Accounting Measures of Corporate Liquidity, Leverage, and Costs of Financial Distress

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■ A general view of financial distress is that it results from a mismatch between the currently available liquid assets of a firm and its current obligations under its "hard" financial contracts. Mechanisms for dealing with financial distress rectify the mismatch by either restructuring the assets or restructuring the financing contracts, or both. The costs of financial distress are those resulting from the costs of asset restructuring (converting illiquid assets to liquid ones) or the costs of informal or formal debt restructuring. The costs of financial distress will have important implications for the liquidity and leverage policies of a firm. In particular, when the costs of financial distress are high, the firm may maintain a larger fraction of its assets as liquid assets and/or be cautious in taking on debt (hard contracts). In this study, I analyze the relationship between the costs of financial distress and (i) the corporate liquidity policy, and (ii) the leverage policy of a firm.

Liquid assets constitute a considerable portion of total assets and have important implications for the firm's risk and profitability. For instance, Baskin [6] reports that among his sample of 338 major U.S. corporations, 9.6% of invested capital was held in cash and marketable securities in 1972. In our sample of 223 major U.S. corporations, the average annual liquidity ratio was 6.3% in the period 1979-1981. Kallberg [19] documents that top managers pay a lot of attention to management of corporate liquidity. In his book on liquidity management, Kallberg [19] provides six stages of decreasing liquidity as follows: (i) meeting current obligations from current cash flows, cash balances and short-term investments; (ii) using short-term credit; (iii) careful management of cash flows, e.g., through management of credit policy and inventory levels; (iv) renegotiation of debt contracts; (v) asset sales; and (vi) bankruptcy. This scheme suggests a direct link between

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liquidity policies pursued by management and costs of financial distress. Using various proxies for the different direct and indirect costs at various stages of financial distress, its relationship to corporate liquidity is examined. Although several measures of corporate liquidity have been suggested, I focus on the accounting measures of liquidity, such as the liquid ratio.

A second response to high financial distress costs is to limit the use of debt financing. Although the inverse relationship between bankruptcy costs and leverage has been studied previously, I will propose new measures of asset illiquidity and indirect bankruptcy costs in exploring the relationship between leverage and the costs of financial distress.[1] The remainder of the paper is organized as follows. In Section I, a simple model of dealing with financial distress is used to develop testable relationships between (i) distress costs and corporate liquidity policy, and (ii) distress costs and corporate leverage. Several proxies for different components of financial distress are developed in Section I.C. Methodology and data are described in Section II. Results are presented in Section III. Section IV concludes.

I. Development of Hypotheses

A. A Model of Financial Distress

The financing contracts of a firm can be loosely categorized into hard and soft contracts. An example of a hard contract is a coupon debt contract which specifies periodic payments by the firm to the bondholders. If these payments are not made on time, the firm is considered to be in violation of the contract and the claimholders can seek specified and unspecified legal recourses to enforce the contract. Common stock and preferred stock are examples of soft contracts. Here, even though its claimholders have expectations of receiving current payouts from the firm in addition to their ownership rights, the level and frequency of these payouts are often policy decisions made by the firm. These payouts can be suspended and/or postponed,

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[1]Recent cross-sectional studies include Ferri and Jones [11], Flath and Knoeber [12], Marsh [23], Titman [29], Castanias [9], Bradley, Jarrell, and Kim [7], Auerbach [5], Long and Malitz [22], and Titman and Wessels [31]. Some of these papers (e.g., Titman [29], Bradley, Jarrell, and Kim [7], Auerbach [5], Long and Malitz [22], and Titman and Wessels [31]), examine variables that are similar to some of those examined here. The studies find a negative relation between both research and development and advertising and leverage, but have mixed findings relating to the different measures of nondebt tax shields and leverage and volatility and leverage.

if the liquid resources remaining in the firm after satisfying the claims of the hard contracts are not sufficient.

The assets of a firm also have a natural categorization based on liquidity. Cash or cashlike (marketable) securities are liquid assets. Long-term investments (such as plant and machinery) which may only produce liquid assets in the future may be called "illiquid" assets.

The above categorizations of the financing contracts of a firm and its assets give rise to a natural definition of *financial distress*. A firm is in financial distress at a given point in time when the liquid assets of the firm are not sufficient to meet the current liquidity requirements of its hard contracts.

Since financial distress results from a mismatch between the currently available liquid assets and the current obligations of its "hard" financial contracts, mechanisms for coping with financial distress involve correcting the mismatch by either increasing the liquidity of the assets (through asset sales) or decreasing the "hardness" of the debt contracts (through debt renegotiation). The total costs of accomplishing this through a combination of asset restructuring and/or debt restructuring, through formal mechanisms (e.g., Chapter 11 bankruptcy procedure) or through informal mechanisms (e.g., private debt work-outs), constitute the costs of financial distress.[2] For a recent survey of the literature on financial distress and mechanisms for dealing with it through asset and/or debt restructuring, see John and John [16].

B. Testable Hypotheses

Given the above characterization of financial distress, a firm with high costs of financial distress will reduce its exposure in two ways: (i) increase the liquid component of its assets, and (ii) reduce the extent of its hard contracts (such as debt). This immediately leads to the following hypotheses:

> *H1:* The proportion of total assets invested by a firm in liquid assets (e.g., cash and marketable securities) will be increasing in its costs of financial distress.

> *H2:* The proportion of debt in the capital structure of a firm will be decreasing in its costs of financial distress.

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[2]Haugen and Senbet [15] argue that capital market mechanisms could accomplish restructuring of the problematic hard contracts and replacing them with a softer mix. They argue that the transactions cost of these "private" mechanisms are small and should form an upper bound on the costs of coping with financial distress.

In the following section, I will develop various proxies for the costs of financial distress.

C. Proxies for Costs of Financial Distress

Empirical proxies for the costs of financial distress are developed based on the simple economic model of coping with financial distress presented in Section I.A. Since financial distress is resolved through asset restructuring (asset sales or other liquidations) and/or financial restructuring (private or formal debt renegotiations), the costs of these different mechanisms of resolving distress will represent financial distress costs.

First, let us consider the liquidation costs which are the costs incurred when assets are sold to raise cash and remedy distress.[3] The most important cost of liquidation is the destruction of going-concern value that occurs when assets are sold to pay down debt. This loss of value will be greater for intangible assets and assets that generate firm-specific rents (e.g., growth opportunities, managerial firm-specific human capital, monopoly power, and operating synergies whose value depends on the firm's assets being kept together). Financial distress will be relatively more costly for firms whose assets are more intangible or firm-specific (see John and Vasudevan [18] and Shleifer and Vishny [28]). The ratio of the firm's market value to the replacement costs of its assets, defined as Tobin's q, is used as a proxy for the loss of going-concern value due to asset sales (see Lindenberg and Ross [21]). Replacement costs approximate what the firm's assets could be sold for piecemeal, and are positively correlated with the liquidation value of the asset. Firms with a higher market value/replacement costs ratio will have higher costs of asset liquidations. Therefore, Tobin's q ratio (equal to market value/replacement costs) will be used as a proxy for the loss of going-concern value in asset sales and premature liquidations associated with financial distress.

For several reasons, assets are more likely to be sold when debt is restructured in Chapter 11 rather than privately. First, automatic stay gives the debtor more power over the disposition of the firm's assets, by enjoining creditors from exercising their nonbankruptcy right to sue the firm and seize collateral. Asset sales that would normally be in violation of the firm's debt covenants will be

allowed if the firm can convince the bankruptcy judge that such sales are necessary for the continued operation of the business. Second, since the debtor can undermine the value of lenders' collateral and grant new lenders superpriority standing, fully secured lenders will in general prefer liquidation over reorganization. This may create additional pressure for asset sales in bankruptcy. In Chapter 11, creditors can initiate asset sales by "making a motion to sell" before the court. In addition, Chapter 11 cases can be converted into Chapter 7 liquidations. For a sample of Chapter 11 filings in the Southern District of New York (including nonpublic firms), White [34] finds that one-third either end up in Chapter 7 or as liquidating reorganizations. The fraction of bankruptcies converted to Chapter 7 liquidations is smaller (only five percent) in the sample studied in Gilson, John, and Lang [13].

Finally, purchasing assets from a financially distressed firm is less risky in Chapter 11, because asset sales are executed by a court order and are thus free from legal challenge. In addition, assets that are purchased from an insolvent firm that subsequently files for Chapter 11 may have to be returned as a "voidable preference" or "fraudulent transfer." Given the costs incurred if an asset sale is later challenged or canceled, potential purchasers of an asset will prefer to deal with firms in Chapter 11.

Titman [30] and Titman and Wessels [31] have argued that the costs of liquidation are higher for firms that produce unique or specialized products. Their workers and suppliers often have job-specific skills and capital, and their customers find it difficult to find alternative servicing for their relatively unique products. For these reasons, a high degree of specificity or uniqueness engenders high distress costs. Expenditures on research and development over sales (RD) and advertising over sales (ADV) are indicators of uniqueness. R&D expenditures measure uniqueness because firms that sell products with close substitutes have low R&D intensity since their innovations can be easily duplicated. Similarly firms marketing relatively unique products advertise intensely. Liquidation costs are also likely to be high for firms which make products requiring specialized servicing and spare parts. As a proxy for asset specificity, a dummy variable SPC is constructed, where SPC equals *one* for firms with SIC codes between 3400 and 4000 (firms producing machines and equipment) and *zero* otherwise.

The variables RD and ADV will proxy for indirect costs of financial distress also through another channel. Myers [24] has argued that risky debt and financial distress can lead to underinvestment in growth options. R&D expendi-

[3]Brown, James, and Mooradian [8], Asquith, Gertner, and Scharfstein [4], Lang, Poulsen, and Stulz [20], and Ofek [27] present evidence of asset restructuring by firms in distress. All the above papers document that asset sales are frequently used by financially distressed firms in their sample, either during private debt restructuring or the formal Chapter 11 reorganization.

tures and advertising expenditures create a stock of future investment options that can expire unutilized if the firm runs into financial distress. These costs can be minimized if the firm reduces its insolvency risk by maintaining high liquidity. Measures of corporate liquidity should be higher for firms with high R&D and advertising.

Another measure of the liquidity costs of asset restructuring is the "collateral value" of the assets (see Shleifer and Vishny [28]). Titman and Wessels [31] suggest two proxies for the "collateral value." The ratio of inventory plus gross plant and equipment to total assets (IGP/TA) is positively related to collateral value. The ratio of intangible assets to total assets (INT/TA) is negatively related to collateral value. The liquidity costs of asset restructuring are *negatively* related to "collateral value." A firm with assets of high collateral value need only maintain low levels of liquidity. In other words, the liquidity measures will be decreasing in IGP/TA and increasing in INT/TA.

Another proxy for the expected costs of financial distress will be the variable BR, which is a dummy variable for the actual incidence of bankruptcy (Chapter 11 filing by the firm) during a ten-year period after the liquidity decision is taken. (If the firm had a bankruptcy filing during this period, $BR = 1$, otherwise $BR = 0$.) This variable is meant to proxy for factors not included above, which the management may have considered when the liquidity decision was taken, as potentially affecting the probability of bankruptcy. Corporate liquidity will be increasing in the probability of bankruptcy.[4]

Given the above proxies for costs of financial distress, hypotheses *H1* and *H2*, as developed in Section I.B., can now be tested.

II. Methodology and Data

A. Methodology

In the first part, the relationship between corporate liquidity and expected costs of financial distress is examined. Here, a linear relationship between measures of liquidity and proxies for expected costs of financial dis-

tress will be used. Different specifications of a linear model of the following form will be tested:

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\begin{aligned}
LIQR = a_0 &+ a_1Q + a_2RD + a_3ADV + a_4BR + a_5SPC \\
&+ a_6DEBT + a_7CASHCY + a_8GROWTH \\
&+ a_9LSALES + a_{10}OI/S + a_{11}OI/TA \\
&+ a_{12}IGT/TA + a_{13}INT/TA + a_{14}VOI + e_1
\end{aligned} \quad (1)
$$

where

$LIQR$ = the liquidity ratio, measured as the average ratio of cash and marketable securities to total assets in 1979-1981;

Q = the average Tobin's q ratio in the period 1979-1981, which is calculated as the market value of the firm (sum of the market value of the preferred stock, the market value of the common stock, the market value of long-term debt adjusted for its age structure, less the short-term assets) divided by the replacement costs of the firm's plant and inventories. The associated numbers are obtained from the Griliches' R&D Master File (Cummins et al [10]);

RD = the average ratio of R&D expenditures to capital expenditures in 1979-1981;

ADV = the average ratio of advertising expenditures to capital expenditures in 1979-1981;

BR = 1 if the firm has filed for Chapter 11 during 1981-1991, and equals 0 otherwise;

SPC = 1 if the firm has an SIC code between 3400 & 4000 (firm produces machinery and equipment); equals 0 otherwise;

$DEBT$ = the average debt ratio (calculated as the sum of short-term nonspontaneous debt and long-term debt) divided by the sum of short-term nonspontaneous debt, long-term debt, preferred stock and market value of equity) in the period 1979-1981;

$LTDEBT$ = the average debt ratio (calculated as long-term debt over total assets) in the period 1979-1981;

$CASHCY$ = the average cash cycle (calculated as the difference of average inventory age plus average collection period minus average payment period) in 1979-1981;

$GROWTH$ = the average compound growth rate of sales between 1974 and 1979;

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[4]In analyzing the costs of bankruptcy, it has become common to distinguish between direct and indirect costs. Direct costs are out-of-pocket transactions costs (such as charges for legal and investment banking services). Indirect costs include all other costs related to the firm's bankruptcy. For example, managers may forego profitable investment opportunities because they are distracted by dealings with creditors of the bankruptcy court. Warner [32], Ang et al [3], Altman [2], and Weiss [33] have estimated the costs of Chapter 11 reorganizations empirically.

$LSALES$ = the natural logarithm of average annual sales in 1979-1981;

VOI = the volatility of operating income, estimated as the standard deviation of the first-level differences of EBIT in the years 1975-1978 divided by average total assets in the same period (see Bradley et al [7]);

OI/S = the average ratio of operating income over sales in 1979-1981;

OI/TA = the average ratio of operating income over total assets in 1979-1981;

IGP/TA = the average ratio of inventory plus gross plant and equipment to total assets in 1979-1981;

INT/TA = the average ratio of intangible assets to total assets in 1979-1981; and

e_1 = the error term.

The main explanatory variables on which this study focuses are the proxies for the expected costs of financial distress. In Section I.C., it was argued that Tobin's q ratio (Q) represents a measure of the indirect costs of financial distress. $LIQR$ will be increasing in Q. The dummy variable BR proxies for the probability of bankruptcy. An underlying assumption is that the ex post incidence of Chapter 11 filings during 1979-1989 would equal the ex ante estimation made by the management in 1979 (based on some bankruptcy prediction models, see, e.g., Altman [1]). $LIQR$ will be increasing in BR. The other proxies for costs of financial distress are those that are related to costs of liquidation of assets. As argued in Section I.C., the costs of liquidation are higher for firms that produce unique or specialized products and lower for firms with assets of high "collateral value." The costs of liquidation, and hence $LIQR$, are increasing in RD, ADV, SPC and INT/TA and decreasing in IGP/TA, as argued earlier in Section I.C.

The variables $LSALES$, $CASHCY$, $DEBT$, OI/S, OI/TA and VOI are control variables to account for the level of liquidity justified by transaction and precautionary motives. The variable $LSALES$ proxies for the transaction needs of the firm. The cash cycle of the firm ($CASHCY$) measures the time it takes to recoup cash outlays, and hence it affects cash balances. A larger cash cycle (say, for example, due to a large average collection period) implies a larger amount of receivables, which are near-cash assets which will be converted into liquid assets periodically. Therefore a large cash cycle is a net source of liquidity which is not already accounted for in $LIQR$. Corporate liquidity should be decreasing in the length of the cash cycle ($CASHCY$). Similarly, operating incomes or cash

flows provide a ready source of liquidity. Firms with ready access to debt markets and other sources of borrowing can also use debt as a substitute for liquidity maintenance. Therefore, firms with good operating incomes (OI/S or OI/TA) or ready sources of financing (proxied by measures of debt) can afford to keep lower levels of liquidity. Hence liquidity ratios ($LIQR$) would be lower for firms with higher operating incomes or debt. The growth of sales (as proxied by $GROWTH$) may also provide a source of liquidity. If sales growth and corresponding cash flows build up the liquid reserves of the firm faster than its use, then liquidity maintained would be decreasing in $GROWTH$. The variable VOI, volatility of operating income will capture the maintenance of liquidity for precautionary reasons (i.e., to avert shortfalls of cash). Hence liquidity ratio ($LIQR$) would be increasing in VOI.

Costs of financial distress may not be the only reason for the relationship between corporate liquidity and variables such as R&D and advertising expenditure. R&D and advertising expenditure may contribute to building up of assets and resources characterized by asymmetric information between corporate insiders and outside investors in the market. In this setting, Myers and Majluf [26] have argued that firms can optimally maintain financial slack (i.e., excess liquidity) which can be used to finance projects, avoiding the adverse-selection costs of interacting with a less informed market. This would give rise to an increasing relationship between corporate liquidity and ADV and/or RD.

In summary, the predicted signs of the coefficients in the regression model in Equation (1) are positive for a_1, a_2, a_3, a_4, a_5, a_{13} and a_{14}, and negative for a_6, a_7, a_8, a_{10}, a_{11} and a_{12}. The coefficient of $LSALES$ is indeterminate.

In the second part, the relationship between measures of debt and expected costs of financial distress is examined. In addition to the debt measure ($DEBT$) defined following Equation (1), I will introduce another debt measure called long-term debt ($LTDEBT$) defined as follows: $LTDEBT$ is the average debt ratio (calculated as long-term debt over total assets) in the period 1979-1981. A linear relationship between the debt measure ($DEBT$ or $LTDEBT$) and proxies for the costs of financial distress will be used. Different specifications of a model of the following form for both of the debt measures will be estimated:

$$\left.\begin{array}{l} DEBT \\ \text{or} \\ LTDEBT \end{array}\right\} = b_0 + b_1 Q + b_2 RD + b_3 SPC + b_4 IGP/TA + b_5 OI/S + b_6 OI/T + b_7 GROWTH + b_8 LSALES + b_9 VOI + b_{10} BR + e_2 \qquad (2)$$

Exhibit 1. Descriptive Statistics

	N	Mean	Standard Deviation	Median	Minimum	Maximum
ADV	251	0.02	0.03	0.00	0.00	0.16
BR	261	0.05	0.22	0.00	0.00	1.00
CASHCY	260	103.91	60.82	97.87	-12.08	311.59
DEBT	260	0.30	0.17	0.29	0.00	0.80
GROWTH	260	0.14	0.07	0.12	-0.04	0.46
SPC	261	0.31	0.46	0.00	0.00	1.00
IGP/TA	240	0.90	0.22	0.91	0.35	1.52
INT/TA	176	0.03	0.05	0.01	0.00	0.38
LIQR	260	0.06	0.05	0.05	0.01	0.29
LSALES	260	7.54	1.03	7.43	6.06	11.48
LTDEBT	231	0.18	0.09	0.17	0.00	0.43
OI/S	240	0.14	0.07	0.12	-0.03	0.55
OI/TA	240	0.18	0.06	0.17	-0.05	0.39
Q	.223	0.95	0.74	0.69	0.20	4.98
RD	215	0.02	0.02	0.01	0.00	0.12
VOI	260	0.03	0.03	0.03	0.01	0.24

where the variables are as defined following Equation (1), and e_2 is the error term.

As argued before, Tobin's q is a proxy for indirect bankruptcy costs and costs of illiquidity which would have a negative impact on the use of debt. Similarly, RD and SPC are associated with higher costs of financial distress. Hence, both measures of debt should be decreasing in Q, RD and SPC. IGP/TA denotes the collateral value of the assets and it is associated with lower costs of illiquidity in an asset sale or premature liquidation. Hence, assets with high collateral value have a large debt capacity. Debt measures will be positively related to IGP/TA.

Firms with large cash inflows need less external financing and less debt financing.[5] In other words, firms with large operating incomes should have less borrowing. Debt should be decreasing in OI/S and OI/TA.

Finally, a higher incidence of bankruptcy will be associated with larger levels of debt.

In summary, the expected sign for coefficients b_1, b_2, b_3 and b_{10} is positive; it is negative for b_4, b_5, b_6, and b_7. Coefficients b_8 and b_9 of control variables LSALES and VOI may be positive or negative.

B. The Data

The original sample contains 223 firms from the Fortune 500 companies in 1980 for which we were able to find the q ratio in the Griliches' R&D Master File for 1979-

1981 (Cummins et al [10]). Data to calculate the remaining variables LSALES, CASHCY, VOI, GROWTH, LTDEBT, DEBT, RD and ADV were retrieved from the COMPUSTAT tapes.[6]

Exhibit 1 contains some descriptive statistics (mean, median, standard deviation, minimum and maximum value) of the variables. For the firms in our sample, the liquidity ratio, LIQRAT, ranges from a minimum value of 0.01 to a maximum of 0.29, with a mean of 0.06 and median of 0.05. Of the firms, 43% had liquidity ratios in excess of 0.05, whereas 19% had liquidity ratios of 0.10. Thus, for a typical firm, liquidity requires a nontrivial commitment of capital. The q ratio ranges from 0.20 to 4.98 with a mean of 0.95 and a median of 0.69. The debt ratio ranged from 0 to 0.8 with a mean of 0.30 and a median of 0.29. Similarly, the long-term debt ratio ranged from 0 to 0.43 with a mean of 0.18 and a median of 0.17. Therefore, the sample is representative of large firms which are not currently in financial trouble.

III. Results

Exhibit 2 presents regression results from five different specifications of the basic model in Equation (1). In all specifications, the coefficient of the variable Q, the primary proxy for financial distress (Tobin's q), is positive and significant at the 0.01 level. Other proxies for high liquidation costs, such as research and development (RD)

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[5]Over 95% of external financing by firms is debt (see John and John [17]). This is also suggested by the "pecking order" hypothesis in Myers [25].

[6]Due to the varying availability of these data, we utilize samples of different sizes in our tests.

Exhibit 2. Regression of Corporate Liquidity on Proxies for Financial Distress Costs (Dependent Variable: *LIQR*)

Regression	(1)	(2)	(3)	(4)	(5)
CONSTANT	0.067[b]	0.076[a]	0.121[a]	0.072[a]	0.155[a]
	(1.969)	(2.591)	(3.618)	(2.517)	(3.96)
ADV	0.423[a]	0.422[a]			
	(3.18)	(3.582)			
BR	0.001	0.019	0.031[c]	0.023	0.044[a]
	(0.048)	(1.091)	(1.797)	(1.449)	(2.557)
CASHCY	-0.000[b]	-0.000[a]	-0.000[a]	-0.000	-0.000[a]
	(-2.437)	(-2.48)	(-2.583)	(-1.207)	(-3.973)
DEBT		-0.097[a]	-0.153[a]	-0.118[a]	-0.199[a]
		(-4.126)	(-5.727)	(-5.069)	(-5.92)
GROWTH	-0.127[b]	-0.191[a]	-0.107[a]	-0.220[a]	-0.218[a]
	(-2.077)	(-3.265)	(-2.902)	(-4.002)	(-3.292)
SPC	0.009	0.011	-0.004		
	(1.101)	(1.555)	(-0.483)		
IGP/TA	-0.045[b]				
	(-2.195)				
INT/TA					0.071
					(0.507)
LSALES	0.005	0.004	0.004	0.005	0.004
	(1.481)	(1.099)	(1.059)	(1.598)	(1.100)
OI/S			-0.191[b]		
			(-2.282)		
OI/TA					-0.186[b]
					(-2.114)
Q	0.022[a]	0.020[a]	0.022[a]	0.021[a]	0.020[a]
	(3.5)	(3.639)	(3.199)	(3.846)	(2.318)
RD			0.541[a]		0.675[a]
			(2.711)		(2.868)
VOI				0.209[c]	
				(1.64)	
Adjusted R^2	0.206	0.283	0.331	0.253	0.433
N	198	213	176	222	128

Notes:
[a]Significantly different from zero at the 0.01 probability level.
[b]Significantly different from zero at the 0.05 probability level.
[c]Significantly different from zero at the 0.10 probability level.
Numbers in parentheses are *t*-statistics.

and advertising expenditure (*ADV*), were also positive and significant at the 0.01 level in regressions (1), (2), (3) and (5) where they were included. The coefficient of *BR*, the dummy variable for the incidence of bankruptcy, is also positive and significant in specifications (3) and (5). Together, these results provide strong evidence in support of hypothesis *H1* that corporate liquidity is increasing in proxies of financial distress costs.

The coefficients of the control variables also had the predicted signs, many of them statistically significant. As predicted, variables which stand for ready sources of liquidity, such as *CASHCY, DEBT, GROWTH, IGP/TA, OI/S* and *OI/TA*, have a negative relationship to corporate liq-

uidity. In all specifications, i.e., (2), (3), (4) and (5), where *DEBT* is included, its coefficient is negative and significant at the 0.01 level. Similarly, the coefficient of *GROWTH* is negative and significant at the 0.01 level in specifications (2) through (4), and at the 0.05 level in specification (1). Coefficients of the proxy for collateral value, *IGP/TA*, and the proxies for intermediate cash flows (*OI/S* and *OI/TA*) are also negative and significant at the 0.05 level in all regressions that include them. Overall, corporate liquidity is decreasing in proxies for alternate sources of liquidity (as predicted). This negative relationship is strong, as suggested by the statistical significance of the coefficients of *CASHCY* and *DEBT*.

Exhibit 3. Regression of Debt Measures on Proxies for Financial Distress Costs

| | Dependent Variable | | | | |
| | DEBT | | | LTDEBT | |
Regression	(1)	(2)	(3)	(1)	(2)
CONSTANT	0.695[a]	0.677[a]	0.564[a]	0.226[a]	0.277[a]
	(10.688)	(8.643)	(5.934)	(19.619)	(1.624)
BR		0.061		0.069[b]	0.066[b]
		(1.422)		(2.417)	(2.125)
GROWTH		-0.162	-0.205		0.028
		(-1.116)	(-1.305)		(0.237)
SPC	-0.044[a]	-0.042[b]	-0.031	-0.026[b]	-0.023[c]
	(-2.504)	(-2.289)	(-1.433)	(-2.033)	(-1.792)
IGP/TA		0.023	0.042		0.021
		(0.446)	(0.672)		(0.512)
LSALES	-0.010	-0.010	-0.007		-0.010[c]
	(-1.247)	(-1.192)	(-0.759)		(-1.694)
OI/S			-1.026[a]		-0.056
			(-4.588)		(-0.38)
OI/TA	-1.260[a]	-1.231[a]			
	(-7.82)	(-7.127)			
Q	-0.087[a]	-0.079[a]	-0.086[a]	-0.048[a]	-0.046[a]
	(-6.095)	(-4.313)	(-3.906)	(-4.451)	(-2.872)
RD			-0.042	-0.463	-0.272
			(-0.081)	(-1.42)	(-0.777)
VOI					0.139
					(0.546)
Adjusted R^2	0.511	0.510	0.430	0.192	0.184
N	207	207	176	168	168

Notes:
[a]Significantly different from zero at the 0.01 probability level.
[b]Significantly different from zero at the 0.05 probability level.
[c]Significantly different from zero at the 0.10 probability level.
Numbers in parentheses are t-statistics.

The coefficients of *SPC*, *INT/TA* and *LSALES* are not statistically significant. As predicted, a higher earnings volatility implies a higher corporate liquidity need (the coefficient of *VOI* is positive and significant at the 0.10 level).

In summary, corporate liquidity maintained is increasing in proxies of financial distress costs; it is decreasing in the collateral value of the assets, and other sources of liquidity available, such as intermediate cash flows, projected growth in cash flows, sources of borrowing and the length of the cash cycle.

In Exhibit 3, I present regression results on different specifications of the model in Equation (2), using two measures of debt, *DEBT* and *LTDEBT*, as dependent variables. In all three specifications with *DEBT* as the dependent variable, the coefficient of Tobin's q, the main proxy

for financial distress costs, is negative (as predicted) and significant at the 0.01 level. Asset specificity (as proxied by the dummy variable *SPC*) is negative (as predicted) and significant in specifications (1) and (2). Proxies for intermediate cash flows (*OI/S* and *OI/TA*) have coefficients which are negative (as predicted) and significant at the 0.01 level in specifications (1), (2) and (3). In summary, corporate debt levels are decreasing in proxies of financial distress costs (*Q* and *SPC*) and proxies of intermediate cash flows (*OI/S* and *OI/TA*). All three regressions have adjusted R^2 values around 50%.

In the two specifications of Equation (2) presented in the last two columns of Exhibit 3, *LTDEBT* is the dependent variable. As predicted, the coefficients for proxies of financial distress costs (*Q* and *SPC*) are negative in both specifications. The coefficients of *Q* are statistically sig-

nificant at 0.01 levels in specifications (1) and (2), and those of *SPC* are significant at the 0.05 level in specification (2). Overall, this negative relationship with financial distress proxies seems to be the strongest. As predicted, firms with larger long-term debt have a higher probability of bankruptcy (coefficient of *BR* is positive and significant at the 0.05 level). The coefficients of *OI/S*, *OI/TA* and *IGP/TA* are not significant. Overall, long-term debt is decreasing in proxies of financial distress costs.

In summary, the evidence in Exhibit 3 is consistent with hypothesis *H2* that debt levels are decreasing in proxies of financial distress costs. We have used a new measure of destruction of going-concern value (i.e., Tobin's q) and found such a relation to be strong with either measure of leverage, *DEBT* or *LTDEBT*, as the dependent variable.[7]

IV. Conclusion

Based on a simple model of financial distress. I postulate a positive relationship between the optimal liquidity maintained by a corporation and the costs of illiquidity of its assets. These costs include costs of distressed asset sales and loss of going-concern value in liquidations. Some new proxies are proposed for the costs of illiquidity and the indirect costs of financial distress. These include Tobin's q, R&D and advertising expenditures, an index of asset specificity and an index of the probability of bankruptcy. The liquidity ratio is documented to be positively related to these proxies of financial distress costs. It is negatively related to proxies for alternate sources of anticipated liquidity such as intermediate cash flows, debt financing, length of cash cycle and the collateral value of assets.

Total debt is also negatively related to Tobin's q and asset specificity as well as measures of intermediate cash flows. Long-term debt is also negatively related to Tobin's q and asset specificity.

Overall, the evidence is strongly consistent with the hypothesized relationships between corporate liquidity and financial distress costs, and corporate leverage and financial distress costs.

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[7]To consider possible structural dependencies between models (1) and (2), I estimated the coefficients simultaneously using a SYSLIN procedure of SAS (a two-stage least-squares procedure) with appropriate restrictions on the coefficients. The estimates were virtually identical and hence not reported. See Green [14, Ch. 19] for details.

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