

Leases and Operating Capacity

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Abstract

The omission of operating leases from the balance sheet distorts not only reported leverage but also reported operating capacity. In the context of the joint project initiated by FASB and IASB on accounting for leasing, we compare the information content of reported and lease-adjusted operating assets under four alternative approaches: The present value of minimum lease payments (PVMLP, consistent with the FASB proposal), PVMLP adjusted downward to reflect differences in the amortization patterns of the capitalized lease asset and obligation (Adjusted PVMLP, consistent with the IASB proposal), and two alternative methods for capitalizing the rent expense (consistent with Moody's approach). We find that all four approaches are relevant in that pro forma operating assets that reflect the capitalization of operating leases provide incremental information about future sales over and above the information in reported assets. However, the rent capitalization approaches result in measures of operating assets that are less reliable than reported assets. In contrast, operating assets under the two PVMLP approaches dominate reported operating assets in predicting revenue. These findings suggest that capitalizing operating leases by discounting future lease commitments increases both the relevance and reliability of assets as predictors of future revenue. Comparing the two PVMLP approaches, we find that assets measured under the Adjusted PVMLP approach (i.e., the IASB proposal) better predict revenue compared to assets measured under the PVMLP approach (the FASB proposal).

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1. Introduction

Leasing is a common method of financing operating assets. For example, in a 2005 study of off-balance sheet arrangements, the SEC estimated that approximately 63% of the total population of issuers report operating leases, and 22% report capital leases. In terms of dollar amounts, the relative magnitude of operating leases is much larger than implied by these statistics. According to the SEC study, reported future cash flows committed under operating and capital leases in 2005 were approximately 1,250 and 45 billion USD for operating and capital leases, respectively, implying that almost all leases are omitted from the balance sheet. Given the economic significance of these off-balance sheet obligations, many users of financial reports adjust companies' reported debt to include the estimated economic obligation associated with operating leases. For example, S&P notes that "of course, when we look at leverage, our analysis goes beyond reported debt on the balance sheet and includes such items as leases, pension and retiree medical liabilities, guarantees, and contingent liabilities" (Standard & Poor's Corporate Rating Criteria, 2008, page 24). Such adjustments are supported by academic research, which provides extensive evidence on the association between leases and equity and credit risks.¹

In addition to understating debt, operating lease accounting omits from the balance sheet the operating capacity that the leased property provides. While sophisticated users of financial statements understand the lease-debt omission and adjust leverage ratios accordingly, it appears that less attention is paid to adjusting operating assets.² To understand the importance of such adjustments, consider a company

¹ For example, Bowman (1980), Imhoff et al. (1991 & 1993), Ely (1995), Dhaliwal et al. (2011), Bratten et al. (2013), Kraft (2014), and Altamuro et al. (2014).

² Several working papers have shown that measures of capitalized lease assets provide incremental information about future profitability (e.g., Ge 2006, Wang 2013, Graham and King 2011). However, these studies do not compare the overall predictive ability of the capitalized lease assets with that of reported assets or across the alternative capitalization approaches, which is a primary objective of the current study. In addition, the current study focuses on evaluating the lease capitalization approaches contemplated by the FASB and IASB.

that has recently changed its growth strategy from purchasing to leasing fixed assets (e.g., stores).³ If one predicts that company's revenue based on the historical relationship between asset growth (or capital expenditures) and subsequent revenue—as is commonly done—the revenue forecast will be understated as the newly leased assets are omitted from the balance sheet. In contrast, if reported operating assets are adjusted to reflect leased capacity, the asset/subsequent revenue relationship will be maintained, resulting in unbiased revenue forecasts. Similarly, cross-sectional differences in purchasing versus leasing make it difficult to compare operating capacity across companies based on reported assets. For example, firms that tend to lease rather than purchase assets have relatively high asset turnover ratios even if they are less efficient than their peers. Adjusting reported assets to reflect leased operating capacity would eliminate or at least mitigate this distortion. In this study we investigate whether and the extent to which adjusting operating assets to reflect the capitalization of operating leases improves their ability to reflect operating capacity and predict revenue.

Recognizing the shortcomings of existing accounting, FASB and IASB initiated a joint project on lease accounting to “increase transparency and comparability among organizations by recognizing lease assets and liabilities on the balance sheet.”⁴ While both standard setters agree on the need to recognize lease assets and liabilities on the balance sheet, their current proposals for the measurement of the lease expense and lease asset (right-of-use) differ. The FASB has tentatively decided to propose a dual model that retains the existing distinction between capital/finance (Type A) leases and operating (Type B) leases in terms of expense recognition, and which would therefore result in different reported assets. In its 2013

³ Such changes are quite common. For example, Cornaggia et al. (2012) provide evidence that firms' lease-versus-buy decisions change significantly over time; Mills and Newberry (2005) find that firms use more operating leases when they enter into contractual loan agreements that provide incentives to manage debt ratings or when they become closer to violating these debt rating covenants; and Graham et al. (1998) document a negative relation between operating leases and tax rates across firms and over time.

⁴ Leases—Joint Project of the FASB and the IASB: Project Objective and Summary of the Proposed Model, http://www.fasb.org/jsp/FASB/FASBContent_C/ProjectUpdatePage&cid=900000011123.

exposure draft, the FASB proposed treating most operating leases as Type A, but as of April 2015 it appears to have reversed this plan and now proposes that operating leases be classified as Type B. The IASB has tentatively decided to propose a single lessee model, under which a lessee would account for all (finance/capital and operating) leases as Type A. Under both proposals, the lease liability would be identical for all leases (present value of future lease payments), which allows us to focus on the relationship between the alternative measures of lease asset and future revenue and abstract from leverage/risk-related considerations.

Drawing from practice and prior academic research, we develop and compare four alternative methods for measuring the lease asset: (1) the present value of minimum lease payments (PVMLP, consistent with the FASB proposal for “Type B” leases, the planned classification of operating leases as of April 2015), (2) PVMLP adjusted downward to reflect differences in the amortization patterns of capitalized lease assets and obligations (Adjusted PVMLP, consistent with the IASB proposal for all leases and the FASB proposal for “Type A” leases), (3) rent expense capitalized at the lessor required rate of return (the required return approach), and (4) rent expense capitalized based on the relationship between PVMLP and next year lease payments (the proportionality approach). Using a subsample of observations with available information, we also examine the approach proposed by the FASB in the 2013 exposure draft, which uses the PVMLP for leases of property and the Adjusted PVMLP for other leases. The PVMLP and Adjusted PVMLP approaches follow the S&P rationale in adjusting the financial statements for operating leases, while the rent capitalization approaches are similar to the approach used by Moody’s. Both types of approaches, with variation in implementation, are also used by other practitioners including investors, analysts and regulators.

We find that all four approaches are relevant in that pro-forma operating assets that reflect the capitalization of operating leases provide incremental information about future sales over and above the

information in reported assets. However, the rent capitalization approaches result in measures of operating assets that are less reliable than reported assets. In contrast, pro-forma assets measured under the two PVMLP approaches dominate reported assets in predicting future sales. When we focus on the ability of fixed assets to predict sales, the results are even stronger. These findings suggest that capitalizing operating leases by discounting future lease commitments is desirable not only in that it allows the financial statements to better reflect financial leverage and related risks (e.g., Bowman 1980, Imhoff et al. 1991 & 1993, Ely 1995, Dhaliwal et al. 2011, Bratten et al. 2013, Kraft 2014, Altamuro et al. 2014), but also by increasing the relevance and reliability of assets as predictor of revenue. Further comparing the two PVMLP approaches, the results suggest that the Adjusted PVMLP approach (i.e., the IASB proposal) is preferable to the PVMLP approach (the FASB proposal). Similarly, using the lease classification proposed in the 2013 FASB exposure draft, under which most operating leases are reported using the Adjusted PVMLP approach, results in more informative assets than under the current FASB proposed classification. Because the capitalized lease obligation, and therefore the leverage/risk-related information, is the same under the PVMLP and Adjusted PVMLP approaches, our findings suggest that the IASB approach (which is largely the approach proposed in the 2013 FASB exposure draft) is preferable to the current FASB plan.

In addition to informing the deliberations of the FASB and IASB on accounting for leases, the evidence provided by the study is relevant for practitioners and academics that use measures of operating assets and capital expenditures as proxies for operating capacity or as predictors of revenue growth. In particular, the study demonstrates the types of lease-related adjustments that better reflect operating capacity and facilitate more precise revenue predictions.

The paper proceeds as follow. Section 2 discusses the current and proposed accounting treatment for lease transactions and presents and motivates the research questions. Section 3 describes the sample

and variables, including the alternative measures of lease-adjusted operating assets. Section 4 presents the empirical results, and Section 5 concludes the paper. Appendix A demonstrates and compares the alternative lease accounting treatments.

2. Accounting for Leases

This section describes Generally Accepted Accounting Principles (GAAP) for lease transactions (Subsection 2.1) and their shortcomings (Subsection 2.2). It also reviews the proposed FASB and IASB changes to lease accounting (Subsection 2.3), and states and motivates the research questions (Subsection 2.4).

2.1 US GAAP

A lease is a contract between a lessor and a lessee that conveys the right to use property, generally for a specified period of time. The lessor holds legal title to the asset and the lessee uses the asset. Current GAAP for leases is derived from the view that a lease that transfers substantially all of the benefits and risks of ownership should be accounted for as the acquisition of an asset and the incurrence of an obligation by the lessee (“capital lease”), and as a sale or financing by the lessor. Other leases should be accounted for consistent with their legal substance, that is, as a rental of property (“operating lease”).

A lessee classifies a particular lease as a capital lease if it meets any one of the following classification criteria:⁵

- The lease transfers ownership of the property to the lessee by the end of the lease term.⁶
- The lease contains an option to purchase the leased property at a bargain price.

⁵ Land and building elements of a lease are generally evaluated and accounted for as a single unit, unless the land represents 25% or more of the total fair value of the leased property.

⁶ The lease term is the fixed noncancelable term plus all periods for which renewal is “reasonably assured” due to bargain renewal options or failure to renew penalties. Renewal or extension of a lease beyond the original lease term normally triggers a fresh lease classification.

- The lease term is equal to or greater than 75 percent of the estimated economic life of the leased property.
- The present value⁷ of the minimum lease payments⁸ equals or exceeds 90 percent of the fair value of the leased property.⁹

If none of the above criteria is met, the lessee classifies the lease as an operating lease.

Accounting treatment under the capital lease method involves the following steps. At inception, the lessee records the acquisition of an asset and the incurrence of an obligation equal to the lesser of the present value of the minimum lease payments or the fair value of the leased property. Subsequently, the lessee treats the periodic lease payments as payments of the lease obligation and interest. The lessee also depreciates the leased property in a manner consistent with its normal depreciation policy for owned assets.¹⁰ The depreciation period is restricted to the lease term, rather than the life of the asset, unless the lease provides for transfer of title or includes a bargain purchase option.

Under the operating lease method, in contrast, no liability is reported on the balance sheet, and an asset is recorded only to the extent that payments already made have not been fully consumed (prepaid rent). Consumed lease payments are reported as rental expense in the income statement.

⁷ The discount rate used in calculating the present value is the lessee's incremental borrowing rate, unless (1) the lessee knows the lessor's implicit rate and that rate is lower than the incremental borrowing rate (in which case the lessee should use the lessor's implicit rate), or (2) the present value of the minimum lease payments is greater than the fair value of the leased asset (in which case the lessee should use the fair value of the leased asset and the implied internal rate of return).

⁸ Minimum lease payments are those that the lessee is obligated to make, subject to the following adjustments: Contingent rentals such as payments based on sales or hours of use are excluded. Payments depending on an existing index or rate such as CPI or LIBOR are included in the minimum lease payments based on the level of the index/rate at lease inception (the effects of subsequent changes in the index/rate are considered contingent rentals). Executory costs such as insurance, maintenance, and taxes are excluded. Minimum lease payments also include bargain price options, residual value guarantees, and failure to renew penalties that are not "reasonable assured" to be avoided due to renewal.

⁹ The term and present value criteria are not used for land or for property which at lease inception is in the last 25% of its original economic life.

¹⁰ If the lessee guarantees the residual value, the asset should be depreciated to the excess of the guarantee over the amount (if any) that the lessee expects to pay due to the residual value falling below the guaranteed amount. The reason for this is that at the end of the lease term, the lease liability is equal to the guarantee (which is included in the minimum lease payments). This liability is removed by crediting the leased asset and cash (if a payment is required).

Under both methods, the lessee is required to disclose the future minimum lease payments both in the aggregate and for each of the five succeeding fiscal years. Appendix A demonstrates and compares the two methods.

Current IFRS for leases are similar to US GAAP. Like US GAAP, IFRS mandates two accounting methods for leases—operating and finance (capital). These methods are based on the same logic and principles as US GAAP, except that the classification criteria are qualitative rather than quantitative.¹¹

2.2 Issues with current GAAP

Most lessees prefer the operating lease method, because this method: (1) does not recognize the lease obligation, thereby lowering reported leverage; (2) recognizes lower expenses in the earlier years compared to the capital lease method, resulting in higher equity and lower leverage ratios (as well as higher earnings for growth firms);¹² and (3) does not recognize the leased property, thereby increasing reported ROA. Lessees achieve this desired accounting treatment by setting the terms of lease transactions so that they qualify for the operating lease method, or by manipulating estimates required to test whether the capitalization criteria are met. For example, a lessee might increase the contingent part of lease payments to reduce the minimum lease payments, or it might overstate the “incremental borrowing rate” used in calculating the present value of minimum lease payments so that the present value will fall below

¹¹ Other differences include: (a) Under IFRS, land and building elements must be considered separately, while under US GAAP separate accounting is required only if the land’s fair value is at least 25% of the fair value of the leased property. (b) Under IFRS, lease renewals are normally treated as an extension, while under US GAAP they typically trigger a fresh lease classification. (c) Under IFRS, an operating lease may be classified as an investment property and accounted for using the fair value model, with the liability accounted for as if the lease were a finance lease (the concept of “investment property” does not exist in US GAAP). (d) Under IFRS, immediate gain recognition from the sale and leaseback of an asset is allowed in many cases, while under US GAAP immediate gain recognition is uncommon.

¹² The capital lease method is more conservative than the operating lease method (i.e., it results in lower equity) because it recognizes larger cumulative expenses than the operating lease method at any point during the lease term. This follows because the total of lease-related expenses (i.e., rent expense under the operating lease method or the sum of depreciation and interest under the capital lease method) over the lease term is equal to the total rent payments independent of the lease method, while the pattern of the periodic expense is flat (straight line) for the operating lease method and declining for the capital lease method. Under the capital lease method, interest expense declines over the lease term commensurate with the decline in the lease liability, and the depreciation expense is either constant (straight line) or declines over the lease term (accelerated depreciation). Appendix A demonstrates and compares the two lease accounting methods.

the 90% threshold. Consequently, leases that economically should be accounted for using the capital lease method are often omitted from the balance sheet and the related payments are reported as rent expense.

Another concern about lease accounting is the lack of comparability. Similar lease transactions may receive very different treatments, with important consequences for both the balance sheet and performance metrics. For example, earnings before interest, taxes, depreciation and amortization (EBITDA)—a commonly used performance metric—reflects rent payments but excludes both depreciation and interest expense. Thus, operating leases reduce EBITDA whereas capital leases do not. Also, cash flow from operations is higher and accruals are lower under the capital lease method, because operating lease payments are classified as operating cash outflows, while capital lease payments are apportioned between interest (operating activities) and repayment of lease obligation (financing activities).

Because relatively few leases are accounted for under the capital lease method, it appears that in practice comparability issues should be relatively mute. This, however, is not the case. Leasing substitutes borrowing and purchasing the asset, with the latter transaction accounted for similar to capital leases. Both types of transactions—leasing and borrowing & purchasing—are common, and there is substantial cross-sectional and time-series variation in leasing versus borrowing & purchasing (see footnote 3). This variation makes it difficult to measure operating capacity or predict sales based on the level of or trend in reported assets. In addition, all leases, whether accounted for using the capital or operating lease methods, are excluded from the cash flow statement measure of capital expenditures. Consequently, for many firms, reported capital expenditures significantly understate the true investment in operating capacity.

To address (some of) the above issues, many analysts capitalize operating leases, arguing that the capital lease method is more informative and consistent with economic reality, and that using the same method to account for all leases improves the comparability of financial information across firms and over

time. While the capitalization of operating leases involves adjusting both assets and liabilities, analysts and researchers typically focus on the impact on leverage and risk (see footnote 1). However, financial statements are used for additional purposes besides evaluating risk. In particular, financial reports are a primary source of information for forecasting sales and profits. This study investigates the impact of alternative lease-related adjustments on the ability of assets to capture operating capacity and predict sales.

2.3 Proposed changes to lease accounting

Responding to “a widespread request from users of financial statements and other stakeholders to change the accounting guidance so that lessees would be required to recognize assets and liabilities arising from leases”, the FASB and ISAB have initiated a joint project on accounting for leasing. “The objective of the project is to increase transparency and comparability among organizations by recognizing lease assets and liabilities on the balance sheet and disclosing key information. This represents an improvement over existing leases standards, which do not require lease assets and lease liabilities to be recognized by many lessees.” While the FASB and IASB are currently contemplating requiring the capitalization of most leases, they have not yet decided the exact approach.

As of April 2015, the FASB decided on a dual approach for lessee accounting, with lease classification determined in accordance with the principle in existing lease requirements (that is, determining whether a lease is effectively an installment purchase by the lessee). A lessee would account for most existing capital/finance leases as Type A leases (amortization of the right-of-use (ROU) asset recognized separately from interest on the lease liability) and most existing operating leases as Type B leases (single total lease expense). Under both Type A and Type B leases, the lessee would recognize a ROU asset and a lease liability, initially measured at the present value of lease payments. For Type A leases, the unwinding of the discount on the lease liability will be recognized as interest separately from the amortization of the right-of-use asset, while for Type B leases a single straight-line lease cost will be

recognized, combining the unwinding of the discount on the lease liability with the amortization of the right-of-use asset.

The current proposed lease classification (Type A versus Type B) represents a change from the FASB's 2013 exposure draft, under which most leases of assets other than property (for example, equipment, aircraft, cars, trucks) would have been classified as a Type A, while most leases of property (land and/or a building or part of a building) would have been classified as Type B.

Unlike the FASB, the IASB decided on a single approach for lessee accounting, under which a lessee would account for all leases as Type A leases (amortization of the ROU asset recognized separately from interest on the lease liability). Appendix A demonstrates and compares the alternative lease accounting treatments.

2.4 Research questions

Given the limitations of the current accounting for leases described above, and the planned changes to lease accounting by the FASB and IASB, the primary research questions addressed in this study are: Do measures of lease-adjusted operating assets provide information incremental to that in reported operating assets in forecasting revenue? Are those measures more reliable than reported operating assets? Which of the proposals (IASB, FASB, or the previous FASB proposal as delineated in the 2013 exposure draft) result in the most reliable measure of operating assets? How do the FASB and IASB measures compare to often-used rent capitalization proxies?

Our focus on the ability of lease-adjusted assets to predict revenue is consistent with the primary objective of financial reporting, which according to the FASB is “[to] provide information to help investors, creditors, and others assess the amounts, timing, and uncertainty of prospective net cash inflows to the related enterprise” (SFAC No. 1). These cash flows are driven primarily by the company's revenue, on which we focus. Indeed, fundamental valuation models use revenue forecasts as the key assumption

and relate most other forecasts (e.g., of operating profit, working capital, and capital expenditures) to revenue.

3. Sample and Variables

To compare the alternative lease accounting methods, we need to estimate the amounts that would have been reported under those methods. A key input in the analysis is the discount rate, whose effect on the capitalized lease asset varies across the methods. To mitigate the potential for incorrect inference regarding the informativeness of the different methods due to differential measurement error, we estimate the discount rate based on each firm-year's actual or predicted credit rating.¹³

The sample consists of all firm-year observations with available actual or predicted credit rating for the fiscal year end month (FinRating), as well as the Compustat and CRSP data required to measure the variables described below. Because a key lease-related data item (MRCTA, discussed below) is available starting 1995, the sample period spans the years 1995 through 2014. To maintain consistency with the credit rating analysis, we omit very small firms (total assets and revenue less than 10 million USD in December 2014 prices) as well as financial and utilities.

The analysis' variables include operating revenue, reported operating assets, and four alternative measures of lease-adjusted operating assets. Operating revenue is measured as Compustat's data item SALE. Operating assets are measured as total assets (Compustat's data item AT) minus cash, cash equivalent and short-term investments in marketable securities (Compustat's data item CHE), minus long-term marketable securities, cost method investments, and other investments (Compustat's data item IVAO), and minus equity method investments (Compustat's data item IVAEQ). We exclude these assets

¹³ For observations with unavailable credit ratings, we use predicted credit ratings measured using the procedure developed in Nissim (2015).

because they generally do not contribute to operating revenue.¹⁴ We next describe the measurement of the discount rate, the capitalized lease obligation, and each of the four measures of lease assets.

3.1 Discount rate

We measure the interest rate used to discount the minimum lease payments using the following procedure. For each firm-year observation with non-missing values for interest expense (Compustat data item XINT)¹⁵ and interest income (Compustat data item IDIT),¹⁶ we calculate the effective interest rate on reported debt as follows:

$$\text{Effective interest rate on reported debt} = \text{XINT} / (.5 \times (\text{RepDebt}_{-1} + \text{RepDebt}))$$

Where RepDebt is the sum of debt in current liabilities (Compustat's data item DLC) and long-term debt (Compustat's data item DLTT).¹⁷ We then calculate the proportion of long-term debt in the firm's debt structure (PropLTD):

$$\text{PropLTD} = \text{DLTT} / \text{RepDebt},$$

and, for firm-years with PropLTD > 2/3, we define the effective interest rate on long-term debt as equal to the effective interest rate on reported debt (for other firm-years we set this variable equal to missing value). Next, each fiscal year $t = 1995, \dots, 2014$ (based on Compustat's assignment of June/ t to May/ $t+1$), we calculate for each numeric credit rating at fiscal yearend (FinRating = 1, 2, ..., 7) the median value of the effective interest rate on long-term debt. Finally, we merge the median rate with the firm-year observations by year and credit rating, and set each firm-year discount rate equal to that median rate. In

¹⁴ Some liquid funds are needed for generating operating revenue. However, estimating that amount is difficult. We therefore exclude all liquid funds, consistent with the common definition of operating assets in the literature. As a robustness check, we repeat the analysis including an estimate of required liquid funds (based on revenue and industry membership) in operating assets, and find results similar to those reported.

¹⁵ In measuring XINT, Compustat adds capitalized interest back to interest expense (and to nonoperating income, NOPIO), so there is no need to adjust for capitalized interest when estimating the effective interest rate.

¹⁶ We calculate the effective interest rate only for companies with non-missing interest income (IDIT) to assure that interest expense is not reported net of interest income.

¹⁷ Using average debt is equivalent to assuming that changes in debt on average occur at the middle of the year.

other words, we estimate the discount rate (“the lessee incremental borrowing rate”) as equal to the median effective interest rate on reported debt across firms with mostly long-term debt ($\text{PropLTD} > 2/3$) and with the same credit rating as the subject company.

3.2 Capitalized lease obligation

Firms are required to disclose operating lease commitments for each of the subsequent five years (Compustat data items MRC1 through MRC5) as well as the total of all commitments after year five (“thereafter commitments”; Compustat data item MRCTA). To measure the capital lease obligation, we need to estimate the annual lease payments after year five. Two alternative approaches are to either assume that annual lease payments remain constant from year five (e.g., Imhoff et al. 1991), or that they remain constant from year six at an amount equal to the average lease commitment during years one through five. (Under both methods, the final payment is the residual amount.) Our results are similar under the two approaches. Because existing lease commitments typically decline as leases expire, using year five commitment in extrapolating lease commitments after year five is generally preferable to using the average over years one through five. We therefore assume that annual commitments after year five are constant and equal to year five commitment, unless that calculation results in more than 20 years of payments, in which cases we spread the “thereafter commitments” over twenty years.¹⁸

Having specified the annual amounts of lease payments in all future years, we next calculate their present value using the discount rate described in Section 3.1. Because lease payments are made throughout the year, we assume that the payments are made at the middle of each year. The resulting amount, which we refer to as the present value of minimum lease payments (PVMLP), is the estimated capitalized lease obligation.

¹⁸ This adjustment is made because some companies have relatively low or even zero commitment for year five and still report substantial lease commitments after year five (e.g., due to residual value guarantees). In any case, the adjustment affects a small number of observations, and the results are similar without it.

3.3 Capitalized lease asset: PVMLP approach

Under this approach, the capitalized lease asset is set equal to PVMLP (i.e., the capitalized lease obligation). This is the approach proposed by the FASB for Type B leases. While relatively straightforward to implement, this approach involves several sources of measurement error. In many cases, leased assets provide greater capacity than implied by PVMLP, while in other cases PVMLP overstates operating capacity. PVMLP understates operating capacity when the lease term covers a period shorter than the asset's useful life or when the lease contract provides for contingent payments. This follows because the minimum lease payments span only the contract term and exclude contingent rentals. On the other hand, PVMLP may overstate the ability to generate revenue for two reasons. First, minimum lease payments relate to all leased property—whether used in operations or subleased—while subleased assets do not contribute to revenue (sublease rent income is netted against the rent expense or included in “other income”). Second, if operating leases were capitalized (or if the firm borrowed and purchased the asset instead of leasing), the recognized asset would have declined over time at a rate faster than the decline in PVMLP, as explained next.

Under the capital lease method, the initial book value of the asset is the present value of the amounts to be paid (i.e., the present value of the minimum lease payments at lease inception, or original PVMLP). Subsequently, the asset is depreciated on either a straight-line or accelerated basis (i.e., large declines in the early years), while the liability is amortized on a decelerated basis (i.e., small declines in the early years). The periodic reduction in the liability—the principal component of each lease payment—increases over time as the liability and hence the interest component of each payment declines. Consequently, the asset's book value after the initial recognition is smaller than the lease obligation, which is equal to the present value of the remaining lease payments, or PVMLP). Appendix A demonstrates this

effect with a numerical example.¹⁹ Thus, the PVMLP approach overstates the asset compared to the capital lease approach. Yet, this is apparently the more common approach used when the financial statements are adjusted with respect to operating leases (e.g., by S&P), and it is the method proposed by the FASB for type B leases.

3.4 Capitalized lease asset: Adjusted PVMLP approach

One alternative to the PVMLP approach for measuring leased operating capacity is to estimate the asset that would have been reported had all leases been accounted for using the capital lease method. This approach is consistent with the IASB proposal for all leases and the FASB proposal for Type A leases. To estimate the asset that would have been reported had all leases been accounted for using the capital lease method, we use the following method.²⁰ Assuming that the annual minimum lease payment (MLP) for a given lease is constant throughout the lease term, the original and current PVMLP ($PVMLP_o$ and $PVMLP$, respectively) for that lease can be calculated as follows:

$$PVMLP_o = MLP \times \frac{1 - \left(\frac{1}{1+r}\right)^{n_o}}{1 - \frac{1}{1+r}}$$

$$PVMLP = MLP \times \frac{1 - \left(\frac{1}{1+r}\right)^{n_r}}{1 - \frac{1}{1+r}}$$

Where n_o (n_r) is the original (remaining) lease maturity and r is the discount rate. Dividing the first expression by the second and multiplying by $PVMLP$, we get:

¹⁹ The same difference between operating and capital leases holds for operating leases versus borrowing and purchasing the asset, as the capital lease method essentially accounts for the transaction as if the lessee purchased the leased asset using borrowed funds.

²⁰ Another approach is to use prior years' financial information to estimate each year's new leases and the related PVMLP, and account for the new leases using the capital lease method (i.e., initially record a capitalized asset and liability equal to the PVMLP, and subsequently apportion payments between interest and principal and amortize the capitalized asset). This approach, however, involves substantial measurement error, primarily due to business combinations and divestitures over time.

$$PVMLP_o = PVMLP \times \frac{1 - \left(\frac{1}{1+r}\right)^{n_o}}{1 - \left(\frac{1}{1+r}\right)^{n_r}}$$

which is an estimate of the original book value of the capitalized lease asset. That estimate can be multiplied by the ratio of remaining life (n_r) to original life (n_o) to calculate the current net book value of the asset (i.e., assuming straight-line depreciation):

$$\text{Lease asset under the Adjusted PVMLP approach} = PVMLP \times \frac{1 - \left(\frac{1}{1+r}\right)^{n_o}}{1 - \left(\frac{1}{1+r}\right)^{n_r}} \times \frac{n_r}{n_o}$$

Because the product of the two ratios $\left(\frac{1 - \left(\frac{1}{1+r}\right)^{n_o}}{1 - \left(\frac{1}{1+r}\right)^{n_r}} \times \frac{n_r}{n_o}\right)$ is less than one, the net book value of the asset is always smaller than the capitalized lease obligation ($PVMLP$), consistent with the patterns of the asset and liability over time discussed above.

We estimate the average remaining lives of leases (n_r) as the number of years through the most distant year with positive lease commitments (after spreading the “thereafter commitments” over future years as described above). To estimate the average original lives (n_o), we divide the estimated remaining life (n_r) by the ratio of net depreciable PP&E to gross depreciable PP&E:

$$n_o = \frac{n_r}{\frac{\text{Net depreciable PP\&E}}{\text{Gross depreciable PP\&E}}}$$

That is, we assume that (1) the firm uses straight-line depreciation, (2) salvage value is negligible, and (3) the ratio of remaining life to original life for leases is the same as for owned depreciable PP&E.²¹

²¹ We estimate depreciable PP&E by subtracting land and improvement and construction in progress from reported PP&E. For a small number of observations, the estimated original life is very long. To mitigate the impact of measurement error, we winsorize the original life at 40 years.

3.5 Capitalized lease asset: Required return and proportionality approaches

The previous two approaches for the capitalization of operating leases utilize the present value of future lease payments. An alternative set of approaches focuses on the capitalization of the rent expense, with different methods for calculating the capitalization factor.²² We examine two methods for calculating the capitalization factor: based on interest and depreciation rates (the Required Return approach), and based on the relationship between PVMLP and next year lease payments (the Proportionality approach). Under both approaches, we apply the capitalization factor to next year rent expense, forecasted as the product of the current year rent expense and the ratio of PVMLP to the previous year PVMLP. In other words, we assume that the rent expense is proportional to PVMLP over time.²³

Under the Required Return approach, the capitalization rate is calculated as the sum of the discount rate (r) and the depreciation rate (d). The rationale for this approach is as follows. Lessors charge rent payments sufficient to provide a return on their invested capital and to cover the depreciation in the value of the leased asset. Thus, if v denotes the value of the asset and e denote the next year rent expense, we have

$$e = v \times (r + d),$$

and thus the capitalization factor is equal to $\frac{v}{e} = \frac{1}{r+d}$. We therefore estimate the lease asset as the product of next year rent expense and $\frac{1}{r+d}$.

²² For example, in describing their rating methodology, Moody's (2010) notes: "We adjust the balance sheet by adding both debt and fixed assets (usually gross plant, property and equipment). We compute this debt by multiplying current rent expense by a factor between 4x and 10x, or, if the present value (PV) of the minimum lease commitments (using the incremental borrowing rate as the discount rate) is higher, we will use the PV."

²³ An alternative approach is to use the ratio of current-to-previous year minimum lease payment (MLP) in year 1 instead of the PVMLP ratio. While MLP in year 1 corresponds to next year rent expense more closely than PVMLP, unlike the rent expense MLP is not necessarily linear over time. For example, if a contract specifies MLP of \$100 in year 1 and \$200 in year 2, the rent expense will be \$150 in each on the next two years. Using the PVMLP instead of MLP in year 1 helps mitigate this effect.

We measure the depreciation rate as equal to the inverse of the average useful lives of all PP&E in use (i.e., including land and improvements but excluding construction in progress), assuming that the mix of leased assets is the same as that of recognized assets. We estimate the average useful life of PP&E in use as the ratio of average gross PP&E in use to depreciation expense.²⁴ We include land in this calculation (which reduces the depreciation rate) because lease payments related to the use of land need not compensate the lessor for any depreciation.

An alternative approach for deriving the capitalization rate is to base it on the relationship between PVMLP and the minimum lease payment (MLP) in year 1. Under this approach, which we refer to as the Proportionality approach, we estimate the capitalized lease asset as the product of next year rent expense and the ratio of PVMLP to MLP in year 1.²⁵ If contingent rentals (which are included in the rent expense but excluded from MLP) and other differences between the rent expense and MLP are proportional to MLP over time (i.e., they are always about X% of MLP, where X can vary across companies), then the capitalization factor applied to next year rent expense should equal the ratio of PVMLP to MLP in year 1.²⁶

Each of the four approaches for estimating leased assets discussed above involves assumptions and estimates. Whether and the extent to which the operating lease adjustments made under these approaches improve the ability of assets to measure operating capacity and predict sales is an empirical question, to which we turn next.

²⁴ When depreciation is reported combined with amortization, we use the total of depreciation and amortization. Specifically, we measure depreciation as Compustat item DP minus AM (when non-missing).

²⁵ In a small number of cases, MLP in year 1 is smaller than the average MLP in years 1 through 5. To mitigate measurement error, in those cases we use the average MLP instead of MLP in year 1 in calculating the discount factor.

²⁶ Note that this is a stronger assumption than the one used to predict next year rent expense, as it relies on the pattern of MLPs in addition to their size.

4. Empirical Results

Table 1 reports descriptive statistics from the distributions of the determinants and measures of capitalized lease assets, and Table 2 reports the median ratio of PVMLP to reported operating assets by industry (8-digit GIC). Mean (median) PVMLP is more than 10% (5%) of operating assets, demonstrating the significance of operating leases. For many firms—primarily retailers and airlines—PVMLP is very large, often exceeding 50% of operating assets. Comparing the four capitalization approaches, Adjusted PVMLP produces the smallest increase in assets (on average about 75% of PVMLP). In contrast, the rent capitalization approaches yield capitalized lease assets substantially larger than PVMLP, especially the Required Return approach. Interestingly, the relatively large capitalized lease assets under the rent capitalization approaches are obtained with capitalization factors smaller than the often-mentioned rent multiplier ranges of 6-8 or 4-10 (e.g., see footnote 21).

We next evaluate the effect of lease capitalization under each of the four alternative approaches on the ability of operating assets (Subsection 4.1) and fixed assets (Subsection 4.2) to forecast future revenue. We also compare the lease classification proposed in the 2013 FASB exposure draft with the current FASB and IASB proposals (Subsection 4.3).

4.1 Operating assets

Panel A (Panel B) of Table 3 provides summary statistics from four pooled regressions of next year log of (growth in) revenue on (1) log of (growth in) reported operating assets, and (2) log of (growth in) lease-adjusted operating assets. The four regressions in each panel correspond to the four alternative measures of lease-adjusted operating assets. Each regression contains industry-specific intercepts and slopes.

As expected, the R-squared statistics in the level specifications of Panel A are very high, ranging between 92% and 93%. These statistics reflect not only the size effect (log revenue is correlated with log assets) but also the large differences in asset turnover across industries (e.g., Soliman 2008), which are

captured by the industry-specific intercepts and slopes. In contrast, the R-squared statistics in the growth specifications of Panel B are substantially smaller, about 12% on average. Compared to the log specifications, industry membership and size have a relatively small effect on the relationship between revenue growth rates and asset growth rates. More importantly, correlated omitted variables are less likely to bias the estimates in the growth specifications. We therefore view the results of these regressions as more relevant.²⁷

We conduct an ANOVA analysis to evaluate and compare the significance of the alternative measures of operating assets in predicting revenue. Specifically, we report F-statistics associated with each group of variables (industry intercepts, industry-specific operating asset coefficients, and industry-specific coefficients on lease-adjusted operating assets) as well as z-statistic that compare the variation in future revenue explained by the four alternative lease-adjusted operating assets measures with that explained by reported operating assets.

The F-statistics compare the incremental variation of the corresponding group of variables with the unexplained variation. A significant F-statistic implies that the related group of variables provides incremental information about future revenue after controlling for the other included variables, i.e., those variables provide relevant information. We use the F-statistics to test the relevance of the lease adjustments as well as to examine whether the information in lease-adjusted operating assets subsumes the information in reported operating assets. The highly significant F-statistics associated with the lease-adjusted operating asset variables indicate that all four approaches are relevant in that pro-forma operating assets that reflect the capitalization of operating leases provide incremental information about future revenue over and above

²⁷ In essence, the growth regressions represent changes specification while the log regressions represent levels specification. As is well-recognized in the literature, changes specifications tend to yield less biased estimates than levels specifications. A key advantage of a changes specification over a levels specification is that omitted variables that vary across firms but are not significantly different for any single firm from one year to the next are eliminated by the differencing. In this way, potentially confounding firm-specific factors that are not included in the levels specification are effectively controlled for in the changes analysis, to the extent that they do not vary substantially for the same firm from one year to the next.

the information in reported assets. However, the F-statistics associated with reported operating assets are also significant, implying that these variables contain information about future revenue incremental to each of the lease-adjusted measures of operating assets. This later result could be due to measurement error in the capitalized lease assets and/or to differential information in lease assets and recognized assets for future revenue. We return to this issue below.

The z-statistics, which are calculated using bootstrapping, compare the explained variation (SS3) of each of group of lease-adjusted operating asset variables with that of the reported operating assets variables.²⁸ A positive and significant value for a z-statistic implies that adjusting operating assets by capitalizing operating leases using the corresponding method results in greater explained variation than that of reported operating assets. We use these statistics to test whether lease-adjusted operating assets dominate (i.e., are more reliable than) reported operating assets in predicting future revenue. We find that for the Adjusted PVMLP approach, lease-adjusted operating assets dominate reported operating assets, as the z-statistics that compare the variation in future revenue explained by the lease-adjusted operating assets with the variation explained by reported assets are positive and significant in both panels. Lease-adjusted operating assets under the PVMLP approach also explain greater variation in revenue than that explained by reported assets, but the z-statistic is insignificant in the growth specification (Panel B). In contrast, the rent capitalization approaches result in measures of operating assets that are less reliable than reported operating assets, as the corresponding z-statistics are negative.

These results suggest that the IASB proposal for capitalizing operating leases (Adjusted PVMLP) is preferable to the FASB proposal (PVMLP). Given the many assumptions and estimates involved in

²⁸ When making such comparisons, bootstrap tests are more robust than parametric tests (see, e.g., Parra-Frutos 2014). To calculate the z-statistic, we select, with replacement, 100 random samples of the same size as the number of observations. For each such sample, we conduct the ANOVA and calculate the difference between the explained variation by the lease-adjusted operating assets and the variation explained by reported operating assets. Finally, we calculate the z-statistic of the difference across the 100 samples.

estimating Adjusted PVMLP in this study, the superiority of the IASB proposal is likely to be even higher than implied by the results. Companies have finer (including private) information that would allow them to more precisely measure Adjusted PVMLP.

4.2 Fixed assets

Leased assets are usually fixed assets, while operating assets—the focus of the previous section—also include other assets, such as inventory, receivables and intangible assets. Fixed assets may have different implications for future revenue than other assets. For example, an increase in inventory is likely to predict a revenue increase in the near term, while capital expenditures may take several years before the acquired asset is fully productive. In addition, fixed assets yield revenue over multiple years, while working capital assets contribute to revenue over only one period. Thus, even if the capitalized lease asset contains no measurement error, reported operating assets may still provide incremental information about future revenue as it reflects a different combination of working capital and fixed assets than lease-adjusted operating assets. Therefore, to conduct a “cleaner” test of the reliability of the capitalized lease asset, we repeat the analysis using reported and lease-adjusted fixed assets instead of operating assets. Table 4 reports the results. Both the PVMLP and Adjusted PVMLP approaches significantly dominate reported operating assets and, similar to Table 3, the improvement in revenue forecasting ability is larger under the Adjusted PVMLP method.

4.3 The FASB’s 2013 Exposure Draft

As noted earlier, the current FASB proposed lease classification (Type A versus Type B) represents a change from the 2013 exposure draft. Under the current FASB plan, most operating leases will be classified as Type B, while under the exposure draft most leases of assets other than property (for example, equipment, aircraft, cars, trucks) would have been classified as Type A and most leases of property (land and/or a building or part of a building) would have been classified as Type B. The results of the previous

analyses suggest that this change from the exposure draft probably reduced the information content of the capitalized lease asset, as the Adjusted PVMLP (Type A) approach dominates the PVMLP (Type B) approach. Nevertheless, to test this more directly, we conduct the following analysis.

Using the subsample of observations for which the composition of PP&E across the different asset types is available, we estimate the proportion of Type B leases under the exposure draft as the ratio of the total of buildings (Compustat's data item FATB) and land and improvements (FATP) to gross PP&E (PPEGT). In other words, we assume that the distribution of leased assets by type is the same as the distribution of recognized assets. The mean (median) ratio of property to total PP&E is 0.22 (0.19), implying that under the exposure draft most operating leases would be classified as Type A. We estimate the capitalized lease asset as the weighted average of PVMLP and Adjusted PVMLP, with the firm's Type B proportion ($1 - \text{Type B proportion}$) as the weight for PVMLP (Adjusted PVMLP). We then repeat the growth regressions of Panel B of Tables 3 and 4 using the estimated capitalized lease asset measured under the exposure draft classification instead of the Proportionality method (which, as shown earlier, performs poorly). The results, reported in Table 5, demonstrate that using the lease classification proposed in the 2013 FASB exposure draft results in more informative assets than under the current proposed classification. In particular, in each of the two panels, the z-statistic associated with the exposure draft classification is significant and larger than that associated with the PVMLP method, which is insignificant.

5. Summary and Conclusions

Leasing allows a firm to gain access to assets by committing to make future payments. The existing accounting models for leases have been criticized for failing to provide a complete picture of an organization's leasing activities because the assets and liabilities arising from operating leases are not recognized on the balance sheet. In response to widespread requests from users of financial statements

and other stakeholders, FASB and IASB are working on a joint project that would potentially change the lease accounting. Academics and practitioners have long recognized that operating leases represent economic obligations, and that measures of leverage should be adjusted to reflect those off-balance-sheet obligations when evaluating risk. The FASB and IASB agree and propose that lease liabilities be recognized on the balance sheet at the present value of future lease payments. However, FASB and IASB differ in the proposed measure of lease assets. In addition, some practitioners and academics use measures of lease assets that are different from those proposed by the Boards.

We evaluate four alternative approaches for adjusting operating assets with respect to operating leases and compare the ability of reported and lease-adjusted assets to predict revenue. The four methods examined are: (1) the present value of minimum lease payments (PVMLP, consistent with the FASB proposal for “Type B” leases, the planned classification of most operating leases as of April 2015), (2) PVMLP adjusted downward to reflect differences in the amortization patterns of the capitalized lease asset and obligation (Adjusted PVMLP, consistent with the IASB proposal for all leases and the FASB proposal for “Type A” leases), (3) rent expense capitalized at the lessor required rate of return (the Required Return approach), and (4) rent expense capitalized based on the relationship between PVMLP and next year lease payments (the Proportionality approach).

We find that all four approaches are relevant in that pro forma operating assets adjusted for the capitalization of operating leases provide incremental information about future sales over and above the information in reported assets. However, the two rent capitalization approaches result in measures of operating assets that are less reliable than reported assets. In contrast, operating assets under the PVMLP and Adjusted PVMLP approaches dominate reported operating assets in predicting sales. When we focus on the ability of fixed assets to predict sales, the results are even stronger. These findings suggest that capitalizing operating leases by discounting future lease commitments is desirable not only in that it allows

the financial statements to better reflect financial leverage and related risks (e.g., Bowman 1980, Ely 1995, Altamuro et al. 2014), but also by increasing the relevance and reliability of assets as predictor of revenue. Comparing the two PVMLP approaches, the results suggest that the Adjusted PVMLP approach (i.e., the IASB proposal) is preferable to the PVMLP approach (the FASB proposal). Similarly, using the lease classification proposed in the FASB's 2013 exposure draft, under which most operating leases would be classified as Type A, result in more informative assets than under the current proposed classification. Because the capitalized lease obligation—and therefore the risk-related information—is the same under the PVMLP and Adjusted PVMLP approaches, our findings suggest that the IASB approach (which is largely the approach proposed in the FASB's 2013 exposure draft) is preferable to the current FASB plan.

One caveat to this study is that we use public disclosures to estimate and evaluate quantities that, if the related standards are adopted, will be measured by companies using finer (including private) information. We attempt to mitigate this concern by carefully estimating the required inputs (e.g., synthetic credit ratings and discount rates), but the potential for significant error remain. Yet, we find that the approach that involves significant estimation (Adjusted PVMLP) produces more informative measures than the relatively straight-forward alternative (PVMLP). Thus, if measured by companies, the difference in information content between the Adjusted PVMLP and PVMLP approaches may be even larger than demonstrated in this study. A related caveat is that, if firms are required to capitalize operating leases, the quality of the information may change – it may either increase (e.g., due to greater auditor attention as per Libby et al., 2006, or to a greater cognitive effort by controllers and CFO as per Clor-Proell and Maines, 2014) or decline (e.g., due to earnings management).

Appendix A: Accounting for leases

This appendix demonstrates and compares lessees' accounting for lease transactions under the capital (CL) and operating (OL) lease methods as well as under the proposed FASB Type B method. As discussed in Section 2, the proposed IASB method and the proposed FASB Type A method are similar to the capital lease method. The example assumes a lease transaction incepted at the beginning of year 1, which covers five years and involves annual payment of \$200 at the beginning of each year. The lessee's borrowing rate is 8%, implying a PVMLP of \$862.43 and the following interest expense schedule (for CL and Type A leases):

	Beginning Balance	Payment	Balance for interest	Interest Expense	Ending Balance
Year 1	862.43	200	662.43	52.99	715.42
Year 2	715.42	200	515.42	41.23	556.65
Year 3	556.65	200	356.65	28.53	385.18
Year 4	385.18	200	185.18	14.82	200.00
Year 5	200.00	200	0	0	0

Comparing the methods:

	Income Statement Effects				Balance Sheet Effects				
	OL, Type B	CL, Type A		CL/Type A - OL/Type B	CL/Type A - OL/Type B	CL / Type A asset ^a	Type B asset ^b	CL / Types A & B liability	OL asset & liability
	Rent expense	Interest expense	Depreciation expense	Lease expenses	Cumulative lease exp. Difference				
Incep.	-	-	-	-	-	862.43	862.43	862.43	0
Year 1	200	52.99	172.49	25.48	25.48	689.95	715.42	715.42	0
Year 2	200	41.23	172.49	13.72	39.20	517.46	556.65	556.65	0
Year 3	200	28.53	172.49	1.02	40.22	344.97	385.18	385.18	0
Year 4	200	14.82	172.49	-12.69	27.53	172.49	200.00	200.00	0
Year 5	200	0	172.49	-27.51	0	0	0	0	0

^a \$862.43 minus accumulated depreciation.

^b \$862.43 minus cumulative principal payments, where each principal payment is equal to \$200 minus the periodic interest expense.

As the above example demonstrates, at any point in time during the lease term, retained earnings (and therefore equity) are smaller under the capital lease/Type A methods compared to the operating lease/Type B methods. In addition, in the early years, earnings are lower under the capital

lease/Type A methods compared to the operating lease/Type B methods, but this difference reverses in the later years. Liabilities are the same under the capital leases/Type A/Type B methods, and are larger than liabilities under the operating lease method. Assets under the CL/Type A methods are smaller (larger) than assets under the Type B (OL) method.

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Table 1
Descriptive statistics for determinants and measures of capitalized operating leases

	Obs.	Mean	Std. Dev.	5%	25%	50%	75%	95%
<i>PVMLP / operating assets</i>	43,319	0.132	0.197	0.006	0.025	0.056	0.142	0.565
<i>Capitalized Lease Asset (Adjusted PVMLP) / PVMLP</i>	43,744	0.750	0.136	0.478	0.673	0.770	0.850	0.936
<i>Capitalized Lease Asset (Required return) / PVMLP</i>	42,991	2.616	1.926	0.720	1.349	2.105	3.253	6.288
<i>Capitalized Lease Asset (Proportionality) / PVMLP</i>	42,945	1.393	0.784	0.606	0.958	1.194	1.574	2.913
<i>Discount rate</i>	43,720	0.074	0.013	0.053	0.066	0.073	0.080	0.097
<i>Average remaining life of operating leases</i>	43,744	7.9	3.7	3.0	5.5	7.2	9.2	14.7
<i>Average original life of operating leases</i>	43,744	18.5	8.8	7.2	12.2	16.7	22.9	40.0
<i>Average useful life of PP&E in use</i>	43,744	12.8	6.6	4.7	8.1	11.7	16.1	25.2
<i>Capitalization factor (Required return)</i>	43,743	6.31	1.86	3.38	4.99	6.27	7.54	9.43
<i>Capitalization factor (Proportionality)</i>	43,595	3.85	1.71	1.64	2.71	3.51	4.61	7.22

The sample includes firm-year observations for fiscal years 1995-2014 that satisfy the data requirements discussed in Section 3. Operating assets are measured as total assets minus cash and investments. PVMLP is the present value of minimum lease payments, which is also equal to the capitalized lease asset under the PVMLP method. The other three approaches for measuring the capitalized lease asset (Adjusted PVMLP, Required return, and Proportionality) as well as the parameters used in calculating these estimates (discount rate; remaining, original and useful lives; and the capitalization factors) are described in Section 3.

Table 2
Median ratio of PVMLP to reported operating assets by industry

<u>Industry</u>	<u>Median ratio</u>	<u>Industry</u>	<u>Median ratio</u>
Apparel Retail	0.763	Building Products	0.049
Homefurnishing Retail	0.652	Semiconductor Equipment	0.049
Drug Retail	0.568	Brewers	0.047
Specialty Stores	0.474	Health Care Equipment	0.046
Education Services	0.468	Leisure Products	0.046
Airlines	0.431	Metal & Glass Containers	0.045
Restaurants	0.394	Publishing	0.044
General Merchandise Stores	0.345	Highways & Railtracks	0.044
Computer & Electronics Retail	0.287	Health Care Supplies	0.043
Food Retail	0.256	Oil & Gas Refining & Marketing	0.041
Automotive Retail	0.223	Semiconductors	0.041
Biotechnology	0.197	Household Products	0.040
Department Stores	0.167	Diversified Chemicals	0.039
Home Improvement Retail	0.140	Consumer Electronics	0.039
Footwear	0.137	Commodity Chemicals	0.038
Advertising	0.133	Aerospace & Defense	0.037
Airport Services	0.132	Construction Materials	0.037
Internet Software & Services	0.130	Distillers & Vintners	0.037
IT Consulting & Other Services	0.127	Soft Drinks	0.036
Application Software	0.122	Technology Distributors	0.036
Apparel, Accessories & Luxury Goods	0.117	Electronic Manufacturing Services	0.036
Air Freight & Logistics	0.115	Integrated Telecommunication Services	0.036
Systems Software	0.109	Integrated Oil & Gas	0.035
Food Distributors	0.109	Packaged Foods & Meats	0.034
Alternative Carriers	0.102	Auto Parts & Equipment	0.034
Movies & Entertainment	0.102	Leisure Facilities	0.033
Research & Consulting Services	0.101	Specialized Consumer Services	0.033
Human Resource & Employment Services	0.099	Electrical Components & Equipment	0.033
Health Care Facilities	0.097	Household Appliances	0.032
Diversified Support Services	0.095	Textiles	0.032
Wireless Telecommunication Services	0.091	Pharmaceuticals	0.031
Distributors	0.090	Electronic Components	0.031
Internet Retail	0.088	Agricultural Products	0.031
Hypermarkets & Super Centers	0.085	Oil & Gas Equipment & Services	0.031
Health Care Services	0.084	Paper Packaging	0.030
Marine Ports & Services	0.081	Industrial Machinery	0.030
Railroads	0.080	Fertilizers & Agricultural Chemicals	0.030
Health Care Distributors	0.079	Broadcasting	0.029
Personal Products	0.078	Specialty Chemicals	0.027
Office Services & Supplies	0.075	Cable & Satellite	0.026
Home Entertainment Software	0.073	Diversified Metals & Mining	0.026
Commercial Printing	0.071	Casinos & Gaming	0.026
Marine	0.071	Industrial Gases	0.025
Construction & Engineering	0.071	Industrial Conglomerates	0.023
Heavy Electrical Equipment	0.070	Agricultural & Farm Machinery	0.023
Security & Alarm Services	0.068	Aluminum	0.022
Health Care Technology	0.068	Steel	0.022
Data Processing & Outsourced Services	0.068	Construction Machinery & Heavy Trucks	0.021
Catalog Retail	0.066	Tobacco	0.019
Managed Health Care	0.066	Coal & Consumable Fuels	0.018
Life Sciences Tools & Services	0.065	Paper Products	0.016
Trucking	0.064	Forest Products	0.015
Communications Equipment	0.063	Homebuilding	0.014
Tires & Rubber	0.063	Oil & Gas Storage & Transportation	0.014
Technology Hardware, Storage & Peripherals	0.062	Automobile Manufacturers	0.012
Trading Companies & Distributors	0.059	Motorcycle Manufacturers	0.011
Environmental & Facilities Services	0.058	Oil & Gas Exploration & Production	0.009
Hotels, Resorts & Cruise Lines	0.053	Precious Metals & Minerals	0.008
Electronic Equipment & Instruments	0.052	Silver	0.006
Home Furnishings	0.052	Oil & Gas Drilling	0.006
Housewares & Specialties	0.050	Gold	0.004

The sample includes firm-year observations for fiscal years 1995-2014 that satisfy the data requirements discussed in Section 3. Operating assets are measured as total assets minus cash and investments. PVMLP is the present value of minimum lease payments, calculated as described in Section 3.

Table 3
ANOVA examining whether the capitalization of operating leases improves the ability of operating assets to predict sales

Panel A: Predicting log sales using log of reported and lease-adjusted operating assets (N = 39,215)

	PVMLP			Adjusted PVMLP			Required Return			Proportionality		
	SS3	F-stat	p-value	SS3	F-stat	p-value	SS3	F-stat	p-value	SS3	F-stat	p-value
Industry	701.9	18.5	0.000	713.3	18.7	0.000	627.1	16.5	0.000	708.77	18.5	0.000
Industry × OA	355.6	9.3	0.000	315.6	8.1	0.000	675.7	17.6	0.000	729.43	18.8	0.000
Industry × Adjusted OA	568.6	14.9	0.000	514.4	13.4	0.000	561.8	14.7	0.000	420.93	10.9	0.000
R-squared	0.9283			0.9280			0.9283			0.9274		
z-stat (adjusted vs. reported.)	5.8			6.9			-1.3			-3.6		

Panel B: Predicting sales growth using growth in reported and lease-adjusted operating assets (N = 34,818)

	PVMLP			Adjusted PVMLP			Required Return			Proportionality		
	SS3	F-stat	p-value	SS3	F-stat	p-value	SS3	F-stat	p-value	SS3	F-stat	p-value
Industry	19.6	3.4	0.000	19.7	3.5	0.000	20.53	3.6	0.000	20.5	3.6	0.000
Industry × Growth in OA	10.3	1.8	0.000	10.7	1.9	0.000	38.77	6.7	0.000	41.0	7.1	0.000
Industry × Grow. In adjust. OA	13.1	2.3	0.000	14.9	2.6	0.000	8.84	1.5	0.000	7.8	1.4	0.006
R-squared	0.1203			0.1213			0.1181			0.1175		
z-stat (adjusted vs. reported.)	1.3			2.5			-7.2			-8.7		

The sample includes firm-year observations for fiscal years 1995-2014 that satisfy the data requirements discussed in Section 3. Panel A (Panel B) provides summary statistics from pooled regressions of next year log of (growth in) revenue on current year log of (growth in) operating assets and lease-adjusted operating assets. Each regression contains industry-specific intercepts and slopes. The ANOVA analysis is used to evaluate and compare the significance of the alternative measures of operating assets in predicting sales. Four measures of lease-adjusted operating assets are used: reported operating assets (total assets minus cash and investments) plus PVMLP (PVMLP), reported operating assets plus adjusted PVMLP (Adjusted PVMLP), reported operating assets plus capitalized lease asset measured under the required return approach (Required Return), and reported operating assets plus capitalized lease asset measured under the proportionality approach (Proportionality). The four methods are described in Section 3.

Table 4
ANOVA examining whether the capitalization of operating leases improves the ability of PP&E to predict sales

Panel A: Predicting log sales using log of reported and lease-adjusted PP&E (N = 39,215)

	PVMLP			Adjusted PVMLP			Required Return			Proportionality		
	SS3	F-stat	p-value	SS3	F-stat	p-value	SS3	F-stat	p-value	SS3	F-stat	p-value
Industry	2091.6	32.6	0.000	2207.8	34	0.000	1748.8	27.2	0.000	2055.6	30.1	0.000
Industry × PP&E	1015.3	15.7	0.000	1360.8	20.8	0.000	812.0	12.5	0.000	879.8	12.8	0.000
Industry × Adjusted PP&E	5310.7	82.1	0.000	5032.7	76.8	0.000	5279.6	81.5	0.000	3973.9	57.8	0.000
R-squared	0.8788			0.8772			0.8786			0.8712		
z-stat (adjusted vs. reported.)	36.6			41.6			23.8			18.3		

Panel B: Predicting sales growth using growth in reported and lease-adjusted PP&E (N = 34,483)

	PVMLP			Adjusted PVMLP			Required Return			Proportionality		
	SS3	F-stat	p-value	SS3	F-stat	p-value	SS3	F-stat	p-value	SS3	F-stat	p-value
Industry	22.1	3.7	0.000	22.0	3.7	0.000	23.3	3.9	0.000	23.3	3.9	0.000
Industry × Growth in PP&E	11.3	1.9	0.000	7.8	1.3	0.016	50.8	8.4	0.000	51.2	8.5	0.000
Industry × Grow. in adj. PP&E	19.4	3.2	0.000	19.8	3.3	0.000	12.5	2.1	0.000	9.7	1.6	0.000
R-squared	0.0847			0.0849			0.081			0.0795		
z-stat (adjusted vs. reported.)	2.0			4.4			-7.9			-8.5		

The sample includes firm-year observations for fiscal years 1995-2014 that satisfy the data requirements discussed in Section 3. Panel A (Panel B) provides summary statistics from pooled regressions of next year log of (growth in) revenue on current year log of (growth in) fixed assets and lease-adjusted fixed assets. Each regression contains industry-specific intercepts and slopes. The ANOVA analysis is used to evaluate and compare the significance of the alternative measures of fixed assets in predicting sales. Four measures of lease-adjusted fixed assets are used: reported fixed assets plus PVMLP (PVMLP), reported fixed assets plus adjusted PVMLP (Adjusted PVMLP), reported fixed assets plus capitalized lease asset measured under the required return approach (Required Return), and reported fixed assets plus capitalized lease asset measured under the proportionality approach (Proportionality). The four methods are described in Section 3.

Table 5
ANOVA comparing the FASB's 2013 Exposure Draft to the current FASB and IASB Proposals

Panel A: Predicting sales growth using growth in reported and lease-adjusted operating assets (N = 23,113)

	PVMLP (Type B, FASB)			Adj PVMLP (Type A, IASB)			Required Return			FASB Exposure Draft		
	SS3	F-stat	p-value	SS3	F-stat	p-value	SS3	F-stat	p-value	SS3	F-stat	p-value
Industry	13.9	2.6	0.000	13.9	2.6	0.000	14.3	2.7	0.000	13.9	2.6	0.000
Industry × Growth in OA	8.8	1.6	0.000	8.3	1.5	0.000	28.7	5.3	0.000	8.3	1.5	0.000
Industry × Grow. In adjust. OA	11.2	2.1	0.000	11.4	2.1	0.000	6.4	1.2	0.078	11.3	2.1	0.000
R-squared	0.1233			0.1235			0.1193			0.1234		
z-stat (adjusted vs. reported.)	1.3			2.3			-7.4			2.0		

Panel B: Predicting sales growth using growth in reported and lease-adjusted PP&E (N = 22,944)

	PVMLP (Type B, FASB)			Adj PVMLP (Type A, IASB)			Required Return			FASB Exposure Draft		
	SS3	F-stat	p-value	SS3	F-stat	p-value	SS3	F-stat	p-value	SS3	F-stat	p-value
Industry	17.1	3.1	0.000	16.9	3	0.000	17.4	3.1	0.000	17.0	3.0	0.000
Industry × Growth in PP&E	9.8	1.7	0.000	6.1	1.1	0.242	34.0	6.0	0.000	6.3	1.1	0.194
Industry × Grow. in adj. PP&E	16.0	2.8	0.000	14.9	2.6	0.000	10.6	1.9	0.000	14.5	2.6	0.000
R-squared	0.0873			0.0864			0.0827			0.0860		
z-stat (adjusted vs. reported.)	1.8			3.3			-6.3			3.2		

The sample includes firm-year observations for fiscal years 1995-2014 that satisfy the data requirements discussed in Sections 3 and 4.3. Panel A provides summary statistics from pooled regressions of next year growth in revenue on current year growth in operating assets and lease-adjusted operating assets. Panel B provides summary statistics from pooled regressions of next year growth in revenue on current year growth in fixed assets and lease-adjusted fixed assets. Each regression contains industry-specific intercepts and slopes. The ANOVA analysis is used to evaluate and compare the significance of the alternative measures of assets in predicting sales. Four measures of lease-adjusted assets are used: reported assets plus PVMLP (PVMLP), reported assets plus adjusted PVMLP (Adjusted PVMLP), reported assets plus capitalized lease asset measured under the required return approach (Required Return), and reported assets plus capitalized lease asset measured under the proportionality approach (Proportionality). The four methods are described in Sections 3 and 4.