

Capital Structure and the (Changing?) Role of Off-Balance-Sheet Lease Financing

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First Draft: April 2008

This Draft: April 2009

ABSTRACT

Using trend regression analysis, we demonstrate the remarkable increase in operating (off-balance-sheet) lease financing and simultaneous decrease in use of capital (on-balance-sheet) leases over the last 27 years. This trend is consistent with the contentions of regulators and popular press that firms are intentionally structuring leases to qualify for off-balance-sheet accounting treatment. We include a proxy for the unobserved benefits of the off-balance-sheet accounting treatment as an additional explanatory variable in a traditional capital structure model and find a significantly negative relationship: as unexplained operating lease activity increases, conventional debt ratios decrease. Our results suggest lower conventional leverage ratios may underestimate the financial risk of such firms as these lower debt ratios may be associated with higher unexplained off-balance-sheet financing. Finally, we report evidence that the determinants of the mix of on- versus off-balance sheet lease activity is changing over time. Our results should be of interest to a host of market participants as the US considers changes in the off-balance-sheet accounting treatment of lease financing.

JEL classification: G32, M41, M48

Keywords: Capital structure, Operating leases, Off-balance-sheet financing

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In this study we investigate both the trends in off-balance-sheet lease financing and the relationship between unexplained off-balance-sheet lease financing and corporate capital structures. Financial leasing theory and prior empirical evidence suggests that leasing activity is explained by expected costs of bankruptcy, costs of contracting, tax status and asset specificity [Sharpe and Nguyen (1995), Graham, Lemmon and Schallheim (1998), Krishnan and Moyer (1994)].¹ We demonstrate that even after controlling for these explanations, there is a significant increase in off-balance-sheet lease financing over the past few decades.

Since all leases are, fixed-term, fixed-income claims with bankruptcy priority over equity and some tax benefit, they are akin to debt. There is significant benefit for managers to move these non-cancelable obligations off the balance sheet. We show that the benefits of off-balance-sheet accounting treatment of leases are themselves a determinant of leasing activity, i.e. including a proxy for these benefits in a traditional capital structure model reveals a significantly negative relation between operating lease activity and conventional debt ratios. Our results suggest lower conventional leverage ratios may understate the financial risk of such firms.

Moving leases off-balance-sheet as operating leases is easy under current Generally Accepted Accounting Principles (GAAP). Anecdotally, a 2007 *Forbes* article states, "...companies have been working the system [lease accounting] to lower the amount of debt they show investors."² Indeed, the magnitude of operating (off-balance-sheet) lease financing has increased remarkably over time. Regulators and popular press

¹ Capital leases are included as debt in traditional leverage measurements as these leases should essentially reflect secured debt.

² "Debt Hazards Ahead", June 16, 2007, *Forbes Magazine*. See also "Hidden in Plain Sight", August 2005, *CFO Magazine*.

alike have expressed concern that the financial reporting of operating leases may not reflect the underlying economics of the transaction [Securities and Exchange Commission (2005)]. As early as 2003, former SEC chairman Arthur Levitt Jr asked:

“Should companies still be allowed to leave billions of off-balance sheet debt, such as lease financing, out of a company’s reported liabilities? Off-balance sheet debt persists, distorting the financial picture investors have been given in companies in many sectors. Markets will discipline themselves and their participants but only if they have accurate information.”³

Concerns of regulators notwithstanding, we note that in a frictionless market the off-balance-sheet accounting treatment should have no economic benefit. Non-cancellable future lease payments under operating leases are not recognized on the balance sheet, but they do appear in the disclosure notes to the financial statements. Financial statement users should be able to adjust for accounting differences across operating leases and capital leases leaving no benefits due to purely accounting differences.⁴ It is an important empirical question as to whether these trends are significant and if so, whether the benefits of off-balance-sheet financing influence observed corporate capital structures. We find they do.

More specifically, we demonstrate that leasing activity has increased significantly over time. We confirm this trend is attributable to an increase in off-balance-sheet leases; in fact we document a decreasing trend in capital (on-balance-sheet) leases.⁵ This is consistent with the trend reflecting a growing preference for off-balance-sheet lease

³ “The SEC’s Repair Job”, February 10, 2003, *Wall Street Journal*.

⁴ We discuss the different treatment of these obligations by Moody’s and S&P below.

⁵ Mean operating leases to total debt increases 744.8% from 1980 to 2007, while capital leases to total debt decreases 49.8% over that period. The trends occur while the number of firms in each annual cross-section first increase then falls to a third of the number in 1980, making it doubtful that the trends are due to some type of firm effect.

financing specifically and that capital leases are intentionally structured to qualify for operating lease financing treatment as suggested by former Chairman Levitt and others.⁶

To further investigate the extent to which this trend reflects a substitution effect, we consider the types of firms increasing their off-balance sheet financing. In the univariate setting we show that firms with the lowest risk of financial distress and lowest amount of R&D intensity (asset specificity) have the largest increases in off-balance sheet financing. . Financial theory suggests that liquid fixed assets of general usage are appropriate for lease financing. However, our analysis suggests this phenomenon is pervasive across many industries beyond the usual suspects of retail and transportation.

Prior leasing theory does not include benefits from keeping the leases off the balance sheet as a determinant of the lease versus buy decision. We employ the error term from an otherwise-well-specified, state-of-the-literature model of operating lease financing [Graham, Lemmon, and Schallheim (1998)] as a proxy for the unexplained benefits of off-balance-sheet treatment. By including this as an additional explanatory variable in a state-of-the literature model of conventional capital structure [Lemmon, Roberts, and Zender (2008)], we find that these benefits of off-balance-sheet treatment are in fact negatively related to observed debt levels. As the benefits of off-balance-sheet debt increase, observed conventional debt levels decrease.

Finally, within the leasing context, we investigate whether the economics of the firm can explain the observed mix of operating leases and capital leases. Existing

⁶ This may reflect an attempt on the part of corporate managers to appear more conservatively financed and/or to expand their debt capacity. It may also reflect the desire of lenders to maintain legal ownership to avoid potential court-sponsored asset stripping as observed in the Eastern Airlines case. However, if the only explanation for the increase in lease financing were lack of access to debt markets, the increase should be observed in capital leases as well as (or even in lieu of) operating leases.

theoretical determinants have explanatory power, but these relationships appear to be changing over time.

We expect that our findings will be of interest to regulators, information intermediaries, academics, and practitioners. A current, ongoing joint project between the Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB) considers bringing all material, long-term lease obligations onto the balance sheet. Our results suggest that benefits from the off-balance sheet accounting of operating leases influence corporate decision-making and provides some support for these proposed changes. However, to the extent that theoretical determinants of leasing maintain explanatory power, a rule that requires capitalizing *all* operating leases may not be appropriate. Our results offer a similar caution to information intermediaries that apply “one-size-fits-all” adjustments for operating leases.

The following section of the paper details the accounting for leases. Section II provides background information on the financial reporting of leases. In Section III, we discuss prior literature, state our research questions and formulate testable hypothesis. In Section IV, we describe our data and methodology. We present our results in Sections V and VI, and Section VII concludes the paper.

II. Financial Reporting of Leases by the Lessee

Under current Generally Accepted Accounting Principles (GAAP), lease obligations should be classified by the lessee as a capital lease if the lease meets at least one of the

four criteria identified in *Accounting for Leases, Financial Accounting Standard No. 13*.⁷

The four criteria are as follows:

- (1) the agreement specifies that ownership of the asset transfers to the lessee
- (2) the agreement contains a bargain purchase option
- (3) the lease term is equal to 75% or more of the expected economic life of the asset
- (4) the present value of the minimum lease payments is equal to or greater than 90% of the fair value of the asset.

At inception of a *capital* lease, a lease liability and a leased asset would be recognized on the balance sheet. The leased asset would be depreciated over its useful life and periodic interest accrual over time would decrease the lease liability. The capital lease is a financing vehicle for the purchase of an operational asset and is essentially secured debt. However, if a lease arrangement does not meet any one of the four criteria of a capital lease, it is accounted for as an operating lease. Operating leases have no effect on the balance sheet; periodic rent expense is recorded on the income statement.

Anecdotally, numerous websites advertise services and techniques for structuring operating leases suggesting opportunistic lease structuring has developed into its own thriving industry since the passage of SFAS 13. Miller and Bahnsen (2008) actually suggest that accounting firms have helped clients structure lease arrangements to remain off-balance sheet. The exact specifications under criteria 3 and 4 of SFAS 13 may create an accounting loophole that allows a lease intended as security to be classified as an operating lease and remain “off-balance sheet”. That is, leases may be purposefully structured to achieve operating lease accounting, even though the substance of the lease is essentially secured debt (capital lease). For example, because of the specific cutoffs

⁷ FAS 13 is effective for lease transactions entered into on or after January 1, 1977.

(75% and 90%) in the accounting standard, lease arrangements that are 74% of the asset life or 89% of the fair value of the leased asset can qualify for operating lease treatment under GAAP.⁸ To the extent that market frictions exist, firms may have incentives to take advantage of these accounting rules to keep lease financing “off balance sheet”.

III. Literature Review and Hypothesis Development

A. The lease versus buy decision

Existing literature considers theoretical determinants of the lease versus buy decision and examines this choice empirically. However, given recent evidence of increasing, and potentially dubious, reliance on off-balance-sheet lease financing, a reexamination of the traditional leasing model is warranted. Financial leasing theory and prior empirical evidence suggests that leasing activity should be explained by expected costs of bankruptcy, costs of contracting, tax status and asset specificity (Sharpe and Nguyen (1995), Graham, Lemmon and Schallheim (1994), Krishnan and Moyer (1994)). However, given concerns as to whether the financial reporting of lease classifications reflects the economic substance of the transaction, we investigate whether the theoretical determinants of leasing continue to explain operating lease activity across time.

Leasing theory predicts a positive relation between financial distress and leasing activity. Financially distressed firms are likely to obtain more favorable financing terms from lessors than from traditional creditors. This stems from the priority of lessors’ claims in bankruptcy proceedings and this relation is likely to be strongest for leases classified as operating leases that ostensibly never intend to transfer ownership. Weiss &

⁸ Under International Accounting Standards, IAS 17, whether a lease is a capital lease or an operating lease depends on the substance of the transaction rather than the legal form of the contract. That is, the criteria for capital lease treatment under IAS 17 differs from FAS 13 in not specifying specific cutoffs.

Wruck (1998) document the court-sponsored asset stripping of Eastern Airlines where the court allowed the debtor to sell secured creditors' collateral (including capital leases) to fund operating losses.^{9,10} Because the lessor maintains ownership of assets under operating (off-balance-sheet) leases, they are less subject to this potential asset stripping than traditional secured creditors or lessors utilizing capital (on-balance-sheet) leases that indicate intended transfer of ownership. This legal precedent may help explain the increase in operating leases across time.

Krishnan and Moyer (1994) empirically investigate the relation between leases and the costs of bankruptcy. They focus on capital leases, rather than operating leases, in order that differing tax motivations for operating leases do not confound the relation between costs of bankruptcy and leasing activity. They find that capital leasing activity is positively related to the costs of bankruptcy.

Leasing activity should be positively related to the cost of external funds. Firms with high costs of external funds may be able to reduce their investment costs by leasing assets. Finance theory and empirical evidence suggests that the cost of external funds will be higher when information asymmetry, agency problems, and underinvestment problems are more severe (Myers and Majluf, 1984, Sharpe and Nguyen, 1995, Graham, Lemmon and Schallheim, 1998).

Leasing theory predicts that the potential borrower (lessee) marginal tax rate is negatively related to the propensity to lease assets. The leasing arrangement can transfer

⁹ Eastern Airlines filed Chapter 11 on March 9, 1989. After \$1.4 billion in operating losses, Eastern ceased operations and auctioned remaining aircraft. The final reorganization plan was confirmed by the bankruptcy court on December 22, 1994.

¹⁰ In addition to the aircraft sold to fund losses, many recovered aircraft were recovered in poor condition. Weiss and Wruck note that because Eastern failed to maintain planes as dictated by the terms of its capital leases, lessors had to make major repairs on many recovered planes to return them to flying condition.

tax shields from the lessee to the lessor. A lessee that is unable to fully utilize tax deductions can transfer those deductions to lessors facing higher marginal tax rates who can in turn offer a lower after-tax cost of financing. A profitable lessor can take advantage of the tax benefits of interest payments and depreciation and pass these savings along (at least in part) to the lessee in lower cost leasing. To transfer tax shields, the lease must qualify as a “true lease” under IRS tax rules. For legal and tax purposes, when the lessor retains ownership of the leased asset, the lease is a “true lease” for the lessee, however this tax classification is not publicly available. Prior research uses the operating lease classification as a proxy for “true leases”. Tax rules for leasing are similar on most dimensions to financial reporting rules.¹¹ Prior empirical studies provide evidence in support of the predicted relation between leasing and tax status. Graham, Lemmon and Schallheim (1998) find operating leases are negatively related to the pre-financing marginal tax rate.

Finally, the lease versus buy decision should be influenced by the nature of the asset. Fixed assets of general usage (such as real estate, aircraft, trucks and automobiles, electronics and computer equipment) are readily transferable and as a result have greater availability on the leasing market. The ability to lease assets should be negatively related to the specificity of the asset. With few alternative uses, the economics of specialized assets suggest conventional debt (or equity) financing. For firms without access to debt markets, specialized assets could be financed with capital (rent to own) leases, but unlikely to be structured as operating leases unless the motivation were to keep the non-cancelable commitments off the balance sheet. Consistent with these predictions, prior

¹¹ See Graham, Lemmon and Schallheim (1998) for a detailed comparison of tax and financial accounting rules.

empirical research finds a negative relation between leasing activity and proxies for the specificity of the asset (Graham, Lemmon and Schallheim (1998), Sharpe and Nguyen (1995)).

B. Operating Leases

Though the lease versus buy decision is well studied, there is relatively little prior literature focused on off-balance-sheet lease financing. This is surprising given the evidence reported in a 2005 report by the SEC that the magnitude of the undiscounted non-cancellable future payments required under operating leases was estimated to be \$1.25 trillion. Prior literature provides mixed evidence on whether the market appropriately adjusts for the off-balance sheet reporting of operating leases. Early evidence suggests that the market participants make adjustments for off-balance-sheet operating lease obligations (Ely (1995), Imhoff, Lipe and Wright (1993), Beattie, Edwards and Goodacre (1998)). However, more recent evidence in Ge, Imhoff and Lee (2008) suggests that investors do not properly adjust for operating lease obligations in assessing equity risk. With respect to credit risk, Altamuro, et al. (2008) provide evidence consistent with banks considering the off-balance-sheet operating lease obligations in setting loan spreads. To the extent that operating lease obligations are not properly reflected in risk assessments, firms may benefit from the latitude in accounting standards that allows for leases with non-cancellable future payments to qualify for operating lease treatment and remain off-balance sheet.

C. Research questions and testable hypotheses

Our first research question is motivated partially by the concerns of regulators and popular press of financial shenanigans on the part of firms intentionally structuring leases to qualify for off-balance-sheet accounting treatment. As noted above, because these operating leases are disclosed in the footnotes of audited financial statements filed with the SEC, regulators, investors, and other market participants should be able to adjust their assessments of financial risk to account for these obligations. And thus we have no a priori expectation about the extent to which firms engage in this behavior.

Q1: Has the role of lease financing in the capital structure changed through time?

H1a: Operating lease financing as a percentage of conventional debt is constant over time.

H1b: Capital lease financing as a percentage of conventional debt is constant over time.

Traditional theories and models of corporate capital structure focus on the demand for debt versus equity capital, either as a trade off of cost and benefit of debt financing or timing of the equity markets.¹² Given the court-sponsored asset-stripping documented in the Eastern Airlines case, we should consider the supply of capital is also determined by potential lender risk profiles. Firms facing financial distress may find better terms from lessors who maintain ownership of the asset.

¹² Demand-driven theory of optimal capital structure begins with Modigliani and Miller (1963). Extensions include DeAngelo and Masulis (1980), Kim (1982), Modigliani (1982), Myers (1984) and Bradley, Jarrell, and Kim (1984). Empirical tests of these models include Titman and Wessels (1988), MacKie-Mason (1990), Berger, Ofek, and Yermack (1997), Shyam-Sunder and Myers (1999), Hovakimian, Opler, and Titman (2001), Fama and French (2002), Mehrotra, Mikkelson, and Partch (2003), Dittmar (2004), Hovakimian, Hovakimian, and Tehranian (2004), and Frank and Goyal (2009). Baker and Wurgler (2002) propose a theory which suggests that a firm's capital structure is the cumulative result of managerial attempts to time the equity market. Similarly, Graham and Harvey (2001) and Barry, Mann, Mihov, and Rodriguez (2008) note the importance of debt timing with respect to interest rates.

Q2: Is the increase in operating lease financing attributable to firms facing higher probability of financial distress?

H2: The increase in operating lease financing is attributable to firms with lower Z-scores.

A related consideration is the differential tax status of the lessee vis-à-vis the creditor or lessor. If the potential lessee faces a lower marginal tax rate, this firm may prefer to transfer the tax benefit of ownership to the lessor by structuring the lease as an operating lease in order to lower the cost of lease financing.

Q3: Is the increase in operating lease financing attributable to firms that cannot take full advantage of debt tax shield?

H3: The increase in operating lease financing is attributable to firms with lower marginal tax rates.

Financial theory suggests that liquid fixed assets of general usage (such as real estate and aircraft) are appropriate for lease financing. If there is a change in the industrial composition of firms using lease financing, we can infer the role of the lease has changed. Specifically, evidence of increased operating lease financing among industrial firms would indicate greater propensity to lease less liquid (potentially firm-specific assets) that are considerably riskier from the perspective of the lessor. With few alternative users, the economics of specialized assets suggest conventional debt financing. For firms without access to debt markets, specialized assets could be financed with capital (rent to own) leases, but unlikely to be structured as operating leases unless the motivation were to keep the non-cancelable commitments off the balance sheet.

Q4a: Is there a change in the industrial composition of firms using lease financing? Is there an increase in off-balance-sheet lease financing among industrial firms?

Q4b: Is there an increase in off-balance-sheet lease financing among firms with relatively high investment in Research & Development?

H4a: The industrial composition of firms utilizing (operating and capital) leases is constant over time.

H4b: The R&D intensity of firms utilizing off-balance-sheet leases is constant (low) through time.

To the extent that market frictions exist, the off-balance-sheet treatment of operating leases may be an overlooked benefit to be considered in the lease versus buy decision. We investigate whether benefits of off-balance-sheet financing influence observed corporate capital structures. The benefit of off-balance-sheet financing is that market participants may not fully consider non-cancellable future lease payments that are not recognized on the balance sheet as debt and make inaccurate (lower) risk assessments. Therefore, we expect that as the benefits of off-balance-sheet debt increase, we expect that the observed, on-balance-sheet debt levels decrease.

Q5: Do benefits from the off-balance-sheet financing of leases influence corporate capital structures?

H5: Benefits from off-balance sheet-debt are unrelated to conventional debt ratios.

Finally, within the leasing context, we investigate whether the economics of the firm can explain the observed mix of operating leases and capital leases. Given the latitude in accounting standards for classifying leases and the concern of regulators that firms utilizing off-balance-sheet financing are “hiding debt”, this is an important empirical question. Empirical scrutiny of the appropriateness of these financial reporting lease

classifications is sparse and out of date with the results of our study.¹³ If leases are funds of last resort for firms without access to debt markets, we should expect to see firms utilizing capital leases (renting to own). However, if the trend in lease financing is a reflection of a preference for off-balance-sheet financing to appear more conservatively financed, we expect to see firms utilizing operating leases in lieu of capital leases.

Q6: Is the observed trend in lease financing attributable to operating (off-balance sheet) lease financing or to capital (on-balance sheet) lease financing?

H6: Off-balance sheet lease financing as a percentage of total (on- and off-balance sheet) lease financing is constant over time.

Q7: Do firms use operating leases to expand debt capacity? That is, do firms finance assets with operating leases in lieu of on balance sheet financing (conventional debt or capital lease), or do they utilize operating leases in addition to traditional on balance sheet financing?

H7: Though operating leases increase over time, total non-cancelable contracts (including leases and conventional debt) as a percentage of equity financing remain constant through time.

IV. Data and Methodology

A. Sample Selection

Our initial sample is all firms in the merged CRSP-Compustat database from 1980 through 2007. We include only firms with common stock and exclude regulated financial firms (SIC codes 6000-6799) and utilities (SIC codes 4800-4999). Before matching

¹³ Krishnan and Moyer (1994) investigate whether capital leases may be misclassified as operating leases for their sample in the years 1984-1986. They concluded that in these three years, very few firms had non-cancelable lease arrangements that were not reported as capital leases on the balance sheet.

Compustat and CRSP data we adjust for the Compustat convention that companies with fiscal years ending between June of year t and May of year $t+1$ are coded as year t . We assign firms with fiscal years ending in the first quarter of year $t+1$ to year $t+1$ and assume a 6-month lag between the end of a firm's fiscal year end and when financial statement information is publicly available. Firms with a less than \$1 million in total assets, negative sales, and no debt are then removed from the sample. After forming the needed variables listed in Appendix A, we winsorize each variable, except the marginal tax rate data, at the upper and lower 0.05 percentiles. See Appendix A for detailed description of variable definitions.¹⁴

We use the maximum amount of data available in each of our tests below. We calculate, but do not present summary statistics of the data. The number of firm years for each series ranges from a maximum of 103582 with simulated marginal tax rates (MTR) and expected cost of financial distress (ecost) having the fewest observations, 70549 and 32735 respectively. These series look similar to previous samples. Most of the series are fat tailed with cash flow volatility (CFvol), ecost and negative owners equity (oeneg) having a considerable amount of positive skew.

B. Unobserved Benefits of Off-Balance Sheet Leasing

Besides testing for trends in univariate settings, we also test whether ‘abnormal’ operating lease levels (operating leases not explained by proxies for theoretical

¹⁴ The simulated marginal tax rate data we use was kindly provided by John Graham and we also acknowledge the use of the 38 industry designations which come from Ken French’s web page. In some of the robustness exercises we replace estimates of the market value of assets based on COMPUSTAT data with an estimate using the Black-Scholes option pricing model as in Vassalou and Xing (2004). Duan, Gauthier, and Simonato (2005) show how this method of estimating the unobserved asset value, within the context of Merton’s (1974) model, is identical to maximum likelihood estimation. To estimate these market values of assets we follow the algorithm described in Cao, Simin, and Zhao (2008).

determinants) help explain conventional debt ratios. To create a proxy for ‘abnormal’ operating lease levels we estimate the state-of-the-literature model of theoretical determinants of lease financing by Graham Lemmon Schallheim (1998), hereafter, GLS. In particular we estimate the specification in equation (1) using a panel regressions with fixed year effects.

$$\begin{aligned} \text{OPlease/TV}_{it} = & \alpha_1 + \beta_1\text{Mrt} + \beta_2\text{Ecost} + \beta_3\text{Zmod} + \beta_4\text{Oeneg} + \beta_5\text{Mtb} + \beta_6\text{Coll} \quad (1) \\ & + \beta_7\text{RnD} + \beta_8\text{Size} + \beta_9\text{d2000} + \beta_{10}\text{d3000} + \beta_{11}\text{d4000} \\ & + \beta_{12}\text{d86} + \beta_{13}\text{d8792} + \varepsilon_{it} \end{aligned}$$

We report traditional t-statistics and t-statistics based on an extension of cluster-robust standard errors that allows for clustering along more than one dimension proposed by Cameron et al. (2006) and Thompson (2006).¹⁵ Since operating leases as a percentage of firm value is the dependent variable in this model, we use the error terms from this estimation as the proxy for the abnormal operating lease levels (AbOplease).

We then estimate the conventional leverage model of Lemmon Roberts Zender (2008) for both market leverage (ML) and book leverage (BL) and both with and without AbOplease. This allows us to test if AbOplease is significantly related to the Conventional Leverage dependant variable. Specifically we estimate the following specifications both with and without AbOplease.

$$\begin{aligned} \text{BL}_{it} = & \alpha_1 + \beta_1\text{Intlev} + \beta_2\text{LnSale} + \beta_3\text{Mtb} + \beta_4\text{Profit} + \beta_5\text{Tang} + \beta_6\text{Indmedlev} + \quad (2) \\ & \beta_7\text{CFvol} + \beta_8\text{SDivpay} + \beta_9\text{AbOplease} + \varepsilon_{it} \end{aligned}$$

¹⁵ Two-way clustering corrects for both time-series and cross-sectional dependence. In our application we cluster by firm and year to capture time series dependence within firms and cross-sectional dependence within year.

$$ML_{it} = \alpha_1 + \beta_1 \text{Intlev} + \beta_2 \text{LnSale} + \beta_3 \text{Mtb} + \beta_4 \text{Profit} + \beta_5 \text{Tang} + \beta_6 \text{Indmedlev} + \beta_7 \text{CFvol} + \beta_8 \text{SDivpay} + \beta_9 \text{AbOplease} + \varepsilon_{it} \quad (3)$$

Data definitions are provided in Appendix I.

V. Empirical Results on H1 thru H5

A. *Leasing across time: univariate analysis*

Figure 1 presents evidence on how the magnitude of operating lease liabilities to total debt (Oplease/TD) has been increasing over time while the magnitude of capital lease liabilities to total debt (Caplease/TD) has been decreasing. We show that the mean ratio of Caplease/TD was 0.118 in 1980 and by 2007 the ratio has declined to 0.059. On average, capital leases make up a smaller portion of debt across time. In contrast, mean Oplease/TD is large in magnitude and is increasing across time. Specifically, mean Oplease/TD is 0.84 in 1980 and by 2007 has risen to 7.116. Off-balance sheet financing in the form of operating leases, is an increasingly important source of funding. The same trend exists when we plot unscaled operating leases and capital leases or if we scale these variables of interest by total financial claims where total financial claims include on-balance sheet debt and our estimate of operating lease liabilities. We also find the same trend when we use a constant sample of firms across time.

In Table 1, we test whether the observed trends are statistically significant. We regress Oplease/TD on a time trend and Caplease/TD on a time trend. Our sample spans the period 1980-2007, so our time trend variable represents values from 1 to 28 where 1 corresponds to the year 1980 and 28 corresponds to the year 2007. Our results in Table 1, confirm that the observed time trends are statistically significant. When Oplease/TD is the dependent variable, the coefficient on time trend is positive and statistically

significant.¹⁶ In contrast, when Caplease/TD is the dependent variable, the coefficient on time trend is negative and statistically significant. We check our results are not driven by the small sample size via a bootstrapping procedure that resamples the original data 10,000 times. Our results are qualitatively similar under the bootstrapping procedure. We take this evidence as a rejection of both H1a and H1b.

Given these documented trends in leasing activity, we investigate whether the levels of operating lease activity across time are consistent with factors that influence the lease versus buy decision. Leasing theory predicts that lease activity should be positively related to the risk of bankruptcy. In Figure 2, we classify firms by year into 5 portfolios based on the likelihood of bankruptcy. We use Altman's Z score as a proxy for the likelihood of bankruptcy.¹⁷ Altman's Z scores increase with financial health and therefore portfolio 1 (5) contains the most (least) distressed firms.

In Panel A of Figure 2, we plot the mean level of Oplease/TD for Z score portfolios. Across time, the mean level of operating lease liabilities to total debt is lowest for firms with the lowest bankruptcy risk (p5). However, at higher levels of bankruptcy risk (p 1-4), the relationship is less stable. In untabulated analysis, we confirm that the upward trend in the mean level of Oplease/TD across time in the top and bottom Z-score portfolios is statistically significant. In Panel B of Figure 2, we plot the mean level of Caplease/TD for Z score portfolios. After 1986, the mean level of Caplease/TD is lowest for firms with the lowest bankruptcy risk (p5). Firms with the highest bankruptcy risk

¹⁶ The trend is significant based t-statistics formed using Newey-West standard errors or based on the Vogelsang90% PS confidence intervals.

¹⁷ Altman's Z-score is a better predictor of distress across time than other accounting based measures of financial distress. Altman's Z includes market information and is less susceptible to distortions from increases in R&D activity across time that affects accounting based measures of performance (Franzen, Rodgers and Simin (2007)).

(p1) have the highest mean Caplease/TD in 17 of the 27 years. In untabulated results we confirm a significant downward trend in mean Caplease/TD for firms with the lowest bankruptcy risk, but find no significant trend for firms in the highest bankruptcy risk portfolio. While evidence in these figures suggests that the relation between distress risk and leasing activity is positive across time, we reject the null (H2) that the increase in operating lease financing is attributable solely to firms with lower Z-scores.

In Figure 3, we investigate the relation between tax status and leasing activity across time. Leasing theory predicts a negative relation between tax status and leasing activity. Empirical evidence in GLS suggests that the relation should be stronger for operating leases than capital leases as capital leases may not qualify as a “true lease” under IRS tax rules. Given that GLS investigate leasing activity to total firm value, we also scale leasing activity here by total firm value (Oplease/Value and Caplease/Value). In Panel A of Figure 3, we sort firms into 3 portfolios based on the estimated before interest marginal tax rate (MTR) and plot the mean Oplease/Value across time by MTR portfolios. We find that after 1988, Oplease/Value is generally highest (lowest) for firms with the lowest (highest) marginal tax rates. In Figure 3 Panel B, we find similar evidence of a negative relation across time between Caplease/Value and MTR. Untabulated trend regressions provide little support for H3. There is no evidence of a significant upward trend in operating lease financing for any of the three portfolios.

In Figure 4, we investigate the relation between leasing activity and asset specificity. We use R&D expense to total market value of assets as our measure of asset specificity as R&D intensive firms are more likely to have specialized assets.¹⁸ We sort

¹⁸ We find qualitatively identical patterns whether we define firm total value as book value, market value or as the implied market value described in the appendix.

firms by year into three R&D portfolios. Because the median level of R&D as a percentage of assets is zero, the bottom portfolio (p1) contains firms without R&D expenses. The highest portfolio (p3) contains firms with non-zero R&D and the middle portfolio contains both zero and non-zero R&D firms. In Figure 2 Panel A, we provide evidence as to whether the expected negative relation between operating lease activity and asset specificity holds. From 1996 to 2007, mean operating lease activity decreases monotonically across R&D portfolios. We find similar evidence in Panel B for capital leases. This provides initial evidence that asset specificity remains an important determinant of leasing activity across time but provides little support for H4b. Trend coefficients are significantly positive for all three operating lease portfolios and are significantly negative for lowest R&D intensity capital least portfolio.

In Table 2 we estimate the trend regressions for equally weighted industry portfolios. Financial theory suggests that liquid fixed assets of general usage are appropriate for lease financing indicating that industries such as retail and transportation may be driving the trends in operating and capital leasing. In Panel A we find that 14 of the 29 industries exhibit significant positive trends in operating lease as a percentage of total debt. There is some evidence that Oil and Gas Extraction and Food and Kindred Products had a significant decrease over this period. In Panel B all but two of the industries portfolios had a significant negative trend in capital leases as a percentage of total debt with fourteen of the trends falling within the 90% Vogelsang confidence intervals. This evidence indicates that leases for more than just general usage liquid assets are being structured off-balance sheet. This evidence leads us to reject H4a; The industrial composition of firms utilizing operating and capital leases is constant.

B. Leasing across time: multivariate analysis

We next investigate whether these expected relationships between operating lease activity and theoretical determinants of leasing hold in a multivariate leasing model. In Table 3 Panel A, we specify the leasing model following Graham, Lemmon and Schallheim (1998). We regress estimated operating lease liabilities to total firm value on proxies for tax status, expected costs of bankruptcy, asset specificity and costs of contracting. As measured in GLS and defined in the appendix, our independent variables are, before interest marginal tax rate, expected cost of distress, modified Z-score, a dummy variable for whether owners' equity is negative, market to book, collateral, and firm size. We include industry dummy variables and time period indicators as in GLS. We find that the explanatory power of the model across our sample period is 26% which is similar to that reported in GLS of 25%. In addition, we find that, with the exception of collateral, all of the signs on the coefficients on our explanatory variables are significant in the expected direction. Specifically, we find that marginal tax rate is negatively related to operating lease activity as expected. Our proxies for distress (expected costs of bankruptcy, modified Z-score, negative owners' equity) are positively related to operating lease activity as expected. The proxy used for asset specificity here is collateral. Collateral is defined as net property, plant and equipment to book value of total assets and therefore is a measure of asset tangibility. As a result, the expected relation between collateral and operating leases is positive (earlier we expected a negative relation because asset specificity was defined in terms of R&D intensity). We find an insignificant coefficient on collateral in our model. The coefficients on market to book

and size are significantly negative as expected. In our more recent sample period (1980-2007), we confirm that the leasing model continues to explain operating lease activity.

Based on the evidence above, we use the error term from the leasing regression as a proxy for the unspecified benefits from off balance sheet financing. We expect that these benefits are an important determinant of observed debt levels. Specifically, we expect that observed on-balance sheet debt ratios should decrease as the benefits from off-balance sheet financing increase. In Table 3 Panels B and C, we estimate the capital structure model specified in Lemmon, Roberts and Zender (2009) including the error term, AbOplease from the GLS regression model (1). We find support for our prediction. In Panel B, we define the dependent variable as book leverage. We find a significant negative relation between debt ratios and AbOplease, our proxy for benefits from off-balance sheet financing. In Panel C, we define the dependent variable as market leverage. We find a negative relation between debt ratios and AbOplease but it is not statistically significant under a robust t-statistic. However, in unreported analysis, we rerun the first stage, GLS model, redefining market to book consistent with the LRZ specification of market to book (see appendix). We find that the error terms from this model are negative and statistically significant in the second stage LRZ model under either specification of the dependent variable (book leverage or market leverage). Therefore, we find evidence that increased unexplained leasing activity results in lower conventional debt levels and we reject H5.

VI. Structuring leases: capital or operating leases

In this section we develop and answer questions Q6, if off-balance-sheet lease financing as a percentage of total lease financing is constant over time and Q7, do firms

use operating leases in lieu of on-balance-sheet financing or to expand debt capacity? Firms have considerable discretion in the choice to structure leases as capital or operating leases. GLS (1998) detail the theoretical determinants of lease financing as distinct from debt financing. Based on their results we hypothesize that given the GAAP qualifications for capital lease financing, we should expect that *from the lessor's perspective* only the most liquid and least firm-specific assets would qualify for operating lease financing. For firm-specific assets the capital lease provides the tax-advantages (relative to conventional debt) suggested by GLS and still effectively transfers ownership to the lessee.

Testing the choice of lease structure is difficult because the assets leased as operating leases are unobservable, i.e. off the balance sheet. However, we can compare types of firms that rely more heavily the off-balance-sheet financing. If our supposition is correct, we should expect a greater use of operating leases in retail and transportation because these assets should be relatively readily redeployed to alternative lessees. If firms with less readily redeployed assets have tax incentive to rely on lease finance rather than traditional debt as per GLS (1998), we expect lessors to prefer leasing terms of a capital lease to mitigate the lessor risk of reclaiming an illiquid asset.

We also hypothesize that risk of collateral loss in bankruptcy motivates the decision of how a lease is structured. Plots of capital and operating leases are consistent with a structural shift in the mid-1990s and coincide with the confirmation of Eastern Airlines final reorganization plan on December 22, 1994. Weiss and Wruck (1998) detail what they term the “court-sponsored asset stripping” of this airline whereby the bankruptcy court approved sale of creditor collateral to fund operating losses.¹⁹ Perhaps

¹⁹ In the end, Eastern's secured creditors received repayment in cash and/or the return of (poorly maintained) collateral totaling 82% of their claims while unsecured creditors recovered an average 11.2%.

the increased reliance on operating leases is a function of lessors' desire to maintain ownership of assets in the face of potential bankruptcy. The bankruptcy court's willingness to deny creditors their collateral may have resulted in a structural shift in how leases are structured.

A. Structuring leases: the Evidence

We model the proportion of total leases that are off the balance sheet and rely heavily on the explanatory variables advanced by GLS (1998) as determinants of capital and operating lease financing. In addition to explanatory variables employed by GLS, we also include the R&D intensity of the firm, indicator variables for Retail and Transportation firms and for the full sample an indicator for the latter time period. We report means and medians of the sample in Table 4 and the regression results for our full sample, 1980-2007, and separately for the early and later periods 1980-1995 and 1996-2007, respectively, in Table 5. Consistent with earlier graphs and tables suggesting an increased reliance on off-balance-sheet lease financing, the indicator for the latter time period is significantly positive.

We obtain interesting results with respect to the marginal tax rate. Consistent with the GLS results, we find that *mrt* is significantly negatively related to operating leases in the full sample and the earlier time period (1980-1995). However, for the latter subsample (1996-2007) *mrt* becomes significantly *positively* related to operating leases suggesting that the remarkable expansion in the use of operating leases cannot be explained by the explanatory tax considerations from the earlier period. The role of off-balance-sheet leases has changed over time.

The expected cost of financial distress ($ecost$) and negative owners equity ($oeneg$) are insignificant in these models. However the modified Z-score is significantly negative and increasingly so in the latter time period. Recall that lower Z-scores indicate greater financial distress and thus this relationship suggests that greater distress is related with greater reliance on off-balance-sheet leasing as a proportion of total leases. This is consistent with expectations that lessors prefer to retain ownership of assets when lessee faces potential bankruptcy.

Graham et al. document a negative coefficient on market-to-book ratio in models of debt, capital lease, and operating lease financing. We obtain a significant negative relationship between MTB and operating leases as a proportion of total leases in the full sample, but this is largely attributable to the latter period (1996-2007). This negative relationship is the opposite of the mechanical result that off-balance-sheet financing lowers book value. Our results suggest that firms with higher growth opportunities rely less heavily on off-balance-sheet leasing.

We employ a measure of collateral value (PPE/TA), R&D intensity, and indicators for retail and transportation to consider the role of asset specificity. Because commercial real estate is relatively easily redeployed to alternative uses, the positive coefficients on the retail dummy variable are expected. However, the transportation indicator changes sign and is never significant suggesting airlines and trucking firms are actually not more likely to lease off the balance sheet. The strong negative relationship between collateral value (PPE/TA) and operating leases appears initially counter-intuitive. However, because the operating leases are unobserved this result may be

mechanical, i.e. given some level of PPE, more of these assets leased off the balance sheet would lower the reported PPE.

Research and development, on the other hand, is never capitalized regardless of the financing choices of the firm. Over the full sample R&D is insignificant. However this is a result of pooling the significantly positive relationship in the early period with the significantly negative relationship in the latter period. Results obtained in the latter period are more consistent with our expectations that firms with more general-usage assets would likely find lessors less agreeable to operating lease contracts. We conclude that the types of firms relying on off-balance-sheet financing have changed over time.

Firm size is strongly positive in all specifications. This result *does not* support an access to capital argument for off-balance-sheet financing. This result may be consistent with large firms leasing assets off the balance sheet in addition to (not in lieu of) their on-balance-sheet debt. To further consider this role of existing conventional debt, we run these models again including both firm size and traditional debt ratios as explanatory variables. We find that, controlling for firm size, which remains positive and significant traditional debt ratios are consistently significantly *negatively* related to the reliance on off-balance-sheet leases as a proportion of total leases. This is consistent with a trade-off of debt for lease financing and the results reported earlier suggesting that unobserved benefits of off-balance sheet leases are a significant determinant of capital structure.

VII. Conclusion

We document remarkable trends: mean operating leases (as a percentage of total debt) increases 744.8% from 1980 to 2007, while capital leases to total debt decreases

49.8%. Moreover, we find not only that the propensity toward off-balance-sheet financing has increased over time, but the types of firms using this source of financing have changed over time. Finally, our results suggest that the benefit of the off-balance-sheet accounting treatment is a significant determinant of corporate capital structure: as off-balance-sheet lease financing increases, conventional debt ratios fall. These results suggest that conventional debt ratios under-estimate financial risk. Our results should be of interest to a host of market participants as the US considers changes in the off-balance-sheet accounting treatment of lease financing.

Generally Accepted Accounting Principles (GAAP) afford firms considerable flexibility to structure leases to qualify for off-balance-sheet treatment. We note that some market participants recognize this flexibility. However, the approaches employed by Moody's Investors Service and by Standard & Poor's to address this concern appear ad hoc and even perverse with respect to marginal conventional debt. Rather than discount actual non-cancellable signed lease commitments, Moody's advocates multiples of operating lease expense to estimate the value of operating leases; Moody's (1999). One problem with this approach is that only existing signed lease commitments are non-cancellable and thus analogous to debt. The use of multiples assumes leases are perpetually renewed. This may be the case on average, but until obligations are signed firms retain an option should they face any change in circumstance.

Standard & Poor's methodology discounts future commitments at firm-specific rates that reflect their cost of on-balance-sheet debt.²⁰ Specifically, S&P compute a firm-specific discount rate from each firm's most recent annual report as Interest Expense divided by Average Conventional Debt. Thus, firms with high conventional debt ratios

²⁰ Standard & Poor's (2006).

are perversely given the benefit of higher discount rates. This approach systematically under-states the extent of off-balance-sheet leasing for firms with higher conventional debt relative to firms with lower conventional debt. Consider, for example, two firms with the same assets – both on and off the books. If Firm A employs 50% debt and 50% equity financing for their on-balance sheet assets while Firm B uses 100% equity financing, Firm A will have a much higher discount rate leading to a lower valuation of the off-balance-sheet assets (relative to Firm B which has signed the same lease contracts for the same off-balance-sheet assets). For a credit rating, this disproportionately under-penalizes firms with both on-balance-sheet and off-balance debt. In a cross-sectional regression, this induces a spurious negative relationship between conventional debt and the propensity to lease (via the operating lease structure).

Given the imperfect and inconsistent treatment by credit rating agencies, perhaps it is not surprising that regulators and popular financial press contend that firms intentionally structure leases to qualify for off-balance-sheet accounting treatment in order to hide non-cancellable financial commitments from investors. It is thus an important empirical question as to whether the reliance on off-balance-sheet lease financing has changed over time and the extent to which benefits of off-balance-sheet financing influence observed corporate capital structures.

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Appendix

From Lemmon, Roberts & Zender (2008):

Total Debt = short term debt (34) + long term debt (9).

Book Leverage = total debt / book assets (6).

Firm Size = log(book assets), where assets are deflated by the GDP-deflator.

Profitability = operating income before depreciation (13) / book assets.

Cash Flow Volatility = the standard deviation of historical operating income requiring at least three years of data.

Marginal Tax Rate = simulated marginal tax rates obtained from John Graham.

Market Equity = Stock Price (199) * Shares Outstanding (54).

Market Leverage = Total Debt / (Total Debt + Market Equity).

Market-to-Book = (market equity + total debt + preferred stock liquidating value (10) – deferred taxes and investment tax credits (35)) / book assets.

Collateral = Inventory (3) + net PPE (8) / book assets.

Z-Score = 3.3 * Pre-Tax Income (170) + Sales (12) + 1.4 * Retained Earnings (36) + 1.2 * (Current Assets (4) – Current Liabilities (5)) / book assets.

Tangibility = net PPE / book assets.

Net Debt Issuance = the change in total debt from year $t-1$ to year t divided by the end of year $t-1$ total assets.

From Graham Lemmon Schallheim (1998):

Following GLS, we compute the present value of non-cancelable operating leases (OPLEASE) as the debt equivalent value of operating leases.

$$OPLEASE = \text{RentExp}_0 + \sum_{t=1}^5 \frac{MPL_t}{(1 + K_d)^t}$$

Here RentExp_0 is the current year rental expense, MLP_t is the minimum lease payments ($t=1, \dots, 5$ years), and K_d is cost of debt capital. All inputs to this computation are obtained from Compustat, except the cost of capital, which we set equal to 10% following GLS.²¹ The other variables in the GLS model are defined as follows:

$BL = \text{Book Leverage} = \text{total debt} / \text{total assets} = (\text{data 34} + \text{data 9}) / \text{data6}$

$ML = \text{Market Leverage} = \text{total debt} / (\text{total debt} + \text{market equity}) = (\text{data34} + \text{data9}) / [\text{data34} + \text{data9} + (\text{data199} * \text{data54})]$

$\text{Intlev} = \text{Initial leverage}$ is the first non-missing value for leverage

$\text{LnSale} = \text{Log (sales)} = \log (\text{data12})$

$\text{Mtb} = \text{Market-to-book} = (\text{market equity} + \text{total debt} + \text{preferred stock liquidating value} (10) - \text{deferred taxes and investment tax credits (35)}) / \text{book assets}$

$\text{Mtb_GLS} = \text{Market-to-book} = \text{market value of firm} / (\text{book value of firm} + \text{oplease})$

$\text{Proft} = \text{Profitability}$ is operating income before depreciation (data13) / book assets

$\text{Tang} = \text{Tangibility}$ is net PPE (data8) / book assets (data6)

$\text{Indmedlev} = \text{Industry median leverage}$ defined using Fama French 38 industries.

$\text{CFvol} = \text{Cash Flow Volatility}$ is the standard deviation of historical operating income (data13) requiring at least three years of data.

$\text{DivPay} = \text{Dividend payer}$ 1 if pays dividends (if $\text{data21} > 0$), 0 otherwise

$\text{Mrt} = \text{Simulated before interest marginal tax rate}$

$\text{Ecost} = \text{Ex ante expected cost of financial distress}$ measured by the standard deviation of the first difference in the firm's earnings before depreciation, interest, and taxes

²¹ Lim, et al. (2003) report the above measure underestimates operating lease liability. Ignoring commitments beyond five years, disclosed in financial statement footnotes as a sum of commitments “thereafter”, underestimates the non-cancellable liability. Ge (2006) re-computes the present value of leases including “thereafter” portion as follows:

$$\text{OPLEASE} = \text{RentExp}_0 + \sum_{t=1}^5 \frac{\text{MPL}_t}{(1 + K_d)^t} + \sum_{t=6}^{6+\text{Addyrs}} \frac{\text{EMPL}_t}{(1 + K_d)^t}$$

Where $\text{ADDYRS} = \text{Thereafter minimum lease payments} / \text{MPL}_5$ and $\text{EMPL} = \text{Thereafter minimum lease payments} / \text{ADDYRS}$. However, she notes similar results when using the more conservative estimates of Graham, et al. Compustat reports “thereafter” portion of lease payments beginning in 2000. Because the more precise estimate employed by Ge would confine empirical analyses to the post 2000 period and because underestimating non-cancelable lease commitments biases against our finding a significant impact on capital structure measures, we employ the more conservative estimates of Graham, et al.

divided by the mean level of the book value of total assets multiplied by the sum of research and development and advertising expenses divided by assets.

Zmod = modified version of Altman's (1968) Z-Score

Oeneg = dummy variable equal to one if the book value of common equity is negative

Coll = Collateral is net property, plant and equipment / book value of total assets

RnD = Research & Development / book value of total assets

Size = log (firm value)

d2000 = Dummy for SIC codes 2000-2999

d3000 = Dummy for SIC codes 3000-3999

d4000 = Dummy for SIC codes 4000-4999

d86 = Dummy for 1986

d8792 = Dummy for 1987-1992

Figure 1
Average Capital and Operating Leases as a Percentage of Total Debt

This figure plots average capital leases and average non-cancellable operating leases (both scaled by total balance sheet) over time.

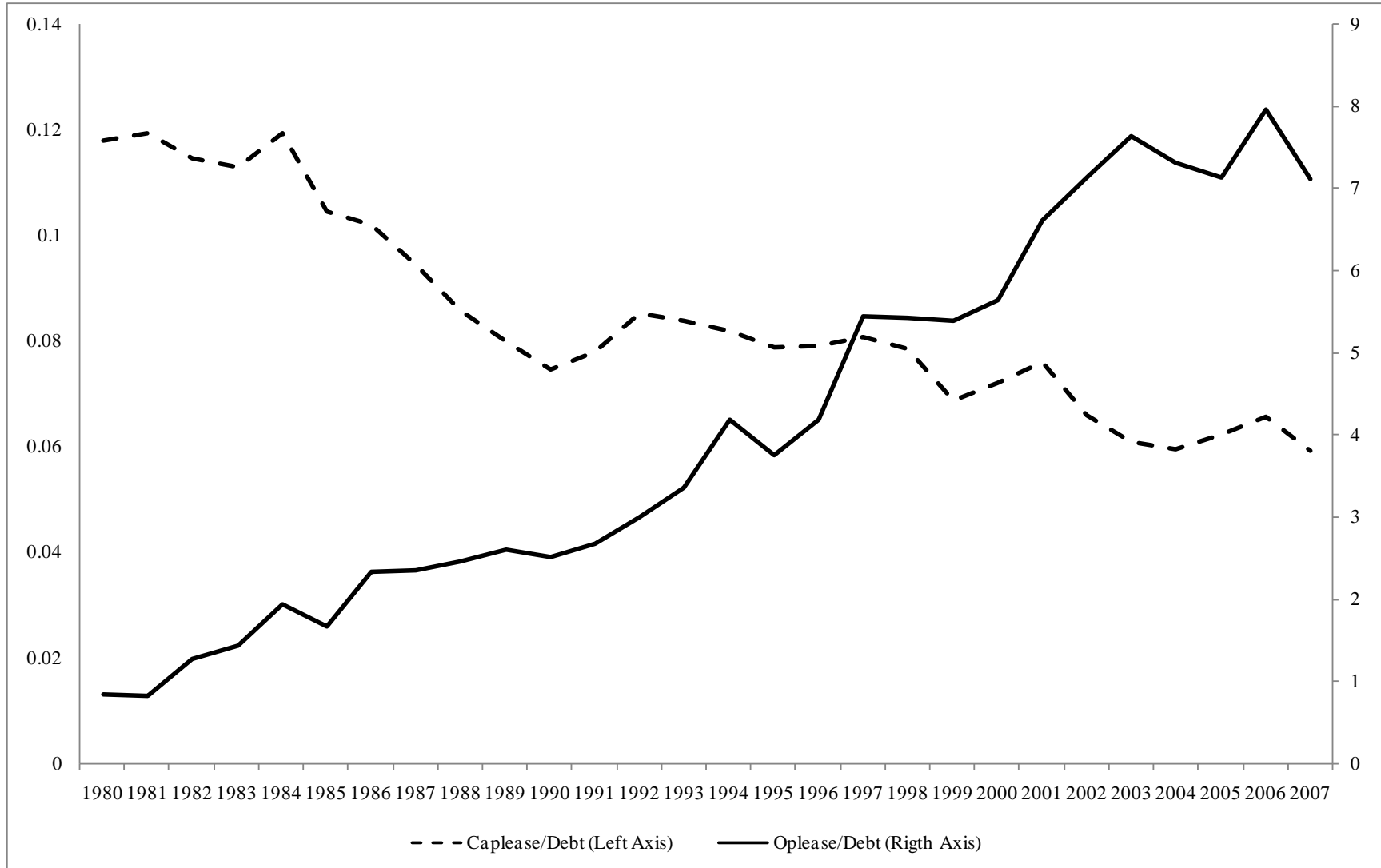


Table 1
Trend Regressions

Dependent variables are ratios: Present value of non-cancellable operating leases scaled by total balance sheet debt; and Capital leases scaled by total balance sheet debt. The independent variable is a time trend. Trend regressions employ data obtained from Compustat over the years 1980-2008. The Bootstrapping results are presented below each regression. Newey-West t-statistics are formed using 2 lags. A star indicates significance based on the Vogelsang90% PS confidence intervals.

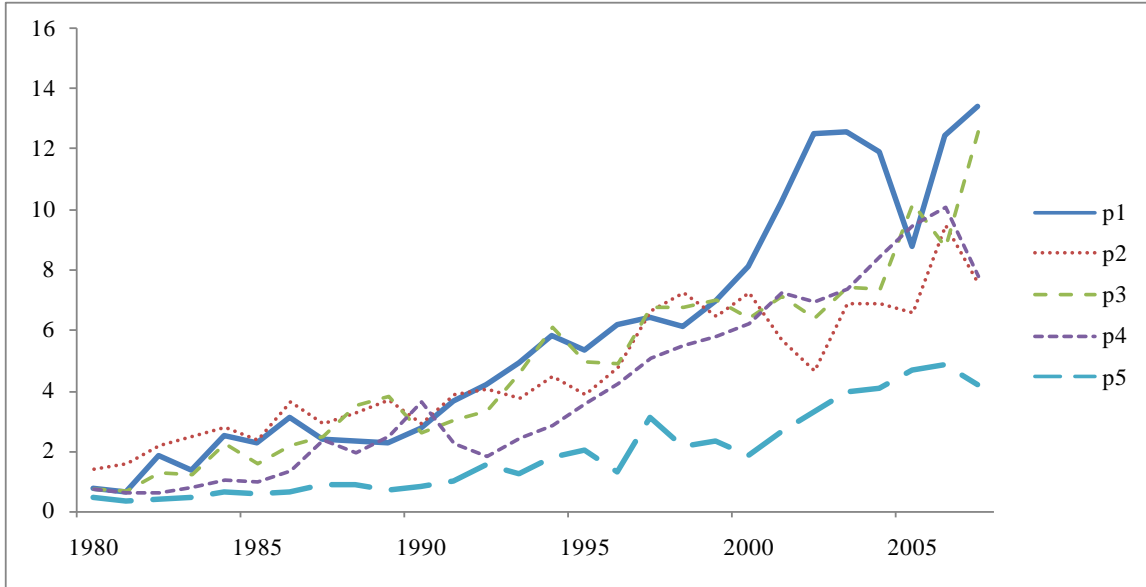
Oplease / TD				
	Coefficient	OLS t-stat	NW t-stat	R2 / Rbar
Intercept	0.10	0.52	0.41	0.96
Trend	0.27*	24.30	20.18	0.96
Bootstrap				
Intercept	0.08	0.56	1.05	0.96
Trend	0.27	25.12	33.24	0.96
Caplease / TD				
	Coefficient	OLS t-stat	NW t-stat	R2 / Rbar
Intercept	0.12	41.15	25.92	0.86
Trend	0.00*	-12.74	-9.66	0.86
Bootstrap				
Intercept	0.12	43.40	50.22	0.86
Trend	0.00	-13.34	-18.50	0.85

Figure 2

Descriptive Statistics on Leasing Activity and Distress Risk across Time

This figure plots annual averages of Oplease and Caplease as percentages of total debt sorted into portfolios by distress risk. We sort firms each year on distress risk using Altman's Z-score where Z-score portfolio, p1, represents the *lowest* Z-score portfolio and contains firms with *highest* risk of financial distress.

Panel A: Mean operating lease liabilities to total debt sorted into portfolios by Z score portfolios



Panel B: Mean capital lease liabilities to total debt sorted into portfolios by Z score

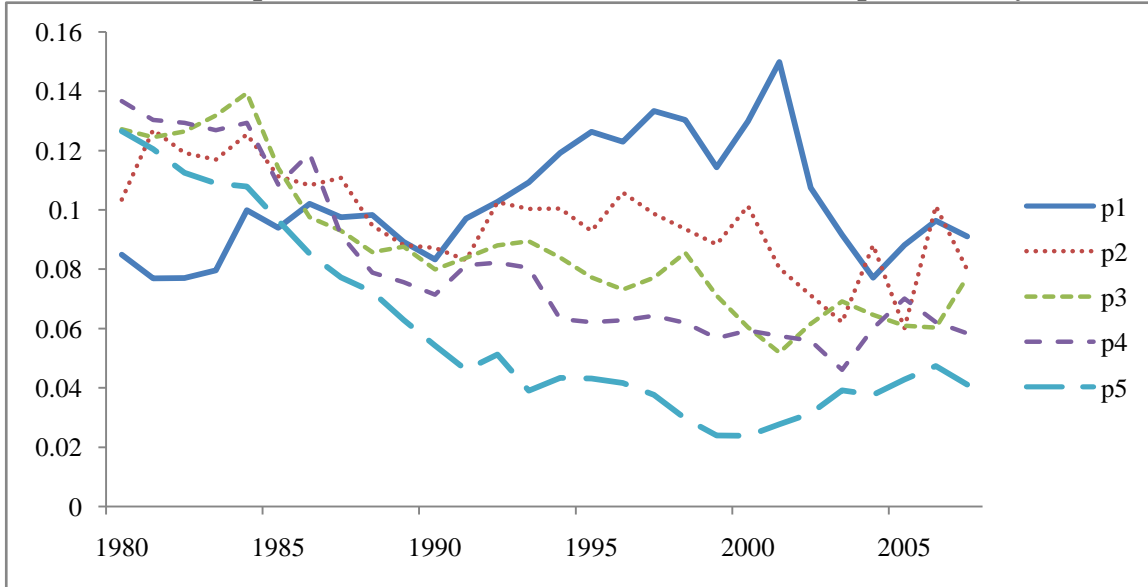
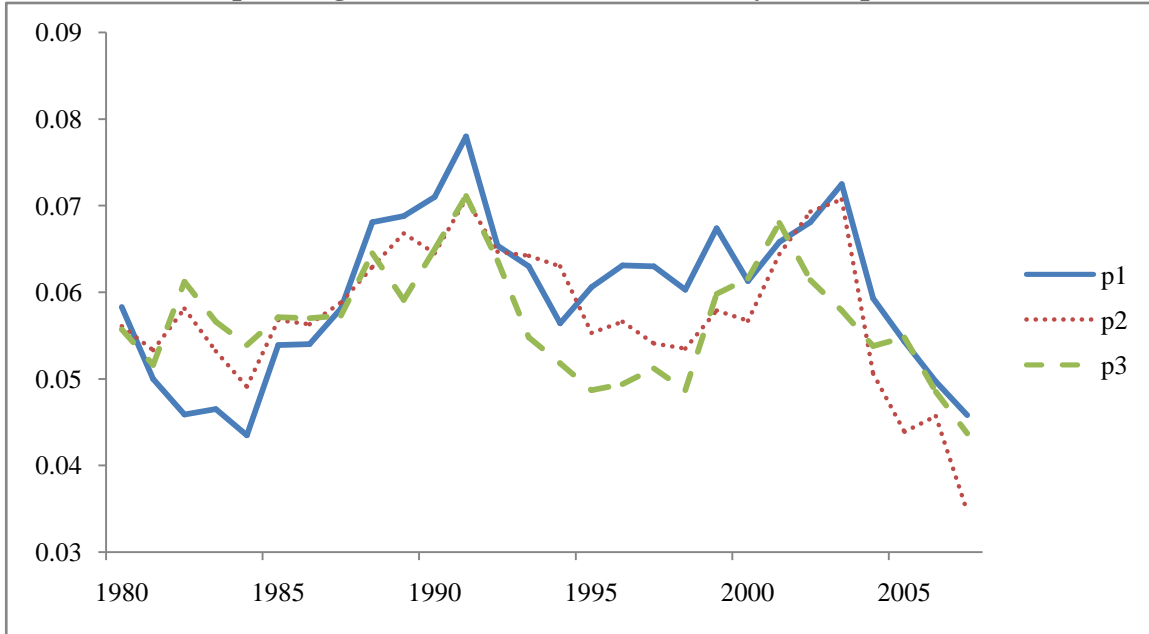


Figure 3

Descriptive Statistics on Leasing Activity and Tax Status across Time

This figure plots annual averages of Oplease and Caplease as percentages of total debt sorted into portfolios by marginal tax rates. Total firm value is defined as the book value of total assets minus book value of common equity plus the market value of common equity plus Oplease. We sort firms each year into terciles based on before interest marginal tax rate where MTR portfolio, p1, represents the *lowest* MTR portfolio and contains firms with *lowest* marginal tax rate.

Panel A: Mean operating lease liabilities to total debt by MTR portfolios across time



Panel B: Mean capital lease liabilities to total debt by MTR portfolios across time

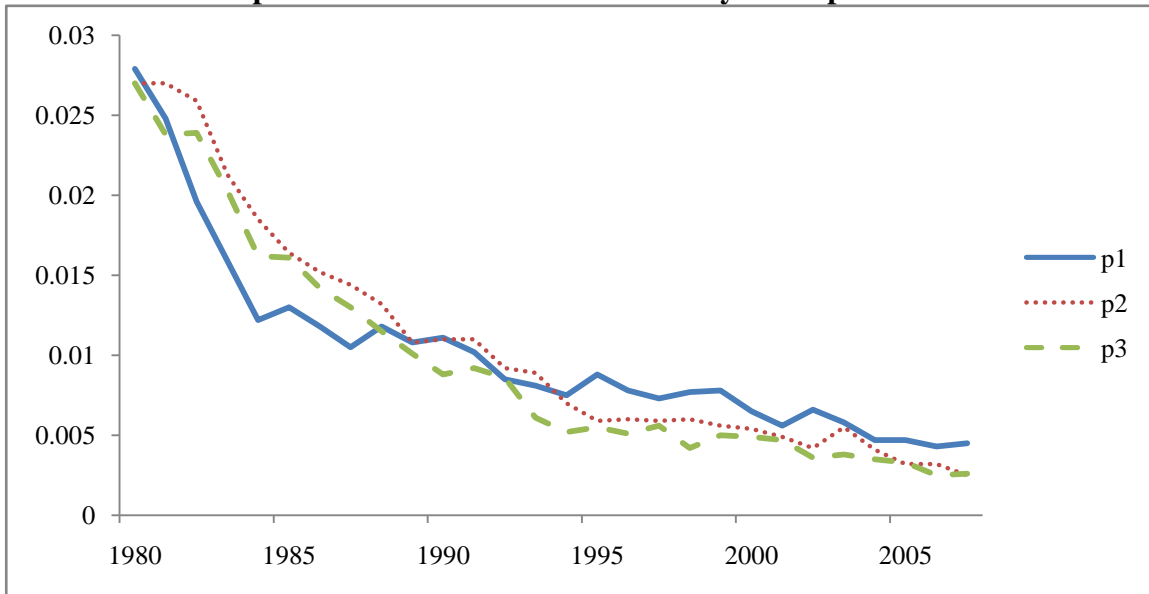
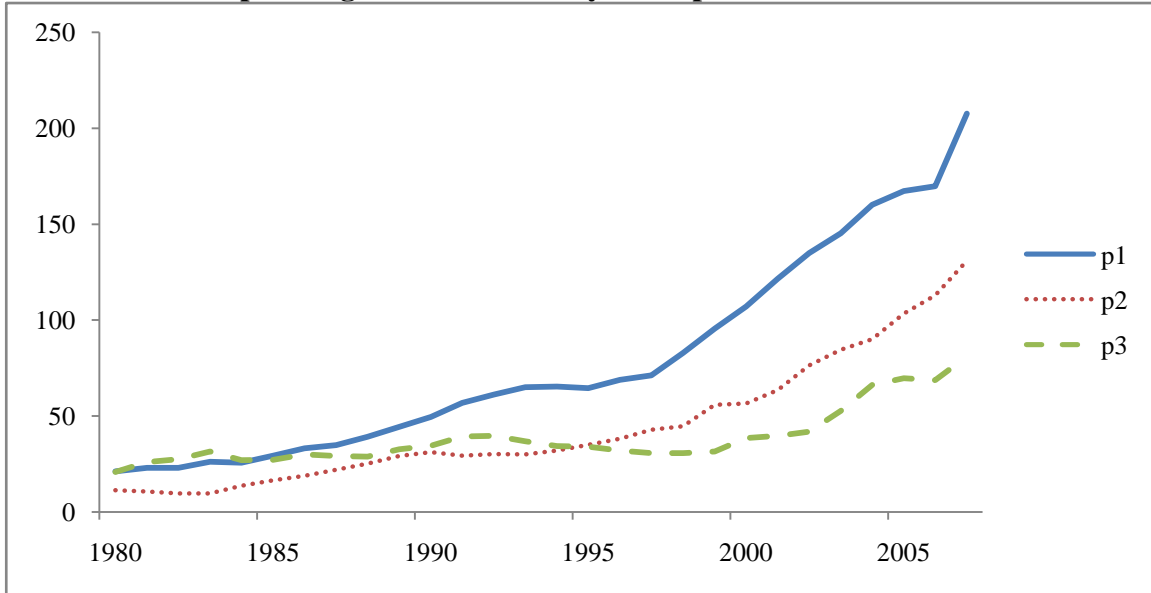


Figure 4

Descriptive Statistics on Leasing Activity and R&D Intensity across Time

This figure plots annual averages of Oplease and Caplease as sorted into portfolios by R&D intensity. R&D intensity is defined as annual R&D expense to total market value of assets where market value of assets is based estimated from an option pricing model (see appendix for methodology). R&D portfolio, p1, represents the *lowest* R&D intensity portfolio and contains firms with *lowest* R&D intensity.

Panel A: Mean operating lease liabilities by R&D portfolios across time



Panel B: Mean capital lease liabilities by R&D portfolios across time

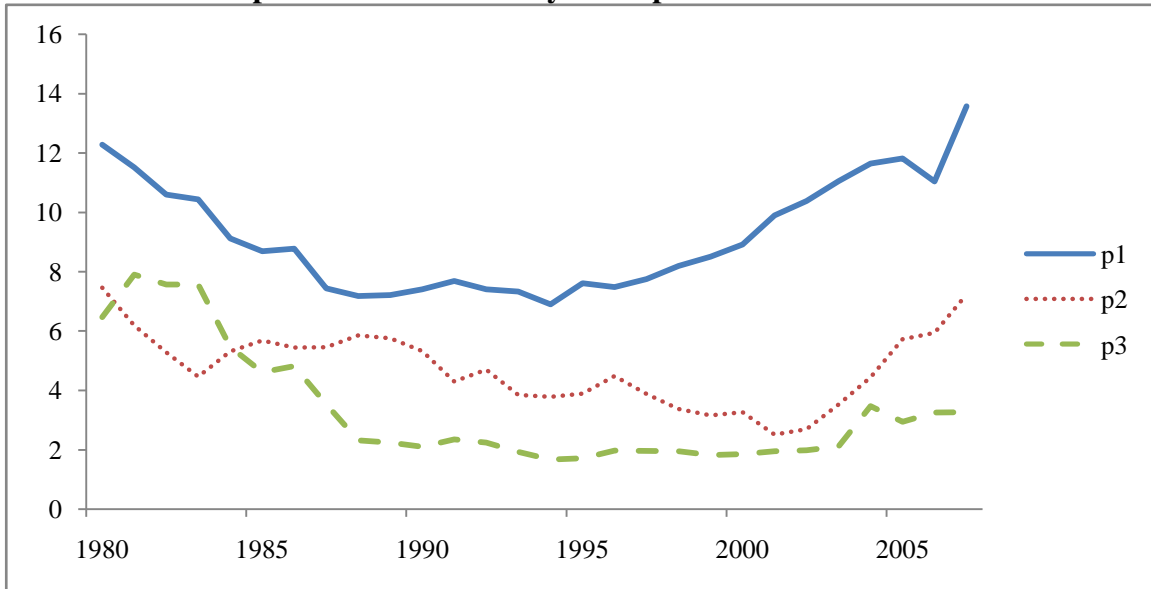


Table 2
Trend Regressions by Industry

Dependent variables are ratios: Present value of non-cancellable operating leases scaled by total balance sheet debt (Panel A); and Capital leases scaled by total balance sheet debt (Panel B). Trend regressions employ data obtained from Compustat over the years 1980-2007. Newey-West t-statistics are formed using 2 lags. A star indicates significance based on the Vogelsang90% PS confidence intervals.

Panel A: Operating leases / Total Debt			
	OLS t-stat	NW t-stat	
Agriculture forestry and fishing	1.28	1.03	
Mining	-0.07	-0.09	
Oil and Gas Extraction	-1.79	-2.06	
Nonmetallic Minerals Except Fuels	-1.64	-1.36	
Construction	2.62	5.39	*
Food and Kindred Products	2.14	2.85	*
Tobacco Products	-3.06	-2.12	
Textile Mill Products	2.29	1.85	
Apparel and other Textile Products	1.22	1.09	*
Lumber and Wood Products	0.78	1.70	
Furniture and Fixtures	1.90	2.26	
Paper and Allied Products	-0.15	-0.15	
Printing and Publishing	2.71	1.82	
Chemicals and Allied Products	6.37	6.15	*
Petroleum and Coal Products	-0.28	-0.45	
Rubber and Misc Plastics Products	0.30	0.28	*
Leather and Leather Products	3.61	4.77	*
Stone Clay and Glass Products	2.86	2.21	
Primary Metal Industries	1.52	1.84	*
Fabricated Metal Products	1.29	2.31	*
Machinery Except Electrical	5.49	4.46	*
Electrical and Electronic Equipment	13.85	13.22	*
Transportation Equipment	3.00	5.22	*
Instruments and Related Products	11.09	8.52	
Misc Manufacturing Industries	2.03	1.89	
Transportation	4.88	8.21	*
Wholesale	5.56	5.37	*
Retail Stores	13.56	16.11	*
Services	13.47	10.90	

Table 2 (continued)

Panel B: Capital leases / Total Debt			
	OLS t-stat	NW t-stat	
Agriculture forestry and fishing	-2.92	-3.52	
Mining	-2.30	-2.61	*
Oil and Gas Extraction	-8.86	-10.02	*
Nonmetallic Minerals Except Fuels	-2.21	-1.76	*
Construction	-2.33	-2.73	
Food and Kindred Products	-12.63	-13.10	*
Tobacco Products	-3.49	-3.89	
Textile Mill Products	-6.92	-6.04	
Apparel and other Textile Products	-7.57	-7.88	
Lumber and Wood Products	-5.44	-5.15	
Furniture and Fixtures	-7.70	-4.47	
Paper and Allied Products	-4.23	-2.52	
Printing and Publishing	-7.92	-7.43	*
Chemicals and Allied Products	-1.19	-0.90	
Petroleum and Coal Products	-7.99	-6.40	*
Rubber and Misc Plastics Products	-5.93	-3.71	*
Leather and Leather Products	-9.09	-7.43	*
Stone Clay and Glass Products	-1.15	-0.94	
Primary Metal Industries	-7.91	-6.40	*
Fabricated Metal Products	-13.07	-8.25	*
Machinery Except Electrical	-8.72	-6.13	*
Electrical and Electronic Equipment	-5.20	-5.12	
Transportation Equipment	-7.44	-4.81	*
Instruments and Related Products	-2.38	-2.92	
Misc Manufacturing Industries	-4.60	-3.38	*
Transportation	-7.02	-4.38	
Wholesale	-13.26	-12.45	*
Retail Stores	-8.35	-4.41	
Services	-4.82	-7.09	

Table 3**Abnormal operating leases in models of traditional capital structure**

This table reports the results from multi-stage regression analysis. The dependent variable in Panel A is the ratio of operating leases to total firm value following GLS. We retain the error term from Panel A as a measure of “abnormal” operating leases and include this as an additional explanatory variable in the model of traditional capital structure in Panels B and C which report results for book value and market value of conventional leverage, respectively, as estimated in LRZ.

Panel A: Estimating abnormal operating leases

	Coefficient	Robust t-stat	OLS t-stat
Marginal Tax Rate	-0.015	-1.872	-3.140
Expected cost of distress	0.000	1.926	4.631
Modified Z-score	0.001	1.856	3.477
Negative Owner’s Equity	0.010	2.196	3.398
Market to book ratio	-0.013	-12.316	-33.791
Collateral	-0.003	-0.259	-0.965
Firm Size	-0.006	-8.292	-23.125
SIC 2000-2999	-0.073	-17.293	-52.555
SIC 3000-3999	-0.078	-19.125	-71.363
SIC 4000-4999	-0.014	-0.389	-1.175
Year 1986 indicator	-0.008	-6.663	-3.123
Years 1987-1992 indicator	0.008	3.183	6.133
Rbar-squared	0.262		
R-squared	0.263		
N obs	23962		
N var	12		

Panel B: Conventional capital structure (Book value leverage)

	Coeff.	Robust t-stat	OLS t-stat	Coeff.	Robust t-stat	OLS t-stat
intLev	0.225	9.832	34.131	0.237	10.091	36.051
LnSales	0.008	4.185	11.069	0.009	4.819	12.674
M/B	-0.012	-5.327	-14.989	-0.011	-4.960	-14.404
Profit	-0.218	-10.193	-29.405	-0.228	-10.572	-30.816
Tang	0.185	11.020	27.539	0.177	10.858	26.481
Indmed	0.042	1.010	2.442	0.111	2.796	6.400
CFvol	0.000	-0.823	-1.528	0.000	-0.935	-1.765
DivPayer	-0.041	-6.249	-14.916	-0.046	-7.144	-16.705
AbOplease				-0.310	-8.141	-18.820
Rbar 2	0.139			0.151		
R2	0.139			0.151		
N obs	23962			23962		
N var	8			9		

Table 3 (continued)

Panel C: Conventional capital structure (Market value leverage)						
		Robust	OLS		Robust	OLS
	Coeff.	t-stat	t-stat	Coeff.	t-stat	t-stat
intLev	0.222	9.185	31.662	0.224	9.180	31.792
LnSales	0.010	4.677	12.999	0.010	4.759	13.191
M/B	-0.060	-15.592	-70.542	-0.060	-15.434	-70.402
Profit	-0.255	-11.003	-32.268	-0.256	-11.052	-32.390
Tang	0.172	8.968	24.145	0.171	8.915	23.918
Indmed	0.221	4.776	12.160	0.232	5.137	12.486
CFvol	0.000	-3.229	-5.932	0.000	-3.232	-5.966
DivPayer	-0.054	-6.664	-18.423	-0.054	-6.783	-18.609
AbOplease				-0.050	-1.045	-2.834
Rbar 2	0.291			0.291		
R2	0.291			0.291		
N obs	23962			23962		
N var	8			9		

Table 4:

This table reports the mean and medial percentage of total leases that are structured as operating leases (as opposed to capital leases) for the overall sample and in years 1995 and 2007. This table also contains means and medians of theoretical determinants of lease financing in each time period. Significance of differences between 1995 and 2007 are reported for each.

	1980 thru 1995 N=11521		1996 thru 2007 N=10355	
	Mean	Median	Mean	Median
Oplease/Total Lease	0.82	0.98	0.92	1.00
MRT	0.33	0.34	0.27	0.35
Ecost	8.19	2.37	9.89	2.92
Zmod	2.00	2.28	1.31	1.89
MTB	1.32	0.96	1.76	1.25
Coll	0.30	0.28	0.27	0.22
RnD	32.50	2.22	62.05	4.63
Size	11.38	11.22	12.65	12.62

Table 5a:

This table reports regression models with percentage of total leases that are structured as operating leases (as opposed to capital leases) as the dependent variable. We estimate models over the entire sample and separately for the periods 1980-1995 and 1996-2007. Coefficients are scaled by 100.

	Full Sample			1980-1995			1996-2007		
	Coeff	Rob. t-stat	OLS t-stat	Coeff	Rob. t-stat	OLS t-stat	Coeff	Rob. t-stat	OLS t-stat
MRT	-17.42	-2.91	-10.87	-26.13	-3.79	-9.69	6.07	2.32	3.42
Ecost	-0.01	-0.41	-1.06	-0.03	-0.97	-2.40	0.00	-0.02	-0.03
Zmod	-0.28	-1.68	-3.12	-0.50	-1.51	-2.95	-0.34	-2.51	-3.96
Oeneg	-0.64	-0.45	-0.60	0.69	0.29	0.37	-2.06	-1.41	-1.92
MTB	-0.63	-2.97	-4.96	-0.47	-0.99	-2.00	-0.46	-3.04	-3.68
Coll	-25.52	-8.98	-25.74	-32.31	-7.69	-18.94	-17.71	-8.05	-17.17
RnD	0.00	0.15	0.36	0.01	2.57	5.07	0.00	-1.31	-2.81
Size	1.86	6.63	20.60	1.57	4.01	9.98	1.09	4.80	10.35
Retail	5.09	4.05	9.28	4.43	2.36	4.91	3.80	3.20	6.47
Trans	2.42	0.48	0.59	3.58	0.77	0.50	-0.49	-0.06	-0.12
Rbar	0.05			0.05			0.04		
R2	0.05			0.05			0.04		
Nobs	21876			11521			10355		

Table 5b:

This table reports regression models with percentage of total leases that are structured as operating leases (as opposed to capital leases) as the dependent variable. We estimate models over the entire sample and separately for the periods 1980-1995 and 1996-2007.

	Full Sample			1980-1995			1996-2007		
	Coeff	Rob. t-stat	OLS t-stat	Coeff	Rob. t-stat	OLS t-stat	Coeff	Rob. t-stat	OLS t-stat
MRT	-8.84	-1.73	-5.31	-21.22	-3.03	-7.53	5.88	2.26	3.30
Ecost	-0.01	-0.57	-1.47	-0.02	-0.89	-2.16	0.00	0.05	0.07
Zmod	-0.26	-1.58	-2.95	-0.58	-1.73	-3.50	-0.28	-2.16	-3.37
Oeneg	-0.74	-0.53	-0.71	0.34	0.15	0.19	-2.02	-1.36	-1.87
MTB	-0.51	-2.38	-4.01	-0.51	-1.10	-2.17	-0.46	-3.07	-3.66
Coll	-23.19	-8.02	-23.77	-33.16	-7.36	-19.50	-16.13	-7.49	-16.06
RnD	0.00	0.54	1.29	0.01	2.69	5.46	0.00	-1.32	-2.86
Size	1.33	4.79	13.74	1.60	3.95	10.10	1.09	4.77	10.27
d2000	-3.85	-2.86	-7.65	-5.45	-2.75	-6.62	-1.79	-1.40	-3.24
d3000	-3.66	-3.36	-9.37	-5.90	-3.59	-9.29	-1.46	-1.50	-3.42
d4000	-0.51	-0.10	-0.12	0.06	0.01	0.01	-2.38	-0.29	-0.56
d86	-0.69	-0.30	-0.76	0.14	0.08	0.13			
d8792	4.12	1.58	8.81	3.19	1.54	5.78			
d9607	8.21	3.08	17.81						
Rbar	6.95			6.07			3.51		
R2	7.01			6.17			3.61		
Nobs	21876			11521			10355		

Table 6:

This table reports regression models with changes in the percentage of total leases that are structured as operating leases (as opposed to capital leases) as the dependent variable. We also take first differences of MTR, Zmod, MTB, and Coll. We estimate models over the entire sample and separately for the periods 1980-1995 and 1996-2007. Coefficients are scaled by 100.

	Full Sample			1980-1995			1996-2007		
	Coeff	Rob. t-stat	OLS t-stat	Coeff	Rob. t-stat	OLS t-stat	Coeff	Rob. t-stat	OLS t-stat
dMrt	-1.36	-1.40	-1.52	-4.93	-2.85	-3.25	0.89	1.18	0.82
Ecost	0.00	-0.64	-0.52	0.00	0.21	0.22	0.00	-0.99	-0.81
dZmod	-0.16	-1.58	-2.19	0.12	0.81	0.94	-0.31	-2.57	-3.53
Oeneg	-0.08	-0.14	-0.16	0.14	0.16	0.17	-0.02	-0.03	-0.03
dMTB	0.04	0.34	0.55	0.04	0.15	0.25	0.03	0.24	0.38
dColl	-17.33	-7.04	-11.77	-15.73	-5.22	-7.35	-19.15	-4.82	-9.47
RnD	0.00	-1.28	-0.81	0.00	-0.88	-0.86	0.00	-0.69	-0.37
Size	-0.06	-2.34	-1.37	0.03	0.62	0.51	-0.09	-2.50	-1.52
Retail	-0.41	-2.73	-1.59	-0.19	-0.77	-0.47	-0.53	-2.98	-1.56
Trans	-1.41	-0.92	-0.66	-5.97	-2.13	-1.55	0.93	0.96	0.37
Rbar	0.01			0.01			0.01		
R2	0.01			0.01			0.01		
Nobs	18887			9641			9246		