ECONOMIC CONSEQUENCES OF ACCOUNTING STANDARDS
The Lease Disclosure Rule Change*

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We examine capital structure changes to investigate the impact of SFAS No. 13 on lessees. While this accounting standard essentially rearranged capital lease disclosures (from footnotes to the balance sheet), mandated capitalization substantially altered key accounting ratios. Our results document a systematic substitution from capital leases to operating leases and nonlease sources of financing. In addition, lessees appear to reduce book leverage by increasing equity and reducing conventional debt. The magnitudes of these responses are cross-sectionally related to preadoption levels of footnoted capital leases.

1. Introduction

This paper documents a significant change in the capital structure of lessee firms in response to Statement of Financial Accounting Standard (SFAS) No. 13, 'Accounting for Leases' [FASB (1976)]. Before the accounting rule change, most leases that were effectively purchases of assets (hereafter 'capital leases') were reported in footnotes to the financial statements.[1] SFAS No. 13 changed the form of capital lease disclosures by requiring all capital leases to be reported as assets and debt – effectively moving capital leases from the footnotes to the balance sheet. Lease capitalization was expected to increase

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[1]Prior to SFAS No. 13, firms had the option of reporting capital leases either in the footnotes or in the body of the financial statements. Most lessees, especially firms with relatively large amounts of capital leases, elected footnote disclosure for their capital leases. Technically, these off-balance sheet capital leases are termed 'financing' leases, under ASR No. 147 [SEC (1973)]. Here we ignore this distinction and refer to all leases that are essentially purchases of assets as capital leases.

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book leverage ratios and reduce accounting rates of return. Based on contract-ing-costs arguments [summarized in Holthausen and Leftwich (1983) and Watts and Zimmerman (1986)], we hypothesize that financial statement changes caused by the standard increased the cost of using capital leases, thereby causing lessees to reduce the proportion of assets financed through capital leases.

The most pervasive effect we observe is substitution from capital leases to operating leases (all leases not classified as capital leases).[2] Firms employing relatively larger amounts of capital leases reported substantial declines in capital leases and corresponding increases in operating leases around adoption of the standard. We also find substitution towards nonlease financing, indi-cated by a decline in total leasing (operating and capital combined). Finally, the standard is associated with leverage-reducing changes within nonlease sources of financing, evidenced by increases in equity and decreases in conventional long-term debt. The magnitude of these capital structure changes, which offset the expected financial statement impact of the standard, are cross-sectionally related to preadoption levels of footnoted capital leases.

We examine the lease accounting rule change because it had a major impact on lessees' financial statements. Balance sheet debt is expected to double for our sample of lessees with relatively higher preadoption levels of footnoted capital leases.[3] The existence of prepronouncement 'as-if capitalized' footnote disclosures enables us to predict the standard's impact on lessees' financial statements, thereby allowing cross-sectional analyses. Footnote disclosures also identify cash flows for capital and operating leases both before and after the change, thereby allowing estimation of firm responses to the standard along a number of dimensions.

The regression methodology employed here uses control periods from before and after the new standard to identify unexpected capital structure changes associated with the rule change. This procedure controls for two statistical problems that potentially bias inferences based on analyses of financial statement variables: heteroskedasticity and regression to the mean. To provide additional control for confounding effects, we analyze a well-defined subsam-ple of lessees. We also offer a nonparametric analysis that is used to comple-ment the regression results. Unlike earlier studies that analyze only one

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[2]All long-term leases that are not effectively purchases of assets are classified as operating leases. (Short-term leases and rental contracts are excluded from the analysis.) While the distinction between capital and operating leases is assumed to be dichotomous, the degree to which ownership rights and risks can be transferred to lessees is clearly a continuous variable. Here we use the accounting definitions of capital and operating leases to represent two groups of leases that transfer relatively more and relatively less ownership rights to the lessee, respectively.

[3]Other factors supporting the perceived importance of this standard include the number of comment letters received by the Financial Accounting Standards Board (FASB) concerning SFAS No. 13, during its development, and the fact that the FASB has issued thirteen subsequent pronouncements related to leases.

response variable (discussed in section 4.1) we analyze potential responses along many dimensions. Our results demonstrate the importance of considering alternative responses that firms affected by a new standard might use to offset the financial statement effects of the rule change.

Section 2 of this paper develops the research hypothesis. Section 3 reports results of empirical tests, and section 4 discusses the methodology employed and provides a summary of the results and their implications.

2. Research hypothesis

Fig. 1 describes the lease disclosure environment before and after SFAS No. 13. The notation introduced in fig. 1 and used throughout the paper identifies the net present values (PV) of capital lease obligations reported in footnotes ($PVCAP_f$) and balance sheets ($PVCAP_b$), as well as minimum scheduled cash flows (FL) for both capital leases ($FLCAP$) and operating leases ($FLOP$). While some leases were capitalized ('booked') as assets and debt prior to the standard, most capital leases were reported in footnotes in accordance with existing accounting rules [AICPA (1964, 1973), SEC (1973)]. After the standard, the present values of preadoption capital lease obligations reported in footnotes are required to be capitalized retroactively as debt and the corresponding unamortized asset values included as assets. Because of differences in the timing of expenses for capital and operating leases, owners' equity is expected to decline after capitalization and net income is expected to decrease for most lessees (with increasing nominal amounts of capital leases) [El-Gazzar et al. (1986)].[4]

The financial statement impact of lease capitalization and the consequences expected by managers of affected firms are well documented elsewhere [Abdel-khalik (1981)]. Increases in debt and assets combine with decreases in equity and income to cause expected increases in accounting measures of leverage and decreases in accounting rates of return. Managers specifically mentioned debt covenant violations as a problem caused by increased accounting leverage ratios [FASB (1976)]. Also accounting rates of return are frequently used either explicitly as a measure of managerial performance in compensation contracts [Healy (1985)] or implicitly by compensation committees in setting overall compensation [Antle and Smith (1986)]. Managers of lessee firms with debt contracts, managerial compensation agreements, or other contracts affected by SFAS No. 13 had economic incentives to offset the

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[4]Unlike the uniform balance sheet effect of the standard, lease capitalization can either increase or decrease income. Relative to operating leases, expenses are higher (lower) for capital leases early (late) in the lease life. However, examination of preadoption footnote data that disclosed 'as-if-capitalized' information, for a subsample of lessees described in the appendix, uncovered no income-increasing firms and indicated a high cross-sectional correlation between increases in leverage and percent decreases in income.

Lease disclosures available before and after SFAS No. 13[1]

PANEL A: Present values of all future lease payments (STOCKS)[2]

TYPE OF LEASE (source of information)	PRE SFAS NO. 13	POST SFAS NO. 13
CAPITAL[3] (balance sheet and footnotes)	1) Booked as asset/liability $$\boxed{PVCAP_b}$$ .... 2) Off-Balance Sheet $$\boxed{PVCAP_f}$$	Booked as asset/liability $$\boxed{PVCAP_b}$$
OPERATING	Present values are not reported for operating leases	

PANEL B: Next five year's lease payments(FLOWS)[2]

TYPE OF LEASE (source of information)	PRE SFAS NO. 13	POST SFAS NO. 13
CAPITAL[3] (footnotes)	1) Booked as asset/liability $FLCAP_b$ (not reported) .... 2) Off-Balance Sheet $\boxed{FLCAP_f}$	Booked as asset/liability $\boxed{FLCAP_b}$
OPERATING (footnotes)	$FLOP$ (reported combined)	$\boxed{FLOP}$

[1] Summary notation used to present lease disclosures is as follows. The first two letters, *PV* and *FL*, represent present values (in panel A) and cash flows (in panel B), respectively. The remaining letters (*CAP* or *OP*) represent capital and operating leases, respectively. The subscripts *b* and *f* indicate that present values for capital leases are reported in the balance sheet and footnotes, respectively.

[2] Only boxed items were disclosed in Annual Reports. In Panel B, $FLCAP_b$ was not reported and $FLCAP_f$ and FLOP were reported as a combined amount in the pre SFAS No. 13 period. To obtain separate values for flows in this period, an average ratio FLCAP/PVCAP is computed for each firm in the post SFAS No. 13 period. This ratio is multiplied by $PVCAP_b$ and $PVCAP_f$, for each firm, to impute $FLCAP_b$ and $FLCAP_f$ for the pre SFAS No. 13 period. FLOP is estimated by subtracting the imputed value of $FLCAP_f$ from the total for FLOP and $FLCAP_f$ reported in the pre SFAS No. 13 period.

[3] Most capital leases in the pre SFAS No.13 period were not booked as assets and liabilities on the balance sheet. Instead they were labelled "financing" leases and footnote disclosures reported the financial statement effects that would have occurred if these leases had been booked as assets and liabilities. After SFAS No. 13, all capital leases are booked on the balance sheet.

Fig. 1

financial statement effects of lease capitalization. While stockholders and managers are the parties adversely affected by the standard and managers are expected to determine appropriate responses, for expositional purposes we refer to the firm (or the lessee) as the party being affected by and determining responses to the standard.

Each firm's response to the standard depends on factors such as the cost of violating debt contract restrictions, the way accounting-based restrictions are stated and measured, and the upper and lower limits in compensation arrangements. Potential responses include 1) renegotiating parameters of contracts affected by lease capitalization, 2) violating debt covenants and entering into technical default, and 3) mitigating the financial statement impact of lease capitalization by undertaking offsetting capital structure changes. This last response includes a host of capital structure changes representing substitution from capital leases and conventional debt into equity and other forms of off-balance sheet financing (including operating leases). In general, the specific response (or mix of responses) selected by each lessee is determined by the relative costs and benefits of alternative responses, and magnitudes of firm responses are determined by factors such as the magnitude of the standard's impact on relevant accounting ratios and the amount of preadoption 'slack' relative to limits specified in affected contracts.

Our research strategy is to examine actual lessee responses to the standard to provide evidence on the relative costs and benefits of alternative responses. Additional confirmation that the responses observed are a consequence of the standard is provided by examining the cross-sectional relation between the magnitudes of firm responses and the expected impact of the standard. In the absence of data on relevant parameters of affected contracts, preadoption levels of footnoted capital leases ($PVCAP_f$ reported immediately prior to the standard) are assumed to proxy for the expected impact of the standard.[5] In effect, we assume that cross-sectional variation along omitted contractual variables (such as limits specified in debt contracts and preadoption 'slack' relative to these limits) is random, or at least sufficiently unrelated to the proxy used to allow statistically significant relations to be observed. To enable comparisons across lessees, $PVCAP_f$ is deflated by long-term capitalization (LTC), which equals the book value of long-term conventional debt and equity plus the present values of all capital lease obligations ($PVCAP_f + PVCAP_b$). The same ratio was employed by the SEC (1973) to measure the

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[5]Examination of footnote data indicates that, while the expected liability increase due to lease capitalization ($PVCAP_f$) is correlated with expected asset increases, equity decreases, and income reductions across lessees, the dollar value of this liability effect differs slightly from the asset and equity effects and varies substantially from the income effect (see footnote 4). We assume that the liability-based proxy used here is cross-sectionally related to expected changes in accounting measures of leverage and rates of return, despite the fact that these accounting measures are based on financial statement items that include both liability and nonliability accounts.

extent to which firms employ footnoted capital leases. Despite potential measurement error, we believe this proxy for the expected impact of the standard is the best available, and it is used as the explanatory variable for all empirical tests.

In summary, the research hypothesis is motivated by the effects of lease capitalization on key accounting ratios used explicitly and implicitly in lending and compensation contracts. Cross-sectionally, the hypothesis predicts that lessees with larger amounts of preadoption footnoted capital leases, scaled by long-term capitalization, are relatively more active in their efforts to offset financial statement changes caused by the standard. In contrast, the null hypothesis (of no economic consequences) predicts that lessees mechanically apply the new lease disclosure rules by booking all capital leases previously reported in the footnotes.

3. Empirical tests and results

To test the null hypothesis, we identify unexpected capital structure changes based on available financial disclosures. We first examine the cross-sectional relation between unexpected changes in capital leases around SFAS No. 13 and preadoption levels of footnoted capital leases for all Compustat firms reporting leases. We then examine the same relation for a subsample of 158 firms, to address certain limitations of the Compustat sample results. Since reducing capital leases represents only one of many possible responses to the standard, we also examine four other measurable responses for this subsample: changes in operating leases, changes in overall leasing, changes in conventional (nonlease) debt, and changes in equity.[6]

3.1. Changes in capital leases – Compustat sample

If lessees affected by SFAS No. 13 seek to reduce capital leases, the research hypothesis predicts an unexpected decline in reported capital leases, subsequent to the adoption of SFAS No. 13, that is positively related to preadoption levels of footnoted capital leases. This simple statement of the hypothesis requires adjustment to incorporate several institutional details.

The standard allowed for a lengthy transition period that varied across firms. Annual reports for years ending on or before December 1976 disclosed leases under the old rules. Annual reports for years ending on or after December 1978 were expected to have completed retroactive adoption of the

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[6]Only a subset of the many responses observed are analyzed in depth, since analysis of all potential responses for all lessees is prohibitively expensive (see section 4.2).

standard for all capital leases.[7] Thus, the time between the last report in the preadoption period and the first report in the postadoption period is two years for calendar-year-end firms and three years for all other firms. Moreover some lessees adopted the standard early (typically firms with relatively low amounts of capital leases), while a few others delayed capitalization beyond the 1978 deadline to settle contractual violations caused by adoption of the standard [Pfeiffer (1980)].

To avoid reading individual annual reports to identify firm-specific transition periods, we assume a uniform two-year transition period for all lessees on Compustat. The first year in the postadoption period (called 1978) consists of firm-years with year-ends between December 1978 and November 1979. Similarly, we treat firm-years with year-ends between December 1976 and November 1977 as the last year in the preadoption period and label this year as 1976. All subsequent tests conducted on a subsample of 158 lessees (described in the appendix) use firm-specific transition periods and years are classified as defined by Compustat. While the two-year transition period assumed here causes potential measurement errors, the actual transition period for 128 of 158 firms in the subsample (81 percent) was included within this two-year period. Using an approximate transition period causes underestimation of lessee responses, thereby biasing tests on the Compustat sample in favor of the null hypothesis.[8]

In addition to the complexity regarding transition periods, SFAS No. 13 altered the definition of capital leases to include some leases previously classified as operating leases and also redefined the discount rate used to compute present values of lease obligations.[9] These changes result in a small but indeterminable upward bias in postadoption present values for capital leases, relative to expectations based on preadoption levels of capital leases.

[7]Initially the FASB allowed a five-year grace period, to 1981, before retroactive capitalization was required. This concession was in response to lessee complaints that capitalization would cause them to violate extant contractual agreements. The SEC intervened with ASR 225 [SEC (1977)] and reduced this period to two years. However, the SEC allowed firms to delay capitalization if more time was needed to settle contractual violations caused by adoption of the new standard, provided reasons for the delay were disclosed.

[8]Since lessees were aware of the proposed standard prior to 1976, firm responses could precede the two-year transition period considered here. However, a three-year transition period starting in 1975 is not used since lease data is available only after 1973. The data required for a three-year preadoption control period (introduced later) would not be available.

[9]Under ASR 147 [SEC(1973)], leases had to be both noncancellable and their term exceed 75 percent of the economic life of the asset to qualify as 'capital' leases (more correctly, financing leases). Under SFAS No. 13, however, even cancellable leases can be classified as capital leases. Also, leases meeting any one of four conditions, including the 75 percent of economic life criterion, are classified as capital leases. Under ASR 147, the relevant discount rate was the interest rate implicit in the lease payments. Under SFAS No. 13, the relevant discount rate is the lower of the implicit rate and the 'incremental' borrowing rate of the lessee (defined as the rate the lessee would have to pay to borrow funds at lease inception to purchase the leased asset). This potential reduction in discount rates implies higher present values.

Again, not accounting for this change in definitions biases statistical tests against observing a *decreasing* in capital leases as predicted by the research hypothesis.

To incorporate the two-year transition period and underestimation of expected postadoption values of *PVCAP*, the null and research (alternate) hypotheses are stated in terms of the following cross-sectional model:

$$(PVCAP/A)_{1978} - E[(PVCAP/A)_{1978}]$$

$$= \gamma + \delta(PVCAP_f/LTC)_{1976} + \zeta, \tag{1}$$

$$H_0: \quad \gamma > 0, \quad \delta = 0, \qquad H_a: \quad \gamma > 0, \quad \delta < 0,$$

where

$PVCAP$ = present value of future lease commitments for all capital leases,
A = book value of nonlease assets,
$PVCAP_f$ = present value of future lease commitments for capital leases reported in footnotes,
LTC = long-term capitalization equals $PVCAP_f$ plus book value of debt and equity, and
$E[\cdot]$ = expected value, based on preadoption levels of capital leases.

Since specifications of the independent and dependent variables and their exact functional relation is hampered by lack of theory, we make certain choices to allow empirical tests. In addition to assumptions made in section 2 regarding the explanatory variable, we assume that unexpected changes in capital leases, representing the dependent variable, are linearly related to the explanatory variable. Present values for capital leases ($PVCAP$) are scaled by the book value of nonlease assets (A) to control for changes in firm size and inflation during the lengthy transition period.[10] Extensive sensitivity analyses summarized later reveal that our results are not driven by these choices. Given that expected postadoption values of capital leases, based on preadoption levels, are potentially downward biased (due to the definitional changes per SFAS No. 13), the intercept (γ) is expected to be positive under both hypotheses. Note that both the null and alternative hypotheses predict zero values for the intercept if expectations are correctly specified. Any bias due to the definitional change is assumed to be entirely captured by the intercept.[11]

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[10]Assets financed through capital leases are specifically excluded from the measure used to deflate $PVCAP$ to avoid any bias caused by a decline in capital leases in the postadoption period as predicted by the alternate hypothesis. LTC, the deflator used for the explanatory variable, is not used as a deflator for $PVCAP$ for the same reason.

[11]If, however, the underestimation of postadoption values is positively related to preadoption levels of footnoted capital leases, then estimates for δ will be biased towards zero.

For notational simplicity, we drop firm subscripts (subscript i for the ith firm) used to signify that individual firms are being analyzed in a cross-section regression.

To identify firm responses in the absence of a theory predicting levels of capital leases, we could assume that observed changes in capital leases equal unexpected changes during the transition period (a random walk expectation model).[12] However, if high-lease firms normally reduce leasing and low-lease firms normally increase leasing, a cross-sectional mean-reverting relation would exist between levels and changes in levels of capital leases.[13] Since preadoption levels of capital leases, $(PVCAP/A)_{1976}$, are highly correlated empirically with the independent variable specified in eq. (1), $(PVCAP_f/LTC)_{1976}$, the null hypothesis would be incorrectly rejected in this case. To provide an expectation model that controls for reversion towards a cross-sectional mean, the following relation is estimated over three two-year periods extending from 1974 to 1980:

$$(PVCAP/A)_t - (PVCAP/A)_{t-2} = \alpha + \beta (PVCAP/A)_{t-2} + \eta_t. \quad (2)$$

This cross-sectional relation (firm subscripts dropped for convenience) pools observations for each firm from the transition period and two adjacent control periods defined as follows:

P_1 = a preadoption control period, $t = 1976$,
P_2 = the transition period, $t = 1978$, and
P_3 = a postadoption control period, $t = 1980$.

The presence of reversion towards a cross-sectional mean is indicated by estimated values of the intercept (α) and slope (β) that are greater than and less than zero, respectively. If the slope is not different from zero, the expectation model reduces to a random walk model (with the intercept representing the drift term). In either case, the residuals obtained from this regression measure unexpected changes in capital leases.

Combining eqs. (1) and (2) provides a convenient single-stage regression that simultaneously estimates the expectation model and also tests the null

[12]Smith and Wakeman (1985) summarize the literature on the determinants of leasing. Current theory has not developed sufficiently to suggest a model, that predicts the (optimal) quantity of leasing that firms employ. Also, since useful preadoption disclosures for capital leases originated in 1973, after ASR 147, there is insufficient data to fit firm-specific time-series models. However, the random walk model provides excellent predictions of $PVCAP/A$ for individual years during the preadoption period (R^2 values in excess of 0.95).

[13]This form of mean reversion is different from regression towards firm-specific time-series means. See Freedman, Pisani, and Purvis (1978) for additional details.

hypothesis as follows:

$$Y_t = (PVCAP/A)_t - (PVCAP/A)_{t-2}$$

$$= \alpha + \beta (PVCAP/A)_{t-2}$$

$$+ D\{\gamma + \delta (PVCAP_f/LTC)_{1976}\} + \varepsilon_t, \tag{3}$$

$$H_0: \quad \delta = 0, \qquad H_a: \quad \delta < 0,$$

where

Y = two-year change in $PVCAP/A$, from year $t - 2$ to t,

$PVCAP$ = present value of all future lease payments on all capital leases,

A = book value of all nonlease assets,

$PVCAP_f$ = present value of all future lease payments for capital leases reported in footnotes,

LTC = long-term capitalization $= PVCAP_f$ plus book value of long-term debt and equity, and

D = 1 if $t = 1978$ (transition period, P_2) and

         = 0 if $t = 1976$ (preadoption period, P_1) or $t = 1980$ (postadoption period, P_3).

Note that the first right-hand-side variable uses observations from all three periods to estimate the expectation model in eq. (2). Transition period residuals, representing unexpected changes in capital leases, are then used to measure the cross-sectional relation of interest, expressed in eq. (1). This is done by activating the second right-hand-side variable in eq. (3), through the dummy variable, only for observations from the transition period.[14] Since both the null and alternate hypotheses predict positive values for γ, it is deleted from the hypothesis specification.

A sample obtained from the 1980 edition of the Annual Industrial Compustat tape is used to estimate eq. (3). Firms are included in the three periods if 1) positive values are reported in year t for either capital or operating leases and 2) the data necessary for estimating eq. (3) are available on the tape. Results obtained using the White (1980) correction for heteroskedasticity are

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[14] The high correlation during 1976 between the two right-hand-side variables in eq. (3) might suggest that the expectation model in eq. (2) should be estimated over the control periods only (excluding the transition period) to avoid biasing the expectation model and reducing the likelihood of detecting the hypothesized [eq. (1)] effect. Note, however, that this dilution of the hypothesized effect is only a problem when eqs. (1) and (2) are estimated separately, since the combined single-stage regression in eq. (3) estimates only the incremental effects of each explanatory variable on the dependent variable. A benefit of estimating the expectation model over all three periods, rather than the control periods alone, is that the number of observations used to estimate the expectation model increases by approximately 50 percent.

Table 1

Analysis of changes in capital leases around adoption of SFAS No. 13 – Compustat sample.[a]

Panel A: Regression analysis of changes in capital leases

$$Y_t = (PVCAP/A)_t - (PVCAP/A)_{t-2}$$
$$= \alpha + \beta(PVCAP/A)_{t-2} + D\{\gamma + \delta(PVCAP_f/LTC)_{1976}\} + \varepsilon_t$$

	α	β	γ	δ
Estimate	0.0017	− 0.11	0.021	− 0.55
t-statistic[b]	0.49	− 1.94	4.47	− 7.07
p-value[c]	0.062	0.05	0.00	0.00

$$n = 1987 \qquad R^2 = 0.32$$

Y	= two-year change in $PVCAP/A$
$PVCAP$	= present value of all future lease payments on all capital leases
A	= book value of all nonlease assets
$PVCAP_f$	= present value of all future lease payments on capital leases reported in footnotes
LTC	= long-term capitalization = book value of long-term debt and equity plus $PVCAP_f$
D	= 1 if $t = 1978$ (transition period, P_2) and
	= 0 if $t = 1976$ (preadoption period, P_1) or if $t = 1980$ (postadoption period, P_3)

Panel B: Description of observations by change type

Type of change	$(PVCAP/A)_t$[d]	$(PVCAP/A)_{t-2}$[e]	Two-year change periods			Totals	
			P_1 1974–1976	P_2 1976–1978	P_3 1978–1980	N	Percent
1	= 0	= 0	165	83	63	311	(16%)
2	= 0	> 0	22	18	17	57	(3%)
3	> 0	= 0	36	78	8	122	(6%)
4	> 0	> 0	520	474	503	1497	(75%)
Totals			743	653	591	1987	(100%)

[a] While SFAS No. 13 was enacted in 1976, most firms adopted the standard in 1978. Therefore changes in capital leases during this two-year transition period (P_2) are compared with changes over similar two-year periods during preadoption (P_1) and postadoption (P_3) periods to determine an effect of SFAS No. 13.

[b] t-statistics have been computed based on White (1980) to correct for heteroskedastic error terms.

[c] p-value for δ is based on a one-tailed test. All other p-values refer to two-tailed tests.

[d] End-of-period value.

[e] Beginning-of-period value.

reported in table 1, panel A.[15] The highly significant negative t-statistic on δ indicates rejection of the null hypothesis and is consistent with the alternate

[15] Error terms are heteroskedastic – both cross-sectionally and over time. The dispersion in error terms increases with both right-hand-side variables and is higher in P_2 than it is in the two control periods. While the parameter estimates are unbiased in this case, the standard errors are biased [Kmenta (1971, p. 256)]. The regression procedure PROC REG when used with the ACOV option estimates a heteroskedasticity-consistent variance–covariance matrix for parameter estimates suggested by White (1980) [see SAS (1986)]. It also recomputes the F-tests provided with the TEST statement and reports a χ^2-test (based on asymptotic estimates) and p-values using the consistent variance–covariance matrix. All t-statistics reported equal $\sqrt{\chi^2}$-statistics.

hypothesis.[16] Assuming as a first-order approximation that the two scaling variables, LTC and A, equal each other, the magnitude of δ can be interpreted as a 55 percent marginal decline in reported capital leases; i.e., at the margin, only 45 percent of footnoted capital leases were booked after the standard.[17] The positive value of $\gamma = 0.02$ can be interpreted as follows: firms with no footnoted capital leases in 1976 exhibit an increase in capital leases equal to two percent of their nonlease assets. Presumably this increase is due to the more stringent definitions after SFAS No. 13.

These results indicate considerable cross-sectional variation in firm responses. While firms with relatively low amounts of footnoted leases report unexpected increases in capital leases, firms with larger amounts of footnoted capital leases report unexpected declines in capital leases. Also this decline, as a percent of preadoption levels of capital leases, is larger for firms with larger amounts of footnoted capital leases. Estimates obtained for α and β indicate that the data display some regression to the mean, since β is significantly negative at the five percent level.

We observe clustering of prediction errors caused by lessees reporting no capital leases in either year t or $t - 2$. This violates the ordinary least squares (OLS) regression model's assumption of normally distributed error terms.[18] Table 1, panel B reports the numbers of firms in each of four possible categories (labelled types 1 through 4) depending on whether the amounts of capital leases in years t and $t - 2$ are equal to or greater than zero. Observations of types 1, 2, and 3 form the clusters that violate the normality assumption of the OLS model. Ex ante we could not predict which firms that reported no capital leases in year $t - 2$ were going to report a positive amount in year t. To be consistent we would either have to exclude all firms that reported no capital leases in year $t - 2$ or else include all such firms. We opted for the latter strategy, to allow a more representative sample. Eq. (3) was reestimated on subsets of the Compustat sample obtained by deleting observa-

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[16]Correcting for heteroskedasticity has opposite effects on γ and δ. It increases (reduces) the standard error estimates and decreases (increases) the t-statistics for $\delta(\gamma)$. The t-statistic on δ is approximately -17 without the White adjustment.

[17]More correctly, as footnoted capital leases increase by x percent of LTC (say from 15 percent to 25 percent of LTC), unexpected declines in capital leases increase by $0.55x$ percent of A (from 6.15 percent of A to 11.65 percent of A – using estimated values of γ and δ from table 1). These changes are not strictly comparable given the different deflators used. Reestimating eq. (3) with A as the deflator for the explanatory variable (instead of LTC) provides the following estimates: $\gamma = 0.014$ and $\delta = -0.47$. Thus 53 percent of incremental capital leases were booked after SFAS No. 13.

[18]Cross-sectional dependence in error terms, because of industry concentration, is another potential violation of the standard assumptions of the OLS regression model (positive dependence biases downward the standard errors for parameter estimates). However, given the absence of sufficient time-series data, we are unable to estimate (and correct for) any bias due to this effect.

tions of types 1, 2, and 3 (both individually and collectively) and the results remained essentially unchanged.[19]

We conducted several additional tests to determine if the table 1 results are sensitive to alternate specifications of the regression model and choice of proxy variables. Examination of scatter plots for alternate specifications of the dependent and independent variables over each period indicates that the eq. (3) model is well-specified both in terms of the variables selected as well as the linear relation assumed. Similarly, numerous attempts to reestimate eq. (3) using alternate variables revealed a consistent rejection of the null hypothesis.[20] Finally, alternative methods to adjust for heteroskedasticity provided similar results to those reported here using White's procedure.[21]

3.2. Limitations of Compustat sample results

Smith and Wakeman (1985) suggest that levels of leasing are endogenously determined and correlated with other variables such as tax status, asset structure, contracting costs, and investment opportunities. Therefore changes in these variables, rather than SFAS No. 13, could have altered the costs and benefits of using capital leases, relative to other financing sources.[22] If so, the previous tests are biased due to the omitted correlated variables problem [Kmenta (1971, ch. 10)]. For example, we observe lessees with relatively large amounts of capital leases are concentrated in a few industries, such as airlines and retailers. Our results are consistent with the alternative explanation that an exogenous change that mainly affected these industries caused them to

[19] The type 1 observations, consisting of firms that report no capital leases in both years, form the largest of the three groups. Removing type 1 observations that are concentrated at the origin increases the absolute value of estimates for γ and δ as well as the t-statistics on δ.

[20] We used *proportional* changes in capital leases, both with and without scaling by total nonlease assets, instead of the change measure used in eq. (3). The heteroskedasticity increased significantly, since firms with very low amounts of capital leases report large proportional changes. Using proportional changes reduces sample size since all observations of types 1 and 3 (see table 1, panel B) are deleted because the denominator ($PVCAP_{t-2}$) is equal to zero. However, the effect of SFAS No. 13 is still significant, since δ remains significantly less than zero (t-statistic ≈ -4) when eq. (3) was reestimated using these alternative measures of firm response. We also replaced the scaling variable, nonleased assets (A), with other reasonable candidates such as total assets including capital leases and long-term capitalization. While the absolute value of the t-statistic on δ declined, because of the bias mentioned in footnote 10, in no case did it drop below 5.

[21] Weighted least-squares regressions [Kmenta (1971, ch. 8)] using linear functions of the independent variable eliminated most of the heteroskedasticity present. Although the estimated values of γ and δ differ from those reported in table 1, due to the weighting employed, the t-value on δ always remains highly significant at approximately -6.

[22] Endogeneity of the standard could explain why the new standard and the exogenous change that reduced the benefits of leasing occurred at the same time. Ball (1980) argues that the enactment of a rule change could signal that resistance to the change had declined and the standard was 'allowed' to pass. A decline in the attractiveness of capital leases due to a change in tax laws (for example) could be the reason why firms became less concerned about the effects of SFAS No. 13.

reduce capital leasing. In this case, eq. (3) is misspecified since the relevant explanatory variable, effect of the exogenous change (or its proxy, industry membership), is omitted and a spurious relation is observed with the amount of preadoption footnoted capital leases.

While extant theory has identified variables that influence leasing behavior, a model that specifies how these variables determine levels of leasing is yet to be determined. One research design recommended in such cases is to use matching to control for these relevant explanatory variables [Runkel and McGrath (1972)]. Three variables that are correlated with the proportion of assets financed through capital leases, and are expected to proxy for the determinants of capital leasing, are: industry membership, total leverage (including capital leases), and firm size.[23] We selected a subsample of 79 pairs of firms with each pair consisting of a high-lease firm and a low-lease firm from the same industry with similar size and leverage. High and low levels of leasing are based on preadoption levels of footnoted capital leases. An eq. (3) regression estimated on this subsample is less likely to be confounded by omitted correlated variables, since by construction the sample correlation between the included independent variable and the three omitted variables is reduced, relative to the Compustat sample.[24]

Matching procedures possess certain limitations in quasi-experiments where the researcher does not determine levels of control variables. If all variables relevant to the choice of capital leases have been identified, why do firms in the same industry with similar size and leverage choose different amounts of capital leases? Perhaps the optimal level of capital leases is not a uniquely determined amount; i.e., there is sufficient randomness in the choice of lease financing in the population to allow selection of a reasonable sample of high- and low-lease firms matched on the three control variables. Alternatively, our model is incomplete and matching only for industry, size, and leverage still leaves open the possibility of other omitted correlated variables. Despite these

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[23]See the appendix for additional details on these control variables. The Compustat sample showed highly significant correlations (at less than one percent) between capital leases and these three variables. Certain industries, especially airlines and retailers, and highly levered firms employed more capital leases. Firm size had a more complex effect, since it was positively related to capital leases for certain industries and negatively related for others.

[24]An alternative strategy is to reestimate the table 1 regression with the three control variables as additional explanatory variables. The coefficient for δ remained significantly negative when 1976 values of leverage and size and industry membership are included as regressors. Industry membership is represented by dummies for each of eight broad industry groupings with lessee firms [see Sharpe (1982) for industry definitions]. Also separate regressions were estimated for each industry group with leverage and size as additional regressors. Only in three industry groups (construction, energy, and utilities) was the estimate for δ not significantly below zero, at the five percent level. Lessees in these three industries comprised only nine percent of the Compustat sample and consisted almost entirely of low-lease firms. Since the coefficients for size and leverage varied in sign and significance across industries, we conclude that complex interactions exist among the three control variables, and simply including them in an eq. (3) regression is likely to cause misspecification.

potential limitations, attempts to control for omitted correlated variables are not without benefits. If the null hypothesis is rejected again for the subsample, then the likelihood that SFAS No. 13 induced the results reported in table 1 is increased; if there is an omitted correlated variable, it is not one of these three. Alternatively, if the null hypothesis cannot be rejected, further investigation might identify the omitted variable(s) underlying the table 1 results.

3.3. Changes in capital leases – Subsample results

The appendix details the procedure employed to select the 79 matched pairs of high- and low-lease firms. For the subsample, the correlation between the three control variables and footnoted capital leases is reduced, relative to the Compustat sample.[25] Also, using firm-specific adoption dates to delineate the transition period, instead of the uniform two-year period used for the Compustat sample, provides additional control against contemporaneous effects. The number of firms with one-, two-, and three-year transition periods are 27, 120, and 11, respectively, and actual transition periods started as early as 1975 and extended as late as 1980. As in the Compustat sample, the preadoption and postadoption periods represent the two years immediately before and after the transition period. Individual years in the preadoption period are coded from -3 to -1 with year -1 being the last preadoption year. Similarly, years in the postadoption period are coded from $+1$ to $+3$ with year $+1$ being the first postadoption year.

Eq. (3) is adjusted to accommodate firm-specific transition periods as follows:

$$Y_t = (PVCAP/A)_t - (PVCAP/A)_{t-2}$$

$$= \alpha + \beta(PVCAP/A)_{t-2} \qquad (3')$$

$$+ D\{\gamma + \delta(PVCAP_f/LTC)_{-1}\} + \varepsilon_t,$$

$$H_0: \quad \delta = 0, \qquad H_a: \quad \delta < 0.$$

Here changes in capital leases are measured from year -3 to -1 in P_1 (two

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[25]Unlike size and industry membership, leverage is still significantly related (p-value below 0.05) to footnoted capital leases for the 158-firm subsample. However, residual correlation between footnoted capital leases and the three control variables is unlikely to explain the subsample results (described later in section 3.3), since including all three control variables as additional explanatory variables does not affect the basic result (δ remains significantly less than zero).

years), from year -1 to $+1$ in P_2 (one, two, or three years), and from year $+1$ to $+3$ in P_3 (two years).[26] The expected impact of the standard (second right-hand-side variable) is now the value of $PVCAP_t/LTC$ in the last firm-specific preadoption year, year -1, and is activated by the dummy variable only if the observation relates to the transition period.

The results of estimating eq. (3') for the subsample, reported in panel A of table 2, are similar to the table 1 results observed for the Compustat sample. While the estimate for δ changes from -0.55 (in table 1) to -0.46, unexpected declines in capital leases during the transition period are still significantly related to preadoption levels of footnoted capital leases. Panel B of table 2 provides additional confirmation, by examining median changes in capital leases for high- and low-lease firms and median differences between changes for high- and low-lease firms in each matched pair over the transition and control periods. The overall comparison in the bottom row of panel B, based on a nonparametric signed rank test, significantly rejects the null hypothesis that matched pairs difference in the transition period equal those in the two control periods. This test is conceptually similar to the regression in eq. (3'), since matched pairs differences measure cross-sectional variation and interperiod comparisons measure unexpected changes. Given that the alternate hypothesis expects matched pairs differences to be more negative during the transition period, reported p-values are based on one-tailed tests.

The median changes in capital leases reported in each cell of panel B provide a description of the magnitudes of these changes in each period. We report p-values for Wilcoxon signed rank tests of the null hypothesis that each median change equals zero to compare the relative magnitudes of changes across cells. The high-lease group reported median changes in capital leases, expressed as a percent of total nonlease assets, of -0.9 percent, -6.8 percent, and -1.8 percent during P_1, P_2, and P_3, respectively. For low-lease firms, the corresponding median declines are -0.4 percent, -0.9 percent, and -0.4 percent, respectively. The matched pairs differences confirm these separate comparisons. Note that reporting changes as a percent of nonlease assets does not portray a representative picture of the substantial declines that occurred. For example, the 6.8 percent decline in capital leases (relative to nonlease assets) for the high-lease sample during P_2 represents a 45-percent decline relative to preadoption levels of capital leases.

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[26]Relative to low-lease firms, high-lease firms are a smaller proportion (37 percent) of the 27 firms with one-year transition periods and a larger proportion (64 percent) of the 11 firms with three-year transition periods. Therefore allowing for firm-specific transition periods could create an unintended bias in favor of the alternate hypothesis. However, no bias appears to exist, since the results reported in table 2 remain unchanged (actually, the null hypothesis is rejected even more strongly) when firm-specific preadoption and postadoption periods, of duration equal to each firm's transition period, are employed.

Table 2

Analysis of changes in capital leases around adoption of SFAS No. 13 for a subsample of 158 firms.[a]

Panel A: Regression analysis of changes in capital leases

$$Y_t = (PVCAP/A)_t - (PVCAP/A)_{t-2}$$
$$= \alpha + \beta(PVCAP/A)_{t-2} + D\{\gamma + \delta(PVCAP_t/LTC)_{-1}\} + \varepsilon_t$$

	α	β	γ	δ
Estimate	0.010	− 0.16	0.012	− 0.46
t-statistic[b]	2.77	− 4.26	1.61	− 6.31
p-value[c]	0.01	0.00	0.11	0.00

$$n = 409 \qquad R^2 = 0.57$$

Y	= two-year change in $PVCAP/A$
$PVCAP$	= present value of all future lease payments on all capital leases
A	= book value of all nonlease assets
$PVCAP_f$	= present value of all future lease payments on capital leases reported in footnotes
LTC	= long-term capitalization = book value of long-term debt and equity plus $PVCAP_f$
D	= 1 if $t = 1$ (transition period, P_2) and
	= 0 if $t = -1$ (preadoption period, P_1) or if $t = 3$ (postadoption period, P_3)

Panel B: Median changes in capital leases

$$Y_t \text{ (as \% of } A) = (PVCAP/A)_t \times 100 - (PVCAP/A)_{t-2} \times 100$$

		P_1 Years −3 to −1[a]	P_2 Years −1 to 1[a]	P_3 Years 1 to 3[a]
High-lease group	Median (*p*-value)[c]	− 0.9% (0.07)	− 6.8% (0.00)	− 1.8% (0.00)
Low-lease group	Median (*p*-value)[c]	− 0.4% (0.00)	− 0.9% (0.00)	− 0.4% (0.00)
Difference high–low	Median (*p*-value)[c]	0.2% (0.65)	− 5.9% (0.00)	− 1.1% (0.03)
Overall comparison	(*p*-value)[d]		(0.00)	

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[a]SFAS No. 13 was enacted in 1976, and most firms adopted the standard in 1978. Here firm-specific adoption periods are used and the years coded as follows: The year of (before) adoption is coded 1 (−1) and the two years following year 1 (preceding year −1) are coded 2 (−2) and 3 (−3), respectively. Therefore changes in capital leases for all firms are measured over two-year preadoption (P_1) and postadoption (P_3) periods. For the transition period (P_2), most firms (120 out of 158) have two years between years −1 and 1. For 27 (11) firms the transition period extended over one (three) years.

[b]*t*-statistics have been computed based on White (1980) to correct for heteroskedastic error terms.

[c]In panel A, the *p*-value for δ is based on a one-tailed test; all other *p*-values refer to two-tailed tests. In panel B, *p*-values refer to two-tailed Wilcoxon signed rank tests of the null hypothesis that median changes in present values of capital leases = 0.

[d]*p*-value refers to a one-tailed rank sum test of the null hypothesis that matched pairs differences (high–low) in P_2 equal differences in P_1 and P_3, versus the alternative that differences in P_2 are more negative than differences in P_1 and P_3.

The nonparametric comparisons in panel B complement the regression analysis in panel A.[27] Our results are unlikely to be artifacts of the methodology selected, since we observe similar results using different methodologies. Similarities between the results reported in tables 1 and 2 suggest that the Compustat sample results are not due to an omitted variable and that our subsample seems to be representative of the Compustat sample. Since data required for additional tests had to be hand-collected from footnotes in annual reports, only the subsample is used for additional tests discussed below.

3.4. Changes in operating leases – Subsample results

The observed decline in reported capital leases after the standard suggests that offsetting increases in other sources of financing occurred at the same time. Since operating leases remained outside the purview of SFAS No. 13, firms could escape lease capitalization by restructuring capital leases to qualify as operating leases. An unexpected increase in operating leases in combination with the observed unexpected decrease in capital leases represents a substitution from capital to operating leases. Fig. 1 indicates that only flows (minimum commitments for the next five years), not present values, are disclosed for operating leases, and in the preadoption period operating lease flows are reported in combination with flows for footnoted capital leases.[28] To obtain separate flows during the preadoption period, we assume that for each firm the relation between flows and present values for capital leases remains stationary over time. An average value of this relation, K_i, is computed for each firm i using data from each year in the postadoption period ($t = 1, 2, 3$) as follows:

$$K_i = \sum_{t=1}^{3} (FLCAP_b)_{it} \bigg/ \sum_{t=1}^{3} (PVCAP_b)_{it},$$

where the variables are as defined in fig. 1. The present values of capital leases in the balance sheet and footnotes in each preadoption year ($t = -1, -2, -3$) for each firm i are then multiplied by K_i to obtain estimates of corresponding

[27]Unlike nonparametric comparisons of medians, the regression analysis is sensitive to deviations from the linear relationship hypothesized and to violations of the assumptions of the OLS model. (Note that ignoring cross-sectional dependencies affects reported significance levels for both the regression analysis as well as the median comparisons.) Also, the matched pairs differences provide more control for omitted variables, since each pair is individually matched along all three control variables. On the other hand, the regression model uses variation along the independent variable more efficiently, since the nonparametric comparisons use only a high/low dichotomy. Finally, the regression model includes an expectation model that controls for mean reversion.

[28]Rental commitments for the next year were also disclosed. These one-year-ahead flows are highly correlated, by firm, with the five-year-ahead flows analyzed in the paper. The results in sections 3.4 and 3.5 remain essentially unchanged when one-year-ahead flows are analyzed.

values of flows:

$$(FLCAP_b)_{it} = (PVCAP_b)_{it} \times K_i$$

and

$$(FLCAP_f)_{it} = (PVCAP_f)_{it} \times K_i.$$

Flows for operating leases (*FLOP*) during each year in the preadoption period are determined by subtracting the imputed value of $FLCAP_f$ from the flows reported for operating and footnoted capital leases combined.

A regression model similar to eq. (3') is estimated on operating lease flows to determine if they increased unexpectedly ($\delta > 0$) during the transition period. *PVCAP/A* in eq. (3') is replaced by *FLOP/A*, while the second variable on the right-hand side, $(PVCAP_f/LTC)_{-1}$, remains unchanged. The results reported in table 3, panel A indicate significant unexpected increases in operating leases, suggesting substantial substitution from capital to operating leases. As in tables 1 and 2, the magnitude of δ can be interpreted as a marginal increase in operating leases of approximately 37 percent.[29] The overall comparison reported in the bottom row of panel B, based on rank sum tests, also significantly rejects the null hypothesis (p-value = 0.0). High-lease firms report a median increase in operating leases of 4.6 percent (as a percent of nonlease assets) during the transition period, which is significantly greater than zero. This increase is also significantly larger than the 1.1 percent increase registered by matched low-lease firms during the same period. Changes in operating leases are not significantly different from zero (at the five percent level) outside the transition period for either group. These results indicate that much of the unexpected decline in capital leases is offset by increases in operating leases, suggesting that many capital leases were restructured during the transition period to qualify as operating leases.

3.5. Changes in overall leasing flows – Subsample results

Can substitution into operating leases account entirely for the observed capital lease declines or did some substitution into nonlease financing also occur? Since the measures used for analyzing declines in capital leases (present values in table 2) and increases in operating leases (cash flows in table 3) are not comparable, we examine total leasing flows (FLTOT) to determine if the

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[29] Unlike tables 1 and 2, the estimate for γ is now negative. Since definitional changes regarding discount rates only affect present values not flows, this sign reversal for the intercept suggests that the broader definition of capital leases after SFAS No. 13 resulted in some operating leases being reclassified as capital leases. Not accounting for this definitional change causes underestimation (overestimation) of postadoption levels of capital (operating) leases resulting in the positive (negative) intercept observed in tables 1 and 2 (table 3).

Table 3

Analysis of changes in cash flows for operating leases around adoption of SFAS No. 13 for a subsample of 158 firms.[a]

Panel A: Regression analysis of changes in operating lease flows

$$Y_t = (FLOP/A)_t - (FLOP/A)_{t-2} = \alpha + \beta(FLOP/A)_{t-2} + D\{\gamma + \delta(PVCAP_f/LTC)_{-1}\} + \varepsilon_t$$

	α	β	γ	δ
Estimate	0.017	− 0.26	− 0.015	0.37
t-statistic[b]	4.14	− 4.58	− 1.64	5.94
p-value[c]	0.00	0.00	0.10	0.00

$$n = 369 \qquad R^2 = 0.34$$

Y	= two-year change in $FLOP/A$
$FLOP$	= cash flow commitments for operating leases over next five years
A	= book value of all nonlease assets
$PVCAP_f$	= present value of all future lease payments on capital leases reported in footnotes
LTC	= long-term capitalization = book value of long-term debt and equity plus $PVCAP_f$
D	= 1 if $t = 1$ (transition period, P_2) and
	= 0 if $t = -1$ (preadoption period, P_1) or if $t = 3$ (postadoption period, P_3)

Panel B: Median changes in operating lease cash flows

$$Y_t \text{ (as \% of } A) = (FLOP/A)_t \times 100 - (FLOP/A)_{t-2} \times 100$$

		P_1 Years −3 to −1[a]	P_2 Years −1 to 1[a]	P_3 Years 1 to 3[a]
High-lease group	Median	0.2%	4.6%	− 0.0%
	(p-value)[c]	(0.20)	(0.00)	(0.77)
Low-lease group	Median	0.2%	1.1%	0.0%
	(p-value)[c]	(0.56)	(0.00)	(0.73)
Difference high–low	Median	0.3%	3.1%	0.1%
	(p-value)[c]	(0.56)	(0.00)	(1.00)
Overall comparison	(p-value)[d]		(0.00)	

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[a]SFAS No. 13 was enacted in 1976, and most firms adopted the standard in 1978. Here firm-specific adoption periods are used and the years coded as follows: The year of (before) adoption is coded 1 (− 1) and the two years following year 1 (preceding year − 1) are coded 2 and 3 (− 2 and − 3), respectively. Therefore changes in operating lease cash flows for all firms are measured over two-year preadoption (P_1) and postadoption (P_3) periods. For the transition period (P_2), most firms (120 out of 158) have two years between years − 1 and 1. For 27 (11) firms the transition period extended over one (three) years.

[b]t-statistics have been computed based on White (1980) to correct for heteroskedastic error terms.

[c]In panel A, the p-value for δ is based on a one-tailed test; all other p-values refer to two-tailed tests. In panel B, p-values refer to two-tailed Wilcoxon signed rank tests of the null hypothesis that the median changes in operating lease cash flows = 0.

[d]p-value refers to a one-tailed rank sum test of the null hypothesis that matched pairs differences (high–low) in P_2 equal differences in P_1 and P_3, versus the alternative that differences in P_2 are more positive than differences in P_1 and P_3.

two changes completely offset each other. If no unexpected changes in total leasing flows are observed, then increases in operating leases completely offset capital lease declines. If, however, total leasing flows decline unexpectedly, then a portion of the observed decrease in capital leases represents substitution into nonlease sources of financing.[30]

The results of estimating eq. (3′), adjusted to replace present values of capital leases by total leasing flows, are reported in panel A of table 4. Total leasing flows are obtained by combining flows for capital and operating leases ($FLTOT = FLCAP + FLOP$). While the estimate for δ is negative, it is not significantly different from zero. Since γ is also insignificantly different from zero, no significant decline in total leasing flows occurred during the transition period. In contrast, the panel B results indicate significant rejection of the null hypothesis (p-value on overall comparison is 0.01). During the transition period high-lease firms report a median decline in total lease flows of 1.6 percent (as a percent of total nonlease assets), which is significantly less than zero. The smaller decline of 0.1 percent reported by low-lease firms (not significantly different from zero) results in differences between matched pairs that are also significantly different from zero.

Inconsistencies between the two panels are explained by examining changes during the postadoption period reported in panel B. High-lease firms continue to reduce total leasing flows after adopting the standard, since the median decline of 1.3 percent in P_3 is also significantly less than zero. This continued large decline during P_3 is captured by the expectation model in panel A (significantly negative value of β) leaving only a small and statistically insignificant unexpected decline during P_2 to be explained by the level of footnoted capital leases. Estimating the expectation model over P_1 alone results in a significantly negative (at the five percent level) estimate for δ.[31] The absence of declines in operating leases during P_3 (table 3, panel B) suggests that the continued decline in total leases during P_3 is caused entirely by capital lease declines during this period.[32] Perhaps, some capital leases

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[30]A simple measure indicates that most, but not all, of the decline in capital leases during P_2 is offset by a corresponding increase in operating leases. The ratio of adoption period changes in operating lease flows ($FLOP$) to changes in capital lease flows ($FLCAP$) has a median value of -0.69. This value is significantly lower than zero, which is the expected value if there was no relation between the two changes. However, it is also significantly different from -1, which is the expected value if the two changes completely offset each other.

[31]The coefficients obtained for α and β based on an eq. (2) regression estimated over P_1 alone were used to identify unexpected changes in total leasing during P_2. Regressing these unexpected changes against preadoption levels of footnoted capital leases [eq. (1)] resulted in an estimate for $\delta = -0.097$ (p-value $= 0.05$). Note that any mean reversion effects are considered in the expectation model estimated over P_1.

[32]Analysis of median changes in leasing flows for capital leases ($FLCAP$, not $PVCAP$ as in table 2) indicates a -1.2% decline, as a percent of nonlease assets, for high-lease firms during P_3. Therefore, most of the P_3 decline in total leasing flows of -1.3% (table 4, panel B) for this group of firms is explained by capital lease declines.

Table 4

Analysis of changes in cash flows for all leases around adoption of SFAS No. 13 for a subsample of 158 firms.[a]

Panel A: Regression analysis of changes in total leasing cash flows

$$Y_t = (FLTOT/A)_t - (FLTOT/A)_{t-2}$$
$$= \alpha + \beta(FLTOT/A)_{t-2} + D\{\gamma + \delta(PVCAP_f/LTC)_{-1}\} + \varepsilon_t$$

	α	β	γ	δ
Estimate	0.017	-0.13	-0.0031	-0.023
t-statistic[b]	2.45	-2.44	-0.40	-0.39
p-value[c]	0.01	0.01	0.69	0.35

$$n = 388 \qquad R^2 = 0.07$$

Y	= two-year change in $FLTOT/A$
$FLTOT$	= cash flow commitments for total leases (operating and capital) over next five years
A	= book value of all nonlease assets
$PVCAP_f$	= present value of all future lease payments on capital leases reported in footnotes
LTC	= long-term capitalization = book value of long-term debt and equity plus $PVCAP_f$
D	= 1 if $t = 1$ (transition period, P_2) and
	= 0 if $t = -1$ (preadoption period, P_1) or if $t = 3$ (postadoption period, P_3)

Panel B: Median changes in total leasing cash flows

$$Y_t \text{ (as \% of } A) = (FLTOT/A)_t \times 100 - (FLTOT/A)_{t-2} \times 100$$

		P_1 Years -3 to -1[a]	P_2 Years -1 to 1[a]	P_3 Years 1 to 3[a]
High-lease group	Median (p-value)[c]	-0.2% (0.58)	-1.6% (0.00)	-1.3% (0.03)
Low-lease group	Median (p-value)[c]	-0.6% (0.05)	-0.1% (0.83)	-0.3% (0.47)
Difference high–low	Median (p-value)[c]	0.7\% (0.21)	-1.5% (0.00)	-1.1% (0.19)
Overall comparison	(p-value)[d]		(0.01)	

[a]SFAS No. 13 was enacted in 1976, and most firms adopted the standard in 1978. Here firm-specific adoption periods are used and the years coded as follows: The year of (before) adoption is coded 1 (-1) and the two years following year 1 (preceding year -1) are coded 2 (-2) and 3 (-3), respectively. Therefore changes in total lease cash flows for all firms are measured over two-year preadoption (P_1) and postadoption (P_3) periods. For the transition period (P_2), most firms (120 out of 158) have two years between years -1 and 1. For 27 (11) firms the transition period extended over one (three) years.

[b]t-statistics have been computed based on White (1980) to correct for heteroskedastic error terms.

[c]In panel A, the p-value for δ is based on a one-tailed test; all other p-values refer to two-tailed tests. In panel B, p-values refer to two-tailed Wilcoxon signed rank tests of the null hypothesis that the median changes in total lease cash flows $= 0$.

[d]p-value refers to a one-tailed rank sum test of the null hypothesis that matched pairs differences (high–low) in P_2 equal differences in P_1 and P_3, versus the alternative that differences in P_2 are more negative than differences in P_1 and P_3.

maturing soon after the transition period were not terminated or renegotiated as operating leases during the transition period, they were allowed to expire at maturity.

To summarize, total leases declined during the transition period, relative to the pattern in the preadoption period, and this decline is larger for high-lease firms. Therefore, transition period declines in capital leases (table 2) are only partly offset by increases in operating leases (table 3) and the overall importance of leasing (capital and operating combined) as a source of financing declined after SFAS No. 13. However, since high-lease firms continued to decrease total leasing even after adopting the standard, transition period declines were not unusual compared to the postadoption control period. Apparently the process of substitution into nonlease financing was gradual, and not completed within the transition period.

3.6. Changes in equity and conventional debt – Subsample results

Despite the firm responses documented in tables 2, 3, and 4, some high-lease firms did not report a decline in capital leases or in overall leasing. Such firms were either unaffected by the standard or were able to find alternative ways to mitigate any potential adverse consequences of capitalization (see section 4 for examples of other responses we observe). Abdel-khalik (1981) suggests that decreases in conventional debt and increases in equity may have been employed to reverse the leverage-increasing effect of lease capitalization. He documents unexpected increases in equity issues during a three-year transition period (1975 to 1978) for a sample of high-lease firms, relative to equity issues during a three-year preadoption period (1972 to 1975). This finding motivates our last test which examines the null hypothesis that the mix of nonlease financing for lessees remained unaffected by the standard. The alternate hypothesis predicts that lessees undertook equity-increasing and debt-reducing changes to offset the leverage-increasing effects of the standard on their balance sheets.

Changes in equity and debt are reexamined using our methodology, which includes a postadoption control period, and also tests for a cross-sectional relation between the magnitudes of unexpected debt and equity changes and levels of footnoted capital leases. Consistent with Abdel-khalik's methodology, we use annual changes in debt and equity reported in the Statement of Changes in Financial Position (SCFP) and define net changes in equity and debt as issues less repurchases scaled by year-end book values of nonlease assets. Since lease capitalization is expected to affect contracts that are denominated in book values, these variables attempt to capture managerial efforts to alter the book values of equity and debt. With the exception of *early*

retirement of debt trading above or below face value, all amounts obtained from the SCFP represent book values.[33]

The transition and control periods employed are defined as follows:

T_1 = preadoption period, employs changes reported in SCFP for 1973, 1974, and 1975,

T_2 = transition period, employs changes reported in SCFP for 1976, 1977, and 1978, and

T_3 = postadoption period, employs changes reported in SCFP for 1979, 1980, and 1981.

Note that the three-year periods selected here are different from the two-year periods used in section 3.1 and the firm-specific transition periods used in sections 3.2 to 3.5. This specification maintains consistency with Abdel-khalik (1981) and reflects the fact that the transition period used here is more representative of the total period available for firms to respond to the new standard.[34]

Attempts to estimate the regression in eq. (3') to changes in equity and debt for the subsample uncovered no significant unexpected changes during the transition period. Further examination of the data reveals that, while there are some lessees with increases in equity and decreases in debt during the transition period, these changes are on average not large enough (as a percent of nonlease assets) to generate estimates of δ that are significantly different from zero. As an alternative analysis, changes in debt and equity are investigated to determine if the *frequency* of extreme changes varied systematically over the three periods.

To identify extreme changes in debt and equity we first computed annual debt and equity changes for all Compustat firms from 1973 to 1980. Distributions of both changes, reported in table 5, seem fairly stationary, suggesting that Abdel-khalik's results are probably not due to economy-wide effects. Next we coded all debt and equity changes for our 158-firm subsample to emphasize extreme changes, using the mean (over 1973 to 1980) 5th, 10th, 90th, and 95th percentile points indicated in the bottom rows of panels A and B in table 5.

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[33] Note that the equity change measure specifically excludes changes in the book value of equity due to retained earnings (net income less dividends). We concur with Abdel-khalik that including changes in retained earnings would reduce our ability to detect managerial efforts to change the book value of equity. In effect, this assumes that changes in realized net income, not including shifting of income between adjacent periods, is largely outside managerial control and that managers prefer not to change dividends as a vehicle to adjust the book value of owner's equity.

[34] As mentioned in footnote 8, lease capitalization was expected by lessees prior to enactment of the standard in 1976 and therefore some changes could have preceded the transition period considered here. Note that the availability of a slightly longer time series of SCFP data on debt and equity changes, relative to the lease data required for previous tests, allowed the three-year periods used in this subsection.

Table 5

Issues and repurchases of equity and debt between 1973 and 1980 for all Compustat firms.

Year	N	Percentiles of distribution						
		1%	5%	10%	50%	90%	95%	99%
Panel A: Changes in paid-in-equity = (Equity issues − Equity repurchases)/Total nonleased assets[a]								
1973	1911	− 0.06	− 0.023	− 0.0120	0.000	0.0120	0.040	0.21
1974	1947	− 0.06	− 0.014	− 0.0058	0.000	0.0060	0.020	0.11
1975	1971	− 0.06	− 0.011	− 0.0040	0.000	0.0072	0.020	0.11
1976	2015	− 0.07	− 0.013	− 0.0039	0.000	0.0110	0.030	0.14
1977	2023	− 0.09	− 0.019	− 0.0059	0.000	0.0086	0.020	0.13
1978	2024	− 0.10	− 0.022	− 0.0062	0.000	0.0150	0.046	0.17
1979	2013	− 0.10	− 0.024	− 0.0086	0.000	0.0186	0.060	0.22
1980	1768	− 0.11	− 0.019	− 0.0071	0.000	0.0360	0.100	0.25
Mean		− 0.08	− 0.0174	− 0.0059	0.000	0.0146	0.042	0.16
Panel B: Changes in debt = (Debt issues − Debt retirements)/Total nonleased assets[a]								
1973	1905	− 0.18	− 0.054	− 0.330	0.000	0.110	0.16	0.25
1974	1940	− 0.19	− 0.060	− 0.036	0.000	0.110	0.15	0.27
1975	1964	− 0.25	− 0.094	− 0.058	− 0.001	0.084	0.12	0.25
1976	2002	− 0.22	− 0.088	− 0.054	− 0.001	0.079	0.13	0.25
1977	1999	− 0.20	− 0.074	− 0.037	0.000	0.099	0.16	0.30
1978	2002	− 0.20	− 0.061	− 0.034	0.000	0.110	0.16	0.30
1979	2001	− 0.27	− 0.067	− 0.037	0.000	0.110	0.16	0.29
1980	1767	− 0.19	− 0.080	− 0.043	0.000	0.110	0.16	0.29
Mean		− 0.22	− 0.075	− 0.043	0.000	0.100	0.15	0.28

[a] The variables are obtained from Compustat as follows: *Equity issues* (Compustat data item #108), *Equity repurchases* (#115), *Debt issues* (# 111), *Debt retirements* (#114), *Total nonleased assets* (#6 less #84).

Annual changes in debt and equity below the 5th and above the 95th percentile points are considered to be 'very large', and changes between the 5th and 10th and between the 90th and 95th percentile points are considered 'large' changes. Debt and equity changes for all firm-years are coded a value between − 2 and + 2 as follows:

Code	Change	Description
+ 2 (− 2)	'very large'	if change for that year is greater (less) than the mean 95th (5th) percentile point for all Compustat changes (see table 5)
+ 1 (− 1)	'large'	if change for that year is greater (less) than the mean 90th (10th) percentile point for all Compustat changes (see table 5)
0	'normal'	for all annual changes between the 10th and 90th percentiles

All observed changes are adjusted for offsetting changes in adjacent years. This adjustment is often necessary for debt changes, since debt approaching maturity is typically refinanced. For example, if a firm reported a very large

decrease in debt (coded as -2) in one year only to be followed by a very large increase in debt (coded as $+2$) of approximately the same magnitude in the next year, then both years' debt changes are coded as '0'. The scores are then summed over each three-year period to get an overall coded value for that period. The few cases that had summed values for a period that were greater (less) than $+2$ (-2) had the change codes set to $+2$ (-2).

Table 6 reports frequencies of the five coded values over all three periods. While most firms fall into the normal category (coded '0'), some report extreme changes. For example, the high-lease group in T_1 (upper panel, first column) consists of 4, 4, 65, 1, and 5 firms with equity changes coded -2, -1, 0, $+1$, and $+2$, respectively. The bottom row in each panel presents p-values for Wilcoxon signed rank tests of the null hypothesis that the median change in each period equals zero. The high p-value ($=1$) reported here indicates that extreme decreases of equity (four -2's and four -1's) approximately equal extreme increases (one $+1$ and five $+2$'s) during T_1 for high-lease firms.

Examination of debt and equity changes for the high-lease group during T_2 indicates more extreme equity increases (21) than decreases (11) and more extreme debt decreases (24) than increases (15). Note that both changes reduce balance sheet leverage and similar changes are not observed for T_1 and T_3. Unlike the leverage-reducing pattern observed for high-lease firms, both equity and debt changes for low-lease firms (reported in the middle panel) exhibit consistent patterns over all three periods. Equity changes reveal more extreme decreases than increases in T_1, more increases than decreases in T_3, and an intermediate response during T_2. Debt changes reveal consistently more extreme increases than decreases for all three periods. Also, nonparametric rank sum tests (not reported) indicate that changes during T_2 for high-lease firms are significantly different from changes in T_1 and T_3 (p-values equal 0.05 and 0.045 for equity and debt changes, respectively). For low-lease firms, however, changes in T_2 are not significantly different from those in T_1 and T_3.

While the frequencies for extreme debt and equity changes for high- and low-lease firms are consistent with the alternate hypothesis, the overall comparisons reported in the bottom row of the bottom panel are unable to reject (at the five percent level of significance) the null hypothesis that matched pairs differences in T_2 equal differences in the two control periods. Further investigation using rank sum tests (not reported) reveals that matched pairs differences (bottom panel) in T_2 are significantly different from differences in T_3 (p-values equal 0.035 and 0.03 for equity and debt changes, respectively). However, since similar tests indicate that the matched pairs differences in T_1 are not significantly different from those in T_2, for both equity and debt changes, the overall tests are unable to reject the null hypothesis at the five percent significance level.

Table 6

Changes in equity and debt around adoption of SFAS No. 13 for a subsample of 158 firms.

Coded change value		Equity changes[a]			Debt changes[a]		
		T_1 1972–1975	T_2 1975–1978	T_3 1978–1981	T_1 1972–1975	T_2 1975–1978	T_3 1978–1981
Panel A: High-lease group							
Very large decrease	− 2	4	7	11	10	11	7
Large decrease	− 1	4	4	3	3	13	5
Normal	0	65	47	49	51	40	48
Large increase	1	1	10	5	8	11	12
Very large increase	2	5	11	10	7	4	5
(p-value)[b]		(1.00)	(0.18)	(0.92)	(0.73)	(0.07)	(0.87)
Panel B: Low-lease group							
Very large decrease	− 2	10	8	6	2	2	2
Large decrease	− 1	4	5	5	1	4	6
Normal	0	59	45	41	50	47	51
Large increase	1	4	13	8	9	10	8
Very large increase	2	2	8	17	17	16	11
(p-value)[b]		(0.03)	(0.51)	(0.02)	(0.00)	(0.00)	(0.01)
Panel C: Differences between matched pairs of firms (high–low)							
Max. negative difference	− 4	1	0	0	3	3	2
	− 3	2	1	1	3	6	2
	− 2	2	12	18	13	12	9
	− 1	3	9	9	9	15	11
No difference	0	52	31	33	41	29	32
	1	8	15	8	6	10	16
	2	10	8	5	1	3	4
	3	0	1	1	3	1	0
Max. positive difference	4	1	2	1	0	0	0
(p-value)[b]		(0.14)	(0.87)	(0.03)	(0.00)	(0.00)	(0.11)
Overall comparison (p-value)[c]			(0.25)			(0.08)	

[a]Extreme equity changes reported are coded values between − 2 and +2 based on annual changes in paid-in-capital (stock issuances less repurchases, deflated by nonleased assets) over each of the three periods. Similarly, extreme debt changes are coded values based on issuances less retirements of conventional (nonlease) debt, deflated by nonleased assets. Extreme increases (decreases) for both debt and equity are coded as +1 and +2 (−1 and −2) if the changes are in the top (bottom) 90th and 95th percentiles, respectively, of changes reported by all Compustat firms.

[b]p-values, in parentheses, refer to two-tailed Wilcoxon sign rank tests of the null hypotheses that the median change is 0.

[c]p-values refer to one-tailed rank sum tests of the null hypothesis that matched pair differences (high–low) in T_2 equal matched pair differences in T_1 and T_3, versus the alternative hypothesis that matched pairs differences for equity (debt) changes are more positive (negative) in T_2.

In summary, the results support Abdel-khalik's view that high-lease firms used leverage-reducing changes with nonlease sources of financing to reverse the balance sheet impact of the standard. Several tests comparing transition period changes separately with each control period and separate analyses of the two groups indicate that high-lease firms exhibit an unusual number of extreme debt decreases and equity increases during the transition period. However, the overall results reported here are only marginally significant for debt changes (p-value = 0.08) and not significant for equity changes (p-value = 0.25).[35]

4. Summary

4.1. Methodology employed

Often an 'event study' methodology, based on security prices, is used to measure economic effects of new standards.[36] This approach is indirect because firm responses are hypothesized but not investigated. Instead, security price movements around the release date of new information relating to the standard are examined to observe economic consequences [Leftwich (1981)]. Some researchers have explored alternative methods, focusing on the direct link between accounting changes and firm responses. Typically, financial statement variables have been investigated to infer responses attributable to new accounting standards.[37] For example, the impact of SFAS No. 2, 'Accounting for Research and Development Costs' [FASB (1974)], on reported R&D expenditures has been investigated in several studies [Dukes et al. (1980), Horwitz and Kolodny (1980), Elliott et al. (1984), Selto and Clouse (1985)].

Application of the direct approach to the lease standard requires consideration of several methodological problems noted by Ball (1980) and Wolfson (1980). Unlike earlier studies using the direct approach, we consider firm responses along many dimensions. The effect of other (unknown) contemporaneous changes is minimized by using control periods from before and after the transition period and by analyzing cross-sectional variation in firm responses. We also validate our results by using multiple analyses (regressions and

[35]See the appendix for evidence of significant debt changes (and insignificant equity changes), based on overall comparisons for a subset of high- and low-lease firms. Also, note that the debt changes reported in table 6 are unlikely to be due to mean reversion. Since high-lease firms have less conventional debt than low-lease firms (see table 8), the presence of mean reversion would cause more debt increases for the high-lease group, in contrast with the debt decreases observed here.

[36]For example, FASB pronouncements on oil and gas accounting, foreign currency translation, and changing prices have each been examined using the event study approach.

[37]Other response variables that have been examined include auditor changes [DeAngelo (1982)] and lobbying behavior [Watts and Zimmerman (1978)].

nonparametric matched pairs comparisons) on different samples (Compustat sample and subsample). After examining the data and obtaining an intuitive understanding of what changes occurred, we develop innovative ways to transform and analyze these data. While this study considers variables and relations that are specific to the lease standard examined, we believe many aspects of the methodology employed here are valuable for research studying the impact of other accounting standards.

4.2. Results

Overall our results support the hypothesis that the financial statement effects of lease capitalization required by SFAS No. 13 had a significant impact on lessees. Capital leases as a source of financing declined sharply after the standard. The substantial amount of substitution into operating leases we observe suggests that renegotiation of lease contracts is a low-cost alternative, relative to other responses that potentially mitigate the financial statement effects of the standard. To a lesser extent, other capital structure changes were also selected in some instances, evidenced by an increased use of nonlease financing and leverage-reducing changes in the mix of nonlease financing (decreasing in debt and increases in equity). Overall, most lessees apparently elected not to renegotiate contracts affected by lease capitalization nor to enter into technical default, and employed various capital structure changes instead.

While the magnitudes of firm responses are on average related to the expected impact of the standard, individual firm responses show considerable variation. In addition to the firm responses analyzed here, we observed numerous other actions undertaken by firms to mitigate the effects of the standard, such as 1) successfully renegotiating contracts affected by complying with the standard [American Seating Company's Annual Report for 1978], 2) delaying capitalization to obtain additional time to renegotiate affected contracts [Pfeiffer (1980)], and 3) lobbying by trade groups to obtain special dispensation when applying the standard to leases that are unique to their industries [Barrons (11/12/1977, p. 5)]. What factors determine the choice among alternative responses? Hopefully future research on cross-sectional variation in the mix of firm responses will provide further evidence on the relative costs of alternative responses.

Appendix: Selection of subsample

The subsample provides additional control to help interpret the results for the Compustat sample by attempting to reduce the bias caused by omitted correlated variables. Three omitted variables that could potentially explain firm responses and also be correlated with the included independent variable,

Table 7

Sample selection procedure.

High-lease sample[a]	
Firms in 1980 edition of Compustat (Annual Industrial) tape	2,457
Firms with footnoted capital leases ($PVCAP_f$) reported from 1973 to 1976	388
Firms with $PVCAP_f/LTC > 10\%$	269

Matching procedures[a]	
Initial set of high lease firms	269
Less firms excluded because no matches available due to:	
no low-lease control firms in 4-digit SIC industry group[b]	(122)
no matches on *SIZE*	(49)
no matches on leverage (*LEVR*)	(31)
Initial set of matched pairs	67
Plus high-lease firms moved to low-lease group	12
Final set of matched pairs	79

[a]Variables are obtained from Compustat as follows: $PVCAP_f$ (footnoted capital leases) = #88, *LTC* (long-term capitalization) = #88 + #9 + #10 + #60, *SIZE* (total assets) = #6 + #88, *LEVR* (leverage) = (#9 + #88)/(#9 + #88 + #10 + #60).

[b]Low-lease firms were firms that disclosed any form of leasing during the period 1973 to 1976 and had footnoted capital leases amounting to less than 10 percent of total long-term capitalization, except for the 12 relatively low-lease firms in the four industries with significant amounts of leasing (SIC #4511, 5311, 5411, 5812) that had footnoted capital leases below 20 percent of *LTC*.

$PVCAP_f/LTC$, are:

(1) industry (4-digit SIC code),
(2) total assets (including capital lease), *SIZE*, and
(3) total leverage (including capital lease), *LEVR*.

These variables are defined in table 7. Matching requires identification of pairs of high- and low-lease firms in the same industry that are reasonably matched along *SIZE* and *LEVR*. The 338 firms on Compustat reporting $PVCAP_f$ from 1973 to 1976 are examined to form a 'high-lease' sample. We identified a total of 269 firms with present values of footnoted capital leases ($PVCAP_f$) in excess of 10 percent of total long-term capitalization (*LTC*) for 1976.[38] Firms in this sample are expected to be most affected by lease capitalization since they report the highest amounts of footnoted capital leases. Matches for these 269 high-lease firms are sought by identifying all low-lease firms ($PVCAP_f <$ 10% of *LTC*) in the same 4-digit SIC code that reported a positive amount of

[38]The total 'long-term capitalization' measure was used in ASR No. 147 [SEC(1973)]. Firms with footnoted capital (financing) leases in excess of five percent of this capitalization measure were required to disclose them in their footnotes. Interestingly, many firms below the five percent criterion also disclosed this information.

leasing activity, and then selecting one firm with reasonably similar size (represented by total assets plus $PVCAP_f$) and leverage (long-term debt plus $PVCAP$ divided by long-term capitalization) as of 1976. The size and leverage parameters used to obtain reasonable matches are:

$$SIZE:^{39} \quad 0.40 < \frac{\text{Size of high-lease firm}}{\text{Size of low-lease firm}} < 2.50,$$

and

$$LEVR:^{40} \quad |\text{Leverage of high-lease firm}$$
$$- \text{Leverage of low-lease firm}| \leq 0.25.$$

Note that these parameters are based on visual evaluation of sample firms and have no theoretical basis. They are the smallest ranges we could have selected to leave a reasonably large number of pairs of firms matched on industry, size, and leverage. Similarly, the 10 percent hurdle for high-lease firms is based on a tradeoff between larger sample sizes and potential misclassification of firms. The search for low-lease firms, matched on these three dimensions, was repeated for all 269 firms and resulted in a sample of 67 matched pairs. In observing the firms that were dropped from the sample, we noted that four industries with significant amounts of leasing activity had been almost completely deleted (airlines, retail department stores, retail grocery stores, and fast food chains). These industries comprised the bulk of all lease firms examined in the FASB's research report on leases [Abdel-khalik (1981)] and are considered important to this study.

To include these industries in the study, we permit low-lease firms in these four industries to have a value of the explanatory variable, $PVCAP_f/LTC$, be as high as 20 percent, with their high lease counterparts reporting values in excess of 20 percent. This adjustment is in keeping with the relatively high–relatively low approach to matching and yet maintains a reasonably low probability of misclassifying firms.[41] This adjustment allowed the addition of 12 matched pairs, bringing the sample size to 158 companies (or 79 matched pairs).[42] Note that a 20 percent filter for high-lease industries and a 10 percent

[39] This is a proportional parameter allowing the high-lease firm to be 40 percent as large as the low-lease firm (e.g., \$40/\$100) or the low-lease firm to be 40 percent as large as the high-lease firm (e.g., \$100/\$40).

[40] The absolute difference in leverage is less than or equal to 0.25.

[41] For example, if the filter that determines high- and low-lease groups varied by industry, all industries could have been represented, yet a large number of firms would have been misclassified. 'Low'-lease firms with large amounts of leasing and 'high'-lease firms with low levels of leasing would exist, thereby biasing downwards the probability of observing an effect in the matched pairs comparisons.

[42] For the 12 pairs, the mean and median difference in financing leases (as a percent of long-term capitalization) is 20 percent, with differences between pairs ranging from 5 to 28 percent.

Table 8

Summary data on attributes on high-lease and low-lease samples.

Variable[a]	High-lease group		Low-lease group		Difference high–low	
	Mean	Median	Mean	Median	Mean	Median
$PVCAP/LTC$	0.2241	0.1823	0.0633	0.0563	0.1608[b]	0.1350[b]
$PVCAP_f/LTC$	0.2101	0.1607	0.0434	0.0	0.1667[b]	0.1358[b]
$LOG(SIZE)$	5.1808	4.9471	5.2389	4.9698	0.0580	0.0427
$SALES$	1212.16	208.21	1019.21	191.11	192.95	17.52
$LEVR$	0.4535	0.4641	0.4147	0.4046	0.0388[b]	0.0402[b]
$DEBT\ RATIO$	0.3099	0.3202	0.3895	0.3932	−0.0795[b]	−0.0576[b]
$INTCOV$	5.6414	3.9887	5.6645	4.2658	0.2111	−0.3342
$RONA$	0.0768	0.0754	0.0972	0.0923	−0.0205[b]	−0.0169[b]

[a] The variables are computed as defined below. All values refer to book values as reported by Compustat, except for *Preferred equity* where liquidation values are used. The Compustat data item numbers are in parentheses. $PVCAP_f$ = Footnoted capital leases (#88), $PVCAP$ = Total capital leases (#88 + #84), LTC = Long-term capitalization = $PVCAP_f$ (#88) + *Long-term debt* (#9) + *Common equity* (#60) + *Preferred equity* (#10), $SIZE$ = *Total assets* (#6) + $PVCAP_f$ (#88) (in 1976), $SALES$ = *Net sales* (#12) (in 1976), $LEVR$ = (*Long-term debt* (#9) + $PVCAP_f$ (#88))/LTC (in 1976), $DEBT\ RATIO$ = *Long-term debt* (#9)/(*Long-term debt* (#9) + *Common equity* (#60) + *Preferred equity* (#10)) (in 1976), $INTCOV$ = Median value of *interest coverage* (between 1971 and 1980) defined as (*Interest expense* (#15) + *Pre-tax income* (#18 + #16))/*Interest expense* (#15), $RONA$ = Median value of *Return on assets* (between 1971 and 1980) defined as *Pre-tax income/SIZE*.

[b] Significant at 5% level, based on two-tailed tests.

filter for all other industries has no effect on the regression results in panels A of tables 2, 3, and 4. Also, it biases against finding a significant difference for the matched pairs comparisons reported in panels B of these tables.[43] We do not believe that the matching requirements, which tend to delete many high-lease firms, bias our results in favor of the alternative hypotheses, since the subsample results in table 2 are similar to the Compustat sample results in table 1. The results in footnote 43 indicate that the matching requirements are likely to bias the subsample results against rejecting the null hypothesis.

Table 7 summarizes the effect of each selection criterion on the original set of 388 high-lease firms, and table 8 provides summary statistics that compare the two groups. Consistent with the sample construction procedures, the high-lease group has significantly more footnoted capital leases ($PVCAP_f$) than the low-lease group. Also, high-lease firms have significantly more capital leases ($PVCAP$). Matched pairs are of similar size, based on natural loga-

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[43] To gauge the amount of bias, all overall comparisons in panels B of tables 2, 3, and 4 and table 6 were repeated without these 12 additional pairs. As expected, the differences between high- and low-lease groups are even more significant for the reduced subsample of 67 pairs than they are for the 79 pairs. Note that the debt changes in table 6 become significant at the three percent level. (However, the equity changes remain insignificant at the five percent level.)

rithms of *SIZE*. Also, *SALES*, another measure of firm size is well-matched across the pairs of high- and low-lease firms. However, the total leverage (*LEVR*) match is not completely successful as high-lease firms report significantly higher values of *LEVR* (debt plus capital leases). Given that the high-lease group was constructed to have more footnoted capital leases and similar values of *LEVR*, the low-lease group should have higher amounts of conventional debt (*DEBT RATIO*). Table 8 confirms this expectation. [The interest coverage ratio (*INTCOV*), however, is not significantly different.] The low-lease group is significantly more profitable (*RONA*). Two other measures, not reported in table 8, are the number of years, between 1971 and 1980, that firms reported a tax loss carryforward and the number of years that the firm paid no dividends. While the high-lease group has a slightly lower number of firms that always paid some dividends (58 versus 63 out of the 79 pairs of firms) and also fewer firms that did not report a tax loss carryforward (43 versus 49 out of 79 firms), the differences are not statistically significant using chi-squared tests of independence. To summarize, our subsample of pairs of high- and low-lease firms are similar along all relevant dimensions, except for leverage differences.

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