide evidence consistent with firms restructuring operating leases to short-term or variable leases after ASC 842 adoption. Our study provides the first empirical evidence of the persistence, predictability, and variability of variable-lease expenses. Like Ma and Thomas (2022) and Yoon (2021), we also find

evidence that firms' operating-lease commitments declined after ASC 842 adoption. Unlike Ma and Thomas (2022) and Yoon (2021), our evidence suggests that the decline reflects firms' compliance with ASC 842 rather than shifting operating leases off-balance-sheet.

Second, our findings are relevant to standard setters and practitioners interested in understanding the effects of ASC 842. The FASB and International Accounting Standards Board (IASB) are calling for research examining the effects of ASC 842. Our study answers this call by providing the first empirical evidence on the properties of variable-lease expenses and by demonstrating that they are not significantly less persistent or less predictable compared to operating-lease and finance-lease expenses. We also propose a methodology for estimating variable-lease liabilities and apply it to provide estimates of the economic significance of off-balance-sheet liabilities associated with variable leases across industries. Taken together, our findings suggest that variable-lease expenses are as persistent and predictable as operating-lease and finance-lease expenses, calling into question the assumptions underlying ASC 842's differential treatment of variable leases.

2. Related Literature, Background, and Research Question

2.1 Related Literature

Our study contributes to an extensive body of accounting literature on lease accounting. One important strand within that literature focuses on the questions of whether and what type of incentives shape firms' lease-versus-buy decisions (e.g., Beatty, Liao, and Weber, 2010; Caskey and Ozel, 2019; Eisfeldt, Rampini, Eisfeldt, and Rampini, 2009; Sharpe and Nguyen, 1995). As Caskey and Ozel (2019) point out, both non-reporting incentives, such as access to financing and tax benefits, and reporting incentives, such as window dressing and performance management, could motivate the use of operating leases. Though Caskey and Ozel (2019) find evidence that financing, tax, and operational considerations are drivers of lease decisions, they find only weak evidence that reporting incentives affect lease decisions. Similarly, Beatty et al. (2010) show that

liquidity-constrained firms with low accounting quality are more likely to lease their assets.

Another important stream in that literature examines how companies structure their leases and how capital market participants respond to lease amounts recognized on the financial statements as opposed to amounts disclosed in the footnotes. For example, Imhoff and Thomas (1988) show that firms responded to a previous change in the lease accounting standard—a requirement that firms recognize finance leases on their balance sheets—by replacing finance leases with operating leases, which could remain off-balance-sheet. Thus, firms responded to changes in the lease standard by strategically restructuring leases. As described by Bratten et al. (2013), the central question in this literature is whether capital market participants use recognized and disclosed information in the same way; studies find mixed evidence (e.g., Altamuro et al., 2014; Callahan, Smith, and Spencer, 2013; Ely, 1995). For example, while Callahan et al. (2013) show that capital markets price recognized and disclosed leases differently, Bratten et al. (2013) find evidence that capital markets do not process (unrecognized) operating leases differently than (recognized) finance leases (when the operating-lease disclosures are reliable). This mixed evidence appears to stem in part from differences in financial-statement user characteristics in terms of the processing of disclosed and recognized items, with Schipper (2007) suggesting that users of financial reports put insufficient weight on, and even ignore, disclosed information.

This body of work typically examined these questions in the context of the prior lease accounting standards (e.g., Bratten et al., 2013; Imhoff and Thomas, 1988). One exception is the study by Yoon (2021), which examines these decisions following the adoption of ASC 842. Yoon (2021) documents that firms reduced operating-lease commitments following the adoption of ASC 842, and argues that this decline is consistent with a strategic shift toward variable leases. Similarly, Ma and Thomas (2022) also document that firms reduce their operating-lease commitments after the adoption of ASC 842, but argue that firms are shifting to shorter-term operating leases, which may remain off-balance-sheet.

Our study builds on the lease accounting literature by examining the properties of variable leases

under ASC 842 and analyzing the implications of ASC 842's differential treatment of variable leases for firm and investor behavior. Finally, we provide a methodology for estimating off-balance-sheet variable-lease liabilities, and quantify the impact of variable leases on total debt.

2.2 Accounting for Leases under U.S. GAAP

Before the passage of ASC 842, lease accounting guidelines were provided by ASC 840. In ASC 840, a lease was defined as "an agreement conveying the right to use property, plant, or equipment" (see ASC 840-10-20). Leases typically involve two parties: the lessee (i.e., the party obtaining the right to use the property) and the lessor (i.e., the party conveying the right to use the property). ASC 840 distinguished between capital leases (known as finance leases under ASC 842) and operating leases. According to ASC 840, capital leases were recorded on the lessee's balance sheet because such leases shift all or most of the property's benefits and risks from the lessor to the lessee (see ASC 840-10-10-1). Leases that did not meet the criteria of capital leases were classified as operating leases and were not recorded on the balance sheet.[6]

ASC 840 had long troubled investors, standard setters, and regulators because the differential accounting treatments of operating and capital leases created incentives for firms to strategically structure lease arrangements "to meet various accounting, tax, and other goals" (Securities and Exchange Commission, 2005). In response to these concerns, the FASB began working on a new lease standard in the mid-2000s and in March 2009 published the first Discussion Paper, which introduced the idea of recording operating leases on the balance sheet (FASB, 2016).

In August 2010, the FASB published an Exposure Draft of the new lease accounting rules, which considered comments received on the Discussion Paper and other input. In the Exposure Draft, the FASB concluded that operating leases should be recorded on lessees' balance sheets (IASB/FASB, 2010). The FASB argued that variable leases meet the definition of liability for the

[6]To qualify as a capital lease, a lease agreement needed to meet at least one of four criteria: (1) ownership is transferred by the end of the lease term; (2) the lease contains a bargain purchase option; (3) the lease term is equal to 75% or more of the estimated economic life of the leased property; and (4) the present value of the minimum lease payments equals or exceeds 90% of the fair value of the leased property (see ASC 840-10-25-1).

lessee and an asset for the lessor, and proposed a probability-weighted approach to estimate future variable payments (IASB/FASB, 2010). The proposal also mandated that lessees reassess their variable-lease liabilities in the event of circumstances that might impact future variable payments (FASB, 2016).

The FASB received feedback from preparers and users who objected to the proposal to record variable leases on the balance sheet (FASB, 2016). Preparers argued that the proposed approach would be very costly to apply, especially for longer-term leases with payments linked to the lessee's performance or use of the underlying asset (for example, a 25-year retail-store lease), because it is very difficult to predict the future performance associated with the leased asset. Preparers also pointed out that lessees often entered into leases with variable-lease payments because they want to share with the lessor the risks of uncertainty about the economic benefits to be derived from the leased asset (FASB, 2016). As a result, preparers argued that it would often be difficult to estimate variable-lease payments reliably, and therefore variable leases were not relevant to the measurement of lease assets and lease liabilities. At the same time, some FASB board members pointed out that variable-lease payments are often "in-substance" fixed payments, and that excluding variable-lease payments from the measurement of lease assets and liabilities could create incentives for firms to structure leases as variable (Alqamoussi et al., 2014).

The FASB ultimately deferred to the feedback and eliminated the requirement to record variable leases on the lessee's balance sheet. Some FASB board members believed that variable-lease costs meet the definition of an asset (for the lessor) and a liability (for the lessee), but were convinced that the benefits of recording variable leases on the balance sheet would not justify the costs, particularly because of the concerns expressed about the precision of the measurement (FASB, 2016). A few board members concluded that variable-lease costs do not meet the definition of an asset (for the lessor) or a liability (for the lessee) because they are avoidable by the lessee, and accordingly, the lessee does not have a present obligation to make those payments (FASB, 2016).

In 2016, the FASB passed ASC 842 "to increase transparency and comparability among orga-

nizations by recognizing lease assets and lease liabilities on the balance sheet and disclosing key information about leasing arrangements." Under the new standard, lessees were required to report finance leases and operating leases on their balance sheets, but variable leases could remain off-balance-sheet. If a lease included both a fixed minimum lease payment and a variable payment, the lessee would recognize the fixed part on the balance sheet and keep only the variable part off-balance-sheet.[7] ASC 842 also requires firms to disclose their period lease expenses, including variable-lease expenses, in the footnotes of their financial statements (see Figure 1 for an example). The new standard applied to financial statements released by publicly listed firms (with the exception of emerging growth companies) for fiscal years beginning after December 15, 2018.

2.3 Research Questions

The new lease accounting standard ASC 842 allows firms to keep variable leases off-balance-sheet because variable leases are presumed to exhibit very different properties—less persistent, less predictable, and more variable—than operating and finance leases. Our first set of analyses tests these assumptions.

The answers to these research questions are ex-ante unclear. On the one hand, we expect variable leases to be, by definition, more sensitive to changes in firms' economic activities. As such, variable-lease expenses should exhibit greater variability, lower persistence, and lower predictability than operating-lease or finance-lease expenses. On the other hand, it is possible that expenses from variable leases exhibit properties similar to those from operating and finance leases. For example, in its 2010 Exposure Draft, the FASB argued that lessors and lessees negotiate leases with contingent rental arrangements with a certain level of shared understanding about the likely amount of payments. Similarly, some practitioners argued that lessees and lessors would probably be

[7]Note that ASC 842 allows only variable leases that are not tied to an easily measurable index or rate, such as the Consumer Price Index, to be kept off companies' balance sheets. In addition, the income-statement effects of operating and finance leases are different under the new standard. It is possible that some firms incorrectly classify parts of their lease payments in their lease disclosures. See Heese, Pérez-Cavazos, and Kelley (2021a) for a more detailed discussion of ASC 842.

unwilling to enter into contracts that involved large and unpredictable changes in rental payments.

Other observers also questioned whether corporate preparers aimed to shape the new lease standard to keep a portion of leases off-balance-sheet. A growing literature in accounting demonstrates that parties with a stake in accounting standard setting regularly aim to shape those standards to their benefit (e.g., Allen and Ramanna, 2013; Gipper, Lombardi, and Skinner, 2013; Puro, 1984). In the context of the new lease standard, Comiran (2014) asserts that firms had several motives to influence the new standard, such as possible increases in their cost of capital and in costs related to implementation of the new standard. Standard setters confirmed that ASC 842 was subject to industry lobbying. In his farewell speech, the chairman of the IASB, which developed the standard in close cooperation with the FASB, described the fierce lobbying at the IASB during its development of the new lease accounting standard (Hoogervorst, 2021).

Standard setters worried that excluding variable leases payments from the measurement of lease assets and liabilities could create lease structuring opportunities and incentives (Alqamoussi et al., 2014). Consistent with this concern, prior studies (Ma and Thomas, 2022; Yoon, 2021) and anecdotal evidence suggest that some firms may restructure their operating leases. For example, Delta reported only approximately $6.8 billion in operating-lease liabilities on its balance sheet after adopting the new lease standard; the expected total would have been approximately $11.2 billion, based on reported operating lease commitments in the year prior to adoption of ASC 842 (Eaglesham, 2019). A related potential implication of keeping variable-lease payments off-balance-sheet is that it could affect firms' equity betas and credit ratings. For example, in the case of Delta, the credit ratings agency Moody's, which historically considered Delta's off-balance operating leases when calculating Delta's total liabilities, used Delta's substantially lower capitalized operating leases for its assessment of Delta's liabilities after its adoption of ASC 842, cutting Delta's operating-lease liabilities almost in half (Eaglesham, 2019). These concerns may be unwarranted if credit rating agencies incorporated off-balance-sheet variable-lease liabilities in their credit analyses, similar to how they treated off-balance-sheet leases under the old leasing standard (Kraft,

2015).

Thus, our second set of analyses examines the implications of ASC 842's differential treatment of variable leases for firm and investor behaviors. Specifically, we study whether firms re-structure operating leases as variable and whether firms' variable leases affect equity betas and credit ratings.

3. Data and Summary Statistics

3.1 Sample Construction

We construct a comprehensive database of public firms' disclosed period lease expenses using a two-step process. First, we began by querying the SEC's EDGAR XBRL Application Programming Interface (API), which includes an XBRL data tag for items in the US-GAAP (or IFRS) taxonomy.[8] We supplemented that automated data collection with manual quality checks and additional manual data collection from 10-K footnotes and tables.[9]

For firm-year observations that did not meet these quality-check criteria, we downloaded their annual filings and manually parsed the available historical lease variables.[10] Because this part of the data-collection process is highly labor-intensive, we restrict the sample to firms included in the Russell 3000 index in any given year between 2015 and 2021. We excluded firms that have only zero lease payments throughout our sample period from our analysis to ensure that we do not

[8] See, e.g., https://www.sec.gov/edgar/sec-api-documentation. The XBRL feature has previously been exploited to collect firm-specific lease and rental data by Palazzo and Yang (2019). The XBRL taxonomy is updated annually by FASB. The version (2022) that our data-collection protocol relied on can be found here: https://fasb.org/Page/PageContent?PageId=/xbrl/2022financial.html. The relevant lease variables are those that fall under the "842000 - Disclosure - Leases, Codification Topic 842" parent definition.

[9] We initially collected data by querying each lease-related data tag for each firm via the XBRL API. These tags include firms' disclosures on the different types of lease costs from the lease footnote disclosures in firms' 10-Ks. Similarly, we queried and downloaded data for operating and finance-lease liabilities and right-of-use assets. We performed a series of quality checks on the data extracted from the XBRL API, and only kept the firm-year observations for which we were able to verify the quality and integrity of the underlying data. Specifically, we kept only those firms with at least one year of valid disclosures. We consider disclosures to be "valid" if the relevant lease variables from the GAAP taxonomy classification scheme sum up to within 5% of the total lease figure reported by the firm. In this subset of valid data, we also manually compared a random sample of 50 firms and verified that data fields collected via the API matched those reported in firms' annual reports.

[10] When filings report different numbers for a given fiscal period, we collect data from the most recent filing.

mechanically introduce persistence in lease payments.[11] We winsorize all continuous variables at the top and bottom 1% of the annual cross-sectional distribution.[12]

We then merged in additional financial information from Compustat for fiscal years 2014 through 2021. We relied on Compustat data to create various control variables used in our regression tests, to obtain data on minimum one-year-ahead operating lease commitments, and to create Altman (1968) Z-scores and Ohlson (1980) O-scores. Definitions and data sources for the variables used in our empirical analyses appear in the Appendix.

We also estimated firm-level rolling 252-day CAPM market equity betas using daily stock returns obtained from CRSP and daily factor returns obtained from Kenneth French's data library. Finally, we merged credit-rating data obtained from the S&P Capital IQ's RatingsDirect database.

3.2 Summary Statistics

Table 1 reports summary statistics for the sample of approximately 2,900 unique firms for which we collected data on lease disclosures. Panel A tabulates the frequency distribution of unique firms by year in our sample, and by the first year of ASC 842 adoption: 94% of the firms in our sample adopted ASC 842 in fiscal year 2019 or 2020, when most firms were required to do so. A small number of firms (31 firms, or 1% of our sample) voluntarily adopted the standard prior to 2019; 5% of firms (e.g., emerging growth companies) did so in fiscal year 2021. Although the vast majority of adoption occurred on or after fiscal year 2019, 350 firms voluntarily opted to provide information for fiscal years preceding the first year of ASC 842 adoption (i.e., last column of Panel A).

Table 1, Panel B, reports descriptive statistics on the sample firms' characteristics. The average firm has revenues of about $5.8 billion per year, assets of $16.8 billion, liabilities of $13 billion, and total debt of $3.1 billion. On average, firms have $29 million in annual variable-lease expenses, $74 million in annual operating-lease expenses, and $19 million in annual finance-lease expenses. The number of firms reporting different types of lease expenses differs because not all firms use or

[11] In untabulated tests, we find consistent results when we exclude all firm-years with zero lease payments.
[12] In untabulated tests, we find consistent results when we do not winsorize.

report all types of lease expenses.[13]

4. Empirical Results: Properties of Variable-Lease Expenses

4.1 Prevalence and Economic Significance

Figure 2 demonstrates that variable-lease expenses are common. The solid line shows that more than 40% of firms with operating leases also report variable-lease expenses in a given fiscal year following the adoption of ASC 842. In 2021 (the final year of our sample), 51% of firms with operating leases also reported variable-lease expenses. Figure 2 also shows that variable-lease expenses constitute an economically significant percentage of operating-lease expenses. The red dashed series reports the cross-sectional average ratio of variable-lease expense to operating-lease expense among firms with operating leases: this ratio ranges from 15.5% (in 2019) to 17% (in 2021). For the subsample of firms with both operating-lease and variable-lease expenses, this ratio ranges from 24% (in 2020) to 25.5% (in 2021). In short, these summary statistics show that variable leases are common and economically significant.

4.2 Persistence, Predictability, and Variability

Table 1, the summary statistics table discussed in Section *3.2*, also speaks to the variability of firms' variable-lease costs. By definition, variable-lease expenses should exhibit greater variability than operating- or finance-lease expenses. It is thus interesting to observe in Table 1, Panel B, that the standard deviation of variable-lease expenses ($244 million) is similar to that of operating-lease ($286 million) and finance-lease ($266 million) expenses. Next, we explore these properties using regression analysis.

We begin by estimating the persistence of variable-, operating-, and finance-lease expenses using

[13]Firms are not required to disclose insignificant lease amounts. During the data collection process, we coded a lease expense as zero if a firm disclosed that a particular lease expense was "insignificant" or "immaterial."

the following pooled regression model:

$$Lease_{i,t} = \phi Lease_{i,t-1} + Controls_{i,t} + \delta_t + \epsilon_{i,t}, \tag{1}$$

where $Lease_{i,t}$ refers to the natural log of the lease expense of a particular type for firm i in year t and δ_t refers to year-fixed effects.[14] Due to the inclusion of lagged dependent variables, we do not include firm-fixed effects in these specifications (Angrist and Pischke, 2008). $Controls_{i,t}$ includes the natural log of total assets, return on assets, and the natural log of debt scaled by total assets. In this specification, the persistence parameter (ϕ) captures the extent to which differences in lease expenses between firms in a given year forecast differences in the following year (Rouen, So, and Wang, 2021). If variable-lease payments are more sensitive to economic conditions than operating and finance leases, we may expect a lower persistence parameter for the former.

Table 2, Panel A, reports the results. For each type of lease expense, we report results without (columns 1-3) and with (columns 4-6) firm-level control variables. Columns 1 and 4 show that variable leases are highly persistent: in column 1 (4), the persistence parameter is approximately 0.961 (0.932) and statistically significant at the 1% (1%) level. The remaining columns suggest that operating-lease and finance-lease expenses also exhibit highly statistically significant persistence parameters that are nearly identical in economic magnitudes to variable leases. For example, the persistence parameter for operating leases is approximately 0.965 (0.937) in column 2 (5), suggesting that operating-lease expenses are only 0.48% more persistent than variable-lease expenses.

The results in Table 2, Panel A, provide insights into the cross-sectional persistence of the different types of lease expenses; however, they do not address time-series predictability, a property that speaks more directly to the rationale for keeping variable leases off-balance-sheet. For example, that the R^2 from estimating Eq. (1) is slightly lower for variable-lease expenses (92.74%) than for operating-lease expenses (97.28%) (i.e., columns 1 and 2 in Table 2, Panel A) suggests that the

[14] Following Barth and Clinch (2009), our main specification does not scale $Lease_{i,t}$. Nevertheless, in untabulated tests, we find consistent results when we do not log transform $Lease_{i,t}$ and when we scale un-logged lease expenses by total assets.

former might be more difficult to forecast. We do not examine time-series persistence properties by including firm-fixed effects, because the introduction of such fixed effects to our regression specification in Table 2, Panel A, which uses lagged dependent variables, is likely to induce biases (Angrist and Pischke, 2008).

To directly examine the predictability of each type of lease expense, we test the within-firm predictability of each lease type by computing the mean-squared errors resulting from a naive random-walk forecast. That is, we forecast this year's lease payments based on last year's lease payments. To ensure that the squared prediction errors are comparable across the different lease expenses, which have different distributions, we first standardize each lease expense using the post-ASC842 sample averages and standard deviations such that the distribution of each standardized lease expense exhibits zero mean and unit variance. We compute squared prediction errors using standardized variable-, operating-, and finance-lease expenses.

Table 2, Panel B, provides pairwise tests of the differences in mean squared errors (MSEs) from random-walk forecasts.[15] Column 1 tests the MSE differences between standardized variable- and operating-lease expenses for the subsample of observations with squared prediction errors for both types of lease expense. It suggests that, on average, the MSE from variable-lease expenses is significantly smaller than that from operating-lease expenses. However, the magnitude of the difference is economically small. To help interpret the magnitude of the differences, the last row of Panel B reports the difference in root-mean-squared prediction errors (RMSEs) in each pairwise comparison. Our comparison of variable- and operating-lease expenses suggests that the RMSE resulting from random-walk variable-lease forecasts is 0.006 standard deviations lower than the RMSE resulting from random-walk operating-lease forecasts. Column 2 shows that variable-lease expenses exhibit significantly higher MSEs than finance-lease expenses in the overlapping sample. Again, the difference is economically small at 0.09 standard deviations. Similarly, column 3 shows

[15] Because this analysis requires firms with two consecutive years' observations of a given lease expense type, the number of observations for which squared prediction errors can be computed is smaller than the total number of observations for which we observe lease expenses (in Table 1, Panel B).

that operating-lease expenses exhibit statistically significantly higher MSEs than finance-lease expenses in the overlapping sample, but the magnitudes are not economically significant. Columns 4-6 report the results from a variant of the regression tests in columns 1-3 that include industry-fixed effects, using the four-digit Global Industry Classification Standard (GICS). The results, and our inferences, are virtually identical to the findings from columns 1-3. In untabulated results, we also compare the MSEs using un-standardized lease expenses. Our statistical inferences are identical. Importantly, we do not find evidence that variable-lease expenses are less predictable than operating leases.

4.3 Revenue Elasticity

The results of Table 1 and 2 show that variable-lease expenses are similarly persistent and predictable when compared to operating or finance-lease expenses. To complete our analysis, we examine the degree to which these different types of lease expenses respond to changes in the underlying economic conditions of the firm. In principle, variable leases should exhibit greater responsiveness or co-variability. To test this prediction, we estimate the revenue elasticity of each type of lease expense using the following regression model:

$$Lease_{i,t} = \beta_1 Revenue_{i,t} + Controls_{i,t} + \gamma_i + \delta_t + \epsilon_{i,t}, \tag{2}$$

where $Lease_{i,t}$ refers to the natural log of a lease expense of a particular type for firm i in year t, $Revenue_{i,t}$ refers to the natural logarithm of firm i's revenues in year t, γ_i and δ_t refer to firm- and year-fixed effects respectively, and β_1 represents the revenue elasticity.[16] $Controls_{i,t}$ includes the same variables as before. If variable-lease expenses are more sensitive to firms' economic activities, we would expect them to exhibit a higher β_1 than operating or finance-lease expenses.

[16] While conversations with practitioners suggest that variable leases are typically linked to contemporaneous revenues (e.g., the revenue generated in a specific month), it could be possible that revenues might also be linked to lag or average revenues. Therefore, we also regress $Lease_{i,t}$ on lag as well as average revenues, and obtain qualitatively similar results (untabulated).

Table 3, Panel A, reports the OLS estimates of Eq. (2). Again, for each type of lease payment, we report results separately without (columns 1-3) and with firm-level control variables (columns 4-6). These analyses also include firm-fixed effects, so that we are identifying how lease expenses respond to changes in revenue from the firm-level average.

We make three observations from these regression estimates. First, each type of lease expense exhibits positive and significant (at the 5% level) revenue elasticity. Second, the elasticities are quite small. For example, the estimates in columns 4, 5, and 6 suggest that a 1% increase in revenues corresponds to a 0.147%, 0.098%, and 0.103% increase in variable-, operating-, and finance-lease expenses, respectively. Third, the point estimate for β_1 is larger for variable leases than for operating or finance leases, suggesting that variable-lease expenses respond more strongly to revenue changes.

Eq. (2) does not distinguish between increases and declines in economic activities, and does not consider the possibility that variable-lease payments respond to discrete revenue thresholds. To further understand the co-variability of lease expenses, we also examine how lease expenses respond to negative shocks in firms' economic activities. We estimate the following alternative regression specification:

$$Lease_{i,t} = \beta_2 Large\ Drop_{i,t} + Controls_{i,t} + \gamma_t + \delta_t + \epsilon_{i,t}, \tag{3}$$

where $Large\ Drop_{i,t}$ is set to one for a firm in years in which it experiences a large revenue decline. We define two variants of this variable, either based on the bottom decile of the pooled sample distribution (*Large Drop (Sample)*) or within the fiscal year's distribution (*Large Drop (By Year)*). β_2 represents the downward revenue elasticity. If variable-lease expenses are more sensitive to firms' economic activities, we would expect them to exhibit a β_2 that is more negative than operating-lease or finance-lease expenses. All other variables in Eq. (3) are as defined in Eq. (2).

Table 3, Panel B, reports the OLS estimation results. Columns 1-3 report the results using *Large Drop (Sample)*; columns 4-6 report the results using *Large Drop (By Year)*. All three lease types produce negative β_2 point estimates, but only for variable- (columns 1 and 4) and finance-

(columns 3 and 6) lease expenses are the coefficients statistically significant at the 10% level. Moreover, the downward revenue elasticities of variable-lease and finance-lease expenses are similar and statistically indistinguishable at the 10% level.

We make two additional observations from these regression estimates. First, variable leases indeed exhibit a greater response to large revenue drops than operating leases; we find that the point estimate in column 1 (column 4) is statistically significantly different from the point estimate in column 2 (column 5) at the 5% level. Second, we again point out that the downward elasticities are somewhat small in magnitude. As a point of reference, firms in the bottom decile of revenue changes in the sample distribution (in the cross-sectional sample distribution) experience revenue drops of 53% (50%) on average. Thus, the estimates in columns 4, 5, and 6 suggest that a decline in revenues of approximately 50% corresponds to a decline of only 7% in both variable-lease and finance-lease expenses.

A potential concern with our large-revenue-drop analysis is that variable-lease payments may depend on economic factors that are not highly correlated with revenues. For example, a retailer's variable-lease payments could depend on the overall traffic at a mall (instead of revenues at the leased store). If so, examining changes in variable-lease expenses after large revenue drops might not capture the true degree of co-variability with changes in the most relevant economic activities.[17]

As a validity check, we use the COVID-19 pandemic as an alternative shock to firms' economic activities and focus on industries whose customer traffic dropped substantially during the pandemic and that use variable leases extensively. We introduce *COVID*, which is set to one for fiscal year periods in our sample ending on or after September 2020, as the primary explanatory variable of interest in estimating Eq. (3).[18] We restrict our sample to firms belonging to the airline industry (GICS code 203020), the consumer durables and apparel industry (GICS code 2520), the hotel and restaurant industry (GICS code 2530), and the retail industry (GICS codes 2550). We choose these

[17] It is important to note that our previous results demonstrate that variable-lease expenses are similarly persistent and predictable compared to operating-lease and finance-lease expenses. These results are not affected by the co-variability of variable leases with various economic factors.

[18] Under our definition, six or more months of a firm's fiscal year were impacted by the pandemic.

industries because their constituent companies commonly use variable leases (Eaglesham, 2019) and because economic activities in these industries significantly declined during the COVID-19 pandemic. Accordingly, examining the degree to which variable-lease expenses declined in these industries during the pandemic constitutes a suitable laboratory for understanding the sensitivity of variable leases to negative economic shocks. Table 4, Panel A, reports descriptive statistics for this subset of firms. Consistent with our expectation, firms in this subset use variable, operating, and finance leases more extensively when compared to firms in our full sample.

Table 4, Panel B, reports the results. For comparability with prior results, columns 1-3 first report the estimates from the specifications of Eq. (3), columns 1-3, focusing on *Large Drop (Sample)* as the explanatory variable of interest using the sample of firms in COVID-19-sensitive industries. Columns 4-6 report the results using *COVID* as the explanatory variable of interest. In these specifications, we remove year-fixed effects because of their collinearity with *COVID*. The coefficients on *COVID* are negative in each case but only statistically significant at the 10% level for operating-lease expenses. However, we find that the coefficients are not statistically significantly different (at the 10% level) from each other.

These results alleviate concern that our results in Table 2 could be sensitive to the specific measure of negative shocks to firms' economic activities. These results also corroborate the view that variable leases do not appear to be particularly sensitive to negative economic shocks and are consistent with anecdotal evidence from the airline industry. For example, Heese et al. (2021a) and Heese, Pérez-Cavazos, and Kelley (2021b) show that American Airlines' variable-lease expenses did not drop significantly during the first quarters of the COVID-19 pandemic; they remained large in absolute magnitude and as a percentage of operating-lease and finance-lease expenses.[19]

[19]We acknowledge the possibility that the insignificant decline in variable-lease expenses during the COVID-19 pandemic could in part be explained by government bailout programs impacting firms' expenditures.

4.4 Discussion

The results of our first set of analyses presented in Sections *4.2* and *4.3* show some evidence that variable-lease expenses can in some circumstances be more sensitive to changes in economic conditions than operating- or finance-lease expenses. However, the results also show that the persistence and predictability of variable-lease expenses are similar to those of operating- and finance-lease expenses.

Taken together, these results suggest that the drivers of variable-lease expenses could be generally quite persistent and predictable. To illustrate this point, Eq. (4) models variable-lease expense ($VarLease_{i,t}$) as a linear function of an underlying economic driver ($x_{i,t}$)

$$VarLease_{i,t} = \psi x_{i,t}, \tag{4}$$

where ψ represents the sensitivity of the variable-lease expense to changes in the economic driver. Though variable leases are designed to respond to changes in the economic driver ($\psi > 0$), the expenses may remain persistent and predictable if the underlying economic drivers are persistent and exhibit a low degree of variability. For example, under the formulation of Eq. (4), the persistence regression we estimate in Table 2 (Eq. (1)) captures the persistence of the economic drivers:

$$\psi x_{i,t} = \phi\left(\psi x_{i,t-1}\right) + Controls_{i,t} + \delta_t + \epsilon_{i,t}. \tag{5}$$

Our findings—variable-, operating-, and finance-lease expenses are similarly persistent and predictable—are thus consistent with the idea that the economic drivers underlying variable-lease expenses are highly persistent. As an approximation, we confirm that revenues are highly persistent. Cross-sectional regressions of firm revenues on prior-period revenues produce a slope coefficient of 1.04 that is significant at the 1% level (untabulated).

One limitation of our analysis is that it is constrained (by the availability of data) to the properties of one-year-ahead variable-lease costs. Indeed, objections to recognizing variable-lease

liabilities centered around the difficulty of and lack of precision in forecasting long-horizon variable-lease costs. While we cannot speak to the properties of long-term variable-lease costs, we offer several considerations for why short-horizon properties are of first-order importance to standard setters.

To begin with, the precision of short-horizon forecasts is more important than long-horizon forecasts in the measurement of lease liabilities due to the effect of discounting. In particular, the impact of a given dollar amount of forecast error on the present value of future lease payments declines with the horizon of the forecast as a result of discounting. To illustrate the relative importance of short-horizon versus long-horizon forecasts, we conduct a simulation analysis using lease disclosures from fiscal year 2021. We begin with a sample of 1,978 firms for which minimum lease commitments and operating-lease liabilities are non-missing. We then simulate counterfactual lease liabilities that would result if the future period's minimum lease commitment is higher than the reported amount by 10%, 30%, or 50% (degree of estimation error).

To conduct this analysis, we first reverse-engineer the present-value calculation for each firm's lease liability. To do so, we interpolate the lease commitments beyond five years ahead ($t+5$), reported as "commitments thereafter" (Compustat item "MRCTA"), by linearly fading the lump sum from $t+6$ to $t+10$.[20] We then impute the discount rate that would equate a firm's reported operating lease liability to its actual ($t+1$ to $t+5$) and interpolated ($t+6$ to $t+10$) future minimum lease commitments. Together, these data serve as the benchmark against which we compare counterfactual lease liabilities that result from lease-cost-forecast errors. Specifically, we compute lease liabilities that would result if an estimate of a future period's lease cost is higher by 10%, 30%, or 50%. For each degree of estimation error, we estimate the effect on firms' lease liabilities if the estimation error is incurred in years t + 1 to t + 10. We plot the simulated percentage (%) impact from these different estimation errors on the lease liability in Figure 3.

Figure 3 shows that the precision of short-horizon forecasts is more important than that of long-

[20] We make the simplifying assumption that lease contracts are not longer than 10 years. However, our conclusions remain if we allow for longer lease contracts.

horizon forecasts. Each of the curves is downward sloping, suggesting that short-horizon forecast errors have a far greater economic impact on lease liabilities. For example, a 50% estimation error in one-year-ahead lease costs would overstate the lease liability by about 11% on average, but a 50% estimation error in ten-year-ahead lease costs only over-states the lease liability by about 1% on average. Moreover, as a result of the effect of discounting, estimation errors for long-horizon lease costs have a relatively small impact on lease liabilities: a 10% error for one-year-ahead lease costs has a larger impact on the lease liability on average than a 50% forecast error for ten-year-ahead lease costs.

These results show that the persistence and predictability of short-to-intermediate-term variable-lease costs are most relevant for standard setters in considering the reliability of liability measurement. To better understand the intermediate-term properties of variable-lease costs, we also examine their persistence and predictability over a two-year period and tabulate the results in Table 5.

Table 5, Panel A, shows results from cross-sectional tests examining the persistence of the different types of leases over a two-year period. We follow the format of Table 2, Panel A, but replace the main regressor of interest with $Lease_{i,t-2}$. Table 5, columns 1-3 (without firm-level controls) and 4-6 (including firm-level controls), show that variable leases are highly persistent over a two-year period: in column 1 (4), the persistence parameter is approximately 0.920 (0.872) and statistically significant at the 1% (1%) level. The remaining columns suggest that operating-lease and finance-lease expenses also exhibit highly statistically significant persistence parameters that are nearly identical in economic magnitudes to variable leases. For example, the persistence parameter for operating leases is approximately 0.927 (0.871) in column 2 (5), suggesting that operating-lease expenses are only 0.7% more (0.1% less) persistent than variable-lease expenses. Overall, these results show that the persistence of variable leases over a two-year horizon is similar to that of operating and finance leases.

Additionally, we examine whether the predictability of two-year-ahead variable-lease expenses

differs from that of operating and finance leases. We follow the logic of Table 2, Panel B, but compute MSEs using standardized $Lease_{i,t}$ as the target variable and standardized $Lease_{i,t-2}$ as the forecast. Table 5, Panel B, provides pairwise tests of the differences in MSEs. Column 1 tests the MSE differences between standardized variable- and operating-lease expenses for the subsample of observations with squared prediction errors for both types of expenses. The results suggest that, on average, the MSEs from variable-lease expenses are lower than those from operating-lease expenses. While the difference is statistically significant at the 1% level, it is economically small at 0.03 standard deviations (i.e., the last row which reports the RMSE differences). Columns 2 and 3 show that variable- and operating-lease expenses exhibit statistically significantly (at the 1% level) higher MSEs than finance-lease expenses, but the differences are not economically meaningful. Columns 4-6 report the results from a variant of the tests in columns 1-3 that includes industry-fixed effects, using four-digit GICS industries; our results and inferences are virtually identical. At the minimum, these results suggest that there is no basis for concluding that two-year-ahead variable lease expenses are less persistent or predictable compared to two-year-ahead operating-lease expenses.

Overall, our results are consistent with the possibility that variable-lease payments could be largely fixed in substance (Alqamoussi et al., 2014) and that lessors and lessees negotiate leases characterized by contingent rental arrangements with some level of shared understanding about the likely amount of payments. For example, both parties are probably unwilling to enter into an agreement that involves large and unpredictable changes in lease payments. Given the persistence and predictability of variable lease expenses, our findings thus call into question the current practice of keeping variable-lease liabilities off-balance-sheet.

5. Firms' Outcomes and Investors' Behavior after ASC 842

In this section, we turn to the second research question: to what extent does the different accounting treatments of variable leases impact firms' or investors' behaviors?

5.1 Minimum Operating Lease Commitments

We begin by examining whether firms restructure part of their operating leases as variable leases after the adoption of ASC 842. These tests are motivated by the concerns that companies could change the terms of an operating lease contract to keep it off-balance-sheet after ASC 842 (Alqamoussi et al., 2014). Anecdotal evidence appears to support the possibility that firms might engage in such behavior. For example, in its 2017 10-K, American Airlines disclosed minimum operating lease commitments for 2018 of $2.2 billion. However, in its 2018 10-K, prepared in accordance with ASC 842, American Airlines disclosed actual operating-lease costs of only $1.9 billion, representing a reduction in operating leases of approximately 15.1%. Similarly, recent studies (Li and Venkatachalam, 2022; Ma and Thomas, 2022; Yoon, 2021) show that firms reduced their minimum operating lease commitments after the adoption of ASC 842, and argue that the evidence is consistent with strategic restructuring of operating lease contracts.

To examine the possibility of systematic lease restructuring, we regress firms' minimum one-year-ahead operating lease commitments scaled by prior-year total assets on *ASC842Adopt*. *ASC842Adopt* is set to one for financial statements prepared after the adoption of ASC 842, and zero otherwise. To avoid incorporating the effect of ASC 842 into our scalar variable (total assets), the sample for these tests begins in fiscal year 2014 and ends in the first year after adoption of ASC 842. We do not include year-fixed effects due to their collinearity with *ASC842Adopt*. However, our specifications vary in terms of the inclusion of firm-level controls and the subsamples analyzed.

Table 6, Panel A, columns 1-2, suggest that, for the full sample of firms, adoption of ASC 842 is associated with an average decline in firms' minimum operating lease commitments of 3-4% of total assets. These estimates are statistically significant at the 1% level. Columns 3-4 repeat the same regression specifications but use a subsample of firms more reliant on variable leases. A firm belongs to the "HighVar" subsample if its mean variable-lease expense post-ASC842 exceeds the median for the overall sample. To the extent that the shifting of operating-lease commitments occurs at firms that rely on variable leases more extensively, we expect the negative coefficients on *ASC842Adopt*

to be larger in magnitude. Indeed, the coefficient on *ASC842Adopt* is negative and statistically significant in columns 3-4, and the economic magnitudes are slightly larger than their counterparts in columns 1-2. Finally, columns 5-6 repeat the same regression specifications, estimated on the subsample of firms whose balance sheets stood to be most impacted by ASC 842. Specifically, a firm belongs to the "HighMRC" subsample if the average pre-period ratio of one-year-ahead minimum rental commitments to revenues exceeds the pre-period sample median. To the extent that these firms may have greater incentives or opportunities to restructure leases, we expect the negative coefficients on *ASC842Adopt* to be larger in magnitude. Indeed, the coefficient on *ASC842Adopt* is negative and statistically significant in columns 5-6 and the economic magnitudes are substantially larger than their counterparts in columns 1-2.

Table 6, Panel B, provides an alternative test. Instead of scaling minimum rental commitments by lagged assets, this panel uses contemporaneous revenues as the scalar. The advantage is that the scalar is not mechanically impacted by the adoption of ASC 842, allowing us to use the full sample. The results from these tests are qualitatively very similar to those reported in Panel A.

5.2 Separating the Incentive Hypothesis and the Compliance Hypothesis

Our finding that minimum operating lease commitments decline after the adoption of ASC 842 raises the possibility that some firms restructure operating leases as variable leases (the "incentive hypothesis"). However, the results of Table 6 could also reflect that compliance with ASC 842 encouraged firms to scrutinize lease contracts more carefully, leading them to identify and separate variable components of leases ("the compliance hypothesis").

A maintained assumption of the compliance hypothesis is that, prior to ASC 842, minimum lease commitments contained significant measurement errors and may have included variable-lease costs. Indeed, our conversations with practitioners involved in helping firms to implement ASC 842 suggested that, prior to adopting ASC 842, firms' data collection for and reporting of minimum operating lease commitments were often not robust and thus could include variable-lease costs.

Moreover, compliance with the new lease standard often involved significant updates to firms' internal information systems, including the digitization of lease contracts. Thus, under this alternative hypothesis, compliance with ASC 842 would lead firms to improve disclosure of minimum rental commitments by (appropriately) removing expected variable-lease payments.

To assess these two alternative explanations, we run two additional tests. First, to examine the role of incentives for restructuring, we test whether firms in greater financial distress pre-ASC-842 exhibit a larger decline in minimum operating lease commitments after adopting ASC 842. If firms are strategically restructuring leases, distressed firms would have greater incentives to keep leases off-balance-sheet and should exhibit a greater decline in minimum operating lease commitments than non-distressed firms (e.g., Caskey, 2009). To capture the level of financial distress, we compute firms' pre-period average Altman (1968) Z-Score and Ohlson (1980) O-Score.

Table 7 estimates the regression specifications from Table 6, Panels A and B, column 2, for the subsamples of high- and low-financial-distress firms. In both panels and across both measures of financial distress, we do not find evidence that firms in greater financial distress prior to the new standard experienced a larger decline in operating lease commitments after ASC 842 adoption.

To test the compliance hypothesis, we next examine whether the revenue elasticity of minimum operating lease commitments changes after adoption of ASC 842. If the decline in these commitments is due to firms' greater scrutiny of lease contracts due to compliance, we would expect sensitivity to revenue changes to decrease after adoption of ASC 842. The intuition is that, prior to adoption of the new lease standard, operating-lease commitments also incorporated expected variable-lease payments (which are more sensitive to revenues). After adopting the new lease standard, these minimum commitments are less likely to incorporate expected variable-lease payments, reducing the revenue elasticity of these commitments.

Empirically, we regress the log of one-year-ahead minimum lease commitments on the log of revenues ($Log(Revenue)$), an indicator for ASC 842 adoption ($ASC842Adopt$), and an interaction of the two terms. Under the compliance hypothesis, we expect the coefficient on $Log(Revenue)$ to

be positive and significant and the coefficient on the interaction term to be negative and significant.

Table 8 reports the results of this analysis. Columns 1 and 2 estimate the regression using the full sample of firms and document results consistent with the compliance hypothesis. Both columns include firm controls; neither column includes year-fixed effects, which are highly collinear with *ASC842Adopt*; and only column 2 includes firm-fixed effects. Columns 3-6 repeat the specification of column 2 but for subsamples of low-financial-distress firms (columns 3 and 5) and high-financial-distress firms (columns 4 and 6), as in Table 7. If the compliance hypothesis is the main driver of the observed decline in minimum lease commitments after ASC 842, we expect the revenue elasticity of these commitments to decline for both low- and high-financial-distress companies. The results of Table 8 confirm these predictions. Overall, our findings suggest that the decline in minimum lease commitments after adoption of ASC 842 is primarily driven by compliance with the new standard rather than strategic restructuring of lease contracts to move liabilities off-balance-sheet.

5.3 Leverage, Equity Betas, and Credit Ratings

Next, we examine how leverage, equity betas, and credit ratings change after firms adopted ASC 842. Table 9, Panel A, tests the effect of the new lease standard on firms' debt-to-equity ratios. Ex-ante, we expect the recognition of operating leases due to the new lease standard to significantly increase leverage ratios.

We regress the log of the debt-to-equity ratio on *PostASC842Adopt* and firm-fixed effects. Columns 1 and 2 do not include firm controls; columns 3 and 4 do. We do not include year-fixed effects because they are highly collinear with the *PostASC842Adopt* indicator. In columns 1 and 3, we compare the pre-period debt-to-equity ratios to the first year after ASC 842 adoption; this is similar to the specifications examined in Table 6, Panel A, and 7, Panel A. In both cases we find that leverage increased significantly (both statistically and economically). The magnitude of the coefficient on *PostASC842* reported in column 3—a specification that includes controls for return on assets, log of total assets, log of the book-to-market ratio, and log of market capitalization—is

substantially smaller than that in column 1, which does not include firm-level controls. Nevertheless, the coefficient on *PostASC842Adopt* in column 3 remains economically significant; this suggests that debt-to-equity ratios increased by 25% after firms adopted ASC 842 and were required to recognize operating-lease liabilities. Columns 2 and 4 compare the pre-period debt-to-equity ratios to the full post-period sample, similar to the specifications examined in Table 6, Panel B, and 7, Panel B. These specifications show results very similar to those of their counterparts in columns 1 and 3.

Given the increase in financial leverage after the adoption of ASC 842, we next examine whether market betas were also impacted. Table 9, Panel B, columns 1 and 2, show that firms' equity betas increase modestly after the adoption of ASC 842, by about 2-5% on average. Our finding that the magnitudes of the changes in equity betas are not economically large relative to the magnitude of the increase in financial leverage suggests that, prior to ASC 842, equity betas had already impounded a large fraction of the off-balance-sheet liabilities associated with operating leases. That being said, our results suggest that the new lease standard did provide new information to equity investors; we find that equity betas increase modestly after firms adopted ASC 842.

We also analyze whether equity betas in the post-ASC842 period reflect potential off-balance-sheet liabilities stemming from variable leases. Table 9, Panel B, columns 3-6, analyze a subsample consisting of observations for firms that adopted the new lease standard. Column 3 reports results from regressing equity betas on leverage, year-fixed effects, and firm-level controls. Consistent with theory (Modigliani and Miller, 1958), we find that equity betas in the post-ASC842 period are positively and significantly (at the 5% level) associated with debt-to-equity ratios.

In Table 9, Panel B, column 4, we also include the log ratio of variable-lease expenses to operating-lease expenses as an explanatory variable. Our assumption is that off-balance-sheet liabilities associated with variable leases are proportional to this ratio. Thus, to the extent that equity betas reflect variable-lease liabilities, we expect to find a positive and significant loading on this additional control. However, the results in column 4 show that the coefficient on this

ratio is small and statistically indistinguishable from zero (at the 10% level). Columns 5 and 6 report results from the same specifications as in columns 3 and 4 respectively, but also include firm-fixed effects. Inferences here do not change: equity betas are positively associated with firms' debt-to-equity ratios, but do not reflect the extent of firms' variable leases.

Table 9, Panel C, provides a similar analysis for credit ratings. All of the regression specifications are identical to those in Table 9, Panel B, but we use the log of a ranked measure of credit ratings in which the highest credit rating (AAA) is assigned a value of 23 and the lowest rating (D) is assigned a value of 1. In Table 9, Panel C, columns 1 and 2, we find that credit ratings decline modestly (between 1.5% and 3.5%) after firms adopt ASC 842. In the post-adoption period, we show that credit ratings are negatively and significantly (at the 1% level) associated with financial leverage; however, we do not find that credit ratings reflect the extent of variable leases (see column 3). These results are broadly consistent with our analysis of equity betas, and suggest that firms' variable leases do not affect a firm's credit rating.

For consistency with Table 9, Panel B, we also report the results from the firm-fixed effects specifications in Table 9, Panel C, columns 4 and 5. These results are uninformative. The inclusion of firm-fixed effects absorbs nearly all of the variation in credit ratings, which are very sticky over time.

5.4 Estimating Variable-Lease Liabilities

Our previous analyses suggest that market participants do not appear to factor in potential liabilities stemming from variable leases, consistent with anecdotal evidence (Eaglesham, 2019). Therefore, we propose a methodology for calculating conservative estimates of off-balance-sheet liabilities associated with variable leases.

Our findings in Table 2 and 4 suggest that variable-lease expenses exhibit characteristics similar to those of operating-lease expenses, implying that liabilities associated with variable-lease expenses could be estimated as reliably as operating-lease liabilities. For example, if variable-lease expenses

largely co-vary with operating-lease expenses, and if the liabilities could be reliably estimated, we could use the ratio of variable-lease expenses to operating-lease expenses to estimate the amount of off-balance-sheet variable-lease liabilities for a firm.[21]

Untabulated analyses support the idea that operating-lease expenses represent a useful anchor for variable-lease expenses. We find that variable-lease expenses are about three times more responsive to operating-lease expenses than to revenues: a 1% change in operating-lease expenses corresponds to a 0.5% change in variable-lease expenses.

To test this idea further, we examine the properties of the ratio of variable-lease expenses to operating-lease expenses in Table 10, using the sample of observations with non-missing values for both types of lease expenses. Column 1 shows that the variable-lease-to-operating-lease-expense ratio is highly persistent, exhibiting a persistence parameter of 1.02 that is statistically significant at the 1% level. Columns 2-4 show that this ratio is weakly associated with revenues (both economically and statistically). For example, column 2 suggests that a 1% increase in revenues is associated with a 0.049% (with statistical significance at the 10% level) increase in the ratio, while column 3 suggests that an on-average 50% revenue decline is associated with an 6.5% decline in the ratio (with significance at the 5% level). Column 5 shows that, for the set of firms with the relevant lease expense disclosures, the COVID-19 pandemic did not significantly impact this ratio either statistically (at the 10% level) or economically. As shown in column 6, we obtain similar results using the subset of firms that belong to the variable-lease-dependent and COVID-19 sensitive industries, analyzed in Table 4.

Overall, the results in Table 10 support the use of operating-lease expenses as an anchor for variable-lease expenses. Importantly, these results imply that the ratio of these two expenses corresponds to the ratio of the liabilities associated with variable and operating leases. For intuition, consider the following hypothetical example. Suppose a firm's variable-lease expense each period

[21] In principle, similar arguments could be made for finance-lease expenses. However, we use operating-lease expenses as an anchor for variable-lease expenses because there are twice as many observations of operating-lease expense disclosures as there are of finance-lease expense disclosures in our sample.

is a fixed fraction c of its operating-lease expense:

$$VarLease_{i,t} = c \cdot OpLease_{i,t}. \tag{6}$$

Operating-lease liabilities are computed as the discounted future operating-lease payments:

$$OpLease\ Liability_{i,t} = \sum_{k=1}^{\infty} \frac{OpLease_{i,t+k}}{(1+r)^k}, \tag{7}$$

where r denotes the company's borrowing rate. Variable-lease liabilities are implied by Eq. (6) and (7) and represent a fixed fraction c of operating-lease liabilities:

$$VarLease\ Liability_{i,t} = \sum_{k=1}^{\infty} \frac{c \cdot OpLease_{i,t+k}}{(1+r)^k} = c \cdot OpLease\ Liability_{i,t}. \tag{8}$$

We leverage this intuition to provide back-of-the-envelope estimates of off-balance-sheet liabilities associated with variable-lease expenses. To provide conservative estimates of variable-lease liabilities, we begin by computing the minimum of the observed variable-lease-to-operating-lease expense ratio for each firm after adoption of ASC 842. We then apply this minimum ratio to each firm's disclosed operating-lease liability.

Table 11 reports the results of our estimates using the most recent observation for each firm in our sample (largely from fiscal year 2021). In this table, we report for the estimation sample in row 1, and by industry (using the four-digit GICS) in the remaining rows: the number of firms (column 1), the sum of total assets (column 2), the sum of total debt (column 3), the sum of reported operating-lease liabilities (column 4), and the sum of variable-lease liabilities estimated using the methodology described above (column 5). We also report the average (median) of the ratio of operating-lease liabilities to total debt in column 6 (column 9), the average (median) of the ratio of estimated variable-lease liabilities to total debt in column 7 (column 10), and the average (median) of the ratio of variable-lease liability to operating-lease liability in column 8 (column 11).

Industries with a variable-lease-liability-to-debt ratio of at least 7.7% (the overall average across all industries) are highlighted in grey.

The estimates summarized in Table 11 indicate that recognizing variable leases would add a total of $281 billion in total debt to the balance sheets of our sample firms with variable leases. For the average firm with variable leases, recognizing variable leases would increase total debt by 7.7% (column 7, row 1). These magnitudes vary drastically by industry. For example, recognizing variable leases would increase total debt by more than 10% for the average firm with variable leases in the consumer durables, food and staples retailing, and transportation industries, and by more than 13% in the retailing and pharmaceuticals industries. In contrast, recognizing variable leases would increase total debt by less than 3% for the average firm with variable leases in the automobiles, capital goods, household goods, insurance, materials, energy, and real estate industries.

Moreover, estimated variable-lease liabilities represent an economically significant percentage of operating-lease liabilities: for the average (median) firm, variable-lease liabilities represent approximately 25% (17%) of operating-lease liabilities as shown in column 8, row 1 (column 11, row 1). This ratio is especially high in the transportation industry with 59% (20%) for the average (median) firm and in the food and beverage industry with 63% (20%) for the average (median) firm. The ratio is lower in the automobiles and components industry with 9.4% (6.9%) for the average (median) firm and the telecommunication services industry with 12.4% (9.2%) for the average (median) firm. Overall, the results of Table 11 suggest that recognizing variable leases could be relevant for investors and other users of financial statements, and can help standard setters and users to make more informed decisions on how to treat variable leases.

6. Conclusion

ASC 842 requires firms to recognize both finance and operating leases on a firm's balance sheet. However, the FASB made an exception for leases with variable payments, which can still be kept off firms' balance sheets. The FASB attributed this decision based to feedback from preparers about

the difficulty of reliably estimating future variable-lease payments, which can vary over time due to changes in economic activity associated with the leased asset.

This study shows that variable-lease expenses exhibit statistical properties similar to those of operating and finance leases. Like operating-lease and finance-lease expenses, variable-lease expenses are highly persistent and predictable. However, we do not find evidence that firms strategically restructure operating leases as variable leases after the adoption of ASC 842. Instead, it appears that firms experience a reduction in their minimum operating lease commitments after adopting ASC 842 because the new standard encouraged them to more diligently distinguish operating leases from variable leases. After adopting ASC 842, firms' leverage increases substantially, and equity betas (credit ratings) increase (decrease) modestly. However, equity betas and credit ratings do not reflect potential variable-lease liabilities. Conservative estimates show that recognition of variable-lease liabilities would increase total debt by 8% for the average firm with variable leases. Overall, our findings call into question the assumptions underlying ASC 842's differential treatment of variable leases.

Though our study provides the first evidence on the properties of variable leases, and on the implications for firm and investor behaviors, we acknowledge that our analysis of the implications is constrained by the recency of the new standard and by our lack of data on actual lease contracts. For example, future research could revisit the question of whether firms restructure operating leases as variable leases by analyzing detailed lease-contract data. Similarly, market participants might become more sophisticated over time at incorporating information on firms' variable leases in their assessments of firms' financial liabilities and risks. These are promising avenues for research that will enhance our understanding of ASC 842's effects and of how firms and market participants adapt to new accounting standards.

References

Allen, A. and K. Ramanna (2013, 2). Towards An Understanding of the Role of Standard Setters in Standard Setting. *Journal of Accounting and Economics 55*(1), 66–90.

Alqamoussi, J., S. Muir, D. Zeyher, and P. Buchanan (2014). Leases — In-Substance Fixed Payments. *FASB / IASB Staff Paper* (April), 1–15.

Altamuro, J., R. Johnston, S. S. Pandit, and H. H. Zhang (2014, 6). Operating Leases and Credit Assessments. *Contemporary Accounting Research 31*(2), 551–580.

Altman, E. I. (1968, 9). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *The Journal of Finance 23*(4), 589.

Angrist, J. D. and J.-S. Pischke (2008). Mostly harmless econometrics: An empiricist's companion. *An empiricist's companion* (March), 392.

Barth, M. E. and G. Clinch (2009). Scale effects in capital markets-based accounting research. *Journal of Business Finance and Accounting 36*(3-4), 253–288.

Beatty, A., S. Liao, and J. Weber (2010, 7). Financial Reporting Quality, Private Information, Monitoring, and the Lease-versus-Buy Decision. *The Accounting Review 85*(4), 1215–1238.

Bratten, B., P. Choudhary, and K. Schipper (2013). Evidence that Market Participants Assess Recognized and Disclosed Items Similarly when Reliability is Not an Issue. *The Accounting Review 88*(4), 1179–1210.

Callahan, C. M., R. E. Smith, and A. W. Spencer (2013, 7). The Valuation and Reliability Implications of FIN 46 for Synthetic Lease Liabilities. *Journal of Accounting and Public Policy 32*(4), 271–291.

Caskey, J. and N. B. Ozel (2019, 11). Reporting and Non-Reporting Incentives in Leasing. *The Accounting Review 94*(6), 137–164.

Caskey, J. A. (2009). Information in equity markets with ambiguity-averse investors. *Review of Financial Studies 22*(9), 3595–3627.

Comiran, F. H. (2014). Lobbying Behavior: Evidence from Proposed Changes in Lease Accounting. *Working Paper*.

Eaglesham, J. (2019, 11). Airlines Get a Break in New Accounting for Leases. *The Wall Street Journal (https://www.wsj.com/articles/airlines-get-a-break-in-new-accounting-for-leases-11573819202)*.

Eisfeldt, A. L., A. A. Rampini, A. L. Eisfeldt, and A. A. Rampini (2009). Leasing, Ability to Repossess, and Debt Capacity. *Review of Financial Studies 22*(4), 1621–1657.

Ely, K. M. (1995). Operating Lease Accounting and the Market's Assessment of Equity Risk. *Journal of Accounting Research 33*(2), 397–415.

FASB (2016). Background Information and Basis for Conclusions. Technical report.

Gipper, B., B. J. Lombardi, and D. J. Skinner (2013, 12). The politics of accounting standard-setting: A review of empirical research. *Australian Journal of Management 38*(3), 523–551.

Hales, J. W., S. Venkataraman, and T. J. Wilks (2012, 1). Accounting for Lease Renewal Options: The Informational Effects of Unit of Account Choices. *The Accounting Review 87*(1), 173–197.

Heese, J., G. Pérez-Cavazos, and J. Kelley (2021a). Accounting for Leases at American Airlines (A). *Harvard Business School Case 120-069*, 1–23.

Heese, J., G. Pérez-Cavazos, and J. Kelley (2021b). Accounting for Leases at American Airlines (B). *Harvard Business School Case 120-113*, 1–6.

Hoogervorst, H. (2021). Speech: The Balancing Act of Finding the Right Accounting Answer. *IASB.org* (March 9).

IASB/FASB (2010). Leases. *Exposure Draft ED/2010/9* (August), 1–66.

Imhoff, E. A., R. Lipe, and D. W. Wright (1993). The Effects of Recognition versus Disclosure on Shareholder Risk and Executive Compensation. *Journal of Accounting, Auditing & Finance 8*(4), 335–368.

Imhoff, E. A. and J. K. Thomas (1988). Economic Consequences of Accounting Standards: The Lease Disclosure Rule Change. *Journal of Accounting and Economics 10*(4), 277–310.

Kraft, P. (2015). Do rating agencies cater? Evidence from rating-based contracts. *Journal of Accounting and Economics 59*(2-3), 264–283.

Li, B. and M. Venkatachalam (2022). Leasing Loses Altitude While Ownership Takes Off: Real Effects of the New Lease Standard. *Working Paper*.

Ma, M. S. and W. B. Thomas (2022). Economic Consequences of Operating Lease Recognition. *Journal of Accounting and Economics (Forthcoming)*.

Modigliani, F. and M. H. Miller (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *American Economic Review 48*(3), 261–297.

Ohlson, J. A. (1980). Financial Ratios and the Probabilistic Prediction of Bankruptcy. *Journal of Accounting Research 18*(1), 109–131.

Palazzo, D. and J. Yang (2019). Spike in 2019Q1 Leverage Ratios: The Impact of Operating Leases. Technical report, Board of Governors of the Federal Reserve System, December 13, 2019, Washington.

Puro, M. (1984). Audit Firm Lobbying Before the Financial Accounting Standards Board: An Empirical Study. *Journal of Accounting Research 22*(2), 624.

Rouen, E., E. C. So, and C. C. Wang (2021). Core earnings: New data and evidence. *Journal of Financial Economics, Forthcoming*.

Schipper, K. (2007, 3). Required Disclosures in Financial Reports. *The Accounting Review 82*(2), 301–326.

Securities and Exchange Commission (2005). Report and Recommendations Pursuant to Section 401(c) of the Sarbanes-Oxley Act of 2002 On Arrangements with Off-Balance Sheet Implications, Special Purpose Entities, and Transparency of Filings by Issuers. Technical report, Securities and Exchange Commission.

Sharpe, S. A. and H. H. Nguyen (1995). Capital Market Imperfections and the Incentive to Lease. *Journal of Financial Economics 39*(2-3), 271–294.

Yoon, Y. S. (2021). Recognition versus disclosure: Operating lease capitalization and managerial leasing decisions. *Working Paper*.

Appendix: Description of Variables

This table defines accounting and financial variables used in our analyses. The variables are constructed using data from Compustat [Compustat]; the SEC's XBRL API, as well as manual data collection [API + Manual]; and the Federal Reserve Economic Data provided by the St. Louis Federal Reserve [FRED]. *lag* (*lag2*) variables refer to prior-year (two-year's prior) value; *abs* variables refer to the absolute value; *log* variables refer to the natural log of the value.

Variable	Description
VarLease	Variable-Lease Cost obtained from API and manual data collection; API data item: "us-gaap/VariableLeaseCost." [API + Manual]
OpLease	Operating-lease cost obtained from API and manual data collection; API data item: "us-gaap/OperatingLeaseCost." [API + Manual]
FinLease	Finance-Lease Cost obtained from API and manual data collection; sum of API data items: "us-gaap / FinanceLeaseInterestExpense" and "us-gaap/FinanceLeaseRightOfUseAssetAmortization." [API + Manual]
VarLease Liability	Estimated Variable-Lease Liability. Constructed at the firm level using the following variables: *OpLease Liability* * Min(*VarLease* / *OpLease*). [API + Manual]
OpLease Liability	Operating-Lease Liability obtained from API and manual data collection: "us-gaap/OperatingLeaseLiability." [API + Manual]
Revenue	Total revenue obtained from Compustat; data item: "REVT." [Compustat]
Assets	Total assets obtained from Compustat; data item: "AT." [Compustat]
Liabilities	Total liabilities obtained from Compustat; data item: "LT." [Compustat]
Debt	Total debt obtained from Compustat; data item: "DT." [Compustat]
Return on Assets	Net income ("NI") / total assets ("AT"). [Compustat]
MRC1	Rental commitments minimum for 1st year; data item: "MRC1." [Compustat]
Market Equity	Market Equity. Constructed at the firm-year level using the following variables: *PRCC_C* * *CSHO* [Compustat]
Book-to-Market	Ratio measuring book equity to market equity constructed at the firm-year level using the following variable: *SEQ/Market Equity* [Compustat]
Z-Score	Altman (1968) Z-score constructed at the firm-year level using the following expression and variables: $3.3 * (EBIT/AT) + 0.99 * (SALE/AT) + 0.6 * (Market\ Equity/LT) + 1.2 * (ACT/AT) + 1.4 * (RE/AT)$, if LT>0 and AT>0 [Compustat]
GNP	Gross National Product scaled (1968 value corresponds to 100); data item: "GNP." [FRED]
O-Score	Ohlson (1980) O-score constructed at the firm-year level using the following expression and variables: $-1.32 - 0.407 * \log(AT/GNP) + 6.03 * LT/AT - 1.43 * WCAP/AT + 0.0757 * LCT/ACT - 1.72 * X - 2.37 * NI/AT - 1.83 * OANCF/LT + 0.285 * Y - 0.521 * (NI - lagNI)/(abs(NI) + abs(lagNI))$ [FRED, Compustat]

Fig. 1. Example of a Lease Footnote: American Airlines Group Inc. 10-K (2021)

This figure provides the lease footnote disclosures of American Airlines Group Inc., as shown in its 10-K for fiscal year 2021.

5. Leases

We lease certain aircraft and engines, including aircraft under capacity purchase agreements. As of December 31, 2021, we operated 696 leased aircraft, with remaining terms ranging from less than one year to 12 years.

At each airport where we conduct flight operations, we have agreements, generally with a governmental unit or authority, for the use of passenger, operations and baggage handling space as well as runways and taxiways. These agreements, particularly in the U.S., often contain provisions for periodic adjustments to rates and charges applicable under such agreements. These rates and charges also vary with our level of operations and the operations of the airport. Because of the variable nature of these rates, these leases are not recorded on our consolidated balance sheets as a ROU asset or a lease liability. Additionally, at our hub locations and in certain other cities we serve, we lease administrative offices, catering, cargo, training, maintenance and other facilities.

The components of lease expense were as follows (in millions):

	Year Ended December 31,		
	2021	2020	2019
Operating lease cost	$ 2,012	$ 1,957	$ 2,027
Finance lease cost:			
Amortization of assets	107	92	79
Interest on lease liabilities	44	38	43
Variable lease cost	2,471	1,801	2,558
Total net lease cost	$ 4,634	$ 3,888	$ 4,707

Included in the table above is $190 million, $172 million and $236 million of operating lease cost under our capacity purchase agreement with Republic for the years ended December 31, 2021, 2020 and 2019, respectively. We hold a 25% equity interest in Republic Holdings, the parent company of Republic.

Fig. 2. Prevalence and Significance of Disclosed Variable-Lease Costs

This figure shows the prevalence and significance of variable-lease costs for our sample firms. The solid line reports the cross-sectional average fraction of firms with variable lease among firms with operating leases. The red dashed series reports the cross-sectional average ratios of variable-lease expense to operating-lease expense among firms with operating leases. The grey dashed series reports the cross-sectional average ratios of variable-lease expense to operating-lease expense among firms with operating and variable leases.

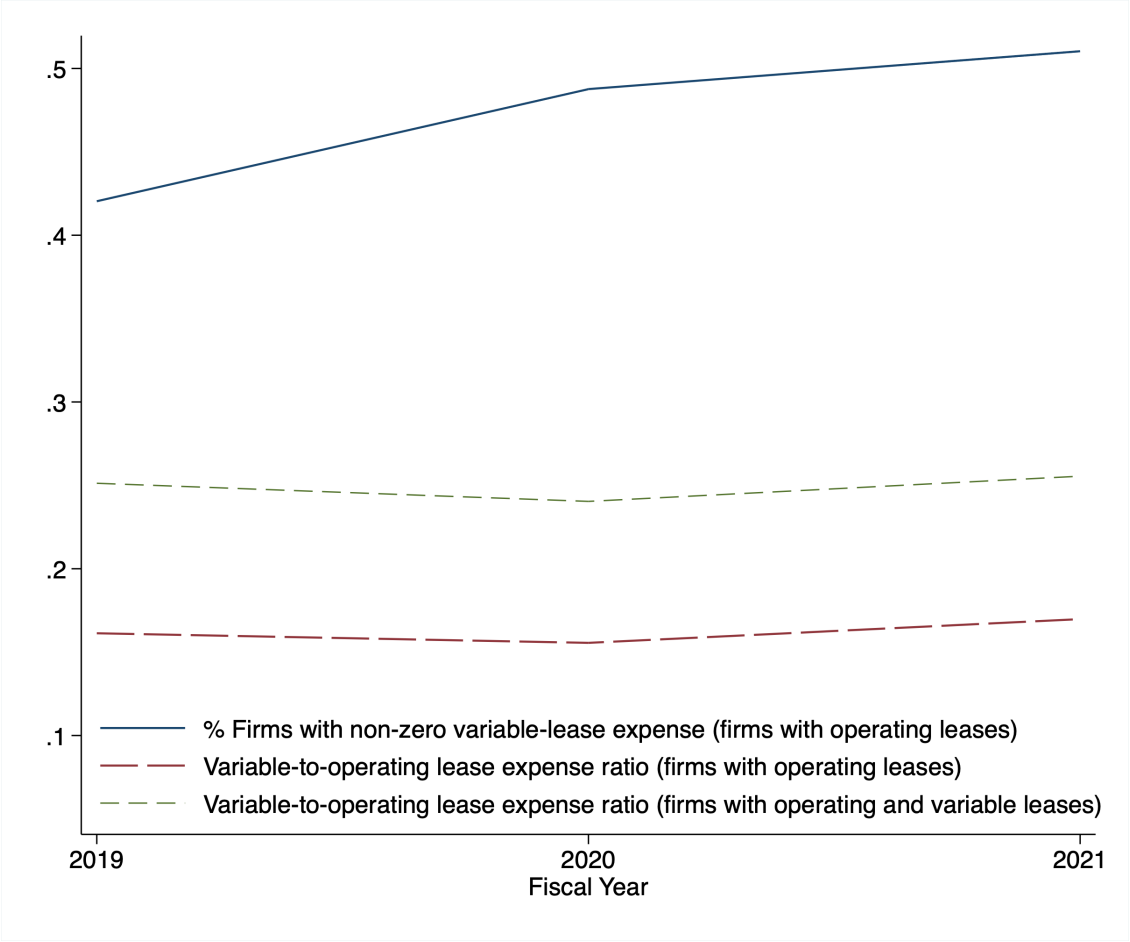

Fig. 3. Simulation Analysis: Impact of Lease Cost Estimation Errors on Lease Liabilities

This figure plots the simulated percentage (%) impact of estimation errors in future lease costs on the lease liability (present value of future lease payments). For this analysis, we use reported operating lease liabilities and reported minimum future operating lease commitments for Compustat fiscal year 2021 and simulate counterfactual lease liabilities that would result if an estimate of a future period's lease cost is higher by 10%, 30%, or 50% (degree of estimation error). For each of these three degrees of estimation errors, we estimate the effect on firms' lease liabilities if the estimation error is incurred in year $t+1$ to $t+10$. The figure plots, for a given degree of estimation error and using the sample firms with relevant lease data, the (local-regression-smoothed) average percentage impact on the present value of lease liabilities as a function of the future period in which the estimation error occurs ("Year of Estimation Error").

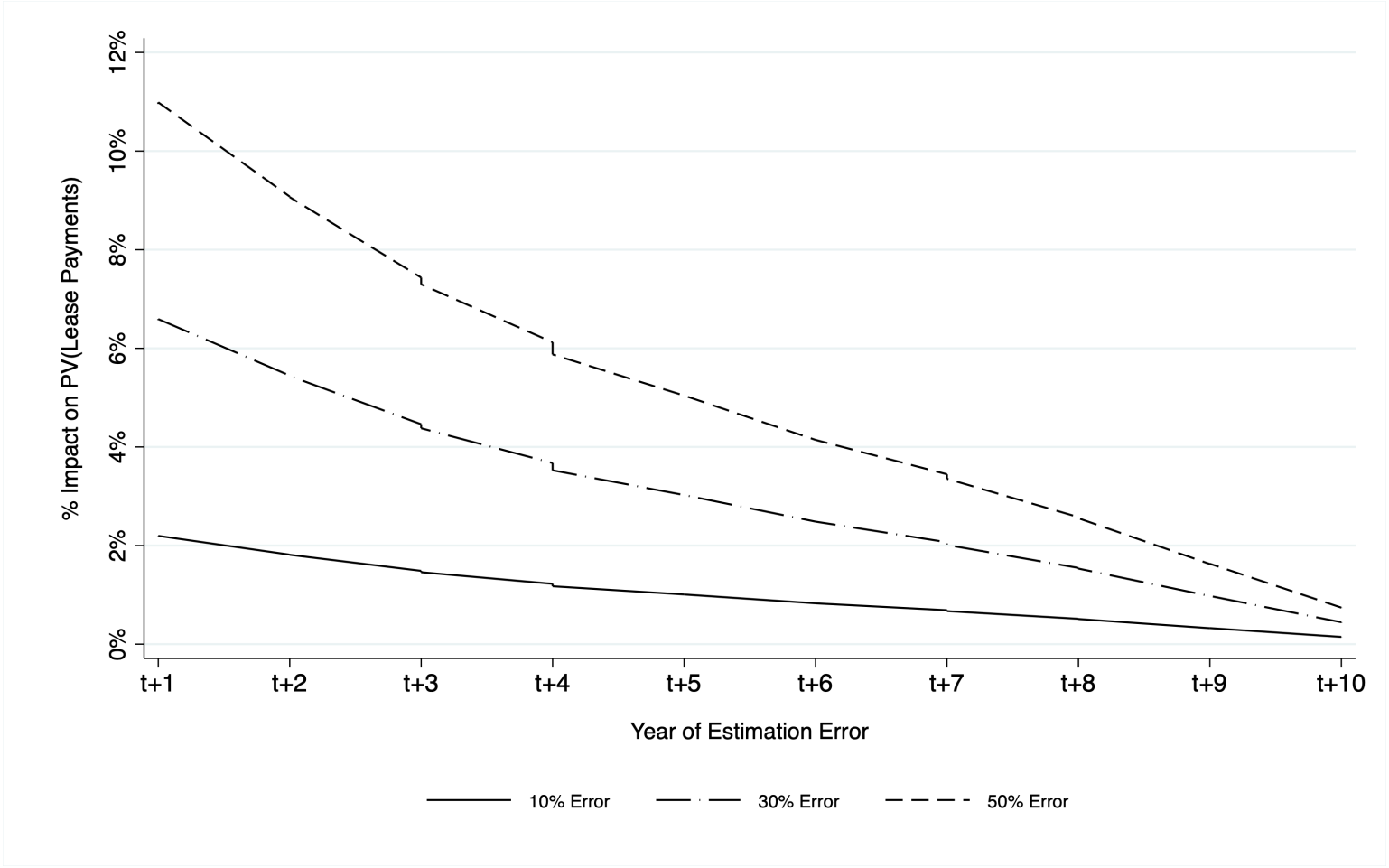

Table 1. Summary Statistics for the Sample

Table 1 presents details on the composition of the sample, which spans the fiscal years 2014 through 2021. Panel A reports the count of firms in our sample that contribute at least one valid data point to our analyses. Its second column tabulates the number of firms in each year that adopted ASC 842 for the first time. The third column tabulates for each year the number of firms that first disclosed their historical lease variables adhering to ASC 842. Panel B presents summary statistics on the main financial variables (in USD millions) analyzed in subsequent tables. The columns N, Mean, and StdDev present total non-missing observations, the sample average, and the sample standard deviation. The columns p10, p25, p50, p75, p90 correspond to the 10th, 25th, 50th, 75th, and 90th percentiles in our sample. All variables are defined in the Appendix.

Panel A: Firm Availability

Year	Total Firms	First Adoption	First Data
2014	2,115	0	2
2015	2,214	0	2
2016	2,307	0	21
2017	2,454	6	165
2018	2,617	25	160
2019	2,845	2,227	2,077
2020	2,909	540	410
2021	2,867	149	90

Panel B: Summary Statistics

	N	Mean	SD	p10	p25	p50	p75	p90
Revenues	19,800	5,773	21,930	37	216	894	3,267	10,993
Assets	19,807	16,816	107,317	157	495	1,886	6,912	23,004
Liabilities	19,784	13,054	95,025	44	214	1,149	4,678	16,116
Debt	17,495	3,111	12,750	0	32	397	1,905	6,249
MRC1	17,166	70	252	1	3	11	45	150
OpLease	8,283	74	286	1	3	11	43	153
VarLease	6,275	29	244	0	0	1	6	35
FinLease	4,484	19	266	0	0	0	5	23
OpLease Liab	7,873	364	1,674	3	12	46	184	649
FinLease Liab	4,374	91	802	0	0	2	27	132

Table 2. Persistence and Predictability of Variable-, Operating-, and Finance-Lease Costs

Table 2 reports results from OLS regressions using the log of variable-lease payments (*Log(VarLease)*), operating-lease payments (*Log(OpLease)*), and finance-lease payments (*Log(FinLease)*) as the dependent variables. Panel A reports estimates regressing on the one-year lag of each respective lease variable. Columns (1)–(3) include year-fixed effects; columns (4)–(6) add firm-level controls. Firm-level controls include *Log(Assets)*, *Return on Assets*, and *Log(Debt/Assets)*. Panel B reports the difference of the mean squared errors (MSEs) between standardized versions of different lease variables. Standardization of each lease variable is performed by scaling each lease variable such that the overall distribution of each lease variable exhibits zero-mean and unit-variance. Columns (1) and (4) refer to the difference of the squared errors between variable lease and operating lease; columns (2) and (5) between variable lease and finance lease; columns (3) and (6) between operating lease and finance lease. Columns (1)-(3) report results without including industry fixed effects, and columns (4)-(6) present results including industry-fixed effects. RMSE refers to the difference in the root mean squared errors (RMSEs) between different lease variables. All variables are defined in the Appendix. All lease variables are winsorized at the top and bottom 1% of the annual cross-sectional distribution. MSEs for each lease type are winsorized at the top and bottom 1% of the standardized distribution. Standard errors appear in parentheses. For Panel A, standard errors clustered at the firm level. Significance levels are indicated by *, **, *** for 10%, 5%, and 1% respectively.

Panel A: Persistence

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(VarLease)	*Log(OpLease)*	*Log(FinLease)*	*Log(VarLease)*	*Log(OpLease)*	*Log(FinLease)*
Lag Log(VarLease)	0.9606***			0.9324***		
	(0.006)			(0.010)		
Lag Log(OpLease)		0.9652***			0.9366***	
		(0.004)			(0.008)	
Lag Log(FinLease)			0.9700***			0.9452***
			(0.009)			(0.013)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No
Firm Controls	No	No	No	Yes	Yes	Yes
Observations	2,327	2,396	1,371	2,327	2,396	1,371
Adjusted R^2	0.9274	0.9728	0.9142	0.9283	0.9734	0.9152

Panel B: Predictability

	(1)	(2)	(3)	(4)	(5)	(6)
	Var–Op	*Var–Fin*	*Op–Fin*	*Var–Op*	*Var–Fin*	*Op–Fin*
MSE Diff	-0.0007*	0.0147***	0.0046***	-0.0008*	0.0148***	0.0047***
	(0.000)	(0.002)	(0.001)	(0.000)	(0.002)	(0.001)
Industry FE	No	No	No	Yes	Yes	Yes
Observations	2,501	1,074	1,070	2,493	1,069	1,065
RMSE Diff	-0.0058	0.0942	0.0439	-0.0053	0.0699	0.0349

Table 3. (Co)Variability of Lease Costs

Table 3 reports results from OLS regressions measuring the sensitivity of lease variables to changes in revenue. The dependent variables are the log of variable-lease payments (*Log(VarLease)*), operating-lease payments (*Log(OpLease)*), or finance-lease payments (*Log(FinLease)*). Panel A reports results from OLS regressions using the log of revenues *Log(Revenue)* and Panel B uses *Large Drop (Sample)* and *Large Drop (By Year)*, which are indicator variables that are set to one for firm-years that have seen a large drop in revenue. Specifically, *Large Drop (Sample)* is set to one for firm-year observations that are in the bottom decile of revenue change in the entire sample described in Table 1; *Large Drop (By Year)* is set to one for firm-year observations that are in the bottom decile of revenue change each year. In Panel B, columns (1)-(3) use *Large Drop (Sample)* as the main explanatory variable of interest; columns (4)-(6) use *Large Drop (By Year)* as the main explanatory variable of interest. All specifications include firm- and year-fixed effects. In Panel A, columns (1)-(3) do not include firm-level controls, while columns (4)-(6) do. In Panel B, all specifications include firm-level controls. Firm-level controls include *Log(Assets)*, *Return on Assets*, and *Log(Debt/Assets)*. All variables are defined in the Appendix. All continuous variables are winsorized at the top and bottom 1% of the annual cross-sectional distribution. Standard errors, clustered at the firm level, appear in parentheses. Significance levels are indicated by *, **, *** for 10%, 5%, and 1% respectively.

Panel A: Elasticity to Revenue

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(VarLease)	*Log(OpLease)*	*Log(FinLease)*	*Log(VarLease)*	*Log(OpLease)*	*Log(FinLease)*
Log(Revenue)	0.1678***	0.1254***	0.1278**	0.1473***	0.0980***	0.1028**
	(0.036)	(0.021)	(0.055)	(0.032)	(0.021)	(0.048)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	No	No	No	Yes	Yes	Yes
Observations	3,442	3,514	2,048	3,442	3,514	2,048
Adjusted R^2	0.9528	0.9804	0.9389	0.9532	0.9819	0.9391

Panel B: Responses to Large Drops

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(VarLease)	*Log(OpLease)*	*Log(FinLease)*	*Log(VarLease)*	*Log(OpLease)*	*Log(FinLease)*
Large Drop (Sample)	-0.0907***	-0.0113	-0.0517*			
	(0.030)	(0.016)	(0.031)			
Large Drop (By Year)				-0.0715**	-0.0125	-0.0677**
				(0.035)	(0.020)	(0.034)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,176	3,247	1,943	3,176	3,247	1,943
Adjusted R^2	0.9498	0.9817	0.9403	0.9497	0.9817	0.9403

Table 4. Analysis of Variable-Lease-Dependent and COVID-19-Sensitive Industries: Airlines, Retail, and Consumer Services

Table 4 reports results from OLS regressions of measures of lease variables on two revenue-change indicators within a subset of industries sensitive to COVID-19. This subset of firms belongs to the following industries: airlines (6-digit GICS code of 203020), retail (4-digit GICS code of 2550), consumer durables and apparel (4-digit GICS code of 2520), and consumer services including hotels and restaurants (4-digit GICS code of 2530). Panel A presents summary statistics on the main financial variables (in USD millions) of the subset of firms analyzed in Panel B. The columns N, Mean, and StdDev present total non-missing observations, the sample average, and the sample standard deviation. The columns p10, p25, p50, p75, p90 correspond to the 10th, 25th, 50th, 75th, and 90th percentiles in our sample. Panel B reports results from OLS regressions of measures of lease variables on two revenue-change indicators. *Large Drop (Sample)* is an indicator variable set to one for firm-year observations that are in the bottom decile of revenue change on the entire sample described in Table 1. *COVID* is an indicator variable set to one for firm-year observations if the firm's fiscal year-end reporting date falls after September 30, 2020. Columns (1)–(3) regress on *Large Drop (Sample)* and include year-fixed effects, firm-fixed effects, and firm-level controls. Columns (4)–(6) regress on *COVID* and include firm-fixed effects, and firm-level controls. Firm-level controls include *Log(Assets)*, *Return on Assets*, and *Log(Debt/Assets)*. All variables are defined in the Appendix. All continuous variables are winsorized at the top and bottom 1% of the annual cross-sectional distribution. Standard errors, clustered at the firm level, appear in parentheses. Significance levels are indicated by *, **, *** for 10%, 5%, and 1% respectively.

Panel A: Summary Statistics on COVID-19 Sensitive Industries

	N	Mean	SD	p10	p25	p50	p75	p90
Revenues	2,320	6,253	19,039	311	689	1,909	5,415	13,250
Assets	2,321	5,956	15,710	276	585	1,850	5,504	14,357
Liabilities	2,316	4,365	11,766	116	297	1,254	3,823	10,867
Debt	2,310	2,387	6,087	2	92	622	2,100	6,202
MRC1	2,308	155	361	3	12	45	167	358
OpLease	956	160	402	4	12	47	162	363
VarLease	860	80	285	0	1	7	41	127
FinLease	549	70	744	0	0	2	10	44
OpLease Liab	916	934	2,871	15	58	225	839	2,119
FinLease Liab	559	240	1,950	0	0	7	57	245

Panel B: Analysis on COVID-19 Sensitive Industries

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(VarLease)	*Log(OpLease)*	*Log(FinLease)*	*Log(VarLease)*	*Log(OpLease)*	*Log(FinLease)*
Large Drop (Sample)	-0.0675	0.0178	0.0788			
	(0.065)	(0.029)	(0.074)			
COVID				-0.0284	-0.0354**	-0.0337
				(0.045)	(0.014)	(0.046)
Year FE	Yes	Yes	Yes	No	No	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	628	647	385	649	668	395
Adjusted R^2	0.9441	0.9885	0.9577	0.9433	0.9885	0.9587

Table 5. Two-Year Persistence and Predictability of Variable-, Operating-, and Finance-Lease Costs

Table 5 reports persistence and predictability results over a two-year time horizon. Panel A reports results from OLS regressions using the log of variable-lease payments (*Log(VarLease)*), operating-lease payments (*Log(OpLease)*), and finance-lease payments (*Log(FinLease)*) as the dependent variables. The results report estimates regressing on the two-year lag of each respective lease variable. Columns (1)–(3) include year-fixed effects; columns (4)–(6) add firm-level controls. Firm-level controls include *Log(Assets)*, *Return on Assets*, and *Log(Debt/Assets)*. Panel B reports the difference of the mean squared errors (MSEs) between standardized versions of different lease variables over a two-year horizon. Standardization of each lease variable is performed by scaling each lease variable such that the overall distribution of each lease variable exhibits zero mean and unit variance. Columns (1) and (4) refer to the difference of the squared errors between variable lease and operating lease; columns (2) and (5) between variable lease and finance lease; columns (3) and (6) between operating lease and finance lease. Columns (1)-(3) report results without including industry-fixed effects, and columns (4)-(6) present results including industry-fixed effects. RMSE refers to the difference in the root mean squared errors (RMSEs) between different lease variables. All variables are defined in the Appendix. All lease variables are winsorized at the top and bottom 1% of the annual cross-sectional distribution. MSEs for each lease type are winsorized at the top and bottom 1% of the standardized distribution. Standard errors, clustered at the firm level, appear in parentheses. For Panel A, standard errors clustered at the firm level. Significance levels are indicated by *, **, *** for 10%, 5%, and 1% respectively.

Panel A: Persistence

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(VarLease)	*Log(OpLease)*	*Log(FinLease)*	*Log(VarLease)*	*Log(OpLease)*	*Log(FinLease)*
Lag2 Log(VarLease)	0.9203***			0.8720***		
	(0.012)			(0.021)		
Lag2 Log(OpLease)		0.9270***			0.8712***	
		(0.008)			(0.015)	
Lag2 Log(FinLease)			0.9332***			0.8785***
			(0.018)			(0.025)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No
Firm Controls	No	No	No	Yes	Yes	Yes
Observations	1,106	1,166	627	1,106	1,166	627
Adjusted R^2	0.8656	0.9353	0.8269	0.8688	0.9385	0.8308

Panel B: Predictability

	(1)	(2)	(3)	(4)	(5)	(6)
	Var–Op	*Var–Fin*	*Op–Fin*	*Var–Op*	*Var–Fin*	*Op–Fin*
MSE Diff	-0.0062***	0.0198***	0.0163***	-0.0063***	0.0199***	0.0164***
	(0.001)	(0.005)	(0.004)	(0.001)	(0.005)	(0.004)
Industry FE	No	No	No	Yes	Yes	Yes
Observations	1,071	463	461	1,069	461	459
RMSE Diff	-0.0321	0.1016	0.0891	-0.0302	0.0684	0.0636

Table 6. Minimum Operating-Lease Payments After ASC842

Table 6 reports the coefficients from an OLS regression of *Log(MRC1*100)* scaled by *Lagged Total Assets* (Panel A) and *Total Revenues* (Panel B) on an indicator set to one for fiscal years after a firm first adopted ASC 842 (*PostASC842*). For both Panels A and B: columns (1) and (2) report estimates using the entire sample reported in Table 1; columns (3) and (4) report estimates using the HighVar subsample of firms whose average annual variable-lease expense is above the overall sample median; columns (5) and (6) report estimates using the HighMRC subsample of firms whose average annual MRC1 is above the overall sample median. For Panel A: in all six specifications, observations after the year in which a firm first adopted ASC 842 are excluded from the sample. For Panel B: in all six specifications, the entire sample was used. Firm-level controls include *Log(Assets)*, Return on Assets, and *Log(Debt/Assets)*. All variables are defined in the Appendix. All continuous variables are winsorized at the top and bottom 1% of the annual cross-sectional distribution. Standard errors, clustered at the firm level, appear in parentheses. Significance levels are indicated by *, **, *** for 10%, 5%, and 1% respectively.

Panel A: Scaled by Lagged Total Assets (Sample Ending in First Year Post-Adoption)

	(1)	(2)	(3)	(4)	(5)	(6)
	Full Sample		HighVar Sample		HighMRC Sample	
ASC842Adopt	-0.0340***	-0.0383***	-0.0355**	-0.0562***	-0.1045***	-0.1181***
	(0.012)	(0.015)	(0.016)	(0.020)	(0.016)	(0.022)
Year FE	No	No	No	No	No	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	No	Yes	No	Yes	No	Yes
Observations	10,105	8,639	4,085	3,560	5,140	4,188
Adjusted R^2	0.9147	0.9177	0.9288	0.9295	0.8588	0.8619

Panel B: Scaled by Total Revenues (Full Sample)

	(1)	(2)	(3)	(4)	(5)	(6)
	Full Sample		HighVar Sample		HighMRC Sample	
ASC842Adopt	-0.0454***	-0.0201	-0.0551***	-0.0403*	-0.1804***	-0.1487***
	(0.014)	(0.016)	(0.020)	(0.023)	(0.021)	(0.025)
Year FE	No	No	No	No	No	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	No	Yes	No	Yes	No	Yes
Observations	16,364	14,814	6,673	6,094	8,197	7,166
Adjusted R^2	0.8405	0.8590	0.8482	0.8690	0.7057	0.7527

Table 7. Minimum Operating-Lease Payments After ASC842: Testing Financial Distress Incentives

Table 7 reports the coefficients from an OLS regression of *Log(MRC1*100)* scaled by *Lagged Total Assets* (Panel A) and *Total Revenues* (Panel B) on an indicator set to one for fiscal years after a firm first adopted ASC 842 (*PostASC842*). For both Panels A and B: columns (1) and (2) report estimates on the subsets of firms that are considered to be in the "Safe" and "Danger" zones according to the Altman (1968) Z-Score model; columns (3) and (4) report estimates on the subsets of firms that are considered to have "Low" and "High" Ohlson (1980) O-Scores as split by the median score. Firm-level controls include *Log(Assets)*, Return on Assets, and *Log(Debt/Assets)*. All variables are defined in the Appendix. All continuous variables are winsorized at the top and bottom 1% of the annual cross-sectional distribution. Standard errors, clustered at the firm level, appear in parentheses. Significance levels are indicated by *, **, *** for 10%, 5%, and 1% respectively.

Panel A: Scaled by Lagged Total Assets (Sample Ending in First Year Post-Adoption)

	(1)	(2)	(3)	(4)
	Z-Score		O-Score	
	Safe	Danger	Low	High
ASC842Adopt	-0.0951***	0.0553	-0.0702***	-0.0212
	(0.017)	(0.034)	(0.022)	(0.024)
Year FE	No	No	No	No
Firm FE	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes
Observations	5,756	2,428	3,918	3,484
Adjusted R^2	0.8912	0.8902	0.8971	0.8714

Panel B: Scaled by Total Revenues (Full Sample)

	(1)	(2)	(3)	(4)
	Z-Score		O-Score	
	Safe	Danger	Low	High
ASC842Adopt	-0.0642***	-0.0446**	0.0011	-0.0186
	(0.015)	(0.018)	(0.017)	(0.022)
Year FE	No	No	No	No
Firm FE	Yes	Yes	Yes	Yes
Firm Controls	No	Yes	No	Yes
Observations	11,048	9,657	7,469	6,523
Adjusted R^2	0.8444	0.8733	0.8417	0.8616

Table 8. Minimum Operating-Lease Payments After ASC842: Testing the Information Role of Regulation

Table 8 reports the coefficients from an OLS regression of *Log(MRC1*100)* on an indicator set to one for fiscal years after a firm first adopted ASC 842 (*PostASC842*). Columns (1) and (2) report estimates using the entire sample reported in Table 1; columns (3) and (4) report estimates using the subsets of firms that are considered to be in the "Safe" and "Danger" zones according to the Altman (1968) Z-Score model; columns (5) and (6) report estimates on the subsets of firms that are considered to have "Low" and "High" Ohlson (1980) O-Scores as split by the median score. Firm-level controls include *Log(Assets)*, Return on Assets, and *Log(Debt/Assets)*. All variables are defined in the Appendix. All continuous variables are winsorized at the top and bottom 1% of the annual cross-sectional distribution. Standard errors, clustered at the firm level, appear in parentheses. Significance levels are indicated by *, **, *** for 10%, 5%, and 1% respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	All Firms		Z-Score		O-Score	
			Safe	Danger	Low	High
Log(Revenue)	0.7021***	0.2011***	0.2776***	0.1410***	0.2898***	0.1779***
	(0.042)	(0.021)	(0.031)	(0.042)	(0.071)	(0.026)
ASC842Adopt	1.0123***	0.0628	0.1366	-0.3501	-0.1474	0.0983
	(0.157)	(0.086)	(0.093)	(0.379)	(0.121)	(0.151)
Log(Revenue)×ASC842Adopt	-0.3190***	-0.0809***	-0.0958***	-0.0671	-0.0461*	-0.0723**
	(0.040)	(0.018)	(0.023)	(0.057)	(0.028)	(0.032)
Year FE	No	No	No	No	No	No
Firm FE	No	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,196	8,102	6,009	667	3,841	2,999
Adjusted R^2	0.6769	0.9621	0.9697	0.9558	0.9683	0.9578

Table 9. Impact of AS842 on Leverage, Equity Beta, and Credit Ratings

Table 9, Panel A, reports results from OLS regressions using the ratio of debt-to-equity as the dependent variable. All models are regressed on an indicator set to one for fiscal years after a firm first adopted ASC 842 (*PostASC842*). For columns (1) and (3), observations after the year in which a firm first adopted ASC 842 are excluded from the sample; for columns (2) and (4), the entire sample was used. Panel B (Panel C) reports results from OLS regressions using the market beta (credit ratings) as the dependent variable. Columns (1) and (2) report results regressing on *PostASC842*. Columns (3)-(6) report results from OLS regressions on (*Log(1+Debt/Equity*) and (*Log(1+VarLease/OpLease*). For column (1), observations after the year in which a firm first adopted ASC 842 are excluded from the sample; for column (2), the entire sample was used; for columns (3)-(6), all firm-year observations after the firm adopted ASC 842 ("Post-Adoption Sample") were used. Firm-level controls include *Return on Assets*, *Log(Assets)*, *Log(Book-to-Market)*, and *Log(Market Equity)*. All variables are defined in the Appendix. All continuous variables are winsorized at the top and bottom 1% of the annual cross-sectional distribution. Standard errors, clustered at the firm level, appear in parentheses. Significance levels are indicated by *, **, *** for 10%, 5%, and 1% respectively.

Panel A: Leverage (Debt/Equity)

	(1)	(2)	(3)	(4)
	Sample ≤ First Year Post-Adoption	Full Sample	Sample ≤ First Year Post-Adoption	Full Sample
PostASC842Adopt	0.4445***	0.4227***	0.2478***	0.2115***
	(0.029)	(0.029)	(0.024)	(0.023)
Year FE	No	No	No	No
Firm FE	Yes	Yes	Yes	Yes
Firm Controls	No	No	Yes	Yes
Observations	10,278	14,708	10,275	14,704
Adjusted R^2	0.7293	0.7042	0.8350	0.8237

Table 9. [Continued]

Panel B: Market Beta

	(1)	(2)	(3)	(4)	(5)	(6)
	Sample ≤ First Year Post-Adoption	Full Sample	Post-Adoption Sample			
ASC842Adopt	0.0514***	0.0177**				
	(0.010)	(0.008)				
Log(1+Debt/Equity)			0.0922**	0.0952**	0.3117**	0.2683*
			(0.041)	(0.041)	(0.157)	(0.161)
Log(1+VarLease/OpLease)				-0.0274		-0.0552
				(0.051)		(0.165)
Year FE	No	No	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,626	15,808	2,068	2,044	1,790	1,755
Adjusted R^2	0.4100	0.4111	0.0459	0.0469	0.6098	0.6084

Panel C: Credit Ratings

	(1)	(2)	(3)	(4)	(5)	(6)
	Sample ≤ First Year Post-Adoption	Full Sample	Post-Adoption Sample			
ASC842Adopt	-0.0156***	-0.0351***				
	(0.005)	(0.006)				
Log(1+Debt/Equity)			-0.1329***	-0.1297***	0.2525	0.2575
			(0.040)	(0.040)	(0.177)	(0.174)
Log(1+VarLease/OpLease)				-0.0207		0.0146
				(0.019)		(0.049)
Year FE	No	No	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,703	5,001	1,084	1,071	1,017	1,000
Adjusted R^2	0.8752	0.8692	0.6210	0.6228	0.9088	0.9080

Table 10. Persistence and (Co)Variability of Variable-to-Operating Lease Cost Ratio

Table 10 reports results from OLS regressions using *VarLease/OpLease* as the dependent variable. *Large Drop (Sample)* and *Large Drop (By Year)* are indicator variables set to one for firm-years that saw a large drop in revenue. Specifically, *Large Drop (Sample)* is set to one for firm-year observations that are in the bottom decile of revenue change on the entire sample described in Table 1; *Large Drop (By Year)* is set to one for firm-year observations that are in the bottom decile of revenue change each year. *COVID* is an indicator variable that evaluates to one for firm-year observations if the firm's fiscal year-end reporting date falls after September 30, 2020. Column (1) reports estimates regressing on the one-year lag of the dependent variable, *Lag VarLease/OpLease*, and includes year-fixed effects and firm controls. Column (2) reports estimates regressing on *Log(Revenue)* and includes year- and firm-fixed effects and firm-level controls. Column (3) reports estimates regressing on *Large Drop (Sample)*; column (4) reports estimates regressing on *Large Drop (By Year)*. Both columns (3) and (4) include year- and firm-fixed effects and firm controls. Columns (5) and (6) report estimates regressing on *COVID* and include firm-fixed effects and firm-level controls. Firm-level controls include *Log(Assets)*, *Return on Assets*, and *Log(Debt/Assets)*. All variables are defined in the Appendix. All continuous variables are winsorized at the top and bottom 1% of the annual cross-sectional distribution. Standard errors, clustered at the firm level, appear in parentheses. Significance levels are indicated by *, **, *** for 10%, 5%, and 1% respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Lag VarLease/OpLease	1.0155***					
	(0.053)					
Log(Revenue)		0.0488*				
		(0.028)				
Large Drop (Sample)			-0.0317			
			(0.020)			
Large Drop (By Year)				-0.0655**		
				(0.029)		
COVID					-0.0159	-0.0180
					(0.010)	(0.013)
Year FE	Yes	Yes	Yes	Yes	No	No
Firm FE	No	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,202	3,301	3,055	3,055	3,301	632
Adjusted R^2	0.9381	0.9724	0.9733	0.9734	0.9720	0.9177

Table 11. Estimating Off-Balance-Sheet Variable-Lease Liabilities

Table 11 reports various industry summary statistics and ratios using balance-sheet data from the sample described in Table 1. The sample consists of the most recent observation for each firm that discloses variable-lease costs, operating-lease costs, and operating-lease liabilities in our dataset with non-zero variable-lease costs and non-missing *Liability* and *Debt*. Column (1) tabulates the number of firms within this sample and by industry. Columns (2)–(5) report the sample and industry sums for each of the relevant balance sheet items. Column (5) reports the sample and industry sums for our estimates of firms' variable-lease liabilities. Column (6) reports the mean of the ratio of operating-lease liabilities to total debt for the sample and for each industry. Column (7) reports the mean of the ratio of estimated variable-lease liabilities to total debt for the sample and for each industry. Column (8) reports the mean of the ratio of estimated variable-lease liabilities to reported operating-lease liabilities for the sample and for each industry. Column (9) reports the median of the ratio of operating-lease liabilities to total debt for the sample and for each industry. Column (10) reports the median of the ratio of estimated variable-lease liabilities to total debt for the sample and for each industry. Column (11) reports the median of the ratio of estimated variable-lease liabilities to reported operating-lease liabilities for the sample and for each industry. Industries with a mean $\frac{VarLease\ Liability}{Debt}$ ratio of at least 7.7% (the overall average across all industries) are highlighted in grey. Industry classifications are based on the four-digit Global Industry Classification Standard (GICS). All variables are defined in the Appendix.

Industry	(1) [Count] Firms	(2) [Sum] *Assets* ($Bil)	(3) [Sum] *Debt* ($Bil)	(4) [Sum] *OpLease Liability* ($Bil)	(5) [Sum] *VarLease Liability* ($Bil)	(6) [Mean] $\frac{OpLease\ Liability}{Debt}$	(7) [Mean] $\frac{VarLease\ Liability}{Debt}$	(8) [Mean] $\frac{VarLease\ Liability}{OpLease\ Liability}$	(9) [Median] $\frac{OpLease\ Liability}{Debt}$	(10) [Median] $\frac{VarLease\ Liability}{Debt}$	(11) [Median] $\frac{VarLease\ Liability}{OpLease\ Liability}$
All	1,358	19,040	5,352	744	281	0.344	0.077	0.253	0.150	0.024	0.171
Energy	63	664	226	13	2	0.148	0.029	0.327	0.051	0.008	0.139
Materials	59	660	205	17	6	0.115	0.024	0.259	0.071	0.011	0.149
Capital Goods	109	1,161	358	25	4	0.204	0.027	0.140	0.112	0.015	0.102
Commercial & Professional Svcs	45	194	69	8	2	0.317	0.065	0.219	0.197	0.027	0.154
Transportation	33	685	319	63	53	0.263	0.129	0.588	0.176	0.038	0.197
Automobiles & Component	15	350	158	4	0	0.233	0.029	0.094	0.104	0.007	0.069
Consumer Durables & Apparel	55	270	85	22	6	0.458	0.109	0.215	0.295	0.028	0.151
Consumer Services	81	479	293	50	14	0.378	0.079	0.300	0.225	0.035	0.220
Retailing	106	1,025	426	177	45	0.594	0.131	0.222	0.641	0.111	0.221
Food & Staples Retailing	18	488	152	59	14	0.486	0.101	0.192	0.476	0.088	0.209
Food, Beverage & Tobacco	39	589	208	10	12	0.185	0.077	0.631	0.053	0.017	0.199
Household & Personal Products	13	211	70	5	2	0.094	0.026	0.307	0.073	0.016	0.253
Health Care Equipment & Svcs	98	961	310	43	10	0.322	0.058	0.225	0.155	0.025	0.149
Pharma, Biotech & Life Science	217	885	297	16	6	0.602	0.156	0.275	0.816	0.104	0.221
Diversified Financials	48	4,414	554	24	4	0.259	0.038	0.163	0.135	0.013	0.140
Insurance	27	1,673	99	9	2	0.155	0.022	0.161	0.082	0.010	0.143
Software & Services	124	866	253	27	5	0.296	0.056	0.206	0.115	0.018	0.173
Tech Hardware & Equipment	55	741	228	19	70	0.285	0.064	0.241	0.157	0.023	0.145
Semiconductors	28	299	74	4	3	0.281	0.077	0.357	0.139	0.043	0.212
Telecommunication Services	8	608	299	59	4	0.285	0.043	0.124	0.241	0.012	0.092
Media & Entertainment	54	1,212	336	56	11	0.313	0.044	0.149	0.161	0.022	0.143
Real Estate	63	604	333	33	7	0.130	0.026	0.290	0.041	0.005	0.118