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Impact of Lease Capitalization on Financial Ratios of Listed German Companies**

Abstract

The separation of leases into operating and finance leases for accounting purposes can result in incentives to favor operating lease contracts, since they avoid on-balance-sheet debt. The IASB and FASB are conducting a long-term joint project on leasing, following the G4+1 group's research on possible improvements to lease accounting. One alternative is to treat all leases in a manner similar to today's finance leasing. Our simulation results for Germany show notable changes in a variety of financial ratios, especially for assets and liability relations, which may trigger management with incentives to dampen these effects. Of note for standard setters, the effects of operating lease capitalization should not be overstated. Only minor effects can be observed for profitability ratios and market multiples often used for valuation purposes. Moreover, most industries remain almost unaffected and the relative ratio-based ranking of all sample companies does not change much. Additionally, we observe that the common CreditStats® model yields somewhat comparable results.

JEL-Classification: M41.

Keywords: Constructive Capitalization; CreditStats®; Leases; Off-balance-sheet Debt; Operating Leases; Tweedie Approach.

1 Introduction

The IASB and FASB added a long-term joint project on lease accounting to their active agendas in July 2006. Important preparatory work was performed by the

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former G4+1 group. The group suggested general capitalization of all noncancellable minimum lease payments with lease terms of more than one year. This approach would extend the current accounting treatment for finance leases to all leases, and therefore would abolish off-balance-sheet accounting for operating leases (McGregor (1996); Nailor and Lennard (2000))[1]. However, the G4+1 proposal is controversial, and has been discussed extensively, especially with regard to the scope of the proposal and the treatment of optional or conditional payments (e.g., Ryan et al. (2001); Lipe (2001); Helmschrott (2000); Fülbier and Pferdehirt (2005)). Although the standard setters have not yet reached formal decisions on the lease accounting reform, published project summaries indicate tendencies towards the capitalization approach[2].

In this study, we simulate general lease capitalization and its consequences on the financial statements of a set of listed German companies. As advocated, by, for example, Schipper (1994), we conduct *ex ante* research, indicating the consequences of a possible future accounting reform. Given the economic significance of leasing – in Germany, leasing accounts for almost a quarter (24.6%) of all investments in equipment (BDL (2006)) – and on prior research conducted for other countries (e.g., Nelson (1963); Beattie, Edwards, and Goodacre (1998); Imhoff, Lipe, and Wright (1991; 1993; 1997)) we expect to find a significant impact on the financial statements of listed German companies. This effect may change individual users' decisions, especially on the German capital market, since market participants seem to treat on- and off-balance-sheet information differently (e.g., Breton and Taffler (1995); Gallery and Imhoff (1998))[3]. Incentive effects resulting from management perspectives may arise in turn.

Our sample comprises 90 companies belonging to the three major German indices DAX 30, MDAX, and SDAX. We collect Datastream/Worldscope data from consolidated financial statements for the years 2003 and 2004 and investigate the capitalization impact on key financial ratios. Our simulation model is based on a modified constructive capitalization approach originally developed by Imhoff, Lipe, and Wright (1991; 1997). We inspect our results with a different simulation procedure based on Standard & Poor's (2002) CreditStats® model.

Our results show a material capitalization impact for a considerable number of companies, especially for the fashion and retail industry groups. Changes in financial ratios occur primarily in assets and liability relations, but we observe minor effects for the profitability ratios and market multiples often used for valuation purposes. Since these effects may indicate higher operating and financial risk as well as tightened debt covenants, the new approach may provide management with incentives to dampen its impact. In contrast, the impact on valuation and compensation (and their respective

1 These studies refer to the G4+1 publications as the McGregor and the Tweedie approaches, respectively, due to the chairmen of the leading standard-setters (Australian ASB 1996, British ASB 2000).

2 See http://www.iasb.org/Current+Projects/IASB+Projects/Leases/Leases.htm and http://www.fasb.org/project/leases.shtml for further details.

3 Other empirical results suggest that capital markets are not necessarily misled by the latter (e.g., Ely (1995); Beattie, Goodacre, and Thomson (2000b)).

incentives) seems low, due to small changes in profitability ratios and valuation multiples.

Our results may also be helpful to standard setters. The effects of operating lease capitalization should not be overstated. No large impact on performance metrics and market multiples can be observed, most of the industries remain rather unaffected, and companies' relative performance does not change much in the context of a ratio-based ranking of our complete sample. Furthermore, we conclude that CreditStats® can supply comparable results in a low-interest environment and when capitalizing comparatively short-term lease contracts.

This paper continues as follows. In section 2 we discuss prior studies on lease capitalization and the relevance of this capitalization procedure. In section 3 we detail our sample, data and simulation model, and present our simulation results in section 4. Section 5 concludes the paper.

2 Prior Research

2.1 Simulations Adjusting for Off-balance-sheet Leases

Nelson (1963) initiates a pilot study on the capitalization of off-balance-sheet lease obligations. He adjusts the balance sheets of eleven U.S. companies that voluntarily disclose additional lease information by increasing assets and liabilities by the present value of the off-balance-sheet obligations. Assets increase in median by 30.2% (maximum 51.5% and minimum 3.4%). Debt to equity (D/E) increases by 94% (median). This capitalization includes all lease contracts, although short-term leases (now called "operating leases") seem to be irrelevant for that time (Hennessy (1961)). Nelson also demonstrates that most financial ratios are adversely affected by lease capitalization and concludes that "financial analysts could easily have made faulty decisions" based on figures not adjusted for lease obligations (Nelson (1963, 54)).

With the introduction of SFAS 13 in 1976 and the distinction between finance (on-balance-sheet) and operating leases (off-balance-sheet), the problem of misleading accounting ratios seems to have been attenuated. However, the requirement to show some obligations on the face of the balance sheet apparently caused a gradual shift from finance leases to operating leases (Abdel-khalik (1981)). Moreover, a renaissance of lease-related research and capitalization studies occurred using only the mere factor method or the discounted cash flow (Houlihan and Sondhi (1984)), both of which are relevant, especially for practitioners (e.g., Imhoff, Lipe, and Wright (1993, 341); Sannella (1989, 50); Moody's (1999); Standard & Poor's (2002)). Although the latter is often more precise (Houlihan and Sondhi (1984); Sannella (1989)), neither method affects net income or equity. Due to their similarity (one is a simplification of the other), here, we regard both methods as factor methods.

Another important group of methods was introduced in the 1990s especially by Imhoff, Lipe, and Wright (1991; 1997), who use the constructive capitalization method. In contrast to factor methods, the constructive capitalization method treats operating leases as finance lease contracts right from the lease's inception. The authors model a value difference between lease asset and lease liability, allowing for equity and net income adjustments after deferred taxes. In their first paper, Imhoff, Lipe, and Wright (1991) analyze the McDonald's annual report for the year 1988, which shows an increase in D/E of 30% and a decrease in return on assets (ROA) of 9%. The authors confirm this result for 14 selected U.S. companies from two lease-intensive sectors, retail and transport, and highlight the relevance of the lease accounting treatment for financial analysis.

Similar studies were performed in the U.S. (Ely (1995); Kilpatrick and Wilburn (2007)) and other countries, such as the United Kingdom (Beattie, Edwards, and Goodacre (1998)), New Zealand (Bennett and Bradbury (2003)), Canada (Durocher (2005)), and the Netherlands (Lückerath-Rovers and de Bos (2005))[4]. Using constructive capitalization based on larger samples than Imhoff, Lipe, and Wright (1991), these studies provide further evidence on the significant impact on several financial ratios, especially D/E and ROA. In addition to country-specific studies, several empirical papers conduct lease capitalization studies for certain industries that reveal material consequences for lease-intensive industries: transport (especially airlines), retail and hospitality (Goodacre (2003b); Gosman and Hanson (2000); Gritta (1974); Gritta, Lippman, and Chow (1994); Imhoff, Lipe, and Wright (1993; 1997); Lanfranconi and Wiedman (2000)).

2.2 Off-balance-sheet Items and Capital Market Participants

The regulation of lease accounting and the distinction between off- and on-balance-sheet reporting may matter for capital market participants. Based on a UK questionnaire survey, Beattie, Goodacre, and Thomson (2006) indicate that users and preparers accept deficiencies in the current lease accounting rules but worry about significant economic consequences of the G4+1-proposal. This result seems justified by earlier studies that find that off-balance-sheet lease obligations can distort the fundamental analysis of companies, especially when financial ratios are involved (e.g., Altman, Haldeman, and Narayanan (1977); Elam (1975)). Munter and Ratcliffe (1983), Wilkins and Zimmer (1983a), and Breton and Taffler (1995), using experimental designs, confirm the impact on financial analysis.

Although these studies indicate that single users (investors or financial analysts) may have problems handling off-balance-sheet lease obligations properly, other empirical results indicate that capital markets in aggregate are not necessarily misled. Finnerty, Fitzsimmons, and Oliver (1980), Imhoff, Lipe, and Wright (1993), Ely (1995) and Beattie, Goodacre, and Thomson (2000b) find that UK and U.S. investors account for off-balance-sheet leases in their risk assessment. Operating lease obligations contribute to the explan-

4 Our study is – to our knowledge – the first constructive capitalization conducted for Germany. Based on this study Pferdehirt (2007) provides a modified follow-up. Leibfried and Rogowski (2005) or Giersberg and Vögtle (2007) use the mere factor method or the discounted cash flow.

atory power of their respective pricing models[5]. However, there is also evidence that in other markets (e.g., Australia), investors do not adjust for operating leasing (El-Gazzar (1993); Gallery and Imhoff (1998); Garrod (1989)). But even when markets do incorporate off-balance-sheet lease information, market inefficiencies occur due to the process of incorporation (Lipe (2001)).

The lease accounting treatment also affects the market for corporate debt. Apart from possible interest-rate effects (Hartman and Sami (1989)), operating lease information is regarded as an important piece of information for substantiating credit decisions (Kemp and Overstreet (1990); Stanga and Tiller (1983)) on a par with finance lease information (Catanach and Kemp (1999)). Creditors seem to prefer capitalization of all lease contracts (Comiskey and Mulford (1998)). Beattie, Goodacre, and Thomson (2000a) imply that the market for corporate debt does not perceive operating lease obligations in the same way as it does on-balance-sheet debt, but other studies indicate that accounting policy does not affect final credit decisions (Wilkins (1984); Wilkins and Zimmer (1983b)).

Management itself seems to expect that capital market participants deal differently with off- and on-balance-sheet information. Thus, management seems to prefer the off-balance-sheet treatment (Abdel-khalik (1981); Imhoff and Thomas (1988); Knutson (1993)), which explains why the shift from finance to operating lease agreements occured after SFAS 13 became effective. Godfrey and Warren (1995) find similar evidence for Australia and Garrod (1989) and Taylor and Turley (1985) for the UK. For a review, see Goodacre (2003a). Therefore, future accounting reforms face potential resistance due to empirically documented tendencies to avoid capitalization.

3 Data Selection and Simulation Model

3.1 Selection of Sample and Data

Our simulation focuses on companies from the three major German indexes, the DAX30, MDAX, and SDAX. According to Datastream, the three indexes, which include the largest German listed companies, comprise a total of 122 companies as of 1 September 2005. After eliminating 32 companies due to data deficiencies[6], we obtain a final sample of 90 companies. We analyze group accounting data from the financial year-end closing dates in 2004. 2003 data is necessary to calculate profitability ratios using average balance sheet positions. To generate comparable results, we use consolidated balance sheet and income statement items from Datastream/Worldscope. We enter some minor items manually[7].

5 Imhoff, Lipe, and Wright (1993) find that factor methods have a higher explanatory power than the constructive capitalization method, presumably due to their extended practical use. Creditors seem to prefer using factor methods for adjustment (Comiskey and Mulford (1998); Houlihan and Sondhi (1984)).

6 We eliminate 24 companies due to lack of Datastream/Worldscope data. Eight more companies do not provide sufficient information on operating leases in their annual reports.

7 In total, less than 1% of the data fields were entered directly from the annual reports.

We use annual reports to extract information about future minimum lease payments and company-specific discount and tax rates. In contrast to most of the simulation studies, we abstain from choosing a fixed discount rate for the complete sample (e.g., Gritta (1974), 10%; Imhoff, Lipe, and Wright (1991; 1993), 10%; Gritta, Lippman, and Chow (1994), 10%; Ely (1995), 10%; Beattie, Edwards, and Goodacre (1998), 10%; Lückerath-Rovers and de Bos (2005), 6%; Durocher (2005), 8%). Due to missing information about individual interest rates for leases, including the interest rate implicit in finance leases, we approximate the missing data by utilizing the discount rates used for pensions or other provisions. Sixty-seven companies disclose these discount rates. We approximate the missing 23 discount rates by using the median of the discount rates disclosed. To calculate the tax effect, we use an average effective tax rate for the past ten years (1995-2004) by taking the median of the ratios yielded by dividing income tax by pre-tax income. Since legal entities' contract-related marginal tax rates are not available, similar to Beattie, Edwards, and Goodacre (1998) we favor company-specific averages over a standardized tax multifactor for the complete sample. We are fully aware of several drawbacks of this approach, such as its historical perspective, the high aggregation level of consolidated data, and especially the distortions due to allowances, deductions, tax credits, and losses, as well as loss carry-forwards and loss carry-backs (Callihan (1994))[8].

According to IAS 17.56 (SFAS 13.16b provides more detail on this issue), all companies must disclose their future minimum (operating) lease payments (MLP) for the following year, for the years two to five and the years after the fifth. Forty-nine companies disclose information in the way required. To isolate the per-year payments out of the information about the aggregated payments attributable to year two to five, we assume a geometric degression model in which the lease payments decline at a constant rate. For each of the 49 companies, we determine a degression factor (dg) with the following characteristics: the degression factor is constant over five periods, with $MLP_{t+1} = MLP_t \times dg$. Therefore, the known MLP_1 determines the unknown MLP_2, MLP_3, MLP_4, and MLP_5. Furthermore, the sum of MLP_2 through MLP_5 must be equal to $MLP_{2\text{-}5}$ reported in the annual report

$$(MLP_{2\text{-}5} = \sum_{t=1}^{4} MLP_1 \times dg^t).$$

Thirty companies disclose each year explicitly; hence, we are able to use more detailed information. The remaining 11 companies of the sample (surprisingly, not all of them are HGB adopters) report aggregated information, for which we use further information provided by the companies on request and/or further (distributional) assumptions.

8 In contrast to Beattie, Edwards, and Goodacre (1998) who calculate a winsorised mean, we use a median under elimination of firm-year-observations based on negative numerators and/or denominators; our data display a reasonable median estimated tax rate of 38%. Moreover, we recalculate our results using a general tax multifactor of 40% without identifying significant changes (not tabulated).

3.2 Financial Ratios Examined

To provide an overview of a company's economic situation and to generate results comparable to prior studies, in *table 1* we cover three broad areas of financial ratios. First, we calculate three ratios displaying the structural changes in the balance sheet of the respective companies. These are the intensity of investment (NCA/TA), equity to assets (E/A), and debt to equity (D/E). Several studies identify these ratios as structural risk measures for evaluating a company's operating and financial risk and show a relation between these risk measures adjusted for operating leases and stock returns (e.g., Bowman (1980); Imhoff, Lipe, and Wright (1993); Ely (1995); Gallery and Imhoff (1998); Beattie, Goodacre, and Thomson (2000b)). Rating agencies (e.g., Standard & Poor's (2005, 44)), financial analysts, and investors (e.g., Barker (1999)) consider debt-related structural risk measures (leverage ratios), including interest coverage ratios such as times interest earned (TIE), as especially important. Therefore, changes in these ratios may also affect management behavior, either because of the expected impact on users ("information inductance", Prakash and Rappaport (1977)) and/or due to the risk of violating specified levels of those ratios in debt covenants (e.g., Begley (1990); Watts and Zimmerman (1986)).

We calculate the second area of ratios (profit margin (PM), return on assets (ROA), return on capital employed (ROCE), return on equity (ROE), times interest earned (TIE), and turnover capital employed (TCE)) to indicate changes in the profitability and the expense structure of the companies. These ratios contribute to the operating risk described above and are particularly relevant for valuation purposes by financial analysts and equity investors (e.g., Barker (1999)). Again, changes in these ratios may affect management behavior in terms of information inductance and/or for contractual reasons, where such reasons may include compensation plans (bonus and performance plans) regularly connected to earnings and profitability ratios, and corresponding value-based management incentive systems (e.g., Healy (1985); Watts and Zimmerman (1986)).

We calculate earnings per share (EPS), price-earnings (P/E) and the book to market ratio (B/M) to substantiate the impact on firm valuation from the capital market perspective, given that these ratios are common valuation multiples (e.g., Booth, Broussard, and Loistl (1997); Rapach and Wohar (2005)). We expect management behavior to align with the rationale explained in the context of profitability ratios.

We expect that all ratios are considerably affected by the capitalization procedure either at the numerator or denominator level, or both. Due to the impossibility of predicting market price changes, we assume that share market prices remain unchanged. Thus, EPS and P/E are altered only by changes in net income (NI).

Table 1: Ratio Definitions

Ratio:	Numerator:	Denominator:
Book/Market (B/M)	Equity excluding minorities	Market capitalization (2004-12-31)
Capital Employed (CE)	Total liabilities + total equity – current liabilities	n/m
Debt/Equity (D/E)	Current plus long-term debt	Equity including minorities
Earnings per Share (EPS)	Net income excluding minorities	Number of shares outstanding
Equity/Assets (E/A)	Equity including minorities	Total assets
Intensity of Investment (NCA/TA)	Non current assets	Total assets
Price/Earnings (P/E)	Market capitalization (12-31-2004)	Net income excluding minorities
Profit Margin (PM)	EBIT	Revenue
Return on Assets (ROA)	EBIT	Average total assets
Return on Capital Employed (ROCE)	EBIT	Average capital employed
Return on Equity (ROE)	Net income excluding minorities	Average equity excluding minorities
Times Interest Earned (TIE)	EBIT	Interest expenses
Turnover Capital Employed (TCE)	Revenue	Average capital employed

Note: *Average* refers to the average of two balance-sheet positions at the end of year 2003 and 2004.

3.3 Modified Constructive Capitalization Model

3.3.1 Original Model

Our simulation is based on the constructive capitalization model of Imhoff, Lipe, and Wright (1991; 1997), which simulates the effects of operating lease capitalization on assets, liabilities, equity, and the related income statement positions. We estimate the off-balance-sheet lease liability by calculating the present value of the future minimum lease payments (MLP). Calculating the book value of the off-balance-sheet asset requires the following assumptions about each single operating lease contract (not always explicated in Imhoff, Lipe, and Wright (1991)): (1) At the inception of the lease, the book value of the leased asset is equal to the value of the lease liability. (2) At the end of the lease, the book values of the asset and liability are zero. (3) The asset is depreciated using the straight-line method. (4) The lease liability and the imputed interest are calculated using the effective-interest method. (5) Lease payments are constant over the lease term. Under consideration of further assumptions about discount rate (i), total (TL), and remaining contract lifetime (RL), the asset value is a function of the present value of MLP at the lease inception (PV_{TL}), i.e., asset value = PV_{TL} x RL/TL. Since the current lease liability is equal to the present value of the MLP over the remaining lifetime (PV_{RL}), the ratio of any lease asset to the corresponding lease liability at any time during the contract period is determined by: (RL/TL) x (PV_{TL}/PV_{RL}), which is equal to (RL/TL) x $\{[1-(1+i)^{-TL}]/[1-(1+i)^{-RL}]\}$. The difference between the lease asset and liability during the lease term causes a decrease of the equity position and an adjustment of deferred taxes. Because

the lease liability always exceeds the lease asset during the term of the lease, equity will always be adjusted downwards.

The determination of the total lifetime is important for the results, but also ambiguous, since annual reports do not give such information. In line with Ely (1995), Bennett and Bradbury (2003), and Durocher (2005), we estimate that the ratio of RL to TL is 50%, which proves that a $\pm 10\%$-points variation alters the capitalization adjustments only slightly[9].

3.3.2 Modification

We use company-specific discount and tax rates, described in section 3.1, wherever possible. In contrast to prior studies, we generate especially lower discount rates ranging from 4.5% to 7.7%, which lead to moderately higher lease asset and liability values, but lower equity effects[10]. Furthermore, the original model applies the single-contract asset-liability ratio to the complete basket of contracts. This procedure accepts misspecified asset values and equity impacts. Other studies calculate the weighted average remaining and total lifetimes to solve this problem (e.g., Beattie, Edwards, and Goodacre (1998); Lückerath-Rovers and de Bos (2005)). In contrast, we separate the MLP into five contract baskets with different remaining lifetimes (one year up to five or more years) and run the model separately on each basket before aggregating their results and adjusting the balance sheet. We identify these baskets by using $MLP_t - MLP_{t+1}$ but assume that the fifth basket has equal annual payments to MLP_5 with a remaining lifetime of 5+ (MLP_{5+}/MLP_5)[11]. We assume that the difference between the outstanding MLP in two consecutive years is the MLP of those lease contracts ending in the first of the two remaining lifetimes. This assumption is consistent with the general assumption of constant lease payments necessary for applying the capitalization model. Moreover, we use the information given in the annual report to the greatest extent possible, capturing the complete range of remaining lifetimes of the underlying contracts. We especially incorporate shorter lifetimes, which leads to a more conservative approach and avoids exaggerated equity effects as the equity effect increases with increasing lifetimes.

In the income statement, EBIT is reduced by the operating lease expenses attributable to leases lasting longer than 12 months. We do not consider the realized operating lease expenses disclosed, as this position includes lease contracts with durations of less than one year. Instead, we use the average of the future minimum lease payments expected for the next year (MLP_1) from both annual reports (2003 and 2004). The

9 We conduct sensitivity analyses to test the robustness of our results. In line with Imhoff, Lipe, and Wright (1991) we find only slight alterations by changing the assumption to 40% as well as 60%. Most of the ratio changes remain statistically significant (not tabulated).

10 When we conduct sensitivity tests, we consider variations of ±1% for each individual interest rate. The signs of the ratio and their statistical significance remain stable (not tabulated).

11 We calculate the remaining lifetime of the last contract basket similar to the original model. In contrast to previous studies, we detect shorter remaining lifetimes in our sample.

depreciation adjustment rests on the five different assets calculated for 2003 and 2004 and the resulting average for each year. We divide each asset by the respective remaining lifetime, and use that result to calculate annual depreciations[12]. We calculate the interest adjustment by multiplying the average of the 2003 and 2004 liability with the company-specific discount rate. Thus, the total impact on EBT is the sum of the adjustments for selling and general administration costs, depreciation, and interest. We multiply this sum by the effective tax rate to determine the tax expense effect. Any remaining impact on NI is split between minorities and income to parent company shareholders.

3.4 CreditStats®

As a control model, we implement the operating lease adjustments of the Standard & Poor's CreditStats® factor model (Standard & Poor's (2002)). This implementation may indicate the performance of adjustment procedures that capital market participants have already used, compared to possible future lease regulations represented by the constructive capitalization model. CreditStats® is also based on the net present value idea of future minimum lease payments. However, there are significant differences to constructive capitalization, because the lease asset is assumed to equal the lease liability, making adjustments of equity, deferred taxes, or minorities obsolete. Although income statement adjustments for interest expenses and selling and general administration costs are similar to constructive capitalization, the calculation of depreciation expense differs. In CreditStats®, depreciation is the difference between the selling and general administration cost adjustment and interest expenses. By definition, there is no impact on NI and EBT.

4 Simulation Results

Here, we present the impact of operating lease capitalization on selected financial ratios.

4.1 Constructive Capitalization

We begin with statistics of the computed liabilities and assets resulting from the capitalization procedure (*Table 2*).

12 As for the years 2003 and 2004, different remaining lifetimes can be calculated for the lease payment lasting 5+ years, the asset depreciation is determined using an average remaining lifetime.

Table 2: Impact of Operating Lease Capitalization on Financial Statement Positions

in EURm	Additional liabilities due to capitalization	Total liabilities before capitalization	Changes	Additional assets due to capitalization	Non-current assets before capitalization	Changes
Minimum	0.9	0.0	0.8%	0.9	15.8	0.4%
1st Quartile	28.0	167.3	6.6%	23.9	270.3	3.2%
Median	93.8	530.3	17.3%	80.4	737.3	8.5%
3rd Quartile	416.3	2,289.8	46.1%	362.0	4,272.8	18.2%
Maximum	9,562.9	68,454.9	3,212.7%	7,877.6	111,737.5	326.5%
Mean	573.9	5,492.2	77.3%	478.9	8,834.4	20.4%
Std. Dev.	1,444.6	14,071.1	340.1%	1,190.3	22,591.0	42.8%
	EBIT before capitalization	**EBIT after capitalization**	**Changes**	**NI before capitalization**	**NI after capitalization**	**Changes**
Minimum	–1,108.7	–1,022.4	0.0%	–1,621.3	–1,616.8	–2.4%
1st Quartile	42.9	46.2	1.3%	12.9	13.0	0.1%
Median	102.3	110.0	2.9%	50.3	50.4	0.2%
3rd Quartile	702.7	744.5	7.2%	350.2	351.8	0.6%
Maximum	10,154.0	10,650.3	113.6%	4,933.0	4,935.4	9.6%
Mean	810.5	840.4	8.1%	401.0	401.5	0.9%
Std. Dev.	1,760.9	1,808.0	15.7%	959.8	960.1	2.1%

The median operating lease liability is € 93.8m, but 25% of the companies must report an extra liability of € 416.3m or more (third quartile)[13]. The recognition of operating lease liabilities yields a median increase in reported liabilities of 17.3% (third quartile: 46.1%). We observe similar effects on the asset side. Capitalization leads to a median operating lease asset of € 80.4m (third quartile: € 362m) causing a median increase in non-current assets of 8.5% (third quartile: 18.2%). Due to the procedure inherent in the constructive capitalization method, we also expect changes in income statement positions EBIT and NI. The median EBIT increase is 2.9%, but 0.2% for NI (third quartiles: 7.2% and 0.6%, respectively).

These results illustrate the relevance of assets and especially liabilities arising from operating leases. In contrast, the EBIT and NI changes are low. The latter finding shows that existing operating lease expenses are only slightly higher than simulated lease asset depreciations (therefore, a moderate EBIT increase) and somewhat similar to the simulated sum of lease asset depreciation and interest (almost no NI effect).

Consequently, the adjustments in financial statement figures entail changes in key financial ratios. *Table 3* presents statistics of the changes in the financial ratios described above.

13 We note that the figure displays the median change, not the change of the medians. Therefore, the calculation of the median change in *table* 2 does not necessarily refer to figures in the same line.

Table 3: Changes in Financial Ratios

	NCA/TA		D/E		E/A		TCE		PM		ROCE	
	absolute	relative	absolute	relative	absolute	relative	absolute	relative	absolute	relative	absolute	relative
Minimum	0.1%	0.1%	0.2%	0.2%	–22.4%	–66.7%	–3.83	–62.2%	0.0%	0.0%	–10.8%	–27.0%
1st Quartile	0.6%	1.2%	5.4%	3.1%	–3.8%	–11.8%	–0.25	–12.2%	0.1%	1.3%	–0.9%	–6.0%
Median	1.8%	3.9%	16.1%	8.0%	–1.4%	–4.9%	–0.10	–5.8%	0.2%	2.9%	–0.2%	–2.0%
3rd Quartile	3.1%	7.9%	38.0%	18.9%	–0.6%	–1.9%	–0.03	–2.4%	0.6%	7.2%	0.0%	–0.2%
Maximum	33.9%	115.0%	1114.3%	301.2%	–0.1%	–0.1%	0.00	–0.1%	2.2%	113.6%	5.5%	30.2%
Mean	3.3%	9.0%	58.1%	22.0%	–3.2%	–9.6%	–0.27	–9.9%	0.4%	8.1%	–0.8%	–3.1%
Std. Dev.	5.2%	17.5%	145.4%	40.7%	4.2%	12.4%	0.51	11.7%	0.4%	15.7%	2.0%	8.9%
	ROA		TIE		ROE		EPS		P/E		B/M	
	absolute	relative	absolute	relative	absolute	relative	absolute	relative	absolute	relative	absolute	relative
Minimum	–5.4%	–15.6%	–441.58	–91.1%	–32.7%	–22.0%	–0.07	–2.6%	–149.38	–31.5%	–117.4%	–34.3%
1st Quartile	–0.3%	–2.4%	–1.76	–17.1%	0.0%	0.4%	0.00	0.1%	–0.11	–0.6%	–1.5%	–2.8%
Median	0.0%	–0.3%	–0.45	–9.2%	0.1%	1.3%	0.00	0.2%	–0.03	–0.2%	–0.5%	–1.0%
3rd Quartile	0.0%	1.1%	–0.09	–2.4%	0.4%	3.3%	0.01	0.6%	–0.01	–0.1%	–0.2%	–0.4%
Maximum	2.6%	37.1%	8.42	35.2%	5.7%	56.9%	0.10	42.6%	0.72	3.1%	0.0%	0.0%
Mean	–0.2%	0.1%	–11.03	–13.8%	0.1%	4.4%	0.01	1.6%	–3.70	–1.4%	–2.8%	–3.2%
Std. Dev.	0.9%	6.7%	55.17	20.9%	3.6%	11.8%	0.02	6.3%	20.96	4.7%	12.4%	6.1%

The table shows absolute and relative changes for each ratio. The ratios that describe the structural changes in the balance sheet (NCA/TA, D/E and E/A) experience a median relative change of 3.9%, 8%, and –4.9% (absolute: 1.8%, 16.1%, and –1.4%), respectively. Thus, the balance sheet structure changes considerably, especially for the most strongly affected 25% (third quartiles, relative: 7.9%, 18.9%, and –1.9% (absolute: 3.1%, 38%, –0.6%), respectively[14]).

The median relative changes in the main profitability ratios, PM, ROCE, ROA, and ROE, range from –2.0% (ROCE) to 2.9% (PM). These alterations (relative and absolute) are moderate. ROCE is affected more strongly than ROA and ROE, especially for the greater changes in capital employed compared to total assets. Therefore, the decrease suffered by TCE – which shows a more inefficient use of capital – is caused solely by the increasing capital employed, but revenues (numerator) remain unchanged. Since the numerator and denominator are affected, the ROCE, ROA, and ROE changes can be either positive or negative. Also, different quartiles might display different signs. Changes in PM are stronger than are those for other profitability ratios, since the increase in EBIT (numerator) is not compensated by a corresponding change in revenues (denominator). The median relative decrease in TIE is much higher, at 9.2% (absolute: –0.45), especially caused by the expected interest increase.

Furthermore, we observe that the market ratios are only slightly affected. EPS and P/E remain almost stable. The median relative changes are 0.2% and –0.2%, respectively. Absolute median changes are almost undetectable. This outcome is in line with prior results about almost-stable NI figures, and finds no real impact on company valuation based on these multiples. The change in B/M is also moderate. This ratio suffers a slightly more noticeable decrease (first quartile, relative: –2.8%, median –1.0% (absolute: –1.5%, –0.5%, respectively)).

We can identify the incentive effects from a management perspective by looking at the materially affected balance sheet-related ratios. In conjunction with considerable TIE changes, higher operating risk, and especially financial risk, may be indicated by the lease capitalization. Therefore, management may be motivated to reduce the information inductance effect and possible debt covenant violations by taking appropriate actions. Such activities could include lease contract modifications (e.g., cancellation options), changes in investment and financing decisions (including the search for alternatives in off-balance-sheet financing, reductions in on-balance-sheet debt, and equity increases), smoothing the ratio changes by income- and asset-increasing earnings management activities (debt-equity-hypothesis, Watts and Zimmerman (1986, 216)), and, finally, lobbying against the new approach (e.g., Abdel-khalik (1981); Goodacre (2003a); Beattie, Goodacre, and Thomson (2006)). In contrast, management appears to be unaffected in terms of valuation and also by compensation incentives due to minor effects on profitability ratios, let alone almost stable valuation multiples. This finding may explain empirical results that equity investors are not necessarily misled by operating leases (e.g., Ely (1995); Beattie, Goodacre, and Thomson (2000b)).

14 More meaningful for the negative E/A-figure is the first quartile with –11.8%.

Our results are in line with prior studies, taking into account that the comparison is hampered by different underlying assumptions, samples, ratios, and model details. However, the capitalization effects identified in prior studies are slightly stronger for the balance sheet structure and for the profitability ratios (especially Beattie, Edwards, and Goodacre (1998); Bennett and Bradbury (2003); Durocher (2005); Lückerath-Rovers and de Bos (2005)). The higher discount rates used in earlier papers seem to be a major driver. Moreover, other samples in other countries may rely more strongly on operating leases than do their German counterparts.

Table 4 displays the median financial ratios before and after capitalization, and the changes in absolute and relative terms. Following Goodacre (2003b) and Lückerath-Rovers and de Bos (2005), we conduct nonparametric tests to assess significance due to the non-normal distribution of financial ratios (Barnes (1987)).

Table 4: Changes in Median Financial Ratios and Spearman Rank Correlation Coefficient

	Constructive Capitalization[1] (n = 90)					
	Basis	Adjusted	Change	Change[2] (rel.)		Spearman
	A	B	B–A	(B–A)/A		
NCA/TA	47.1%	50.8%	3.7%	7.9%	***	0.928
D/E	185%	210%	25%	13.5%	***	0.950
E/A	35.0%	32.2%	–2.8%	–8.1%	***	0.950
TCE	1.90	1.64	–0.25	–13.4%	***	0.950
PM	6.4%	6.9%	0.4%	6.8%	***	0.996
ROCE	11.1%	10.7%	–0.4%	–3.9%	***	0.992
ROA	7.5%	7.4%	–0.1%	–1.3%	***	0.999
TIE	4.63	3.84	–0.80	–17.2%	***	0.970
ROE	12.0%	12.3%	0.3%	2.8%	***	0.993
EPS	1.41	1.42	0.01	0.7%	***	1.000
P/E	16.05	16.01	–0.04	–0.2%	***	1.000
B/M	52.1%	51.3%	–0.8%	–1.5%	***	0.994

Notes:
1 Change in median is used to enable testing procedure. In other respects we refer to the median change.
2 Two-tailed Wilcoxon signed ranks test; ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

We observe that relative changes in medians are significantly different from zero for all ratios at the 1% level[15]. Although Goodacre (2003b) (similar in Lev and Sunder (1979)) alludes to the crucial role of certain ratios in absolute values, e.g., as loan covenant restrictions, he also points out the importance of relative values of financial ratios in comparison to other companies. The performance relative to other companies might become a prominent factor in investment decisions (Goodacre (2003b, 112)). Consequently, we test whether the ranking of the companies for each ratio changes after the operating lease capitalization by calculating Spearman rank correlation coefficients. Since the correlation coefficients assume high values close to one across all financial ratios, we infer that the ranking of our sample companies will not suffer major alterations after the capitalization of operating leases. Therefore, the relative evaluation of companies would not change materially. This result may support the notion of an almost nonexistent valuation impact of the capitalization procedure. Whether this also dampens management incentives to counteract structural balance sheet changes, especially with respect to increased gearings, is debatable. Incentive effects driven by information inductance may remain if management does not correctly anticipate a symmetric capitalization impact on ratio-based company rankings. Company managers already believe that markets are inefficient in terms of (off-balance-sheet) lease financing (e.g., Goodacre (2003a)). Moreover, stability in relative evaluations has minor relevance if particular ratio levels in individual debt covenants remain unchanged. On the other hand, a fundamental change in lease accounting may also question the validity of contractually agreed-upon ratio levels in general and increase the probability of renegotiations, thus diminishing management incentives to take action.

4.2 Comparison with CreditStats®

After analyzing the impact of operating lease capitalization by applying the constructive capitalization method, we examine whether the CreditStats® method yields different results. We compare the median impact of capitalization on liabilities and non-current assets as well as on EBIT and NI following both methods. *Table 5* shows the results. Because the computation procedures for deriving the operating lease liabilities are identical for both models, both yield equal values for the liabilities. On the asset side, we expect to observe material differences, since, according to the CreditStats® method, the operating lease assets always correspond with the liabilities, but assets are only a fraction of the computed liabilities in terms of the constructive capitalization method.

15 We also computed *t*-statistics to test the significance of differences between means (not tabulated). Most differences (except for ROE) are significantly different from zero at the same level as the difference in medians. Additionally, we calculate the Pearson correlation coefficients between the ratios and observe in general magnitudes similar to the Spearman rank correlation coefficient.

Table 5: Constructive Capitalization and CreditStats® by Comparison

Effects on-balance-sheet and income statement positions and median financial ratios for 2004

		Constructive Capitalization	Credit Stats®
Balance sheet effects (median in EURm)			
A	Liabilities operating leases (LOL)	93.8	93.8
B	Long-term liabilities without LOL	530.3	530.3
A/B	LOL/Long-term liabilities without LOL	17.7%	17.7%
C	Assets due to operating leases (AOL)	80.4	93.8
D	Non-current assets without AOL	644.5	644.5
C/D	AOL/Non-current assets without AOL	12.5%	14.5%
Income statement effects (median in EURm)			
E	EBIT before capitalization	102.3	102.3
F	EBIT after capitalization	110.0	109.3
(F–E)/E	Change	7.5%	6.9%
G	NI before capitalization	50.3	50.3
H	NI after capitalization	50.4	50.3
(H–G)/G	Change	0.1%	0.0%
Changes in median financial ratios (relative)		**Change[1]**	**Change[1]**
	NCA/TA	7.9%***	10.6%***
	D/E	13.5%***	10.9%***
	E/A	–8.1%***	–6.6%***
	TCE	–13.4%***	–14.8%***
	PM	6.8%***	6.5%***
	ROCE	–3.9%***	–4.8%***
	ROA	–1.3%***	–2.6%***
	TIE	–17.2%***	–17.2%***
	ROE	2.8%***	n/m
	EPS	0.7%***	n/m
	P/E	–0.2%***	n/m
	B/M	–1.5%***	n/m

Notes:
1 Two-tailed Wilcoxon signed ranks test; ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.
n/m = not meaningful

The median assets originated by the capitalization amount to € 80.4m following the constructive capitalization procedure and € 93.8m following CreditStats®. Therefore, the median increases in non-current assets are 12.5% and 14.5%, respectively. For the income statement positions, we observe an increase in median EBIT figures to € 110m (constructive capitalization) and to € 109.3m (CreditStats®), and therefore, a slightly higher simulated EBIT increase under constructive capitalization (7.5% compared to 6.9%). Due to the model design of CreditStats®, NI remains inherently unaffected, but under constructive capitalization, NI experiences a slight median increase of 0.1%.

We do not observe any changes for ROE, EPS, P/E, and B/M under CreditStats® due to unaffected NI and equity. However, we note that the constructive capitalization simulation also yields only very moderate alterations. When we compare the remaining ratios, we observe that the changes in median ratios have similar magnitudes and directions for both approaches. Therefore, we conclude that the less complex CreditStats® model simulates only slightly different results than does the more detailed constructive capitalization approach. This difference is due to comparatively small equity and NI effects under the latter (low interest rates and comparatively short remaining lifetimes). Once again, this result appears to support the notion that the valuation impact of the capitalization procedure is very scanty. Furthermore, some prominent rating agencies have been capturing the capitalization impact on debt related structural risk measures (leverage ratios), which diminishes again management incentives to counteract.

4.3 Effects on Different Industry Groups

To differentiate between types of industries, we separate our sample into seven groups (chemical, drugs, and healthcare; construction and assembly; fashion; natural resources and energy; others; retail; services). Since Worldscope (WC06011) does not provide acceptable classifications, we create our own by consulting the business descriptions contained in the annual reports[16].

Table 6 presents the median relative change in ratios for the seven industry groups. For almost all ratios, the median relative changes have the same sign across the industry groups. However, extensive differences in magnitude suggest that the industries most strongly affected are retail and fashion. In these industries, the capitalization procedure causes the highest changes in almost all ratios which indicates a significant off-balance-sheet portion of assets and liabilities. Overall, these results support prior research, that certain industries rely more heavily on operating leases than others (e.g., Durocher (2005); Goodacre (2003b); Gritta, Lippman, and Chow (1994); Imhoff, Lipe, and Wright (1993)). However, the comparison is still hampered by, amongst other facts, divergent industry groupings.

16 Information about the industry grouping is available on request.

Table 6: Median Relative Change in Ratios for Different Industry Groups

	NCA/TA	D/E	E/A	TCE	PM	ROCE
Chemicals, drugs, & healthcare	2.6%	5.3%	–2.7%	–2.9%	1.3%	–1.7%
Construction and assembly	4.1%	6.1%	–3.7%	–4.9%	3.1%	–1.0%
Fashion	32.0%	58.1%	–20.9%	–19.2%	7.0%	–15.7%
Natural resources and energy	1.4%	3.5%	–2.5%	–2.5%	1.1%	–1.4%
Others	15.8%	17.7%	–6.4%	–8.9%	2.4%	–5.8%
Retail	12.4%	75.3%	–34.9%	–32.8%	20.2%	–13.8%
Services	3.8%	16.2%	–9.2%	–9.2%	5.2%	–4.5%
	ROA	**TIE**	**ROE**	**EPS**	**P/E**	**B/M**
Chemicals, drugs, & healthcare	–0.9%	–10.6%	0.6%	0.1%	–0.1%	–0.4%
Construction and assembly	0.3%	–5.2%	0.9%	0.2%	–0.2%	–0.7%
Fashion	–7.7%	–26.3%	3.4%	0.1%	–0.1%	–4.2%
Natural resources and energy	–0.8%	–3.3%	1.1%	0.0%	0.0%	–0.8%
Others	0.8%	–38.9%	1.0%	0.3%	–0.3%	–0.7%
Retail	–1.8%	–26.1%	9.5%	0.4%	–0.4%	–10.8%
Services	–1.2%	–16.6%	2.8%	0.2%	–0.2%	–3.6%

4.4 Differences in Lease Capitalization Due to Different Accounting Systems

Our sample consists of 58 companies that use IFRS, 19 companies that use U.S. GAAP, and 13 companies that use HGB. If any, only the IFRS or U.S. GAAP firms are required to follow the proposed possible future lease accounting. Therefore, we separate IFRS, U.S. GAAP, and HGB subsamples to take a closer look at the capitalization impact. HGB accounts remain in the analysis because they have similar deficiencies in the current lease accounting regulation, and because we wish to expose at least a fictitious capitalization impact on those financial statements. Moreover, this inclusion enables us to generate comprehensive results for the indexes under examination. To exhibit exclusive results for the combined IFRS/U.S. GAAP subsample and to appraise the impact of the HGB sample on the total results, we aggregate the three subsamples step by step.

Table 7: Median Relative Change in Ratios for Different Accounting Systems

		NCA/TA	D/E	E/A	TCE	PM	ROCE
IFRS	(n = 58)	3.5%	6.8%	–4.1%	–5.1%	2.3%	–1.9%
U.S. GAAP	(n = 19)	4.3%	11.0%	–5.2%	–6.3%	3.6%	–2.0%
Subtotal	(n = 77)	3.8%	7.3%	–4.6%	–5.3%	2.9%	–1.9%
HGB	(n = 13)	8.3%	22.1%	–14.4%	–9.4%	5.3%	–4.7%
Total	(n = 90)	3.9%	8.0%	–4.9%	–5.8%	2.9%	–2.0%
		ROA	**TIE**	**ROE**	**EPS**	**P/E**	**B/M**
IFRS	(n = 58)	–0.2%	–7.1%	1.0%	0.2%	–0.2%	–0.8%
U.S. GAAP	(n = 19)	0.1%	–10.2%	1.8%	0.3%	–0.3%	–1.1%
Subtotal	(n = 77)	–0.2%	–9.0%	1.1%	0.2%	–0.2%	–0.9%
HGB	(n = 13)	–2.4%	–9.4%	2.8%	0.1%	–0.1%	–4.2%
Total	(n = 90)	–0.3%	–9.2%	1.3%	0.2%	–0.2%	–1.0%

Companies that use HGB show materially higher impacts of lease capitalization on their ratios than do those companies using U.S. GAAP or IFRS. Nevertheless, we consider that the impact on the entire sample is low. There are several possible explanations. Although the distinction between finance and operating leases is comparable throughout the accounting systems, other accounting standards are diverse and may be the reason for different ratio specifications. However, this explanation seems weak, due to the fact that specific differences between the accounting systems cannot instantaneously justify our results. For example, the common notion that HGB is a conservative accounting system (e.g., Joos and Lang (1994)[17]) may indicate depreciation and amortization differences covering one dimension of conservatism (e.g., Beaver (1998)). But if German accounting is really more conservative, then it seems inconsistent with the high impact on the D/E for HGB adopters. Lease capitalization in a high-debt/low-equity environment would imply the opposite: a lower impact on the D/E figure for HGB adopters.

Systematic distortions in discount rates are an alternative explanation in those cases when company-specific discount rates are systematically different for HGB adopters. However, we recalculate the simulation model with a common discount rate for all sample companies and find stable differences. The only possible explanation remaining is that the composition of the HGB subsample is characterized by the accidental accumulation of companies heavily involved in lease contracting. About half of the companies that use

17 We note that there are different notions of conservatism with different consequences for cross-country comparisons; see Gassen, Fülbier, and Sellhorn (2006).

HGB are retailers and fashion companies. Furthermore, other HGB companies such as Deutsche Telekom AG and SIXT AG (car rental) are also strongly involved in lease contracting.

5 Conclusion

In this paper we examine the potential effects of an on-balance-sheet accounting treatment for operating leases on financial statement positions and financial ratios of major German companies. This treatment is currently discussed in a long-term IASB/FASB project on lease accounting and may indicate a future accounting reform. We simulate this accounting treatment for 90 listed German DAX 30, MDAX, and SDAX companies by using both a modified constructive capitalization method and a less complex factor model (Standard & Poor's CreditStats®). Our simulation is based on consolidated accounting figures of 2003 and 2004.

We identify a significant capitalization impact for a considerable number of companies in general, and for certain industry groups (fashion and retail) in particular. Changes in financial ratios occur primarily for balance sheet relations, but we observe minor effects for profitability ratios and valuation multiples. We assume that the former effect will prompt management to engage in counteracting activities that will reduce the information inductance effect that is triggered by signals of higher operating and financial risk as well as possible debt covenant violations. In contrast, the impact on valuation and compensation (and respective incentives) is low, due to only small changes in profitability ratios and valuation multiples.

Our results are limited by the model, various assumptions, and data deficiencies. However, this simulation gives an idea of possible changes of an anticipated lease accounting reform. Our results are in line with prior research in other countries, although the magnitude is comparatively moderate in Germany.

Of note for standard setters, our results further indicate that the effects of operating lease capitalization should not be overstated. There is no extensive impact on performance metrics and market multiples. Most of the industries remain unaffected and the ratio-based ranking of our complete sample does not change much. We also conclude that Standard & Poor's CreditStats® can supply comparable results in a low-interest environment and when a firm is capitalizing comparatively short-term lease contracts.

The practical application of this and other less complex factor models may explain why prior research finds that markets already capitalize operating leases to some extent. These findings may weaken the arguments in favor of the proposed future lease accounting reform. However, whether the current lease accounting treatment represents a true and fair view, whether existing inefficiencies, i.e., costs of adjusting financial statements and other market frictions, and anticipated improvements support a lease accounting reform, remain as open questions for further research.

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