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CAPITAL MARKET FRICTIONS, LEASING AND CAPITAL STRUCTURE

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Abstract

The question of how do corporations finance their operations is one of the central tenets of corporate finance. The extant literature on capital structure tests so far excludes operating leases from the analysis. Using operating lease adjusted debt ratio and market microstructure based measures for information asymmetry, I find that information asymmetry proxied by either illiquidity or bid-ask spread is positively and significantly related to the operating lease adjusted debt ratio even after controlling for other conventional variables, identified by Rajan and Zingales(1995), that are found to explain capital structure. This result is robust to alternative ways of measuring variables and different estimation techniques. Further, I comprehensively reexamine the debt-lease substitute vs. complement relation across several dimensions viz. credit ratings, information asymmetry, debt capacity, R&D, dividends and financial deficit and consistently find a substitute relation between debt and leases in the sample firms. I find that the substitution relation between debt and leases is robust even after correcting for endogeneity.

Keywords: Capital Market Frictions, Leasing, Capital Structure, Information Asymmetry and Debt Capacity

Introduction:

The question of how do corporations finance their operations is one of the central tenets of corporate finance. There are three competing theories viz. trade-off, pecking order and market timing that tries to explain the capital structure decisions by firms[1]. Despite the extant empirical work on testing capital structure theories, the evidence so far does not conclusively support any single theory. It is not an exaggeration to say that, to date, how firms really make their capital structure decisions is still not very well understood. Sharpe and Nguyen (1995) concluded that a comprehensive analysis of corporate capital structure should not disregard the role of leasing, which serves as a means of alleviating financial contracting costs due to adverse selection or

[1] It should be noted that all the three theories are not necessarily mutually exclusive. For example the market timing ability of the managers has to be based on the superior information managers possess about firm prospects.

agency conflicts. Quantitatively, leasing is of first-order importance as a source of financing[2]. Leasing is of comparable importance to long-term debt even for relatively large firms. Also, for some firms such as small and young firms, firms with no credit rating, financially constrained/distressed firms leasing may be the only option. Thus, leasing seems critical for understanding the capital structure of firms.

Eisfeldt and Rampini (2009) argue that leased capital has more *debt capacity* than debt capital because of the ability to repossess the leased asset is high compared to secured debt in case of financial distress of the lessee firm. Hence lessors may be willing to provide more lease capital than the debt capital provided by secured lenders. They similarly conclude that, in measuring leverage, considering the implicit debt due to leasing seems critical. Despite the above conclusions/recommendations, the past empirical work on testing the capital structure theories largely excludes lease financing as a source of external financing besides debt and equity capital. This paper aims to contribute to the corporate finance literature by filling this gap in the extant research on capital structure. I have two goals in this paper. The first goal is to examine the pecking order theory of capital structure in the presence of lease financing. The second is to comprehensively reexamine the debt and lease substitutability.

Using operating lease adjusted debt ratio and market microstructure based measures for information asymmetry, I find that information asymmetry proxied by either illiquidity or bid-ask spread is positively and significantly related to the operating lease adjusted debt ratio even after controlling for other conventional variables, identified by Rajan and Zingales (1995), that are found to explain capital structure**.** This result is robust to alternative ways of measuring variables and different estimation techniques. Further, I comprehensively reexamine the debt-lease substitute vs. complement relation across several dimensions viz. credit ratings, information asymmetry, debt capacity, R&D, dividends and financial deficit and consistently find a substitute relation between debt and leases in the sample firms. I find that the substitution relation is robust even after correcting for endogeneity.

The rest of the paper is organized as follows. Section-I reviews the literature. Section-II deals with data collection and variable measurement. Section-III covers empirical modeling, estimation and results. Section-IV offers robustness checks. Section-V concludes.

I. Literature Review:

One can think of both debt financing and lease financing as components of fixed-claim financing used by corporations[3]. Considering the similarities between lease and debt financing, the traditional pecking order and trade-off theories of capital structure apply equally well to lease

[2] The Equipment Leasing and Finance Association (ELFA) estimates that of the $850 billion in total fixed investment from domestic businesses in 2010, $390 billion (46 percent) will be financed through leasing. These statistics are for only equipment leasing and do not include real estate leasing which is probably even larger.

[3] Bank loans are yet another type of fixed claim financing but not explored in this paper.

financing. The literature on capital structure is voluminous[4]. Only a brief review of pecking order and trade-off theories of capital structure, in the context lease financing, follows:

1.2. Theories of Capital Structure

Pecking Order Theory:

The existence of information asymmetry between managers and investors regarding ongoing operations i.e. assets-in-place and/or future firm prospects i.e. growth options can lead to adverse selection. Stiglitz and Weiss (1981) argue that asymmetric information in debt markets can also cause distortions similar to those for new common share issues. Asymmetric information may increase the cost of new debt, or even result in credit rationing. In the extreme, a "financial collapse" may occur, in which some or all classes of asymmetric-information borrowers are denied loans as seen in the 2007-08 global financial meltdown. Myers (1984) and Myers and Majluf (1984) demonstrated that if managers can issue safe debt, the adverse selection problem due to information asymmetry could be reduced. A pecking order of capital structure arise in their model, where retained earnings followed by safe debt, risky debt and as a last resort equity are used in that order to finance the operations[5]. Consistent with Myers and Majluf (1984) one can argue that leasing, being similar to secured debt, should also mitigate the adverse selection problem. However, relative to secured debt, leased capital induces moral hazard because the salvage value of the leased asset accrues to the lessor in case of operating leases. This leaves the lessee with little or no incentive to maintain the asset in order to preserve its salvage value. Lessors do recognize the issues of moral hazard and include various provisions in the lease contract such as penalty clauses and metered lease payments to reduce abuse of the leased asset. Also, for argument sake, consider that a firm has leased important capital equipment that is used in a production process. If the lessee does not take care or maintain the equipment properly, because it is leased, the loss in production due to the machine downtime can be a lot costlier than what it costs to properly maintain the equipment. Gilligan (2004) argues further that leasing may reduce adverse selection in durable goods markets by increasing the average quality of used goods offered for sale. Johnson and Waldman (2003) argue that the main return to leasing is the reduction in adverse-selection problem in the used-car market. Hendel and Lizzeri (2002) explore the link between adverse selection and leasing and argue that lower adverse selection may account for the higher turnover and slower price declines of off-lease vehicles relative to new vehicles purchased initially. The above evidence suggests that moral hazard is not really a critical issue in leasing practice.

Barclay and Smith (1995), in their study of the priority structure of corporate liabilities, argue that by financing via true lease the firm puts the lease obligation on par with other administrative expenses that have higher priority than normal debt[6]. This makes leasing a highly desirable financial contract in the presence asymmetric information as it puts leasing at the top of the pecking order of external financing choices. Sharpe and Nguyen (1995) argue that financing

[4] For a comprehensive review of the various capital structure theories please refer Harris and Raviv (1991). Graham and Harvey (2001) offers evidence on how the actual capital structure decisions are made in corporations based on a comprehensive survey of CFOs.

[5] Fama and French (2005) argue that while adverse selection is very important element in the choice of external security issuance other factors such as taxes and transaction costs can also lead to pecking order.

[6] Leases are classified into operating and capital leases as per accounting classification. An operating lease is considered as a true lease based on tax classification.

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with a lease may reduce the cost of external funds that arise due to asymmetric information or from agency problems that give rise to costly monitoring. I use the costly external financing argument as firms with high information asymmetry should deploy more capital that is less sensitive to information asymmetry (in this case lease and debt) as per pecking order[7]. But the driving force behind pecking order is information asymmetry and the effect of information asymmetry on leverage is what I would like to test. Accordingly, I posit the following hypothesis:

Firms with high information asymmetry should use more capital that is less sensitive to information asymmetry. Hence information asymmetry should have a positive impact on the amount of debt and operating lease adjusted debt as a fraction of total assets deployed by a firm.

Trade-off Theory:

In the trade-off model, firms identify their optimal leverage by weighing the marginal costs and benefits of issuing an additional dollar of debt. The benefits of debt include the tax deductibility of interest and the reduction of *free-cash flow* problems. The costs of debt include bankruptcy/financial distress costs and agency costs due to conflicts between bondholders and shareholders. Hence an optimal capital structure results as a trade-off between these costs and benefits. Krishnan and Moyer (1994) argue that there is a trade-off between the potential benefits and the contracting costs of leasing[8]. However, as the cost of bankruptcy increases, leasing becomes an attractive financing option. By explicitly recognizing the role of bankruptcy costs, Krishnan and Moyer (1994) offer empirical evidence that leasing has lower associated bankruptcy costs relative to secured debt and thus a preferred financing choice for firms with higher probability of financial distress or bankruptcy. However, is lease capital superior to secured debt outside bankruptcy states? Barclay and Smith (1995) argue that even prior to bankruptcy, lessors enjoy a superior claim over secured lenders. For example, if a lessee defaults on the terms of the lease, the lessor can seize the leased asset with minimum legal costs avoiding any losses and delays that may arise from, costly and lengthy, bankruptcy and reorganization process.

Since both debt and lease financing are fixed-claim obligations trade-off theory predicts that they are substitutes. Also, based on agency story of trade-off theory, debt and lease financing are substitutes for controlling Jensen (1986) free cash flow problem. This leads to the question whether firms exhaust their lease capacity before issuing secured debt? A brief explanation follows: In case of debt financing the borrowing firm gets cash which it can use for various purposes (capital expenditures, repaying existing debt, paying dividends, leverage buyouts etc.) However, in case of lease financing the lessee gets a capital good which is exclusively meant for a specific use. Therefore, lease financing has only the capital expenditure feature but none of the other uses mentioned above are possible. Also, it is argued in the literature that firms with very unique/specific assets may want to buy them either through secured debt or equity. It turns out that unique assets are less liquid compared to other non-unique assets when the lessor tries to re-

[7] While interesting and important, examining the role of leasing on cost of capital is beyond the scope of this paper.

[8] The presence of early cancellation option and option to purchase at the end of operating lease contract can make valuing the lease contract more difficult compared to a secured debt contract. Giaccotto et al. (2007) offer empirical evidence on the value of embedded options in consumer automobile lease contracts.

lease or resell the leased assets. Hence there may not be an efficient secondary market for such unique assets and accordingly limiting the ability to lease such assets in the first place. Further, as argued in the literature, as part of corporate strategy firms may want to buy strategic assets, either through secured debt or equity, rather than lease them.

II. Data Collection and Variables Measurement

I collect the data from flow of funds statements which is available from the year 1971 to test the pecking order theory. However, the data on operating lease i.e. rental commitments is available in COMPUSTAT from only 1974. Hence my data period starts in 1974 and ends in 2006. I follow Frank and Goyal (2003) to produce consistent time series of variables by merging the different format codes to a common format. Following the standard practice in leasing and capital structure literature, I exclude financial firms, regulated utilities and firms involved in major mergers (Compustat footnote code AB). Also excluded are firms with missing book value of assets and a small number of firms that reported format codes 4, 5, or 6[9]. Consistent with Sharpe et al. (1995), I also exclude those firms where leasing is a mainline of business viz. auto repair, computer rental and leasing. The variables are trimmed to remove the most extreme 0.50% in either tail of the distribution. This serves to remove outliers and most misrecorded data.

Book debt ratio (BDR) is the ratio of book value of total debt (Data 9 + Data 34) to book value of lease adjusted total assets viz. [book assets (Data 6) +rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Past studies on leasing (Lim, Mann and Mihov(2005), Yan(2006), Beattie et al. (2000) and Graham, Lemmon and Schallheim (1998)) use 10% as the typical discount rate. Hence, I also use 10% as the discount rate in computing the present value of rental commitments and the thereafter portion. Market debt ratio (MDR) is ratio of book value of total debt to market value of lease adjusted total assets i.e. [Total assets (Data6) – Book equity (Data60) + Market equity (Data25 *Data199)+ rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Book operating lease ratio (BOLR) is ratio of (rental expense + present value of future rental commitments for the next 5 years and present value of thereafter portion) to book value of lease adjusted total assets. Market operating lease ratio (BOLR) is ratio of (rental expense + present value of future rental commitments for the next 5 years and present value of thereafter portion) to market value of lease adjusted total assets. By considering only the long-term debt and ignoring the leases, the true leverage ratio is underestimated[10]. Hence most previous studies on capital structure that try to explain the corporate debt ratios suffer from this measurement error. While measurement error in the dependent variable does not cause bias, it does inflate the residuals and standard errors, making inference more difficult. Hence, I use a comprehensive measure of leverage viz. operating lease adjusted debt ratio and use it in testing the main driving force, i.e. information asymmetry,

[9] Compustat does not define format codes 4 and 6. Format code 5 is for the Canadian file.

[10] Please note that long-term debt already includes capital leases but excludes off-balance sheet operating leases. However, operating leases are substantially larger in magnitude compared to capital leases during the sample period.

behind pecking order theory. Book operating lease adjusted debt ratio(BOLADR) is the ratio of book value of operating lease adjusted debt i.e. (total debt + rental expenses+ present values of rental commitments and thereafter portion) to book value of operating lease adjusted total assets viz. (total book assets+ rental expenses+ present values of rental commitments and thereafter portion). Market operating lease adjusted debt ratio (MOLADR) is the ratio of book value of operating lease adjusted debt to market value of operating lease adjusted total assets. Lease adjusted tangibility (LAT) is ratio of (net PPE +rental expenses+ present values of rental commitments and thereafter portion) to book value of lease adjusted total assets. Lease adjusted Q (LAQ) is the ratio of market value of lease adjusted total assets to lease adjusted book value of total assets. Lease adjusted profitability (LAP) is ratio of (operating income + rental expenses) to lease adjusted total assets. Size is measured as natural logarithm of net sales i.e. ln(Data 12)[11]. Financing deficit is defined as the difference between uses of funds i.e. (cash dividends, investments, and change in working capital) and sources of funds divided by lease adjusted total assets. Sales growth is change in net Sales (Data 12) divided by beginning of period net Sales.

Based on extensive literature survey, Bharath et al. (2008) argue that the adverse selection is an important determinant of market liquidity, when liquidity is proxied by either bid-ask spread or trading volume.[12] Hence, I use a market microstructure measure of stock illiquidity viz. "ILLIQ", measured as the average ratio of monthly absolute return to the dollar trading volume on that month as per Amihud (2002), to proxy for information asymmetry (IA)[13]. A complete list of variable definitions is available in Appendix-1.

Table-I provides the descriptive statistics of the key explanatory variables along with the dependent variables viz. debt ratio and operating lease adjusted debt ratio. In the final sample the average book debt ratio(BDR) is 24.15% and median debt ratio is 21.36%. However, after accounting for operating leases, the mean operating lease adjusted debt ratio (BOLADR) is 31.73% whereas the median ratio is 29.12%. Hence, ignoring the off-balance sheet operating leases significantly understates the actual leverage ratios of corporations. The corresponding market value lease adjusted debt ratio (MOLADR) has a mean of 23.93% and median of 19.67% respectively. The lease adjusted Q (LAQ) ratio has a range of 0.5152 to 17.87 with a standard deviation of 1.981. The lease adjusted profitability (LAP) has a mean of 9.24% and median of

[11] Using the standard measure of size i.e. ln(total assets) is inappropriate here because of endogeneity. In particular, all else equal, firms that lease more will have a lower level of book assets.

[12] Firm managers constitute a subset of the informed traders who in turn are a subset of all traders (both informed and uniformed) in the market. Further they note that the market microstructure measures of information asymmetry are proxies for this adverse selection, albeit imperfect ones since they also encompass informed traders who are not firm managers. Nonetheless, these proxies capture the financial markets' perception of the information advantage held by firm insiders and the resulting adverse selection costs, which are what ultimately affects the cost of issuing information-sensitive securities.

[13] $\boldsymbol{ILLIQ_{iy}} = \frac{1}{M_{iy}} * \sum_{t=1}^{M_{iy}} |\boldsymbol{R_{iym}}| \big/ \boldsymbol{VOLD_{iym}}$

where M_{iy} is the number of months for which data are available for stock *i* in year *y*. R_{iym} is the return on stock *i* in month *m* of year *y* and $VOLD_{iym}$ is the respective monthly dollar volume. The stock price changes without trading when investors agree about the implication of news, while disagreement induces increase in trading volume. Thus, Amihud (2002) argues that ILLIQ can be interpreted as a measure of consensus belief among investors about new information. However, at any point in time, stock liquidity is very likely to be driven by adverse selection but not exclusively so because of inventory and order processing costs. Hence, as a robustness check, I use yearly average of monthly closing bid-ask spread from **CRSP** as an alternative measure for information asymmetry and define $\boldsymbol{BASPREAD_{iy}} = \mathbf{(Ask_{iy}-Bid_{iy})/[(Ask_{iy}+Bid_{iy})/2]}$

12.9%. Lease adjusted tangibility (LAT) has a mean of 0.3843 and median of 0.3349. Firm size has a mean of 10.37 and median of 18.91. The mean and median values for illiquidity (ILLIQ) are 0.0011 and 0.0001 respectively. Bid-Ask spread has a mean of 0.2965 and a median of 0.224. The credit rating dummy (CR) has a mean of 0.7887 and a median of 1. Debt Capacity (DC) has a mean of 0.10 and median of 0.54. Financial deficit (DEF) has a minimum of -8.25 and a maximum of 3.09 with a standard deviation of 0.22. Large tax loss carry forward (LTLCF) dummy has a mean of 0.44 and a median of 0. Marginal tax rate (MTR) before interest deductions has a mean of 28.68% and median of 32.98%.

The sample distribution of key dependent variables by year is reported in Table-II discussed briefly here. The number of firms in COMPUSTAT that utilized operating leases has increased from a low 748 firms in the year 1974 to a high 2200 firms in the year 2000. The average book operating lease ratio has also gone up from a low 5.8% in 1974 to a maximum of 16.1% in 2002. Also, the average book debt ratio has gone down from a maximum of 26.23% in 1974 to a minimum of 20.74% in 2006 indicating the growing popularity of lease financing as an alternative to debt financing during the sample period of 1974-2006.

The pairwise correlations among the key variables along with the p-values for significance are reported in Table-III and briefly discussed here. The book debt ratio (BDR) is significantly and positively correlated to book operating lease ratio (BOLR) The book debt ratio (BDR) is significantly and positively correlated to book operating lease ratio (BOLR) suggesting a complementary relation between debt and leases[14]. Both illiquidity (ILLIQ) and bid-ask spread are positively and significantly correlated to both book operating lease adjusted debt ratio(BOLADR) and market operating lease adjusted debt ratio(MOLADR).

III. Empirical Models, Estimation and Results

3.1. Testing Pecking Order theory in presence of leasing

Tests of the pecking order theory have focused on the main prediction of the model, viz. the **type of securities that firms issue** to cover financing deficits. Papers in this vein include Shyam-Sunder and Myers (1999), Fama and French (2002), and Frank and Goyal (2003). Though Shyam-Sunder and Myers (1999) conclude that the pecking order offers a good approximation to financing behavior, their inference is challenged by Fama and French (2002) and Frank and Goyal (2003). Lemmon and Zender (2010) counter this challenge by arguing that, in testing the pecking order theory, one must account for the value of maintaining financial slack for future investment and to avoid financial distress. After controlling for these considerations, Lemmon and Zender (2010) show that the pecking order still offers a reasonable description of firms' financing behavior. Yet, Leary and Roberts (2010) incorporate financial slack in their explicit analysis of the hierarchy of financing decisions and do not find support for the pecking order theory. In short, the existing evidence so far on the pecking order is mixed at best.

Another route for the test of the pecking order theory concerns the model's predictions about **capital structure**. Titman and Wessels (1988), Rajan and Zingales (1995), Shyam-Sunder and

[14] However, after controlling for other variables I find the substitution relation between the two.

Myers (1999), and Fama and French (2002) are important examples of this line of research. Shyam-Sunder and Myers (1999) estimate a model of the amount of debt issued on financing deficit and predict that the coefficient on financing deficit should equal to one if the pecking order theory holds good. However, Chirinko and Singha (2000) question that interpretation and show that if firms follow a policy of using debt and equity in fixed proportions, the regression will identify this ratio. Hence, finding a coefficient close to (or far from) one cannot be construed as supporting (or refuting) the pecking order theory. Regardless of this debate, most existing tests on the pecking order do not examine a key assumption of that theory: the extent of information asymmetry problems plaguing firms' external funding and further ignore the possibility of leased capital as an alternative source of capital[15]. Thus, it is of interest to examine empirically the main assumption of the pecking order theory viz. **information asymmetry** within an alternative empirical leverage specifications adjusted for leases.

Rajan and Zingales (1995) survey the extant literature on factors driving leverage and provide the key implications into a simple model relating the cross-section of firm leverage – defined as the ratio of total debt to either book value or market value of assets to such conventional firm characteristics as size, tangibility, profitability, and market-to-book assets ratio. Frank and Goyal (2003), Chang, Dasgupta and Hilary (2006) and Bharath et al. (2009) among several other researchers use their specification in the tests of capital structure but ignore leases from the analysis. I modify Bharath et al. (2009) model to include leasing in the following fixed-effects regression, as specified in equation-1 below, and examine the effect of information asymmetry on the level of operating lease adjusted debt ratio.

$$BOLADR_{it} = a_0 + a_1 * IA_{it-1} + a_2 * LAT_{it-1} + a_3 * LAQ_{it-1} + a_4 * LAP_{it-1} + a_5 * Size_{it-1} + \textit{Industry and Year fixed effects} + \varepsilon_{it} \quad \text{------} \quad (1)$$

The main test variable is information asymmetry. Including the conventional explanatory variables identified in Rajan and Zingales(1995) as controls in the above model offers a tough test for pecking order theory. I correct for time-series dependence among the error terms by clustering the residuals based on firm id (gvkey). Also, the included time dummies should remove any cross-sectional dependence between observations in the same time period[16]. I use these heteroskedasticity and cluster robust standard errors for inference.

The estimation results are reported in table-IV and discussed here. Consider model-1. As expected the coefficient on information asymmetry proxied by illiquidity is positive and significant even after controlling for other conventional variables that are found, in the past literature, to explain the capital structure. This supports the main assumption of pecking order theory that information asymmetry is a key driver of the corporate financing. Also, in model-2, where only the book debt ratio ignoring leasing is used as the dependent variable the coefficient on information asymmetry proxied by ILLIQ is positive and significant. Also, the size of the coefficient on information asymmetry is larger in case of operating lease adjusted debt ratio vs. debt ratio. This suggests that by ignoring leasing in measuring leverage underestimates the

[15] An exception is Bharath et al. (2009). However, they completely ignore leasing while testing pecking order.

[16] Please refer Petersen (2009) for a comprehensive comparison of different approaches used in estimating standard errors in financial panel data sets and the implications for inference.

impact of information asymmetry on leverage ratio[17]. The coefficient on lease adjusted market-to-book ratio (LAQ) is negative as expected and significant. This follows because firms with high market-to-book ratios are often thought to have more future growth opportunities. Further, Barclay et al. (2001) present a model showing that the debt capacity of growth options can be negative. Hence firms with high growth opportunities may want to preserve their unused debt capacity to seize potential investment opportunities when they appear. The coefficient on lease adjusted profitability (LAP) is negative and significant. This consistent with the evidence by Titman and Wessels (1988) and Fama and French (2002) that profits and leverage are negatively correlated. Also, more profitable firms may want to buy their assets than lease them[18]. The coefficient on lease adjusted tangibility (LAT) is positive and significant. This follows because tangible assets naturally serve as collateral. Hence, collateral is associated with increased leverage. The coefficient on firm size is positive and significant. Large firms are usually more diversified, have better reputations, and face lower information costs when borrowing. Therefore, large firms are predicted to have more leverage in their capital structure. I obtain similar results by using market ratios for the lease adjusted debt ratio as reported in model 3 and 4 in table-IV. Since operating lease adjusted debt ratio is a continuous variable but censored at zero, I reestimate the model using panel TOBIT[19] as a robustness check. The results are very similar to those obtained by OLS and reported in table-V.

However, pecking order is intended to explain the change in leverage rather than the level. Hence, I also reestimate the equation-1 by OLS using change in variables. I further include lagged leverage to account for the evidence of mean reversion in leverage in the literature (e.g., Taggart, 1977; Marsh, 1982). The estimation results are reported in table-VI and discussed briefly here. The coefficient on information asymmetry proxied by illiquidity and bid-ask spread is positive and significant. This is consistent with the results obtained by Bharath et al. (2009) using just debt as a measure of leverage. Also, the coefficient on lagged leverage is negative and significant supporting the mean reversion of leverage ratio. The estimated coefficients on other variables are significant and have expected signs.

3.2. Leases and Debt: Substitutes or Complements?

There is a considerable debate in literature whether debt and lease substitute or complement one another. Leases and debt are substitutes according to trade-off theory of capital structure. Since both debt and lease financing are fixed-claim obligations trade-off theory predicts that they are substitutes. Also, based on agency story of trade-off theory, debt and lease financing are substitutes for controlling Jensen (1986) free cash flow problem. The substitution relation can also be obtained due to pecking order theory. As argued by Sharpe and Nguyen (1995) that financing with a lease may reduce the cost of external funds that arise due to asymmetric information that give rise to costly monitoring. Bowman (1980), Ang and Peterson (1984),

[17] However, the difference in the magnitude of the coefficients is not statistically significant.

[18] The tradeoff theory predicts that profitable firms should be more highly levered, as long as there are no distress concerns, to offset corporate taxes.

[19] The Tobit estimates are obtained by maximizing the unconditional log likelihood function. Please note that it is not possible to use conditional maximum likelihood procedure to consistently estimate a fixed effects Tobit model for a fixed **T** because no sufficient statistic exists for unobserved individual firm heterogeneity.

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Lewis and Schallheim (1992) found that leasing and debt financing are positively related i.e. complement each other. However, Mukherjee (1991), Krishnan and Moyer (1994), and Beattie, Goodacre, and Thomson (2000) found evidence of substitution relationship.

Ang and Peterson(1984) conclude the following: "*At this point, these findings may be declared as an unsolved puzzle in finance, awaiting future researchers with better data and better methodology (for example, the expression of **debt capacity** as a "fuzzy" band)* [20]." Ang and Peterson (1984) use only capital leases perhaps due to the data constraints in obtaining operating leases. While Yan (2006) is the closest to the spirit of my analysis, I differ from his analysis in several important ways. First, he excludes thereafter portion of operating leases and his analysis uses data only until 1997. I include thereafter portion of operating leases and collect more and recent data up to year 2006. Second, I comprehensively examine the effect of information asymmetry, debt capacity, credit ratings, financial deficit and research and development (R&D), on the variability of the substitution relation between lease and debt, as these variables are not explored in Yan (2006). A brief explanation of why these variables are important in understanding the debt vs. lease substitute relation follows. As per pecking order theory, information asymmetry is a key driver of corporate financing choices. Hence firms that are highly sensitive to information asymmetry may substitute debt with lease financing whereas that have low information asymmetry may use both of them in conjunction. Eisfeldt and Rampini(2009) argue that leasing has more debt capacity than debt capital because of the superior repossession ability of the lessor. Hence for firms with low debt capacity lease financing may be the only option and they may substitute debt with lease financing. However, for firms with high debt capacity one can expect a complementary relation between debt and lease financing. Firms with credit ratings can access the capital markets more readily than firms with no ratings. Hence I expect a substitute relation between debt and leasing for firms with no ratings. However, firms with credit ratings may complement debt financing with leasing. Firms with high financial deficit may not be able to issue additional debt and hence they may substitute debt with leasing. However, for firms with financial surplus, they may complement debt with leasing. Typically the PPE used in R&D is unique or specific to a firm. Hence a firm with high R&D may prefer to buy the assets than lease them and accordingly replace leasing with debt. For firms with low R&D we can expect a complementary relation between debt and leases. Finally, I recognize the simultaneity between debt and leases and model them using simultaneous equation system. As a base case, I reexamine the lease-debt substitutability relation using equation-2 as under.

$$BDR_{it} = b_0 + b_1 * BOLR_{it-1} + b_2 * LAQ_{it-1} + b_3 * LAP_{it-1} + b_4 * LAT_{it-1} + b_5 * Size_{it-1} + \text{Industry and Year fixed effects} + \varepsilon_{it} \quad \text{------ (2)}$$

I correct for time-series dependence among the error terms by clustering the residuals based on firm id (gvkey). Also, the included time dummies should remove any cross-sectional dependence between observations in the same time period. I lag the independent variables in equation-2 above to mitigate any spurious relation between the explained variable and the

[20] Debt Capacity defined on page 15.

explanatory variables. The estimation results, using three different estimation techniques viz. OLS, Tobit and Fama-MacBeth(1973), are reported in table-VII and a brief discussion follows[21].

The coefficients on both book operating lease ratio and market operating lease ratio are negative and highly significant in all the models. This suggests a substitute relation between debt and leases. Now I examine the economic significance of this result. Consider model-5. A one standard deviation increase in book lease ratio decreases the book debt ratio from its mean by 2.35%. This appears substantial considering that the mean debt ratio is 24.15%. The other variables have expected signs and significant.

Since I obtained a substitute relation between debt and lease that was robust to different measures of the variables and different estimation techniques, I further comprehensively examine the effect of information frictions, debt capacity, credit ratings, financial deficit and research and development (R&D) expenditures, on the variability of the substitution relation between lease and debt, as these variables are not explored in the past literature. A description of these variables that are not yet defined follows. Following Almeida and Campello (2007), I define *debt capacity = (cash holdings + 0.715 × receivables + 0.547 × inventory + 0.535 × net PPE)/ lease adjusted total assets.* In Compustat the long-term credit ratings variable (Data 280) is populated for about 22% of the firm-year observations for the 1974-2006 time period used in this study. Hence, consistent with past studies, I code this as a dummy variable equal to 1 if data is not available else 0. R&D expenditures (Data 46) is available for about 58% of firm-year observations. Hence I code it as dummy equal to 1 if data is available else zero. The results based on book values are reported in table-VIII and discussed briefly here.

Credit ratings:

The substitution relation holds good for firms that have credit ratings as well as that do not have credit ratings. However, the substitution relation is much stronger and more significant for firms without credit ratings. The credit rating dummy might also proxy for the firms' ability to access capital markets and thus one can argue that on average the firms with credit rating may be less financially constrained than those without credit rating. Accordingly, firms without credit ratings tend to lease more as they may have difficulty in accessing the debt markets.

Information Asymmetry:

The coefficient on lease ratio is negative for both low illiquidity (quartile1) and high illiquidity(quartile 4) firms suggesting a substitution relation. However, the coefficient is significant only for firms with high illiquidity. This is expected because firms that have high information asymmetry tend to lease more as per Sharpe and Ngyuen(1995) as firms with high information frictions might have difficulty in obtaining debt capital compared to leased capital. However, when I use bid-ask spread as an alternative proxy for information asymmetry, I obtained substitution relation that is significant for both high and low information asymmetry

[21] In an unreported analysis, I examine the effect of financial distress, proxied by modified Altman's Z-score (MZ), on the lease, debt substitute vs. complement relation. I find that the substitution relation holds good for firms with high probability of bankruptcy (low MZ) and low probability of bankruptcy (high MZ).

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firms. But, as expected, the substitution relation is slightly stronger for firms with high bid-ask spread compared to firms with low bid-ask spread.

Debt Capacity

I obtain substitution relation for firms with low(quartile1) as well as high debt capacity(quartile4). However, the substitution relation is stronger for firms with low debt capacity. This consistent with the argument by Eisfeldt and Rampini (2009) that firms with low debt capacity tend to lease more.

Dividends:

I obtain substitution relation for firms that pay dividends and that do not pay dividends. A typical argument in finance literature is that financially constrained firms do not pay dividends. However the substitution relation is much stronger for non dividend paying forms compared to dividend paying firms. This is consistent with the argument by Eisfeldt and Rampini (2009) that financially constrained firms lease more.

Financial deficit:

I obtain substitute relation for firms with financial deficit as well as for firms with financial surplus. However, the relation is much stronger for firms with financial surplus. A possible explanation for this could be that firms with surplus funds may prefer to buy rather than lease their assets.

Research and Development (R&D):

Finally, I again obtain substitute relation between debt and leases for firms with R&D expenditures as well as no R&D. However, the relation is much weaker for firms with R&D expenditures. A possible reason is that R&D can serve as a proxy for asset specificity or uniqueness. As documented by Eisfeldt and Rampini(2009) firms with R&D expenditures tend to buy their unique assets rather than lease them. Hence the substitution relation is less for firms with R&D. I obtain very similar results, reported in table-IX, by using market ratios instead and the debt-lease substitution result holds good.

One can argue that the test variable leasing, in the regression models above, is an endogenous choice variable to a firm[22]. Accordingly, I use one period lagged leasing variable for estimation. However, this may not be very effective if leasing is autocorrelated. Hence, I further address the endogeneity issue by using instrumental variables(IV) with generalized method of moments(GMM) estimation and simultaneous equation modeling of lease and debt with three-stage least squares (3SLS) estimation in robustness checks, in section-IV, below.

[22] Wooldridge (2002) argues that in applied econometrics, endogeneity usually arises in three ways viz. omitted variables, measurement error, and simultaneity. He mentions that the distinctions among the three forms are not always sharp and an equation can in fact have more than one source of endogeneity at any given point in time. The use of lagged dependent variables in dynamic models could be yet another source of endogeneity.

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IV. Robustness Checks

4.1 Insrumental Variable Regressions

I estimate equation-2 again using instrumental variable approach. My first instrument is the three period lagged Lease leverage. Similar to the debt leverage, lease leverage should have a high degree of mean reversion[23]. The second instrument, the lagged median lease leverage for the firm's industry, is constructed by computing yearly leverage medians. The lagged values further ensure that the instrument is independent of the error term while being highly correlated with the lease leverage ratio. I overidentify the system, by including more than one instrument for the endogenous variable, as it is a necessary condition to test instrument exogeneity. I use book (market) values of the variables to instrument for the market (book) values of the endogenous variables to avoid inducing a pure mechanical relation between the instruments and leverage variables. The estimation is carried out using two-step *generalized method of moments(GMM)*. This estimator also produces both heteroskedasticity and autocorrelation consistent (HAC) estimates of both the slope coefficients and the corresponding standard errors.

The estimation results for the second stage regression are reported in table-X and discussed briefly here. The coefficient on operating lease ratio is negative and highly significant suggesting a substitute relation between debt and leases. The coefficients on other variables are significant and have the expected signs. Instrument validity is checked through Hansen's *J* statistic for overidentification. The *J* statistic has a p-value of 0.35 thus failing to reject the null hypothesis that instruments are valid. I further check the relevance of instruments through a test of week instruments. The partial R^2 and Shea's (1997) partial R^2 both have a value of 0.56 and an F-statistic of 5719.21 with a p-value equal to zero.[24] This further mitigates the concern whether instruments are weakly correlated with the endogenous regressors. I obtain similar results by using market leverage ratios and the results are reported in table-X.

4.2 Simultaneous Equation Modeling

One can argue that the decision of how much of debt and lease financing to be used in a firm's capital structure is jointly made i.e. codetermined. To address the simultaneity issue of debt and leasing in equation-2, I model the debt and leasing decisions as a simultaneous equation system and use *three-stage least squares (3SLS)* as estimation technique. In the absence of any clear structural models that address this simultaneity issue in the past finance literature, I posit the following specification:

[23] Studies employing dynamic capital structure models, such as partial-adjustment models, consistently document a significant relation between debt leverage levels and change in debt leverage. Please see Flannery and Rangan (2006) for example.

[24] The partial R^2 gives the marginal R^2 for the excluded instruments in each regression, and the "Shea" R^2 is a type of partial R^2 that accounts for the correlations among the instruments. While there is no formal test for identification of multiple instruments, Baum, Schaffer, and Stillman (2003) recommend "as a rule of thumb, if an estimated equation yields a large value of the standard partial R^2 and small value of the Shea measure, one may conclude that the instruments lack sufficient relevance to explain all the endogenous regressors, and the model may be essentially unidentified." Another rule of thumb as per Staiger and Stock (1997) is that for one endogenous regressor an *F* statistic less than 10 is a cause of concern.

Debt Equation:

$$BDR_{it} = a_0 + a_1 * BOLR_{it} + a_2 * LAQ_{it-1} + a_3 * LAP_{it-1} + a_4 * LAT_{it-1} + a_5 * Size_{it-1} + a_6 * IA_{it-1} + a_7 * CR_{it-1} + a_8 * SG_{it-1} + \text{Industry and Year fixed effects} + \varepsilon_{it} \quad \text{------ (2a)}$$

Lease Equation:

$$BOLR_{it} = b_0 + b_1 * BDR_{it} + b_2 * LAQ_{it-1} + b_3 * LAP_{it-1} + b_4 * LAT_{it-1} + b_5 * Size_{it-1} + b_6 * IA_{it-1} + b_7 * LTLCF_{it-1} + b_8 * MTR_{it-1} + \text{Industry and year fixed effects} + \mu_{it} \quad \text{------- (3)}$$

I exclude credit ratings and sales growth rate from the leasing equation and marginal tax rate (MTR) and tax loss carryforwards (LTLCF) from debt equation[25]. The structure of the exclusion restrictions ensures that the system is identified. The results of the last stage regressions, using book ratios, are reported in table-XI and discussed briefly here[26]. The coefficient on predicted operating lease ratio in debt equation is negative and significant suggesting the substitute relation. Similarly the coefficient on predicted debt ratio in lease equation is negative and significant suggesting the substitute relation. The coefficient on Q is negative and significant in both debt and lease equations suggesting that firms with high growth opportunities should employ less leverage. The coefficient on profitability is negative and significant in both debt and lease equations. More profitable firms might prefer to buy their assets than lease them. However, the negative sign on profitability in debt equation is not consistent with the prediction of trade-off theory that profitable firms should employ more debt to utilize debt tax shields as long as distress is not a concern. The coefficient on tangibility is positive and significant in both debt and lease equations. This follows because tangible assets serve as collateral for fixed-claim financing. The coefficient on firm size is positive and significant in case of debt equation. However in case of lease equation the coefficient on size is negative but not significant. The coefficient on sales growth is positive but insignificant in debt equation.

The coefficient on bid-ask spread is positive and significant in case of both debt and lease equations. This is consistent with pecking order theory as both debt and lease are least sensitive to information asymmetry and accordingly firms with high information asymmetry use more debt and lease leverage. The coefficient on credit ratings is negative and significant in case of debt equation where as it is positive and significant in case of lease financing. This is expected because firms with no credit ratings may have less ability to issue more debt where as firms with no credit ratings typically deploy more lease financing as documented in Sharpe and Ngyuen (1995). The coefficient on marginal tax rate is negative and significant consistent with the past evidence by Graham et al. (1998). This is expected because firms in high marginal tax bracket may prefer to borrow and buy the assets than lease them. As expected the coefficient on debt capacity in leasing equation is negative but not significant. The coefficient on tax loss carryforwards in the lease equation is positive and significant. This is expected because firms

[25] The Marginal Tax Rate database was created by Jennifer Blouin, John Core and Wayne Guay (2010) using Compustat data and available for the period of1980-2007 from the marginal tax database through WRDS. LTLCF is large tax loss carryforwards, a dummy equal to 1 if firm has a positive tax-loss-carry-forward exceeding current year EBITDA else 0.

[26] In an unreported analysis, I also estimate the system with market ratios and the results are qualitatively similar and available upon request.

with significant tax-loss carryforwards will be unable to take full advantage of tax benefits of asset ownership, hence they should lease more.

V. Conclusions

This paper contributes to two related strands of corporate finance literature viz. capital structure and debt, lease substitute vs. complement debate. The extant literature on capital structure tests so far excludes operating leases from the analysis. I construct a comprehensive measure of leverage accounting for the off-balance sheet operating leases. Using this operating lease adjusted debt ratio and market microstructure based measures for information asymmetry, I test the main prediction of pecking order theory that information asymmetry is a key driver of corporate financing choices. I use the data on manufacturing companies in COMPUSTAT for the period of 1974-2006. I find that information asymmetry proxied by either illiquidity or bid-ask spread is positively and significantly related to the operating lease adjusted debt ratio even after controlling for other conventional variables, identified by Rajan and Zingales (1995), that are found to explain capital structure**.** This result is robust to alternative ways of measuring variables and different estimation techniques. The implication of this result is that off-balance sheet operating lease finance is a very important source of capital besides debt and equity and it should be included in measuring the leverage while testing capital structure theories.

Further, I find a substitute relation between debt and leases in the base case model. I find this relation robust to alternative measurements and three different estimation techniques. I comprehensively reexamine this substitution relation across several dimensions viz. credit ratings, information asymmetry, debt capacity, R&D, dividends and financial deficit. I consistently find a substitute relation between debt and leases in the sample firms. Lastly, I find that the substitution relation is robust even after correcting endogeneity through instrumental variables and simultaneous equation modeling of debt and leases. This evidence should hopefully tilt, the yet to be settled, debt-lease substitute vs. complement debate towards the former.

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Table-I
Descriptive Statistics – Full Sample for the period of 1974-2006

Book Debt Ratio (BDR) is total debt (Data 9 + Data 34) to book value of lease adjusted total assets viz. [book assets (Data 6) + rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Book Operating Lease Ratio (BOLR) is rental expenses plus present values of future rental commitments and thereafter portion scaled by lease adjusted total assets. Book Operating lease adjusted debt ratio (BOLADR) is ratio of book value of operating lease adjusted debt i.e. (total debt + rental expenses+ present values of rental commitments and present value of thereafter portion) to book value of operating lease adjusted total assets. Market Debt Ratio (MDR) is total debt (Data 9 + Data 34) to market value of lease adjusted total assets viz. [Total assets (Data6) – Book equity (Data60) + Market equity (Data25 *Data199)+ rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Market Operating Lease Ratio (MOLR) is (rental expenses plus present value of future rental commitments and present value of thereafter portion) scaled by market value of lease adjusted total assets. Market Operating lease adjusted debt ratio (MOLADR) is ratio of operating lease adjusted debt to market value of operating lease adjusted total assets. Lease adjusted Q (LAQ) is the ratio of market value of lease adjusted total assets to lease adjusted book value of total assets. Lease adjusted profitability (LAP) is ratio of (operating income + rental expenses) to lease adjusted total assets. Lease adjusted tangibility (LAT) is ratio of (net PPE +rental expenses+ present values of rental commitments and thereafter portion) to book value of lease adjusted total assets. SIZE is measured as ln(Sales). Illiquidity (ILLIQ), a proxy for information asymmetry, is measured as the yearly average ratio of monthly absolute return to the dollar trading volume on that month as per Amihud (2002). Bid-Ask spread (BASPREAD) is the yearly average of difference between monthly closing bid and ask prices reported as a percentage of midpoint of bid ask quotes. CR is a credit rating dummy for unrated firms and it is equal to 1 if rating is not available else 0. DC is debt capacity computed as (cash holdings + 0.715 × receivables + 0.547 × inventory + 0.535 × PPE)/ lease adjusted total assets. Deficit (DEF) is equal to financial deficit scaled by lease adjusted total assets. LTLCF is large tax loss carryforwards, a dummy equal to 1 if firm has a positive tax-loss-carry-forward exceeding current year EBITDA else 0. Marginal Tax Rate (MTR) is the pre-financing marginal tax rate. The number of firm-year observations (N) is also reported in the table

Variable	N	Mean	Std. Dev	Minimum	Quartile1	Median	Quartile3	Maximum
BDR	54,144	0.2415	0.2051	0	0	0.2136	0.3599	0.9972
BOLR	54,145	0.1006	0.1450	0	0	0.0491	0.1183	0.8127
BOLADR	54,145	0.3173	0.2159	0	0	0.2912	0.4456	0.9984
MDR	48,897	0.1786	0.1728	0	0	0.1334	0.2772	0.7527
MOLR	48,897	0.0755	0.1224	0	0	0.0324	0.0830	0.7505
MOLADR	48,897	0.2393	0.1954	0	0	0.1967	0.3559	0.8546
LAQ	48,897	1.9262	1.9810	0.5152	1	1.3440	1.9778	17.8795
LAP	53,870	0.0924	0.2088	-1.3296	0	0.1290	0.1888	0.4749
LAT	53,982	0.3843	0.2265	0.0056	0	0.3349	0.5304	0.9462
SIZE	54,145	18.7762	2.8219	10.3735	17	18.9054	20.8133	25.0869
ILLIQ*100	54,144	0.0011	0.0041	0	0	0.0001	0.0005	0.0398
BASPREAD	37,967	0.2965	0.3044	0.0108	0	0.224	0.4063	2.1818
CR	54,145	0.7887	0.4082	0	1	1	1	1
DC	52,999	0.5366	0.1384	0.1052	0	0.5433	0.6059	0.9446
DEF	13,259	-0.0354	0.2229	-8.2571	0	-0.0224	0.0133	3.0931
LTLCF	54,145	0.4407	0.4965	0	0	0	1	1
MTR	54,145	0.2868	0.1243	0	0.1834	0.3298	0.35	0.51

Table-II

Distribution of Leverage ratio over the period of 1974-2006

Book Debt Ratio (BDR) is total debt (Data 9 + Data 34) to book value of lease adjusted total assets. Book Operating Lease Ratio (BOLR) is (rental expenses plus present values of future rental commitments and present value of thereafter portion) scaled by lease adjusted total assets. Book operating lease adjusted debt ratio (BOLADR) is ratio of book value of operating lease adjusted debt i.e. (total debt + rental expenses+ present values of rental commitments and thereafter portion) to book value of operating lease adjusted total assets. Market Debt Ratio (MDR) is ratio of total debt to market value of lease adjusted total assets. Market Operating Lease Ratio (MOLR) is (rental expenses plus present value of future rental commitments and present value of thereafter portion) scaled by market value of lease adjusted total assets. Market operating lease adjusted debt ratio (MOLADR) is ratio of operating lease adjusted debt to market value of operating lease adjusted total assets. The number of observations (N) is also reported in the table.

Year	AVG. BDR	Median BDR	AVG. BOLR	Median BOLR	AVG. BOLADR	Median BOLADR	AVG. MDR	Median MDR	AVG. MOLR	Median MOLR	AVG. MOLADR	Median MOLADR	Number
1974	0.2767	0.2623	0.0580	0.0349	0.3195	0.3122	0.3161	0.3068	0.0746	0.0436	0.3676	0.3703	748
1975	0.2641	0.2517	0.0613	0.0374	0.3102	0.3017	0.2724	0.2531	0.0680	0.0396	0.3216	0.3064	763
1976	0.2506	0.2303	0.0591	0.0369	0.2963	0.2881	0.2328	0.2070	0.0616	0.0374	0.2796	0.2602	779
1977	0.2526	0.2345	0.0611	0.0375	0.2989	0.2852	0.2367	0.2167	0.0599	0.0377	0.2817	0.2679	780
1978	0.2556	0.2359	0.0587	0.0368	0.3001	0.2840	0.2313	0.2080	0.0524	0.0334	0.2707	0.2490	792
1979	0.2602	0.2397	0.0588	0.0381	0.3042	0.2904	0.2395	0.2188	0.0540	0.0353	0.2802	0.2708	792
1980	0.2499	0.2288	0.0591	0.0352	0.2937	0.2772	0.2064	0.1708	0.0443	0.0260	0.2401	0.2090	928
1981	0.2365	0.2144	0.0557	0.0316	0.2793	0.2604	0.2041	0.1666	0.0461	0.0253	0.2396	0.2143	1,033
1982	0.2408	0.2095	0.0614	0.0363	0.2881	0.2666	0.1957	0.1558	0.0426	0.0244	0.2295	0.2020	1,133
1983	0.2195	0.1872	0.0587	0.0340	0.2658	0.2345	0.1620	0.1193	0.0394	0.0216	0.1947	0.1604	1,214
1984	0.2279	0.1924	0.0647	0.0361	0.2779	0.2487	0.1853	0.1471	0.0465	0.0268	0.2229	0.1897	1,292
1985	0.2386	0.2085	0.0690	0.0381	0.2909	0.2683	0.1741	0.1297	0.0443	0.0244	0.2100	0.1728	1,431
1986	0.2589	0.2264	0.0713	0.0394	0.3121	0.2842	0.1824	0.1448	0.0470	0.0258	0.2207	0.1860	1,586
1987	0.2545	0.2257	0.0694	0.0380	0.3072	0.2829	0.1995	0.1586	0.0545	0.0275	0.2433	0.2079	1,675
1988	0.2574	0.2310	0.0725	0.0399	0.3121	0.2878	0.1945	0.1543	0.0530	0.0273	0.2370	0.2015	1,741
1989	0.2682	0.2392	0.0755	0.0420	0.3235	0.3012	0.1936	0.1503	0.0530	0.0275	0.2360	0.2034	1,835
1990	0.2672	0.2388	0.0791	0.0437	0.3250	0.3039	0.2183	0.1726	0.0641	0.0329	0.2679	0.2258	1,944
1991	0.2527	0.2199	0.0801	0.0448	0.3128	0.2944	0.1826	0.1250	0.0541	0.0269	0.2261	0.1821	2,074
1992	0.2391	0.2070	0.0761	0.0448	0.2974	0.2727	0.1651	0.1097	0.0493	0.0251	0.2054	0.1594	2,095
1993	0.2255	0.1907	0.0742	0.0441	0.2835	0.2596	0.1500	0.1047	0.0476	0.0243	0.1896	0.1524	2,112
1994	0.2233	0.1908	0.0747	0.0414	0.2811	0.2597	0.1541	0.1089	0.0524	0.0260	0.2041	0.1660	2,136
1995	0.2238	0.1981	0.1067	0.0537	0.3056	0.2809	0.1571	0.1088	0.0774	0.0303	0.2205	0.1768	2,135
1996	0.2204	0.1917	0.1050	0.0517	0.3018	0.2687	0.1519	0.1040	0.0752	0.0294	0.2141	0.1634	2,153
1997	0.2288	0.2021	0.1062	0.0526	0.3099	0.2834	0.1507	0.1040	0.0729	0.0289	0.2113	0.1598	2,145
1998	0.2499	0.2216	0.1095	0.0544	0.3320	0.3099	0.1784	0.1337	0.0781	0.0328	0.2416	0.2018	2,153
1999	0.2565	0.2306	0.1255	0.0590	0.3483	0.3277	0.1848	0.1338	0.0910	0.0333	0.2560	0.2063	2,181
2000	0.2555	0.2300	0.1522	0.0755	0.3667	0.3452	0.1976	0.1435	0.1205	0.0478	0.2903	0.2423	2,200
2001	0.2575	0.2302	0.1604	0.0782	0.3744	0.3509	0.1881	0.1388	0.1232	0.0501	0.2842	0.2295	2,180
2002	0.2490	0.2237	0.1610	0.0819	0.3682	0.3424	0.1918	0.1496	0.1324	0.0584	0.2961	0.2538	2,149
2003	0.2322	0.2007	0.1591	0.0817	0.3510	0.3193	0.1609	0.1140	0.1137	0.0464	0.2468	0.1949	2,136
2004	0.2203	0.1851	0.1534	0.0771	0.3367	0.3045	0.1351	0.0959	0.1047	0.0417	0.2233	0.1780	2,106
2005	0.2130	0.1753	0.1533	0.0755	0.3293	0.2879	0.1318	0.0949	0.1071	0.0424	0.2218	0.1725	2,027
2006	0.2074	0.1747	0.1453	0.0682	0.3196	0.2808	0.1279	0.0905	0.1019	0.0402	0.2141	0.1679	1,697

Table-III
Pairwise Correlation coefficients

Book Debt Ratio (BDR) is total debt (Data 9 + Data 34) to book value of lease adjusted total assets viz. [book assets (Data 6) + rental expense (Data 47) + present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Book Operating Lease Ratio (BOLR) is rental expenses plus present values of future rental commitments and thereafter portion scaled by lease adjusted total assets. Book Operating lease adjusted debt ratio (BOLADR) is ratio of book value of operating lease adjusted debt i.e. (total debt + rental expenses+ present values of rental commitments and thereafter portion) to book value of operating lease adjusted total assets. Market Debt Ratio (MDR) is total debt (Data 9 + Data 34) to market value of lease adjusted total assets viz. [Total assets (Data6) – Book equity (Data60) + Market equity (Data25 *Data199)+ rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Market Operating Lease Ratio (MOLR) is (rental expenses plus present value of future rental commitments and present value of thereafter portion) scaled by market value of lease adjusted total assets. Market operating lease adjusted debt ratio (MOLADR) is ratio of operating lease adjusted debt to market value of operating lease adjusted total assets. Illiquidity (ILLIQ), a proxy for information asymmetry, is measured as the yearly average ratio of monthly absolute return to the dollar trading volume on that month as per Amihud (2002). Bid-Ask spread (BASPREAD) is the yearly average of difference between monthly closing bid and ask prices reported as a percentage of midpoint of bid ask quotes. Significant correlations at a significance level of 5% or better are indicated by an asterisk. The p-values for significance level of the correlation are reported below the correlation coefficient.

|	BDR	MDR	BOLR	MOLR	BOLADR	MOLADR	ILLIQ	BASPREAD
BDR	1							
MDR	0.8457*	1						
	0							
BOLR	0.0239*	-0.0417*	1					
	0	0						
MOLR	0.0362*	0.0792*	0.9244*	1				
	0	0	0					
BOLADR	0.8487*	0.6885*	0.5243*	0.5214*	1			
	0	0	0	0				
MOLADR	0.7078*	0.8565*	0.4363*	0.5678*	0.8408*	1		
	0	0	0	0	0			
ILLIQ	0.0107*	0.0066	0.0072	0.0100*	0.0153*	0.0099*	1	
	0.0125	0.1457	0.0928	0.0267	0.0004	0.0285		
BASPREAD	0.0071	0.0280*	0.0369*	0.0281*	0.0106*	0.0102	0.0354*	1
	0.1684	0	0	0	0.0392	0.0585	0	

Table-IV

Conventional Regressions of Lease Adjusted Leverage

Book Operating lease adjusted debt ratio (BOLADR) is ratio of book value of operating lease adjusted debt i.e. (total debt + rental expenses+ present values of rental commitments and thereafter portion) to book value of operating lease adjusted total assets viz. [book assets (Data 6) + rental expense (Data 47) + present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Market Operating lease adjusted debt ratio (MOLADR) is ratio of operating lease adjusted debt to market value of operating lease adjusted total assets viz. [Total assets (Data6) – Book equity (Data60) + Market equity (Data25 *Data199)+ rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Lease adjusted Q (LAQ) is the ratio of market value of lease adjusted total assets to lease adjusted book value of total assets. Lease adjusted profitability (LAP) is ratio of (operating income + rental expenses) to lease adjusted total assets. Lease adjusted tangibility (LAT) is ratio of (net PPE +rental expenses+ present values of rental commitments and thereafter portion) to book value of lease adjusted total assets. SIZE is measured as ln(Sales). Illiquidity (ILLIQ), a proxy for information asymmetry, is measured as the yearly average ratio of monthly absolute return to the dollar trading volume on that month as per Amihud (2002). Bid-Ask spread (BASPREAD) is the yearly average of difference between monthly closing bid and ask prices reported as a percentage of midpoint of bid ask quotes. In all the models both industry and year dummies were included. T-statistics reported below the slope coefficients and indicated in parentheses for significant coefficients. The * indicates significant at 10% , ** significant at 5% and *** significant at 1% respectively. The estimation period is from 1974-2006. The number of firm-year observations and R^2 values for each model are also reported in the table.

		1	2	3	4	5	6	7	8
	Expected Sign	**$BOLADR_{it}$**	**BDR_{it}**	**$BOLADR_{it}$**	**BDR_{it}**	**$MOLADR_{it}$**	**MDR_{it}**	**$MOLADR_{it}$**	**MDR_{it}**
LAQ_{it-1}	-	-0.011	-0.010	-0.011	-0.010	-0.035	-0.024	-0.03	-0.022
		(-25.12)***	(-25.43)***	(-21.08)***	(-21.07)***	(-88.98)***	(-71.30)***	(-74.71)***	(-59.97)***
LAP_{it-1}	-	-0.203	-0.158	-0.197	-0.154	-0.157	-0.113	-0.14	-0.102
		(-42.91)***	(-38.28)***	(-36.73)***	(-33.14)***	(-38.15)***	(-33.68)***	(-30.47)***	(-27.34)***
LAT_{it-1}	+	0.400	0.220	0.400	0.210	0.290	0.160	0.29	0.160
		(84.71)***	(42.77)***	(71.61)***	(35.49)***	(71.24)***	(39.41)***	(59.57)***	(32.60)***
$SIZE_{it-1}$	+	0.010	0.010	0.010	0.010	0.01	0.000	0.009	0.000
		(18.90)***	(20.72)***	(14.48)***	(16.37)***	(11.10)***	(14.00)***	(8.84)***	(11.42)***
$ILLIQ_{it-1}$	+	0.054	0.045			0.049	0.040		
		(2.83)***	(2.22)**			(2.92)***	(2.43)**		
$BASPREAD_{it-1}$	+			0.013	0.01			0.01	0.009
				(1.98)**	(1.78)*			(1.89)*	(1.72)*
Constant		0.280	0.180	0.030	0.200	0.470	0.280	0.20	0.340
		(7.80)***	(4.34)***	0.780	(4.57)***	(14.95)***	(8.19)***	(5.52)***	(9.80)***
Observations		48647	48646	33920	33919	48647	48646	33920	33919
R-squared		0.31	0.14	0.32	0.15	0.38	0.25	0.40	0.26

- [1] illiq - [2] illiq = 0 chi2(1) = 1.71 Prob > chi2 = 0.1906
- [3] baspread - [4]baspread = 0 chi2(1) = 0.02 Prob > chi2 = 0.8849
- [5] illiq - [6]illiq = 0 chi2(1) = 1.63 Prob > chi2 = 0.2016
- [7] baspread - [8] baspread = 0 chi2(1) = 0.32 Prob > chi2 = 0.5694

Table-V

Tobit Regressions of Lease Adjusted Leverage

Book Operating lease adjusted debt ratio (BOLADR) is ratio of book value of operating lease adjusted debt i.e. (total debt + rental expenses+ present values of rental commitments and thereafter portion) to book value of operating lease adjusted total assets viz. [book assets (Data 6) + rental expense (Data 47) + present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Market Operating lease adjusted debt ratio (MOLADR) is ratio of operating lease adjusted debt to market value of operating lease adjusted total assets viz. [Total assets (Data6) – Book equity (Data60) + Market equity (Data25 *Data199)+ rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Lease adjusted Q (LAQ) is the ratio of market value of lease adjusted total assets to lease adjusted book value of total assets. Lease adjusted profitability (LAP) is ratio of (operating income + rental expenses) to lease adjusted total assets. Lease adjusted tangibility (LAT) is ratio of (net PPE +rental expenses+ present values of rental commitments and thereafter portion) to book value of lease adjusted total assets. SIZE is measured as ln(Sales). Illiquidity (ILLIQ), a proxy for information asymmetry, is measured as the yearly average ratio of monthly absolute return to the dollar trading volume on that month as per Amihud (2002). Bid-Ask spread (BASPREAD) is the yearly average of difference between monthly closing bid and ask prices reported as a percentage of midpoint of bid ask quotes. In all the models both industry and year dummies were included. T-statistics reported below the slope coefficients and indicated in parentheses for significant coefficients. The * indicates significant at 10% , ** significant at 5% and *** significant at 1% respectively. The estimation period is from 1974-2006. The number of firm-year observations and log-likelihood values for each model are also reported in the table.

		1	2	3	4
	Expected Sign	**BOLADR$_{it}$**	**BOLADR$_{it}$**	**MOLADR$_{it}$**	**MOLADR$_{it}$**
LAQ$_{it-1}$	-	-0.011	-0.011	-0.035	-0.033
		(-25.08)***	(-21.18)***	(-88.58)***	(-74.56)***
LAP$_{it-1}$	-	-0.206	-0.201	-0.160	-0.144
		(-42.98)***	(-36.97)***	(-38.22)***	(-30.75)***
LAT$_{it-1}$	+	0.400	0.410	0.300	0.290
		(84.66)***	(71.55)***	(71.52)***	(59.79)***
SIZE$_{it-1}$	+	0.010	0.010	0.001	0.001
		(19.86)***	(15.30)***	(12.21)***	(9.76)***
ILLIQ$_{it-1}$	+	0.061		0.054	
		(3.13)***		(3.22)***	
BASPREAD$_{it-1}$	+		0.008		0.010
			(1.79)*		(1.92)*
Constant		0.270	0.010	0.460	0.140
		(7.48)***	0.200	(14.57)***	(4.02)***
Observations		48647	33920	48647	33920
Log-likelihood		14106	9659	20744	14650

Table-VI

Change Regressions of Lease Adjusted Leverage

Book Operating lease adjusted debt ratio (BOLADR) is ratio of book value of operating lease adjusted debt i.e. (total debt + rental expenses+ present values of rental commitments and thereafter portion) to book value of operating lease adjusted total assets viz. [book assets (Data 6) + rental expense (Data 47) + present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Market Operating lease adjusted debt ratio (MOLADR) is ratio of operating lease adjusted debt to market value of operating lease adjusted total assets viz. [Total assets (Data6) – Book equity (Data60) + Market equity (Data25 *Data199)+ rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Lease adjusted Q (LAQ) is the ratio of market value of lease adjusted total assets to lease adjusted book value of total assets. Lease adjusted profitability (LAP) is ratio of (operating income + rental expenses) to lease adjusted total assets. Lease adjusted tangibility (LAT) is ratio of (net PPE +rental expenses+ present values of rental commitments and thereafter portion) to book value of lease adjusted total assets. SIZE is measured as ln(Sales). Illiquidity (ILLIQ), a proxy for information asymmetry, is measured as the yearly average ratio of monthly absolute return to the dollar trading volume on that month as per Amihud (2002). Bid-Ask spread (BASPREAD) is the yearly average of difference between monthly closing bid and ask prices reported as a percentage of midpoint of bid ask quotes. In all the models both industry and year dummies were included. T-statistics reported below the slope coefficients and indicated in parentheses for significant coefficients. The * indicates significant at 10% , ** significant at 5% and *** significant at 1% respectively. The estimation period is from 1974-2006. The number of firm-year observations and R^2 values for each model are also reported in the table.

		1	2	3	4
	Exp. Sign	**$\Delta BOLADR_{it}$**	**$\Delta BOLADR_{it}$**	**$\Delta MOLADR_{it}$**	**$\Delta MOLADR_{it}$**
ΔLAQ_{it}	**-**	-0.003	-0.003	-0.015	-0.014
		(-4.64)***	(-3.55)***	(-23.32)***	(-19.71)***
ΔLAT_{it}	+	0.416	0.425	0.282	0.285
		(30.36)***	(26.61)***	(25.49)***	(21.79)***
ΔLAP_{it}	**-**	-0.120	-0.100	-0.080	-0.060
		(-14.02)***	(-11.21)***	(-11.49)***	(-8.49)***
$\Delta SIZE_{it}$	+	0.010	0.010	0.010	0.010
		(6.35)***	(5.17)***	(4.60)***	(3.79)***
$\Delta ILLIQ_{it}$	+	0.015		0.017	
		(1.68) *		(1.93)*	
$BOLADR_{it-1}$	**-**	-0.230	-0.270		
		(-39.52)***	(-34.44)***		
$\Delta BASPREAD_{it}$	+		0.008		0.01
			(1.95) *		(2.25) **
$MOLADR_{it-1}$	**-**			-0.240	-0.280
				(-46.12)***	(-40.60)***
Constant		0.060	0.070	0.040	0.060
		(16.87)***	(14.07)***	(10.31)***	(9.30)***
Observations		45377	30414	45377	30414
R-squared		0.26	0.29	0.29	0.31

Table-VII

Regression Estimates of the Substitute Relation between Debt and Leases

Book Debt Ratio (BDR) is total debt (Data 9 + Data 34) to book value of lease adjusted total assets viz. [book assets (Data 6) + rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Book Operating Lease Ratio (BOLR) is rental expenses plus present value of future rental commitments and thereafter portion scaled by lease adjusted total assets. Market Debt Ratio (MDR) is total debt (Data 9 + Data 34) to market value of lease adjusted total assets viz. [Total assets (Data6) – Book equity (Data60) + Market equity (Data25 *Data199) + rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Market Operating Lease Ratio (MOLR) is (rental expenses plus present value of future rental commitments and present value of thereafter portion) scaled by market value of lease adjusted total assets. Lease adjusted Q (LAQ) is the ratio of market value of lease adjusted total assets to lease adjusted book value of total assets. Lease adjusted profitability (LAP) is ratio of (operating income + rental expenses) to lease adjusted total assets. Lease adjusted tangibility (LAT) is ratio of (net PPE +rental expenses+ present values of rental commitments and thereafter portion) to book value of lease adjusted total assets. SIZE is measured as ln(Sales). In all the models both industry and year dummies were included except in models 5 and 6 where time dummies were excluded. T-statistics reported below the slope coefficients and indicated in parentheses for significant coefficients. The *indicates significant at 10%, ** significant at 5% and *** significant at 1% respectively. The estimation period is from 1974-2006. The number of firm-year observations and R^2 / log-likelihood values are also reported in the table.

		1	**2**	**3**	**4**	**5**	**6**
		OLS	**OLS**	**Tobit**	**Tobit**	**Fama-MacBeth**	**Fama-MacBeth**
	Exp. Sign	BDR_{it}	MDR_{it}	BDR_{it}	MDR_{it}	BDR_{it}	MDR_{it}
$BOLR_{it-1}$	+/-	-0.134		-0.165		-0.162	
		(-6.00)***		(-17.85)***		(-10.72)***	
LAQ_{it-1}	-	-0.005	-0.013	-0.016	-0.031	-0.017	-0.033
		(-5.48)***	(-20.09)***	(-28.16)***	(-61.14)***	(-11.50)***	(-10.64)***
LAT_{it-1}	+	0.180	0.090	0.250	0.160	0.220	0.140
		(9.49)***	(6.39)***	(40.19)***	(31.60)***	(33.13)***	(19.26)***
LAP_{it-1}	-	-0.130	-0.110	-0.200	-0.140	-0.240	-0.200
		(-10.80)***	(-13.14)***	(-33.03)***	(-27.88)***	(-10.38)***	(-7.20)***
$Size_{it-1}$	+	0.010	0.020	0.010	0.010	0.001	0.001
		(5.61)***	(10.00)***	(24.50)***	(20.14)***	(3.06)***	(3.51)***
$MOLR_{it-1}$	+/-		-0.070		-0.094		-0.045
			(-3.71)***		(-10.54)***		(-2.80)***
Constant		-0.030	-0.120	0.080	0.340	0.240	0.320
		-0.750	(-3.53)***	(1.74)*	(10.15)***	(6.54)***	(8.34)***
Observations		45741	45453	45741	45453	45741	45453
R-squared/ Log-likelihood		0.05	0.10	3328	11450	0.20	0.27

Table-VIII
Variability of Substitute Relation between Book Debt and Leases across Credit Ratings, Information Asymmetry, Debt Capacity, Dividends, Financial deficit/surplus and R&D

Book Debt Ratio (BDR) is total debt (Data 9 + Data 34) to book value of lease adjusted total assets viz. [book assets (Data 6) + rental expense (Data 47) + present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Book Operating Lease Ratio (BOLR) is rental expenses plus present value of future rental commitments and thereafter portion scaled by lease adjusted total assets. Lease adjusted Q (LAQ) is the ratio of market value of lease adjusted total assets to lease adjusted book value of total assets. Lease adjusted profitability (LAP) is ratio of (operating income + rental expenses) to lease adjusted total assets. Lease adjusted tangibility (LAT) is ratio of (net PPE +rental expenses+ present values of rental commitments and thereafter portion) to book value of lease adjusted total assets. SIZE is measured as ln(Sales). In all the models both industry and year dummies were included. T-statistics reported below the slope coefficients and indicated in parentheses for significant coefficients. The *indicates significant at 10%, ** significant at 5% and *** significant at 1% respectively. The estimation period is from 1974-2006. The number of firm-year observations and R^2 values for each model are also reported in the table.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	NO CR	CR	LOW ILLIQ (Bottom Quartile)	HIGH ILLIQ (Top Quartile)	LOW BASPRD (Bottom Quartile)	HIGH BASPRD (Top Quartile)	LOW DC (Bottom Quartile)	HIGH DC (Top Quartile)	NO DIV.	DIV.	SURPLUS	DEFICIT	NO RND	RND
	BDR_{it}	BDR_{it}	BDR_{it}	BDR_{it}	BDR_{it}	BDR_{it}	BDR_{it}	BDR_{it}	BDR_{it}	BDR_{it}	BDR_{it}	BDR_{it}	BDR_{it}	BDR_{it}
$BOLR_{it-1}$	-0.1567	-0.0799	-0.0651	-0.1523	-0.1653	-0.1542	-0.138	-0.127	-0.180	-0.111	-0.2823	-0.1298	-0.177	-0.106
	(-5.68)***	(-2.32)**	-1.45	(-3.37)***	(-3.51)***	(-4.53)***	(-2.79)***	(-2.70)***	(-6.08)***	(-4.08)***	(-3.55)***	(-5.79)***	(-6.03)***	(-4.20)***
LAQ_{it-1}	-0.0048	-0.0076	-0.0042	-0.0069	-0.0024	-0.0056	-0.007	-0.001	-0.004	-0.005	-0.0054	-0.005	-0.007	-0.005
	(-4.87)***	(-3.08)***	(-2.17)**	(-3.65)***	-1.10	(-3.73)***	(-3.43)***	-0.580	(-4.08)***	(-1.93)*	(-1.66)*	(-5.08)***	(-3.96)***	(-5.15)***
LAT_{it-1}	0.23	0.01	0.15	0.19	0.19	0.20	0.140	0.230	0.250	0.040	0.23	0.18	0.180	0.190
	(10.86)***	0.29	(4.16)***	(4.72)***	(4.72)***	(6.87)***	(3.16)***	(7.52)***	(10.48)***	(1.80)*	(5.29)***	(9.00)***	(6.46)***	(9.32)***
LAP_{it-1}	-0.12	-0.2	-0.17	-0.08	-0.12	-0.14	-0.140	-0.080	-0.110	-0.340	-0.16	-0.13	-0.150	-0.130
	(-9.77)***	(-3.98)***	(-6.55)***	(-3.18)***	(-4.96)***	(-6.92)***	(-4.59)***	(-4.48)***	(-8.26)***	(-10.84)***	(-4.94)***	(-9.91)***	(-6.66)***	(-10.28)***
$SIZE_{it-1}$	0.02	-0.03	0.02	0.01	0.02	0.01	0.010	0.010	0.020	0.010	0.01	0.02	0.020	0.010
	(5.58)***	(4.41)***	(4.10)***	1.21	(3.12)***	(3.66)***	(1.77)*	(2.82)***	(6.30)***	1.520	1.17	(5.99)***	(4.53)***	(5.74)***
Constant	-0.06	0.88	-0.15	0.08	-0.09	-0.05	0.110	-0.070	-0.080	0.160	0.01	-0.07	-0.060	-0.070
	-1.27	(6.90)***	(-1.78)*	0.86	-1.01	-0.7	1.110	-1.190	-1.630	(2.16)**	0.08	-1.61	-0.960	(-1.67)*
Observations	35417	10324	11458	11403	7864	22229	11284	12005	24925	20816	6326	39410	19785	41530
R-squared	0.06	0.07	0.06	0.04	0.05	0.05	0.05	0.05	0.06	0.07	0.07	0.05	0.05	0.05

Table-IX
Variability of Substitute Relation between Market Debt and Leases across Credit Ratings, Information Asymmetry, Debt Capacity, Dividends, Financial deficit/surplus and R&D

Market Debt Ratio (MDR) is total debt (Data 9 + Data 34) to market value of lease adjusted total assets viz. [Total assets (Data6) – Book equity (Data60) + Market equity (Data25 *Data199) + rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Market Operating Lease Ratio (MOLR) is (rental expenses plus present value of future rental commitments and present value of thereafter portion) scaled by market value of lease adjusted total assets. Lease adjusted Q (LAQ) is the ratio of market value of lease adjusted total assets to lease adjusted book value of total assets. Lease adjusted profitability (LAP) is ratio of (operating income + rental expenses) to lease adjusted total assets. Lease adjusted tangibility (LAT) is ratio of (net PPE +rental expenses+ present values of rental commitments and thereafter portion) to book value of lease adjusted total assets. SIZE is measured as ln(Sales). In all the models both industry and year dummies were included. T-statistics reported below the slope coefficients and indicated in parentheses for significant coefficients. The *indicates significant at 10%, ** significant at 5% and *** significant at 1% respectively. The estimation period is from 1974-2006. The number of firm-year observations and R^2 values for each model are also reported in the table.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	NO CR	CR	LOW ILLIQ (Bottom Quartile)	HIGH ILLIQ (Top Quartile)	LOW BASPRD (Bottom Quartile)	HIGH BASPRD (Top Quartile)	LOW DC (Bottom Quartile)	HIGH DC (Top Quartile)	NO DIV.	DIV.	SURPLUS	DEFICIT	NO RND	RND
	MDR_{it}	MDR_{it}	MDR_{it}	MDR_{it}	MDR_{it}	MDR_{it}	MDR_{it}	MDR_{it}	MDR_{it}	MDR_{it}	MDR_{it}	MDR_{it}	MDR_{it}	MDR_{it}
$MOLR_{it-1}$	-0.087	-0.037	-0.005	-0.087	-0.047	-0.113	-0.032	-0.123	-0.109	-0.080	-0.144	-0.063	-0.094	-0.069
	(-4.20)***	-1.150	-0.130	(-2.45)**	-1.420	(-4.26)***	-0.950	(-4.38)***	(-4.94)***	(-3.01)***	(-2.32)**	(-3.52)***	(-3.89)***	(-3.33)***
LAQ_{it-1}	-0.011	-0.022	-0.012	-0.013	-0.008	-0.015	-0.016	-0.006	-0.010	-0.020	-0.012	-0.012	-0.019	-0.012
	(-18.58)***	(-7.31)***	(-9.66)***	(-10.44)***	(-7.22)***	(-13.26)***	(-9.45)***	(-9.61)***	(-17.41)***	(-9.16)***	(-6.14)***	(-19.66)***	(-11.98)***	(-20.00)***
LAT_{it-1}	0.130	-0.060	0.070	0.100	0.060	0.120	0.020	0.100	0.130	0.030	0.170	0.090	0.110	0.110
	(8.75)***	(1.80)*	(2.78)***	(4.24)***	(2.62)***	(5.89)***	-0.820	(5.87)***	(8.01)***	1.270	(4.77)***	(6.33)***	(5.37)***	(7.31)***
LAP_{it-1}	-0.090	-0.310	-0.120	-0.100	-0.080	-0.130	-0.090	-0.050	-0.070	-0.390	-0.170	-0.100	-0.150	-0.110
	(-11.72)***	(-8.20)***	(-7.80)***	(-5.96)***	(-6.31)***	(-9.72)***	(-5.57)***	(-5.59)***	(-9.25)***	(-14.81)***	(-5.35)***	(-12.64)***	(-9.02)***	(-13.40)***
$SIZE_{it-1}$	0.020	0.001	0.030	0.020	0.020	0.020	0.020	0.010	0.020	0.010	0.020	0.020	0.020	0.020
	(10.17)***	0.500	(7.11)***	(4.05)***	(6.08)***	(6.80)***	(5.64)***	(5.74)***	(11.40)***	(3.85)***	(2.81)***	(11.09)***	(7.53)***	(10.89)***
Constant	-0.100	0.350	-0.230	-0.020	-0.17	-0.10	-0.05	-0.05	-0.16	-0.06	-0.19	-0.15	-0.14	-0.11
	(-3.04)***	(3.51)***	(-3.78)***	-0.300	(-2.79)***	(-1.97)**	-0.69	-1.44	(-4.52)***	-0.85	-1.53	(-4.18)***	(-2.48)**	(-3.28)***
Observations	35177	10276	11383	11319	7817	22076	11203	11922	24728	20725	6299	39149	19636	41275
R-squared	0.11	0.14	0.11	0.10	0.09	0.11	0.11	0.09	0.11	0.15	0.12	0.10	0.11	0.10

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Table-X
Robustness Checks
Instrumental Variable Regressions of Substitute Relation between Debt and Leases

Book Debt Ratio (BDR) is total debt (Data 9 + Data 34) to book value of lease adjusted total assets viz. [book assets (Data 6) + rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Book Operating Lease Ratio (BOLR) is rental expenses plus present value of future rental commitments and thereafter portion scaled by lease adjusted total assets. Market Debt Ratio (MDR) is total debt (Data 9 + Data 34) to market value of lease adjusted total assets viz. [Total assets (Data6) – Book equity (Data60) + Market equity (Data25 *Data199) + rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Market Operating Lease Ratio (MOLR) is (rental expenses plus present value of future rental commitments and present value of thereafter portion) scaled by market value of lease adjusted total assets. Lease adjusted Q (LAQ) is the ratio of market value of lease adjusted total assets to lease adjusted book value of total assets. Lease adjusted profitability (LAP) is ratio of (operating income + rental expenses) to lease adjusted total assets. Lease adjusted tangibility (LAT) is ratio of (net PPE +rental expenses+ present values of rental commitments and thereafter portion) to book value of lease adjusted total assets. SIZE is measured as ln(Sales). In all the models both industry and year dummies were included. The estimation is by two-step GMM and only the results of second stage are presented for brevity. The instruments used for BOLR are median MOLR and three period lagged BOLR. T-statistics reported below the slope coefficients and indicated in parentheses for significant coefficients. The *indicates significant at 10%, ** significant at 5% and *** significant at 1% respectively. The estimation period is from 1974-2006. The number of firm-year observations and R^2 along with the Hansen ***J*** statistic, with p-values, for overidentification test are also reported.

	Expected Sign	**BDR_{it}**	**MDR_{it}**
OLR*	-	-0.176	-0.256
		(-12.67)***	(-18.18)***
LAQ_{it-1}	-	-0.017	-0.037
		(-19.67)***	(-40.32)***
LAT_{it-1}	+	0.210	0.170
		(26.00)***	(26.06)***
P_{it-1}	-	-0.200	-0.140
		(-19.65)***	(-21.69)***
$SIZE_{it-1}$	+	0.010	0.010
		(15.80)***	(10.89)***
Constant		0.040	0.110
		(3.35)***	(11.98)***
Observations		40331	42483
R^2		0.10	0.15
Hansen J statistic $\chi^2(1)$ – P value		0.854 (0.36)	1.077 (0.30)

Test of Weak Instruments:

- Shea's partial R^2 =0.56
- F-statistic = 5719.21
- p-value = 0

Table-XI
Robustness Checks
Simultaneous Regressions of Debt and Leases

Book Debt Ratio (BDR) is total debt (Data 9 + Data 34) to book value of lease adjusted total assets viz. [book assets (Data 6) + rental expense (Data 47) + present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Book Operating Lease Ratio (BOLR) is rental expenses plus present value of future rental commitments and thereafter portion scaled by lease adjusted total assets. Market Debt Ratio (MDR) is total debt (Data 9 + Data 34) to market value of lease adjusted total assets viz. [Total assets (Data6) – Book equity (Data60) + Market equity (Data25 *Data199) + rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)]. Market Operating Lease Ratio (MOLR) is (rental expenses plus present value of future rental commitments and present value of thereafter portion) scaled by market value of lease adjusted total assets. Lease adjusted Q (LAQ) is the ratio of market value of lease adjusted total assets to lease adjusted book value of total assets. Lease adjusted profitability (LAP) is ratio of (operating income + rental expenses) to lease adjusted total assets. Lease adjusted tangibility (LAT) is ratio of (net PPE +rental expenses+ present values of rental commitments and thereafter portion) to book value of lease adjusted total assets. SIZE is measured as ln(Sales). In all the models both industry and year dummies were included. Bid-Ask spread (BASPREAD) is the yearly average of difference between monthly closing bid and ask prices reported as a percentage of midpoint of bid ask quotes. CR is a credit rating dummy and it is equal to 1 if rating is not available or unrated firms else 0. DC is debt capacity computed as (cash holdings + 0.715 × receivables + 0.547 × inventory + 0.535 × PPE)/ lease adjusted total assets. LTLCF is large tax loss carryforwards, a dummy equal to 1 if firm has a positive tax-loss-carry-forward exceeding current year EBITDA else 0. Marginal Tax Rate (MTR) is the pre-financing marginal tax rate. The estimation is by 3-stage least squares and only the results of last stage are presented for brevity. T-statistics reported below the slope coefficients and indicated in parentheses for significant coefficients. The * indicates significant at 10% , ** significant at 5% and *** significant at 1% respectively. The estimation period is from 1974-2006. The number of firm-year observations and R^2 values for each model are also reported in the table.

	1	2
	BDR_{it}	**$BOLR_{it}$**
LAQ_{it-1}	-0.013	-0.007
	(-21.78)***	(-2.70)***
LAP_{it-1}	-0.134	-0.107
	(-12.88)***	(-4.56)***
LAT_{it-1}	0.190	0.340
	(5.88)***	(6.69)***
$SIZE_{it-1}$	0.001	0.0005
	(6.35)***	1.280
$BOLR^*_{it}$	-0.120	
	(-2.93)***	
SG	0.001	
	0.660	
BASPREAD	0.01	0.02
	(1.93)*	(2.09)**
CR	-0.110	0.050
	(-32.79)***	(2.08)**
BDR^*_{it}		-0.490
		(-1.97)*
MTR_{it-1}		-0.010
		-0.980
$LTLCF_{it-1}$		0.030
		(2.18)**
Constant	0.06	0.05
	0.30	0.28
Observations	31308	31308
R^2	0.17	0.22

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Appendix-I

Variable Definitions:

Leasing and leverage Variables

- Book value of operating lease adjusted debt = (total debt + rental expenses+ present values of rental commitments and present value of thereafter portion)
- Book value of operating leases = (rental expenses + present values of future rental commitments and thereafter portion)
- Book value of operating lease adjusted total assets =[book assets (Data 6) + rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)].
- Market value of operating lease adjusted total assets = [Total assets (Data6) – Book equity (Data60) + Market equity (Data25 *Data199)+ rental expense (Data 47)+ present value of future rental commitments for the next 5 years (Data 96 and Data 164 to Data 167) and present value of thereafter portion(Data 389)].
- Book Debt Ratio (BDR) = book value of total debt (Data 9 + Data 34) /book value of operating lease adjusted total assets
- Book Operating Lease Ratio (BOLR) = Book value of operating leases / Book value of operating lease adjusted total assets.
- Book Operating lease adjusted debt ratio (BOLADR) = book value of operating lease adjusted debt/ book value of operating lease adjusted total assets.
- Market Debt Ratio (MDR) = book value of total debt (Data 9 + Data 34) /market value of lease adjusted total assets
- Market Operating Lease Ratio (MOLR) = book value of operating leases/market value of lease adjusted total assets.
- Market Operating lease adjusted debt ratio (MOLADR) = book value of operating lease adjusted debt /market value of operating lease adjusted total assets.

Information Asymmetry

- BASPREAD = yearly average of difference between monthly closing bid and ask prices reported as a percentage of midpoint of bid ask quotes.
- ILLIQ = yearly average of ratio of monthly absolute return to the dollar trading volume on that month

Other Variables

- CR = dummy for unrated firms and it is equal to 1 if credit rating is not available else 0.
- Debt Capacity (DC) = (cash holdings + 0.715 × receivables + 0.547 × inventory + 0.535 × net PPE)/ book value of lease adjusted total assets.
- Deficit (DEF) = [uses of funds i.e. (cash dividends, investments, and change in working capital) - sources of funds] /book value of lease adjusted total assets.

- Lease adjusted profitability (LAP) = (operating income + rental expenses) / book value of lease adjusted total assets.
- Lease adjusted Q (LAQ) = market value of lease adjusted total assets/ book value lease adjusted of total assets.
- Lease adjusted tangibility (LAT) = (net PPE +rental expenses+ present values of rental commitments and thereafter portion) / book value of lease adjusted total assets.
- LTLCF = A dummy equal to 1 if firm has a positive tax-loss-carry-forward exceeding current year EBITDA else 0.
- Marginal Tax Rate (MTR) = pre-financing marginal tax rate.
- MZ = 3.3× (Pretax Income/Total Assets) +1.0 × (Net Sales/Total Assets) + 1.4× (Retained Earnings/Total Assets) + 1.2×(Current Assets–Current Liabilities)/(book value of lease adjusted total assets).
- RND = R&D expenditure/ annual sales.
- Sales Growth (SG) = change in net Sales (Data 12)/beginning of period net Sales
- SIZE = ln(Sales).