Financial Statement Analysis of Leverage and How It Informs About Profitability and Price-to-Book Ratios

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Abstract. This paper presents a financial statement analysis that distinguishes leverage that arises in financing activities from leverage that arises in operations. The analysis yields two leveraging equations, one for borrowing to finance operations and one for borrowing in the course of operations. These leveraging equations describe how the two types of leverage affect book rates of return on equity. An empirical analysis shows that the financial statement analysis explains cross-sectional differences in current and future rates of return as well as in price-to-book ratios, which are based on expected rates of return on equity. The paper therefore concludes that balance sheet line items for operating liabilities are priced differently than those dealing with financing liabilities. Accordingly, financial statement analysis that distinguishes the two types of liabilities informs on future profitability and aids in the evaluation of appropriate price-to-book ratios.

Keywords: financing leverage; operating liability leverage; rate of return on equity; price-to-book ratio

JEL Classification: M41, G32

Leverage is traditionally viewed as arising from financing activities: Firms borrow to raise cash for operations. This paper shows that, for the purposes of analyzing profitability and valuing firms, two types of leverage are relevant, one indeed arising from financing activities but another from operating activities. The paper supplies a financial statement analysis of the two types of leverage that explains differences in shareholder profitability and price-to-book ratios.

The standard measure of leverage is total liabilities to equity. However, while some liabilities -- like bank loans and bonds issued -- are due to financing, other liabilities -- like trade payables, deferred revenues, and pension liabilities -- result from transactions with suppliers, customers and employees in conducting operations. Financing liabilities are typically traded in well-functioning capital markets where issuers are price takers. In contrast, firms are able to add value in operations because operations involve trading in input and output markets that are less perfect than capital markets. So, with equity valuation in mind, there are *a priori* reasons for viewing operating liabilities differently from liabilities that arise in financing.

Our research asks whether a dollar of operating liabilities on the balance sheet is priced differently from a dollar of financing liabilities. As operating and financing liabilities are components of the book value of equity, the question is equivalent to asking whether price-to-book ratios depend on the composition of book values. The price-to-book ratio is determined by the expected rate of return on the book value so, if components of book value command different price premiums, they must imply different expected rates of return on book value. Accordingly, the paper also investigates whether the two types of liabilities are associated with differences in future book rates of return.

Standard financial statement analysis distinguishes shareholder profitability that arises from operations from that which arises from borrowing to finance operations. So, return on assets is distinguished from return on equity, with the difference attributed to leverage. However, in the

standard analysis, operating liabilities are not distinguished from financing liabilities. Therefore, to develop the specifications for the empirical analysis, the paper presents a financial statement analysis that identifies the effects of operating and financing liabilities on rates of return on book value -- and so on price-to-book ratios -- with explicit leveraging equations that explain when leverage from each type of liability is favorable or unfavorable.

The empirical results in the paper show that financial statement analysis that distinguishes leverage in operations from leverage in financing also distinguishes differences in contemporaneous and future profitability among firms. Leverage from operating liabilities typically levers profitability more than financing leverage and has a higher frequency of favorable effects.[1] Accordingly, for a given total leverage from both sources, firms with higher leverage from operations have higher price-to-book ratios, on average. Additionally, distinction between contractual and estimated operating liabilities explains further differences in firms' profitability and their price-to-book ratios.

Our results are of consequence to an analyst who wishes to forecast earnings and book rates of return to value firms. Those forecasts -- and valuations derived from them -- depend, we show, on the composition of liabilities. The financial statement analysis of the paper, supported by the empirical results, shows how to exploit information in the balance sheet for forecasting and valuation.

The paper proceeds as follows. Section 1 outlines the financial statements analysis that identifies the two types of leverage and lays out expressions that tie leverage measures to profitability. Section 2 links leverage to equity value and price-to-book ratios. The empirical analysis is in Section 3, with conclusions summarized in Section 4.

1. Financial Statement Analysis of Leverage

The following financial statement analysis separates the effects of financing liabilities and operating liabilities on the profitability of shareholders' equity. The analysis yields explicit leveraging equations from which the specifications for the empirical analysis are developed.

Shareholder profitability, return on common equity, is measured as

$$Return\ on\ Common\ Equity\ (ROCE) = \frac{Comprehensive\ Net\ Income}{Common\ Equity} \qquad (1)$$

Leverage affects both the numerator and denominator of this profitability measure. Appropriate financial statement analysis disentangles the effects of leverage. The analysis below, which elaborates on parts of Nissim and Penman (2001), begins by identifying components of the balance sheet and income statement that involve operating and financing activities. The profitability due to each activity is then calculated and two types of leverage are introduced to explain both operating and financing profitability and overall shareholder profitability.

1.1. Distinguishing the Profitability of Operations from the Profitability of Financing Activities

With a focus on common equity (so that preferred equity is viewed as a financial liability), the balance sheet equation can be restated as follows:

$$Common\ Equity = Operating\ Assets + Financial\ Assets - Operating\ Liabilities - Financial\ Liabilities. \qquad (2)$$

The distinction here between operating assets (like trade receivables, inventory and property, plant and equipment) and financial assets (the deposits and marketable securities that absorb excess cash) is made in other contexts. However, on the liability side, financing liabilities are also distinguished here from operating liabilities. Rather than treating all liabilities as financing debt, only liabilities that raise cash for operations -- like bank loans, short-term commercial paper and bonds -- are classified as such. Other liabilities -- such as accounts payable, accrued

expenses, deferred revenue, restructuring liabilities and pension liabilities -- arise from operations. The distinction is not as simple as current versus long-term liabilities; pension liabilities, for example, are usually long-term, and short-term borrowing is a current liability.[2]

Rearranging terms in equation (2),

Common Equity = (Operating Assets - Operating Liabilities)

- (Financial Liabilities - Financial Assets).

Or,

Common Equity = Net Operating Assets - Net Financing Debt. (3)

This equation regroups assets and liabilities into operating and financing activities. Net operating assets are operating assets less operating liabilities. So a firm might invest in inventories, but to the extent to which the suppliers of those inventories grant credit, the net investment in inventories is reduced. Firms pay wages, but to the extent to which the payment of wages is deferred in pension liabilities, the net investment required to run the business is reduced. Net financing debt is financing debt (including preferred stock) minus financial assets. So, a firm may issue bonds to raise cash for operations but may also buy bonds with excess cash from operations. Its net indebtedness is its net position in bonds. Indeed a firm may be a net creditor (with more financial assets than financial liabilities) rather than a net debtor.

The income statement can be reformulated to distinguish income that comes from operating and financing activities:

Comprehensive Net Income = Operating Income - Net Financing Expense. (4)

Operating income is produced in operations and net financial expense is incurred in the financing of operations. Interest income on financial assets is netted against interest expense on financial liabilities (including preferred dividends) in net financial expense. If interest income is greater

than interest expense, financing activities produce net financial income rather than net financial expense. Both operating income and net financial expense (or income) are after tax.[3]

Equations (3) and (4) produce clean measures of after-tax operating profitability and the borrowing rate:

$$Return\ on\ Net\ Operating\ Assets\ (RNOA) = \frac{Operating\ Income}{Net\ Operating\ Assets}, \tag{5}$$

and

$$Net\ Borrowing\ Rate\ (NBR) = \frac{Net\ Financing\ Expense}{Net\ Financing\ Debt}. \tag{6}$$

Return on net operating assets (RNOA) recognizes that profitability must be based on the *net* assets invested in operations. So firms can increase their operating profitability by convincing suppliers, in the course of business, to grant or extend credit terms; credit reduces the investment that shareholders would otherwise have to put in the business.[4] Correspondingly, the net borrowing rate, by excluding non-interest bearing liabilities from the denominator, gives the appropriate borrowing rate for the financing activities.

Note that RNOA differs from the more common return on assets (ROA), usually defined as income before after-tax interest expense to total assets. ROA does not distinguish operating and financing activities appropriately. Unlike ROA, RNOA excludes financial assets in the denominator and subtracts operating liabilities. Nissim and Penman (2001) report a median ROA for NYSE and AMEX firms from 1963 – 1999 of only 6.8%, but a median RNOA of 10.0% -- much closer to what one would expect as a return to business operations.

1.2. Financial Leverage and Its Effect on Shareholder Profitability

From expressions (3) through (6), it is straightforward to demonstrate that ROCE is a weighted average of RNOA and the net borrowing rate, with weights derived from equation (3):

$$ROCE = \left[\frac{Net\ Operating\ Assets}{Common\ Equity} \times RNOA \right] -$$

$$\left[\frac{Net\ Financing\ Debt}{Common\ Equity} \times Net\ Borrowing\ Rate \right]. \quad (7)$$

Additional algebra leads to the following leveraging equation:

$$ROCE = RNOA + \left[FLEV \times \left(RNOA - Net\ Borrowing\ Rate \right) \right] \quad (8)$$

where FLEV, the measure of leverage from financing activities, is

$$Financing\ Leverage\ (FLEV) = \frac{Net\ Financing\ Debt}{Common\ Equity}. \quad (9)$$

The FLEV measure excludes operating liabilities but includes (as a net against financing debt) financial assets. If financial assets are greater than financial liabilities, FLEV is negative. The leveraging equation (8) works for negative FLEV (in which case the net borrowing rate is the return on net financial assets).

This analysis breaks shareholder profitability, ROCE, down into that which is due to operations and that which is due to financing. Financial leverage levers the ROCE over RNOA, with the leverage effect determined by the amount of financial leverage (FLEV) and the spread between RNOA and the borrowing rate. The spread can be positive (favorable) or negative (unfavorable).

1.3. Operating Liability Leverage and Its Effect on Operating Profitability

While financing debt levers ROCE, operating liabilities lever the profitability of operations, RNOA. RNOA is operating income relative to net operating assets, and net operating assets are operating assets minus operating liabilities. So, the more operating liabilities a firm has relative to operating assets, the higher its RNOA, assuming no effect on operating income in the

numerator. The intensity of the use of operating liabilities in the investment base is operating liability leverage:

$$Operating\ Liability\ Leverage\ (OLLEV) = \frac{Operating\ Liabilities}{Net\ Operating\ Assets}. \tag{10}$$

Using operating liabilities to lever the rate of return from operations may not come for free, however; there may be a numerator effect on operating income. Suppliers provide what nominally may be interest-free credit, but presumably charge for that credit with higher prices for the goods and services supplied. This is the reason why operating liabilities are inextricably a part of operations rather than the financing of operations. The amount that suppliers actually charge for this credit is difficult to identify. But the market borrowing rate is observable. The amount that suppliers would implicitly charge in prices for the credit at this borrowing rate can be estimated as a benchmark:

$$Market\ Interest\ on\ Operating\ Liabilities = Operating\ Liabilities \times Market\ Borrowing\ Rate$$

where the market borrowing rate, given that most credit is short term, can be approximated by the after-tax short-term borrowing rate.[5] This implicit cost is a benchmark, for it is the cost that makes suppliers indifferent in supplying credit; suppliers are fully compensated if they charge implicit interest at the cost of borrowing to supply the credit. Or, alternatively, the firm buying the goods or services is indifferent between trade credit and financing purchases at the borrowing rate.

To analyze the effect of operating liability leverage on operating profitability, we define

$$Return\ on\ Operating\ Assets\ (ROOA) = \frac{Operating\ Income + Market\ Interest\ on\ Operating\ Liabilities}{Operating\ Assets}. \tag{11}$$

The numerator of ROOA adjusts operating income for the full implicit cost of trade credit. If suppliers fully charge the implicit cost of credit, ROOA is the return on operating assets that would be earned had the firm no operating liability leverage. If suppliers do not fully charge for the credit, ROOA measures the return from operations that includes the favorable implicit credit terms from suppliers.

Similar to the leveraging equation (8) for ROCE, RNOA can be expressed as:

$$RNOA = ROOA + [OLLEV \times (ROOA - Market\ Borrowing\ Rate)] \quad (12)$$

where the borrowing rate is the after-tax short-term interest rate.[6] Given ROOA, the effect of leverage on profitability is determined by the level of operating liability leverage and the spread between ROOA and the short-term after-tax interest rate.[7] Like financing leverage, the effect can be favorable or unfavorable: firms can reduce their operating profitability through operating liability leverage if their ROOA is less than the market borrowing rate. However, ROOA will also be affected if the implicit borrowing cost on operating liabilities is different from the market borrowing rate.

1.4. Total Leverage and Its Effect on Shareholder Profitability

Operating liabilities and net financing debt combine into a total leverage measure:

$$Total\ Leverage\ (TLEV) = \frac{Net\ Financing\ Debt + Operating\ Liabilities}{Common\ Equity}.$$

The borrowing rate for total liabilities is:

$$Total\ Borrowing\ Rate = \frac{Net\ Financing\ Expense + Market\ Interest\ on\ Operating\ Liabilities}{Net\ Financing\ Debt + Operating\ Liabilities}.$$

ROCE equals the weighted average of ROOA and the total borrowing rate, where the weights are proportional to the amount of total operating assets and the sum of net financing debt and

operating liabilities (with a negative sign), respectively. So, similar to the leveraging equations (8) and (12):

$$ROCE = ROOA + \left[TLEV \times \left(ROOA - Total\ Borrowing\ Rate \right) \right]. \quad (13)$$

In summary, financial statement analysis of operating and financing activities yields three leveraging equations, (8), (12), and (13). These equations are based on fixed accounting relations and are therefore deterministic: they must hold for a given firm at a given point in time. The only requirement in identifying the sources of profitability appropriately is a clean separation between operating and financing components in the financial statements.

2. Leverage, Equity Value and Price-to-Book Ratios

The leverage effects above are described as effects on shareholder profitability. Our interest is not only in the effects on shareholder profitability, ROCE, but also in the effects on shareholder value, which is tied to ROCE in a straightforward way by the residual income valuation model. As a restatement of the dividend discount model, the residual income model expresses the value of equity at date 0 (P_0) as:

$$P_0 = B_0 + \sum_{t=1}^{\infty} E_0 \left[X_t - rB_{t-1} \right] \times (1+r)^{-t}. \quad (14)$$

B is the book value of common shareholders' equity, X is comprehensive income to common shareholders, and r is the required return for equity investment. The price premium over book value is determined by forecasting residual income, $X_t - rB_{t-1}$. Residual income is determined in part by income relative to book value, that is, by the forecasted ROCE. Accordingly, leverage effects on forecasted ROCE (net of effects on the required equity return) affect equity value relative to book value: The price paid for the book value depends on the expected profitability of the book value, and leverage affects profitability.

So our empirical analysis investigates the effect of leverage on both profitability and price-to-book ratios. Or, stated differently, financing and operating liabilities are distinguishable components of book value, so the question is whether the pricing of book values depends on the composition of book values. If this is the case, the different components of book value must imply different profitability. Indeed, the two analyses (of profitability and price-to-book ratios) are complementary.

Financing liabilities are contractual obligations for repayment of funds loaned. Operating liabilities include contractual obligations (such as accounts payable), but also include accrual liabilities (such as deferred revenues and accrued expenses). Accrual liabilities may also be based on contractual terms, but typically involve estimates. We consider the real effects of contracting and the effects of accounting estimates in turn. Appendix A provides some examples of contractual and estimated liabilities and their effect on profitability and value.

2.1. Effects of Contractual liabilities

The ex post effects of financing and operating liability leverage on profitability are clear from leveraging equations (8), (12) and (13). These expressions always hold ex post, so there is no issue regarding ex post effects. But valuation concerns ex ante effects. The extensive research on the effects of financial leverage takes, as its point of departure, the Modigliani and Miller (M&M) (1958) financing irrelevance proposition: With perfect capital markets and no taxes or information asymmetry, debt financing has no effect on value. In terms of the residual income valuation model, an increase in financial leverage due to a substitution of debt for equity may increase expected ROCE according to expression (8), but that increase is offset in the valuation (14) by the reduction in the book value of equity that earns the excess profitability and the increase in the required equity return, leaving total value (i.e., the value of equity and debt) unaffected. The required equity return increases because of increased financing risk: Leverage

may be expected to be favorable but, the higher the leverage, the greater the loss to shareholders should the leverage turn unfavorable ex post, with RNOA less than the borrowing rate.

In the face of the M&M proposition, research on the value effects of financial leverage has proceeded to relax the conditions for the proposition to hold. Modigliani and Miller (1963) hypothesized that the tax benefits of debt increase after-tax returns to equity and so increase equity value. Recent empirical evidence provides support for the hypothesis (e.g., Kemsley and Nissim, 2002), although the issue remains controversial. In any case, since the implicit cost of operating liabilities, like interest on financing debt, is tax deductible, the composition of leverage should have no tax implications.

Debt has been depicted in many studies as affecting value by reducing transaction and contracting costs. While debt increases expected bankruptcy costs and introduces agency costs between shareholders and debtholders, it reduces the costs that shareholders must bear in monitoring management, and may have lower issuing costs relative to equity.[8] One might expect these considerations to apply to operating debt as well as financing debt, with the effects differing only by degree. Indeed papers have explained the use of trade debt rather than financing debt by transaction costs (Ferris, 1981), differential access of suppliers and buyers to financing (Schwartz, 1974), and informational advantages and comparative costs of monitoring (Smith, 1987; Mian and Smith, 1992; Biais and Gollier, 1997). Petersen and Rajan (1997) provide some tests of these explanations.

In addition to tax, transaction costs and agency costs explanations for leverage, research has also conjectured an informational role. Ross (1977) and Leland and Pyle (1977) characterized financing choice as a signal of profitability and value, and subsequent papers (for example, Myers and Majluf, 1984) have carried the idea further. Other studies have ascribed an informational role also for operating liabilities. Biais and Gollier (1997) and Petersen and Rajan

(1997), for example, see suppliers as having more information about firms than banks and the bond market, so more operating debt might indicate higher value. Alternatively, high trade payables might indicate difficulties in paying suppliers and declining fortunes.

Additional insights come from further relaxing the perfect frictionless capital markets assumptions underlying the original M&M financing irrelevance proposition. When it comes to operations, the product and input markets in which firms trade are typically less competitive than capital markets. Indeed, firms are viewed as adding value primarily in operations rather than in financing activities because of less than purely competitive product and input markets. So, whereas it is difficult to "make money off the debtholders," firms can be seen as "making money off the trade creditors." In operations, firms can exert monopsony power, extracting value from suppliers and employees. Suppliers may provide cheap implicit financing in exchange for information about products and markets in which the firm operates. They may also benefit from efficiencies in the firm's supply and distribution chain, and may grant credit to capture future business.

2.2. Effects of Accrual Accounting Estimates

Accrual liabilities may be based on contractual terms, but typically involve estimates. Pension liabilities, for example, are based on employment contracts but involve actuarial estimates. Deferred revenues may involve obligations to service customers, but also involve estimates that allocate revenues to periods.[9] While contractual liabilities are typically carried on the balance sheet as an unbiased indication of the cash to be paid, accrual accounting estimates are not necessarily unbiased. Conservative accounting, for example, might overstate pension liabilities or defer more revenue than required by contracts with customers.

Such biases presumably do not affect value, but they affect accounting rates of return and the pricing of the liabilities relative to their carrying value (the price-to-book ratio). The effect of

accounting estimates on operating liability leverage is clear: Higher carrying values for operating liabilities result in higher leverage for a given level of operating assets. But the effect on profitability is also clear from leveraging equation (12): While conservative accounting for operating assets increases the return on operating assets (ROOA), as modeled in Feltham and Ohlson (1995) and Zhang (2000), higher book values of operating liabilities lever up RNOA over ROOA. Indeed, conservative accounting for operating liabilities amounts to leverage of book rates of return. By leveraging equation (13), that leverage effect flows through to shareholder profitability, ROCE. And higher anticipated ROCE implies a higher price-to-book ratio.

The potential bias in estimated operating liabilities has opposite effects on current and expected profitability. For example, if a firm books higher deferred revenues, accrued expenses or other operating liabilities, and so increases its operating liability leverage, it reduces its current profitability: Current revenues must be lower or expenses higher. And, if a firm reports lower operating assets (by a write down of receivables, inventories or other assets, for example), and so increases operating liability leverage, it also reduces current profitability: Current expenses must be higher. But this application of accrual accounting affects future operating income: all else constant, lower current income implies higher future income. Moreover, higher operating liabilities and lower operating assets amount to lower book value of equity. The lower book value is the base for the rate of return for the higher future income. So the analysis of operating liabilities potentially identifies part of the accrual reversal phenomenon documented by Sloan (1996) and interprets it as affecting leverage, forecasts of profitability, and price-to-book ratios.[10]

3. Empirical Analysis

The analysis covers all firm-year observations on the combined COMPUSTAT (Industry and Research) files for any of the 39 years from 1963 to 2001 that satisfy the following requirements: (1) the company was listed on the NYSE or AMEX; (2) the company was not a financial

institution (SIC codes 6000 - 6999), thereby omitting firms where most financial assets and liabilities are used in operations; (3) the book value of common equity is at least $10 million in 2001 dollars;[11] and (4) the averages of the beginning and ending balance of operating assets, net operating assets and common equity are positive (as balance sheet variables are measured in the analysis using annual averages). These criteria resulted in a sample of 63,527 firm-year observations.

Appendix B describes how variables used in the analysis are measured. One measurement issue that deserves discussion is the estimation of the borrowing cost for operating liabilities. As most operating liabilities are short term, we approximate the borrowing rate by the after-tax risk-free one-year interest rate. This measure may understate the borrowing cost if the risk associated with operating liabilities is not trivial. The effect of such measurement error is to induce a negative correlation between the return on operating assets (ROOA) and operating liability leverage (OLLEV).[12] As we show below, however, even with this potential negative bias we document a strong positive relation between OLLEV and ROOA.

3.1. Leverage and Contemporaneous Profitability

In this section, we examine how financing leverage and operating liability leverage typically are related to profitability in the cross section. It is important to note that our investigation can only reveal statistical associations. But statistical relationships indicate information effects, on which we focus.

For both financing leverage and operating liability leverage, the leverage effect is determined by the amount of leverage multiplied by the spread (equations (8) and (12) respectively), where the spread is the difference between unlevered profitability and the borrowing rate. Thus, the mean leverage effect in the cross section depends not only on the mean

leverage and mean spread, but also on the covariance between the leverage and the spread.[13] As we show below, this covariance plays an important role in explaining the leverage effects.

Table 1 reports the distributions of levered profitability and its components, and Table 2 reports the time-series means of the Pearson and Spearman cross-sectional correlations between the components. In both tables, Panel A gives statistics for the financial leverage while Panel B presents statistics for the operating liability leverage.[14]

[Insert Table 1 here]

For financing leverage in Panel A of Table 1, levered profitability (ROCE) has a mean of 11.0 percent and a median of 12.3 percent, and unlevered profitability (RNOA) has a mean of 11.4 percent and median of 10.1 percent. On average, ROCE is less than RNOA, so the mean leverage effect (i.e., ROCE – RNOA) is negative (–0.4 percent). The median leverage effect is positive but small (0.6 percent), and the leverage effect is positive for about 60 percent of the observations.

The two components of the financing leverage effect, FLEV and FSPREAD, are both positive and relatively large at the mean and median. Yet the mean leverage effect (i.e., ROCE – RNOA) is negative, and the median is small. The explanation of this seeming contradiction is in Panel A of Table 2. The average Pearson correlation between FLEV and FSPREAD is negative (–0.25). This negative correlation is partially due to the positive correlation between FLEV and the net borrowing rate (NBR) of 0.06: The higher the leverage, the higher the risk and therefore the interest rate that lenders charge. But the primary reason for the negative correlation between FLEV and FSPREAD is the negative correlation between financing leverage (FLEV) and operating profitability (RNOA) of –0.31: Profitable firms tend to have low net financial obligations.

[Insert Table 2 here]

This negative cross-sectional correlation between leverage and profitability has been documented elsewhere (e.g., Titman and Wessels, 1988; Rajan and Zingales, 1995; Fama and French, 1998). One might well conjecture a positive correlation. Firms with high profitability might be willing to take on more leverage because the risk of the spread turning unfavorable is lower, with correspondingly lower expected bankruptcy costs. We suggest that leverage is partly an ex post phenomenon: Firms that are very profitable generate positive free cash flow, and use it to pay back debt or acquire financial assets.[15]

To examine the relation between past profitability and financial leverage, Figure 1 plots the average operating profitability (RNOA) during each of the five prior years for five portfolios sorted by financial leverage.[16] There is a prefect negative Spearman correlation (at the portfolio level) between FLEV and RNOA in each of the five years leading to the current year. Moreover, the differences across the portfolios are relatively large (especially in the case of the low FLEV portfolio) and are stable over time. The relative permanency of the relation between profitability and leverage is consistent with the high persistence of FLEV (see Nissim and Penman, 2001).

[Insert Figure 1 here]

Panels B of Tables 1 and 2 present the analysis of the effects of operating liability leverage. Unlevered profitability, ROOA, has a mean (median) of 8.7 (8.2) percent compared with a mean (median) of 11.4 (10.1) percent for levered profitability, RNOA. Accordingly, the leverage effect is 2.8 percent on average, 1.7 percent at the median, and is positive for more than 80 percent of the observations. Comparison with the profitability effects of financial leverage is pertinent. At the mean, OLLEV is substantially smaller than FLEV, and OLSPREAD is similar to FSPREAD. Yet both the mean and median effect of operating liability leverage on profitability are larger than the corresponding effect of the financing leverage. Indeed, the effect is larger at all percentiles of the distributions reported in Table 1. The explanation is again in Table 2. Unlike

the correlation for financial leverage, the two components of the operating liability leverage effect, OLLEV and OLSPREAD, are positively correlated. This positive correlation is driven by the positive correlation between OLLEV and ROOA.

The positive correlation between RNOA and OLLEV coupled with the negative correlation between OLLEV and FLEV (-0.27/-0.31 average cross-sectional Pearson/Spearman correlation) partially explain the negative correlation between operating profitability and financing leverage. As operating liabilities are substituted for financing liabilities, their positive association with profitability implies a negative relation between profitability and financial leverage.

In summary, even though operating liability leverage is on average smaller than financing leverage, its effect on profitability is typically greater. The difference in the average effect is not due to the spread: The two leverage measures offer similar spreads on average. Rather, the average effect is larger for operating liability leverage because firms with profitable operating assets have more operating liability leverage and less financial leverage.

3.2. Leverage and Future Profitability

Having documented the effects of financing and operating liability leverages on current profitability, we next examine the implications of the two leverage measures for future profitability. Specifically, we explore whether the distinction between operating and financing leverage is informative about one-year-ahead ROCE (FROCE), after controlling for current ROCE. To this end, we run cross-sectional regressions of FROCE on ROCE, TLEV and OLLEV. As TLEV is determined by FLEV and OLLEV, the coefficient on OLLEV reflects the differential implications of operating versus financing liabilities.[17]

Table 3 presents summary statistics from 38 cross-sectional regressions from 1963 through 2000 (from 1964 through 2001 for FROCE). The reported statistics are the time series

means of the cross-sectional coefficients, *t*-statistics estimated from the time series of the cross-sectional coefficients, and the proportion of times in the 38 regressions that each coefficient is positive. Given the number of cross-sections, under the null hypothesis that the median coefficient is zero, the proportion of positive coefficients is approximately normal with mean of 50% and standard deviation of 8%. Thus, proportions above (below) 66% (34%) are significant at the 5% level. The regression specification at the top of Table 3 involves the full set of information examined. The contribution of specific variables is examined by successively building up this set.

[Insert Table 3 here]

The first regression in Table 3 is a baseline model of FROCE on current ROCE. As expected, the average ROCE coefficient is positive, less than one (implying mean-reversion in ROCE), and highly significant. The second regression indicates that operating liability leverage adds information: OLLEV is positively related to next year's ROCE after controlling for current ROCE and total leverage. The subsequent regressions explore the reasons.

Section 2.2 hypothesized that the positive correlation between future profitability and OLLEV might be partially due to accounting effects: OLLEV may indicate the extent to which current ROCE is affected by biased accrual accounting. When firms book higher deferred revenues, accrued expenses and other operating liabilities, they increase their operating liability leverage and reduce current profitability (current revenues must be lower or expenses higher). Similarly, when firms write-down assets, they reduce current profitability and net operating assets (and so increase operating liability leverage). If this effect is temporary, a subsequent reversal in profitability is expected. Accordingly, the level of OLLEV and in particular the current year change in OLLEV (ΔOLLEV) may indicate the quality of current ROCE as a

predictor of future ROCE. So, in the third regression in Table 3, we add ΔOLLEV as a predictor of next year's ROCE.[18] The coefficient on ΔOLLEV is indeed positive and highly significant.

The significance of ΔOLLEV in explaining FROCE is related to the results in Sloan (1996) which shows that accruals (the difference between operating income and cash from operations) explain subsequent changes in earnings, and in Richardson et al. (2002) which investigates both asset and liability accruals. However, the significance of the OLLEV coefficient in the third regression of Table 3 suggests that operating liabilities contain information in addition to current period accounting effects (which are captured by ΔOLLEV).

Section 2 has associated economic effects with contractual liabilities, and both economic and accounting effects with estimated liabilities. So decomposing operating liability leverage into leverage from the two types may inform on the magnitude of the accounting effects. Accordingly, the fourth regression of Table 3 decomposes OLLEV into leverage from contractual liabilities (COLLEV) that are presumably measured without bias and leverage from estimated liabilities (EOLLEV). For the same reason, the regression substitutes the change in the two components of the operating liability leverage (ΔCOLLEV and ΔEOLLEV) for their total (ΔOLLEV). Accounts payable and income taxes payable are deemed contractual liabilities, all others estimated.

Consistent with OLLEV having a positive effect on profitability for both economic and accounting reasons, we find (in the fourth regression in Table 3) that the estimated coefficients on three of the four leverage measures are positive and significant (EOLLEV, ΔCOLLEV and ΔEOLLEV).[19] The coefficient on leverage from estimated liabilities (which reflect accounting effects in addition to economic effects) is larger and more significant than the coefficient on

leverage from contractual liabilities, with a t-statistic of 3.4 for the difference between the two coefficients.[20]

3.3. Leverage and Price-to-Book Ratios

The results of the previous section demonstrate that the level, composition and change in operating liabilities are informative about future ROCE, incremental to current ROCE. As price-to-book ratios are based on expectations of future ROCE, they also should be related to operating liabilities. In this section we explore the implications of operating liabilities for price-to-book ratios. Specifically, we regress the price-to-book ratio on the level of and change in operating liability leverage, decomposing the level and the change into leverage from contractual and estimated liabilities. Similar to the future profitability analysis, we control for TLEV to allow the estimated coefficients on operating liabilities to capture the differential implications of operating versus financing liabilities. As we are interested in the extent to which this information is not captured by current profitability, we also control for current ROCE.

By the prescription of the residual income model, price-to-book ratios are based not only on expected profitability but also on the cost of equity capital and the expected growth in book value. Therefore, to identify the effect of operating liabilities on expected profitability (as reflected in price-to-book), we include controls for expected growth and risk (which determines the cost of equity capital). Our proxy for expected growth is the rate of change in operating assets in the current year (GROWTH). We control for risk using the net borrowing rate (NBR). We acknowledge that these proxies likely measure expected growth and risk with considerable error.

Table 4 presents summary statistics from the cross-sectional regressions. The first estimation is of a baseline model, which includes ROCE, GROWTH and NBR. All three variables have the expected sign and are highly significant. The second regression adds TLEV and OLLEV. Consistent with the results for FROCE (in Table 3), the coefficient on OLLEV is

highly significant: there is a price premium associated with operating liability leverage after controlling for TLEV, ROCE, GROWTH and NBR.

[Insert Table 4 here]

Unlike the results for future ROCE in Table 3, the third regression in Table 4 indicates that the change in leverage is only marginally significant. However, when the change in operating liabilities is decomposed into changes in contractual and estimated liabilities (in the fourth regression), the coefficient on the change in estimated liabilities is positive and significant, and it is significantly larger than the coefficient on the change in contractual liabilities. In terms of the level of operating liabilities, both contractual and estimated liabilities have a positive (and similar) effect on price-to-book.

In sum, we have reported three results in Sections 3.2 and 3.3. First, distinguishing operating liability leverage from financing leverage explains cross-sectional differences in future book rates of returns and price-to-book ratios, after controlling for information in total leverage and current book rate of return. Second, current changes in operating liability leverage add further explanatory power. Third, but less strongly, distinguishing estimated operating liabilities from contractual operating liabilities further differentiates future rates of return and price-to-book ratios.

3.4. Time-Series Variation

The measurement of operating liabilities has changed over time. Specifically, standards pertaining to the recognition of pension, OPEB and net deferred tax liabilities have led to larger operating liabilities. We therefore examine whether the information in operating liabilities about future profitability and price-to-book ratios has changed over time. To this end, we calculate the correlation between time (calendar year) and the incremental explanatory power of operating liabilities in the cross-sectional (annual) regressions. As most of the changes in the measurement

of operating liabilities relate to estimated liabilities, we calculate the correlations for contractual and estimated operating liabilities separately. We focus on the most unrestricted models (the last regression in Tables 3 and 4) because we generally find that all the independent variables are informative about future profitability and price-to-book ratios. To distinguish general trends from those unique to operating liabilities, we report the correlations between time and the incremental explanatory power for each of the independent variables, as well as for the overall explanatory power (i.e., R^2). We measure the incremental explanatory power of each variable using the F-statistic associated with omitting that variable from the regression (the square of the t-statistic from the cross-sectional regression).

[Insert Table 5 here]

Panel A and Panel B of Table 5 present the correlations for the future profitability and price-to-book regressions, respectively. We report both Pearson and Spearman correlations, as well as p-values for the correlations. In both panels, and for both measures of correlations, the following relations are apparent. The overall explanatory power of the independent variables (as measured by R^2) has deteriorated over time, largely due to the decline in the explanatory power of ROCE. In contrast, the explanatory power of EOLLEV has increased over time. Thus, the results in Table 5 indicate that the incremental information in operating liability leverage for future profitability and price-to-book ratios has increased over time.

3.5. Decomposing ROCE

In Section 3.1 we have shown that operating liability leverage has a more positive effect on current profitability than financing leverage. The analyses in Sections 3.2 and 3.3 demonstrate that the differential effect of operating versus financing liabilities also holds for future profitability and price-to-book ratios, even after controlling for current profitability. These results

suggest that operating liability leverage is positively related to the persistence of ROCE. To better understand this relation, note that

$$\text{ROCE} = \text{ROOA} + [\text{RNOA} - \text{ROOA}] + [\text{ROCE} - \text{RNOA}] \quad (15)$$

where [RNOA – ROOA] is the effect of operating liabilities and [ROCE – RNOA] is the financing leverage effect. Thus, for the persistence of ROCE to increase in OLLEV, at least one of the following explanations must hold: (1) operating liabilities have a more persistent effect on ROCE than financing liabilities (that is, [RNOA – ROOA] is more persistent than [ROCE – RNOA]); or (2) ROOA is more persistent than the leverage effects ([RNOA – ROOA] and [ROCE – RNOA]), and OLLEV is positively related to ROOA.

To examine the two explanations, we regress FROCE and P/B on the components of ROCE from equation (15). In the P/B regressions, we control for GROWTH and NBR (see discussion in Section 3.3). The regression results for FROCE (P/B) are presented in Table 6 (Table 7). To evaluate the effect of each step in the decomposition, we report three sets of cross-sectional regressions. The first model is the baseline model from Tables 3 and 4, which includes ROCE as the only profitability measure. The second model decomposes ROCE into profitability from operations (RNOA) and the financing leverage effect (ROCE – RNOA). The third model includes all three components.

[Insert Table 6 here]

The second regression in Table 6 reveals that the financing effect on profitability (ROCE – RNOA) is significantly less persistent than RNOA. However, the persistence of the two leverage effects (financing and operating, in the third regression) is similar. These results, combined with the strong positive correlation between ROOA and OLLEV reported in Table 2, support the second explanation; namely, firms with relatively high OLLEV tend to have high ROOA, which is more persistent than the leverage effects on profitability. These findings are not

due to any short-term effect; we obtained qualitatively similar results when we substituted ROCE three and five years ahead for FROCE (FROCE is ROCE one year ahead).

[Insert Table 7 here]

The P/B regressions, reported in Table 7, provide further support for the higher persistence of operating profitability: The coefficient on RNOA is significantly larger than the coefficient on the financial leverage effect (second regression). However, in contrast to Table 6, the coefficient on the operating liabilities effect (RNOA – ROOA) in the third regression is significantly larger than the coefficient on the financing leverage effect (ROCE – RNOA). As financial leverage increases equity risk, its positive effect on profitability is partially offset by the effect on the cost of equity capital. Hence the net effect of financing liabilities on the price-to-book ratio is relatively small. While operating liabilities may also increase equity risk, their effect on the cost of capital is likely to be smaller than that of financial liabilities because most operating liabilities are either short term and co-vary with operations (working capital liabilities), or contingent on profitability (deferred taxes). Moreover, to the extent that operating creditors are more likely to extend credit when the firm's risk is low, operating liabilities may actually be negatively related to the cost of capital. Consequently, the coefficient on the operating liabilities effect is larger than that on the financing leverage effect. For FROCE, the coefficients on the two leverage effects are similar because, unlike P/B, FROCE is not directly affected by the cost of equity capital.

In support of this conjecture, we observe that the coefficient on NBR is considerably smaller (in absolute value) and less significant after controlling for the financing effect (the second and third regressions). That is, the leverage effect on profitability helps explain the cost of equity capital, which reduces the incremental information in NBR. Similar to Fama and French (1998), therefore, we conclude that our inability to fully control for expected growth and risk in

explaining price-to-book ratios prevents us from interpreting the coefficients on the leverage effects as reflecting only information on future profitability. Nevertheless, our analysis demonstrates that the leverage effects are useful for evaluating price-to-book ratios, which is an important objective in financial statement analysis.

4. Conclusion

To finance operations, firms borrow in the financial markets, creating financing leverage. In running their operations, firms also borrow, but from customers, employees and suppliers, creating operating liability leverage. Because they involve trading in different types of markets, the two types of leverage may have different value implications. In particular, operating liabilities may reflect contractual terms that add value in different ways than financing liabilities, and so they may be priced differently. Operating liabilities also involve accrual accounting estimates that may further affect their pricing. This study has investigated the implications of the two types of leverage for profitability and equity value.

The paper has laid out explicit leveraging equations that show how shareholder profitability is related to financing leverage and operating liability leverage. For operating liability leverage, the leveraging equation incorporates both real contractual effects and accounting effects. As price-to-book ratios are based on expected profitability, this analysis also explains how price-to-book ratios are affected by the two types of leverage. The empirical analysis in the paper demonstrates that operating and financing liabilities imply different profitability and are priced differently in the stock market.

Further analysis shows that operating liability leverage not only explains differences in profitability in the cross section but also informs on changes in future profitability from current profitability. Operating liability leverage and changes in operating liability leverage are indicators of the quality of current reported profitability as a predictor of future profitability.

Our analysis distinguishes contractual operating liabilities from estimated liabilities, but further research might examine operating liabilities in more detail, focusing on line items such as accrued expenses and deferred revenues. Further research might also investigate the pricing of operating liabilities under differing circumstances; for example, where firms have "market power" over their suppliers.

Appendix A: Examples of Contractual and Accrual Accounting Effects of Operating Liabilities

Contractual Liabilities: Accounts Payable

In consideration for goods received from a supplier, a firm might write a note to the supplier bearing interest at the prevailing short-term borrowing rate in the market. Alternatively, the firm can record an account payable bearing no interest, an operating liability. If, for the latter, the supplier increases the price of the goods by the amount of the interest on the note, ROOA is unaffected by contracting with an account payable rather than a note. However, should the supplier raise prices by less than this amount, ROOA and ROCE are increased.

Contractual and Estimated Liabilities: Pension Obligations

To pay wages, firms must borrow at the market borrowing rate, forgo interest on liquidated financial assets at the market rate, or issue equity at its required rate of return. Firms alternatively can pay deferred wages in the form of pensions or post-employment benefits. Employees will presumably charge, in the amount of future benefits, for the foregone interest because of the deferral. But there are tax deferral benefits to be exploited and divided, in negotiations, between employer and employee. Interest costs are indeed recognized in pension expense under U.S. GAAP, but benefits from negotiations with employees could be realized in lower implicit wages (in the service cost component of pension expense) and thus in higher operating income.

In addition to these contractual effects, pension liabilities can be affected by actuarial estimates and discount rates, so biasing the liability. The estimates change the book value of the liability (but presumably not the value), so affect the forecasted rate of return on book value and the price-to-book ratio.

Operating Liabilities for a Property and Casualty Insurer

Property and casualty insurers make money from writing insurance policies and from investment assets. In their insurance business, they have negative net operating assets, that is, liabilities associated with the business are considerably greater than assets. Chubb Corp reports $17.247 billion in investment assets on its 2000 balance sheet and $7.328 billion of assets employed in its insurance business. Liabilities include long-term debt of $0.754 billion and $0.451 billion associated with the investment operation, but the major component of its liabilities is $16.782 billion in operating liabilities for the insurance business, largely comprised of $11.904 for unpaid claims and $3.516 for unearned premiums. Thus, Chubb, as with all insurers, has operating liabilities in excess of operating assets in its insurance business, that is, negative net operating assets of -$9.454. This represents the so-called "float" that arises from a timing difference between premiums received and claims paid, which is invested in the investment assets. For the insurance business, Chubb reported an after-tax income close to zero in 2000 and after-tax losses in prior years. But one expects negative net operating assets to yield low profits or even losses. Indeed, with zero profits, the firm generates positive residual income: zero minus a charge against negative net operating assets is a positive amount. Clearly Chubb can be seen as potentially generating value from operating liabilities. Indeed this is how insurers operate: operating liabilities provide the float which has the appearance of being free but which is charged for, by insurees, in insurance premiums that often result in losses from insurance activities. To

the extent that the implied interest charged by insurees is different from the market rate, the return per dollar of book value and the price-to-book ratio will be affected.

Unpaid claims and unearned premiums are the major component of operating liabilities for these insurers. These liabilities arise from contracts with insurees, but are estimated, possibly with bias. So the book value of the liabilities is determined both by contracts and by the accrual accounting applied.

Operating Liabilities for a Computer Manufacturer

An insurer is a particular kind of business; most businesses have operating assets greater than operating liabilities. But Dell Computer Corporation, an extreme, has negative net operating assets. Dell is known for its efficient inventory and distribution system. But it is also known for putting a lot of pressure on its suppliers. So for fiscal year 2001, Dell reported operating assets of $5.579 billion and operating liabilities of $7.304 billion, to give it negative net operating assets of -$1.725 billion. (Inventories were only $0.400 billion against accounts payable of $4.286 billion.) This negative investment in operations produced an operating income, after tax, of $1.284 billion in fiscal 2002. Residual income from operations for 2002 was, accordingly, $1.284 – (0.10 × – 1.725) = $1.457 billion (assuming a required return for operations of 10%). Residual income was greater than income because of the "value added" from operating liabilities. Dell's suppliers finance its operations, and more, so shareholders effectively earn 10% on the $1.725 billion they do not have to put into the business: the operating liability leverage in effect creates float for shareholders.

Dell is an example of a case where a firm presumably has market power and so can extract value from suppliers. But the operating liability leverage may also incorporate accounting effects. Dell's total operating liabilities of $7.304 billion consisted of $4.286 million in contractual liabilities in accounts payable but also $3.018 billion of accrued liabilities that are subject to estimates. So the forecast of Dell's future ROCE and the determination of the price-to-book ratio depends not only on the firm's ability to increase value from market power over suppliers, but also the extent to which current accrued liabilities are under- or over- estimated by accruals which will reverse in future periods.

Appendix B: Notation and Variables Measurement

This appendix describes how the variables are measured.

Financial Assets = cash and short-term investments (Compustat #1) plus investments and advances-other (Compustat #32).

Operating Assets = Total assets (Compustat #6) minus Financial Assets.

Financial Liabilities = debt in current liabilities (#34) plus long-term debt (#9) plus preferred stock (#130) minus preferred treasury stock (#227) plus preferred dividends in arrears (#242) plus minority interest (#38). (Minority interest is treated as an obligation here; for an alternative minority sharing treatment (that considerably complicates the presentation), see Nissim and Penman (2001). Tests show that the treatment has little effect on the results.)

Net Financing Debt = Financial Liabilities minus Financial Assets.

Common Equity = common equity (#60) plus preferred treasury stock (#227) minus preferred dividends in arrears (#242).

Net Operating Assets = Net Financing Debt plus Common Equity.

Operating Liabilities = Operating Assets minus Net Operating Assets.

Net Financing Expense = after-tax interest expense (#15 × (1 – marginal tax rate)) plus preferred dividends (#19) minus after-tax interest income (#62 × (1 – marginal tax rate)) plus minority interest in income (#49) minus the change in marketable securities adjustment (change in #238). (See comment regarding the treatment of minority interest in the calculation of Financial Liabilities above.)

Comprehensive Net Income = net income (#172) minus preferred dividends (#19) plus the change in marketable securities adjustment (change in #238) plus the change in cumulative translation adjustment (change in #230).

Operating Income = Net Financing Expense plus Comprehensive Net Income.

Marginal Tax Rate = the top statutory federal tax rate plus 2% average state tax rate. The top federal statutory corporate tax rate was 52% in 1963, 50% in 1964, 48% in 1965-1967, 52.8% in 1968-1969, 49.2% in 1970, 48% in 1971-1978, 46% in 1979-1986, 40% in 1987, 34% in 1988-1992 and 35% in 1993-2001.

Market Interest on Operating Liabilities = the one year after tax risk-free rate at the beginning of the fiscal year multiplied by the difference between average Operating Liabilities and average deferred taxes and investment tax credit (#35) during the year. The tax adjustment is calculated by multiplying the risk free rate by (1 – marginal tax rate).

Contractual Operating Liabilities = accounts payable (#70) plus income tax payable (#71).

Estimated Operating Liabilities = Operating Liabilities minus Contractual Operating Liabilities.

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Notes

[1] The operating liability leverage analyzed in this study is not to be confused with operating leverage, a measure sometimes used to indicate the proportion of fixed and variable costs in a firm's cost structure.

[2] See Penman (2001, Chapter 9) for more discussion on separating operating and financing items in financial statements.

[3] Tax on net financial expense is calculated as the product of net interest expense (excluding preferred dividends) and the marginal tax rate. Tax on operating income is calculated as the sum of the reported tax expense and the tax on net financial expense.

[4] RNOA is similar to the return on invested capital (ROIC) calculation that is sometimes used, although one should be careful, in a particular case, to see whether ROIC does indeed separate operating and financing components of the business. The RNOA calculation does not preclude other adjustments (like treating deferred taxes as equity), provided that the adjustment is consistent with recognizing operating liabilities as part of operating activities.

[5] For two types of liabilities, deferred taxes and investment tax credit, the implicit cost is zero and so no market interest should be calculated on them.

[6] Expression (12), like expression (8), is derived by recognizing that RNOA is a weighted average of ROOA and the market borrowing rate (MBR):

$$RNOA = \left[ROOA \times \frac{OA}{NOA} \right] - \left[MBR \times \frac{OL}{NOA} \right] = ROOA + \left[OLLEV \times \left(ROOA - MBR \right) \right] .$$

Again, when operating liabilities include interest-free deferred tax liability and investment tax credit, MBR is adjusted accordingly (downward).

[7] A more detailed analysis of operating liability leverage can produce further insights. For example, pension liabilities, amounting to deferred payment of wages, may increase wages expense for the implicit interest, but there are tax advantages for employees to be exploited also. Note that accounting in the U.S. recognizes interest costs on the pension liability as part of pension expense, so the "implicit interest" is indeed explicit in this case.

[8] See Harris and Raviv (1991) for a review of this literature.

[9] There is an additional difference between deferred revenues and all other liabilities. While other liabilities are reported as the estimated cost to settle, the book value of deferred revenues measures the amount of cash received in exchange for products or services that are still undelivered. Thus, the cost to settle the deferred revenue liability is typically smaller than its book value.

[10] Financing liabilities may also be affected by accounting, but not to the same degree. Debt is not marked to market, but book values are typically close to market value. Moreover, the effective interest method used for book values is unbiased. The marking to market of some financial assets could be done in a biased way.

[11] This criterion results in a loss of approximately 3% of the observations. We impose this restriction since we found that for firms with very small book value the relations are not stable and are considerably different from the rest. Consequently, including these relatively few observations generates estimates which are quantitatively different from the relations for the bulk of the firms (although the inferences remain qualitatively unchanged).

[12] The borrowing cost, which is added to the numerator of ROOA according to (11), is proportional to OLLEV. So if the borrowing rate is too small, ROOA would be understated by an amount positively related to OLLEV.

[13] This follows because $E(X \times Y) = E(X) \times E(Y) + cov(X, Y)$.

[14] In all the analyses in this paper, we winsorize the variables at the 1% and 99% of each cross-sectional (annual) distribution. We winsorize rather than trim because trimming results in an excessive reduction in the sample. We obtain qualitatively similar results with trimming instead of winsorizing and when using various percentile cuts.

[15] Profitable Microsoft, for example, has negative financing leverage as its considerable free cash flow is invested in financial assets.

[16] The analysis is conducted for each sample year, and the figure presents the time series means over the sample years of the portfolio means of RNOA.

[17] An alternative approach is to include FLEV instead of TLEV. We chose to include TLEV for two reasons. First, when TLEV is included, the coefficient on OLLEV directly measures the differential implications of operating versus financing liabilities. In contrast, when FLEV is included, the coefficient on OLLEV reflects the general effects of leverage (e.g., tax shield, lower equity investment base for the same value-generating operations) in addition to those unique to operating liabilities. Second, FLEV and OLLEV are not a decomposition of TLEV; that is, FLEV + OLLEV ≠ TLEV. The reason is that financing leverage is measured relative to equity, while operating liability leverage is measured relative to net operating assets. More importantly, FLEV + OLLEV does not define a unique value of TLEV: alternative combinations of FLEV and OLLEV imply different values for TLEV even when they have the same total. As a result, even if financing and operating liabilities have the same implications for the dependent variable, the coefficients on FLEV and OLLEV may differ statistically, depending on the empirical distributions of the two leverage measures and the correlation between them. At the same time, including TLEV instead of FLEV does not imply that the information in FLEV is lost; as TLEV and OLLEV uniquely define FLEV, they capture the information in FLEV regarding the dependent variable.

[18] When calculating the change in leverage, we use end of year values (instead of annual averages) to measure the current and previous year leverage, and then take the difference.

[19] As both COLLEV and ΔCOLLEV are included in the regression, the coefficient on COLLEV reflects the effect of the prior year level of COLLEV while the coefficient on ΔCOLLEV reflects the differential implications of the change in operating liabilities relative to the information in their level at the end of the year. Thus, the insignificance of the coefficient on COLLEV implies that the information in the prior year level of contractual operating liabilities is captured by current profitability.

[20] The difference between the coefficients on the change in contractual and estimated operating liability leverages is insignificant. Note, however, that both variables reflect the change in operating liability leverage due to change in net operating assets. For example, a write-down of fixed assets would increase both contractual and estimated operating liability leverage.

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Table 1
Analysis of the Effect of Leverage on Profitability

Panel A: Financial leverage and profitability measures

	ROCE	*RNOA*	*ROCE-RNOA*	*FLEV*	*FSPREAD*	*NBR*
Mean	0.110	0.114	-0.004	0.641	0.060	0.054
SD	0.159	0.136	0.100	0.958	0.194	0.132
5%	-0.143	-0.058	-0.160	-0.367	-0.186	-0.066
10%	-0.026	0.010	-0.082	-0.204	-0.085	-0.007
25%	0.066	0.062	-0.019	0.064	-0.003	0.033
50%	0.123	0.101	0.006	0.419	0.039	0.053
75%	0.176	0.156	0.033	0.947	0.101	0.074
90%	0.244	0.239	0.064	1.715	0.251	0.117
95%	0.305	0.326	0.094	2.264	0.401	0.180

Panel B: Operating liability leverage and profitability measures

	RNOA	*ROOA*	*RNOA-ROOA*	*OLLEV*	*OL SPREAD*	*MBR*
Mean	0.114	0.087	0.028	0.444	0.055	0.032
SD	0.136	0.083	0.063	0.382	0.083	0.012
5%	-0.058	-0.031	-0.023	0.120	-0.066	0.015
10%	0.010	0.016	-0.005	0.159	-0.018	0.018
25%	0.062	0.054	0.006	0.237	0.024	0.023
50%	0.101	0.082	0.017	0.346	0.052	0.030
75%	0.156	0.119	0.035	0.514	0.087	0.038
90%	0.239	0.170	0.070	0.781	0.136	0.049
95%	0.326	0.218	0.114	1.076	0.183	0.055

Calculations are made from data pooled over firms and over years, 1963 – 2001, for non-financial NYSE and AMEX firms with common equity at year-end of at least $10 million in 2001 dollars. The number of firm-year observations is 63,527.

In Panel A, ROCE is return on common equity as defined in equation (1); RNOA is return on net operating assets as defined in (5); FLEV in financing leverage as defined in (9); FSPREAD is the financing spread, RNOA – Net Borrowing Rate (NBR), as given in (8); NBR is the after-tax net borrowing rate for net financing debt as defined in equation (6).

In Panel B, ROOA is return on operating assets as defined in equation (11); OLLEV is operating liability leverage as defined in (10); OLSPREAD is the operating liability spread, ROOA – Market Borrowing Rate (MBR), as given in (12); MBR is the after-tax risk-free short-term interest rate adjusted (downward) for the extent to which operating liabilities include interest-free deferred tax liability and investment tax credit.

Table 2
Correlations between Components of the Leverage Effect
Pearson (Spearman) correlations below (above) the main diagonal

Panel A: Financial leverage and profitability measures

	ROCE	*RNOA*	*ROCE-RNOA*	*FLEV*	*FSPREAD*	*NBR*
ROCE		0.87	0.40	-0.13	0.72	-0.07
RNOA	0.77		0.04	-0.45	0.77	-0.09
ROCE-RNOA	0.42	-0.22		0.52	0.12	0.10
FLEV	-0.10	-0.31	0.28		-0.38	0.25
FSPREAD	0.54	0.72	-0.18	-0.25		-0.55
NBR	-0.02	-0.06	0.05	0.06	-0.72	

Panel B: Operating liability leverage and profitability measures

	RNOA	*ROOA*	*RNOA-ROOA*	*OLLEV*	*OL SPREAD*	*MBR*
RNOA		0.98	0.95	0.33	0.97	0.10
ROOA	0.95		0.88	0.21	0.99	0.11
RNOA-ROOA	0.91	0.74		0.53	0.88	0.04
OLLEV	0.35	0.17	0.54		0.19	0.15
OLSPREAD	0.95	1.00	0.74	0.16		-0.01
MBR	0.09	0.09	0.07	0.17	0.00	

Correlations are calculated for each year, 1963-2001, for non-financial NYSE and AMEX firms with common equity at year-end of at least $10 million in 2001 dollars. The table reports the time-series means of the cross-sectional correlations. The number of firm-year observations is 63,527.

See notes to Table 1 for explanations of acronyms.

Table 3
Summary Statistics from Cross-sectional Regressions
Exploring the Relation between Future Profitability and Operating Liability Leverage

$FROCE = \alpha_0 + \alpha_1 ROCE + \alpha_2 TLEV + \alpha_3 OLLEV + \alpha_4 COLLEV + \alpha_5 EOLLEV + \alpha_6 \Delta OLLEV + \alpha_7 \Delta COLLEV + \alpha_8 \Delta EOLLEV + \varepsilon$

	α_0	α_1	α_2	α_3	α_4	α_5	$\alpha_5 - \alpha_4$	α_6	α_7	α_8	$\alpha_8 - \alpha_7$	Mean R^2	Mean N
Mean	0.028	0.623										0.303	1,562
t-stat.	6.195	34.484											
Prop +	0.816	1.000											
Mean	0.028	0.614	-0.005	0.014								0.309	1,562
t-stat.	6.679	35.059	-3.742	5.549									
Prop +	0.842	1.000	0.211	0.789									
Mean	0.028	0.619	-0.005	0.014				0.067				0.316	1,562
t-stat.	6.532	36.087	-3.884	5.393				10.793					
Prop +	0.842	1.000	0.211	0.816				0.974					
Mean	0.027	0.621	-0.005		0.002	0.025	0.023		0.080	0.074	-0.006	0.319	1,562
t-stat.	6.140	36.146	-3.962		0.349	5.432	3.358		6.775	7.934	-0.360		
Prop +	0.816	1.000	0.211		0.553	0.816	0.684		0.895	0.921	0.447		

The table summarizes 38 cross-sectional regressions for the base years 1963 – 2000 (1964-2001 for the future year). Mean coefficients are means of the 38 estimates. The *t*-statistic is the ratio of the mean cross-sectional coefficient relative to its standard error estimated from the time series of coefficients. "Prop +" is the proportion of the 38 cross-sectional coefficient estimates that are positive.

FROCE is measured as next year's return on common equity (ROCE). TLEV is total leverage. OLLEV is operating liability leverage. COLLEV is operating liability leverage from contractual liabilities (identified as accounts payable and income taxes payable). EOLLEV is operating liability leverage from operating liabilities that are subject to accounting estimates (all operating liabilities except accounts payable and income taxes payable). Δ indicates changes over the current year.

Table 4
Summary Statistics from Cross-sectional Regressions
Exploring the Relation between the Price-to-Book Ratio and Operating Liability Leverage

$$P/B = \alpha_0 + \alpha_1 ROCE + \alpha_2 GROWTH + \alpha_3 NBR + \alpha_4 TLEV + \alpha_5 OLLEV + \alpha_6 COLLEV + \alpha_7 EOLLEV + \alpha_8 \Delta OLLEV + \alpha_9 \Delta COLLEV + \alpha_{10} \Delta EOLLEV + \varepsilon$$

	α_0	α_1	α_2	α_3	α_4	α_5	α_6	α_7	$\alpha_7 - \alpha_6$	α_8	α_9	α_{10}	$\alpha_{10} - \alpha_{11}$	Mean R^2	Mean N
Mean	1.314	4.910	0.973	-0.305										0.198	1,629
t-stat.	11.452	7.058	11.717	-3.758											
Prop +	1.000	1.000	1.000	0.282											
Mean	1.058	4.669	1.005	-0.314	0.033	0.491								0.220	1,629
t-stat.	14.022	6.923	12.308	-3.761	1.541	7.351									
Prop +	1.000	1.000	1.000	0.256	0.487	0.974									
Mean	1.055	4.687	1.038	-0.311	0.033	0.488				0.157				0.224	1,629
t-stat.	14.158	6.962	12.451	-3.748	1.503	7.287				1.540					
Prop +	1.000	1.000	1.000	0.256	0.462	0.974				0.769					
Mean	1.026	4.680	1.052	-0.320	0.034		0.501	0.548	0.047		-0.030	0.466	0.496	0.228	1,629
t-stat.	14.158	6.991	12.828	-3.797	1.601		4.722	7.663	0.536		-0.224	3.640	2.867		
Prop +	1.000	1.000	1.000	0.256	0.487		0.795	0.974	0.564		0.487	0.846	0.769		

The table summarizes 39 cross-sectional regressions for the years 1963 – 2001. Mean coefficients are means of the 39 estimates. The *t*-statistic is the ratio of the mean cross-sectional coefficient relative to its standard error estimated from the time series of coefficients. "Prop +" is the proportion of the 39 cross-sectional coefficient estimates that are positive.

P/B is the ratio of market value of equity to its book value. ROCE is return on common equity. GROWTH is the growth rate in operating assets in the current year. NBR is net borrowing rate. TLEV is total leverage. OLLEV is operating liability leverage. COLLEV is operating liability leverage from contractual liabilities (identified as accounts payable and income taxes payable). EOLLEV is operating liability leverage from operating liabilities that are subject to accounting estimates (all operating liabilities except accounts payable and income taxes payable). Δ indicates changes over the current year.

Table 5
Correlations between Time (Calendar Year) and the Incremental Explanatory Power of Independent Variables From the Cross-sectional (Annual) Regressions

Panel A: Dependent variable is FROCE

	Intercept	ROCE	TLEV	COLLEV	EOLLEV	ΔCOLLEV	ΔEOLLEV	R^2
Pearson corr.	-0.524	-0.586	0.205	-0.190	0.326	-0.098	-0.001	-0.679
P-value	0.001	0.000	0.217	0.253	0.046	0.558	0.995	0.000
Spearman corr.	-0.563	-0.690	0.161	-0.101	0.402	-0.042	-0.034	-0.664
P-value	0.000	0.000	0.334	0.545	0.012	0.804	0.840	0.000

Panel B: Dependent variable is P/B

	Intercept	ROCE	GROWTH	NBR	TLEV	COLLEV	EOLLEV	ΔCOLLEV	ΔEOLLEV	R^2
Pearson corr.	0.367	-0.521	-0.150	-0.107	0.625	-0.049	0.639	0.128	0.006	-0.706
P-value	0.021	0.001	0.361	0.516	0.000	0.765	0.000	0.437	0.971	0.000
Spearman corr.	0.379	-0.511	-0.082	-0.119	0.632	0.238	0.555	0.152	-0.237	-0.667
P-value	0.018	0.001	0.618	0.469	0.000	0.145	0.000	0.354	0.147	0.000

The table presents correlations between time (calendar year) and the incremental explanatory power of each of the independent variables in the cross-sectional (annual) regressions of the unrestricted models of FROCE and P/B in Tables 3 and 4 respectively (last set of regressions). Correlations are also presented for the overall explanatory power (i.e., R^2). The incremental explanatory power of each variable is measured using the F-statistic associated with omitting that variable from the regression (the square of the t-statistic from the cross-sectional regression). Both Pearson and Spearman correlations are reported, as well as p-values for the correlations.

FROCE is measured as next year's return on common equity (ROCE). P/B is the ratio of market value of equity to its book value. GROWTH is the growth rate in operating assets in the current year. NBR is net borrowing rate. TLEV is total leverage. COLLEV is operating liability leverage from contractual liabilities (identified as accounts payable and income taxes payable). EOLLEV is operating liability leverage from operating liabilities that are subject to accounting estimates (all operating liabilities except accounts payable and income taxes payable). Δ indicates changes over the current year.

Table 6
Summary Statistics from Cross-sectional Regressions
Exploring the Relation between Future Profitability and Components of Current Profitability

$FROCE = \alpha_0 + \alpha_1 ROCE + \alpha_2 RNOA + \alpha_3 ROOA + \alpha_4 [RNOA - ROOA] + \alpha_5 [ROCE - RNOA] + \varepsilon$

	α_0	α_1	α_2	α_3	α_4	α_5	$\alpha_2 - \alpha_5$	$\alpha_3 - \alpha_4$	$\alpha_3 - \alpha_5$	$\alpha_4 - \alpha_5$	Mean R^2	Mean N
Mean	0.028	0.623									0.303	1,562
t-stat.	6.195	34.484										
Prop +	0.816	1.000										
Mean	0.025		0.649			0.553	0.096				0.308	1,562
t-stat.	5.527		40.438			24.478	7.024					
Prop +	0.816		1.000			1.000	0.895					
Mean	0.022			0.722	0.539	0.534		0.184	0.189	0.005	0.310	1,562
t-stat.	4.645			29.355	15.903	21.176		3.777	5.385	0.281		
Prop +	0.789			1.000	1.000	1.000		0.763	0.868	0.605		

The table summarizes 38 cross-sectional regressions for the base years 1963 – 2000 (1964-2001 for the future year). Mean coefficients are means of the 38 estimates. The *t*-statistic is the ratio of the mean cross-sectional coefficient relative to its standard error estimated from the time series of coefficients. "Prop +" is the proportion of the 38 cross-sectional coefficient estimates that are positive.

FROCE is measured as next year's return on common equity (ROCE). RNOA is return on net operating assets. ROOA is return on operating assets.

Table 7
Summary Statistics from Cross-sectional Regressions
Exploring the Relation between the Price-to-Book Ratio and Components of Current Profitability

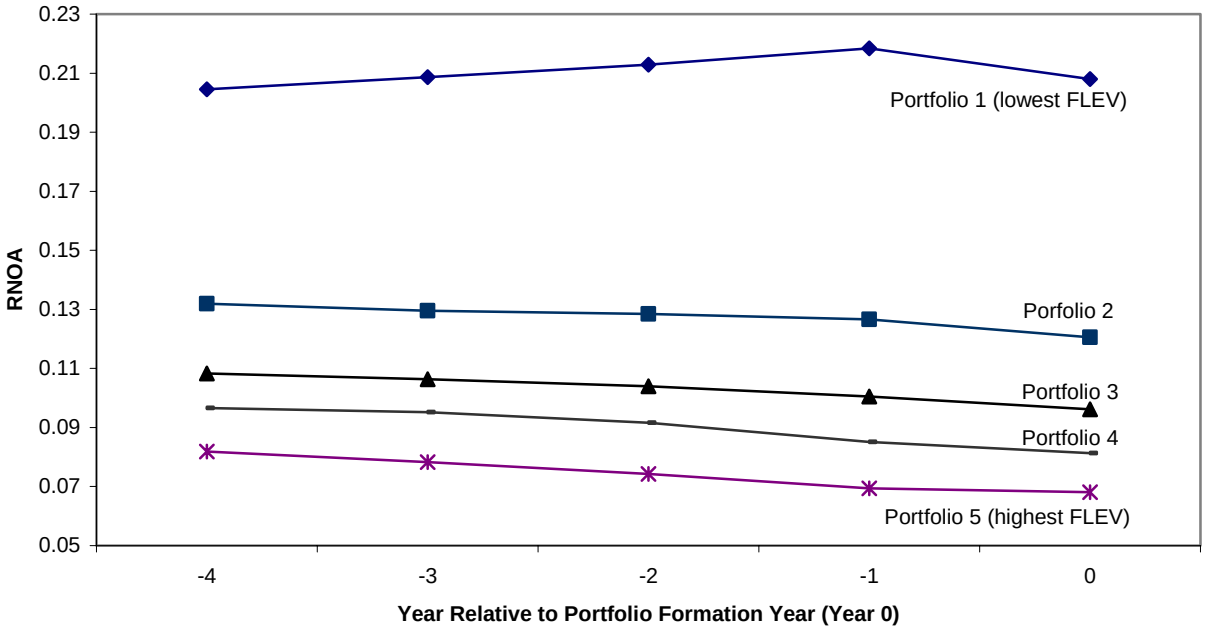
$P/B = \alpha_0 + \alpha_1 ROCE + \alpha_2 RNOA + \alpha_3 ROOA + \alpha_4 [RNOA - ROOA] + \alpha_5 [ROCE - RNOA] + \alpha_6 GROWTH + \alpha_7 NBR + \varepsilon$

	α_0	α_1	α_2	α_3	α_4	α_5	$\alpha_2 - \alpha_5$	$\alpha_3 - \alpha_4$	$\alpha_3 - \alpha_5$	$\alpha_4 - \alpha_5$	α_6	α_7	Mean R^2	Mean N
Mean	1.314	4.910									0.973	-0.305	0.198	1,629
t-stat.	11.452	7.058									11.717	-3.758		
Prop +	1.000	1.000									1.000	0.282		
Mean	1.196		5.913			2.063	3.850				0.915	-0.133	0.246	1,629
t-stat.	10.689		9.221			3.191	8.859				12.076	-1.893		
Prop +	1.000		1.000			0.615	0.949				1.000	0.385		
Mean	1.176			6.112	5.187	1.891		0.924	4.220	3.296	0.912	-0.120	0.255	1,629
t-stat.	9.341			7.237	5.555	2.721		0.744	4.405	7.102	12.110	-1.670		
Prop +	1.000			0.872	0.821	0.564		0.667	0.795	0.923	1.000	0.385		

The table summarizes 39 cross-sectional regressions for the years 1963 – 2001. Mean coefficients are means of the 39 estimates. The *t*-statistic is the ratio of the mean cross-sectional coefficient relative to its standard error estimated from the time series of coefficients. "Prop +" is the proportion of the 39 cross-sectional coefficient estimates that are positive.

P/B is the ratio of market value of equity to its book value. ROCE is return on common equity. RNOA is return on net operating assets. ROOA is return on operating assets. GROWTH is the growth rate in operating assets in the current year. NBR is net borrowing rate.

Figure 1
Past Operating Profitability (RNOA) for Portfolios Sorted by Financial Leverage (FLEV)



The figure presents the grand mean (i.e., time series mean of the cross-sectional means) of RNOA in years -4 through 0 for five portfolios sorted by FLEV in year 0. RNOA is return on net operating assets as defined in (5). FLEV in financing leverage as defined in (9).