DETERMINANTS OF CAPITAL STRUCTURE

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1. Introduction

This paper examines the determination of capital structure from a somewhat different point of view than earlier papers in this area. Specifically, it focuses on the extent to which apparent anomalies in the capital structure can be explained by shifting from the usual exclusive reliance on the objective of value maximization for stockholders to consideration of the sometimes conflicting management interests. The literature in this area so far has been able to explain relatively little variance in the observed debt ratios by the use of theoretically acceptable variables, particularly when it is required that the signs of these variables conform to theoretical expectations. Thus, a careful and unusually comprehensive recent paper is able to explain only 15% of the variance in the "corrected" book debt ratios across a cross-section of firms on the basis of variables relevant to stockholder value maximization, and even then the coefficients of a number of the more significant variables have the wrong signs.[1] Moreover, as the author of that paper notes: "All in all, these results provide rather negative evidence with respect to all the theories of leverage presented above." These theories include bankruptcy-agency cost, limited tax shield, and tax-clientele models.

While the econometric evidence so far available is far from satisfactory,

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[1] Auerbach (1984). When market values are substituted for corrected book value, the explanatory power of the debt regression is substantially increased but, as the author notes, this increase seems almost entirely attributable to the inclusion of the difference between the market value-based measures of assets and the corrected book measures (attributed to good will and expressed as a fraction of capital stock scaled up for this difference) as an additional variable in explaining the market-value measure of the debt ratios.

it does suggest that, to quote another recent paper, "changes in stock prices are positively related to leverage changes ... and changes in firm value are positively related to changes in firm debt level" (Masulis (1982)). While this author points out a number of hypotheses consistent with these results, an obvious one is that managements do not generally use as much debt as stockholder optimization would dictate. There is a perfectly plausible explanation for such managerial behavior if we assume that management has a vital concern in optimizing its own interests. Clearly management's stake in the firm, reflecting both holdings of marketable securities and firm-specific human capital, is both large and largely non-diversifiable. The average stockholder, in contrast, has a relatively small interest in the company in which he owns stock, and his interest can be readily diversified with other holdings. The corporate insider frequently is in a position where circumstances require him to hold a very large block of the stock and, equally important, he has an investment in human wealth in that corporation which is not readily transferable. The insider therefore has much more of a vested interest in insuring the continued viability of the firm, which gives him a much greater incentive than the average stockholder to maintain low debt ratios.

There is other evidence, apart from the usual econometric studies, which is also consistent with a debt ratio determined to a significant extent by management rather than stockholder optimization considerations. For example a survey of industrial corporations, including the 100 largest New York Stock Exchange corporations, a random sample of 272 other NYSE corporations, 137 corporations on the AMEX and 91 OTC corporations with a 51.4% response rate, indicated that 63.6% of the respondents believed that if they were to repurchase and retire 20% of the equity in their capital structure using long-term debt to finance the repurchase, their stock price would increase. Only 22.9% thought their stock price would decrease, with the remainder expecting no

change. In informally discussing the reason why more debt was not used, a number of corporate officials indicated that they considered debt riskier than the market apparently did. So far as we could tell, though this was explicitly indicated in only two instances, the logical interpretation is that management was concerned about the increased risk of loss of control over the corporation implicit in higher debt.

Indirect evidence of this dependence of the debt ratio on management optimization considerations is provided by the studies showing that the risk-adjusted market rate of return on corporate bonds has historically been significantly below the risk-adjusted market rate of return on corporate stocks. The risk adjustment in these studies was based on the covariance of bond and stock returns with a market index composed, in one set of studies, of both stock and non-corporate as well as corporate bonds and, in another set, of a much broader market index including not only securities but other major groups of marketable assets.[1] Residual risk was then added to the market risk to compare risk-adjusted bond and stock returns without any change in the comparative returns on these two classes of assets.[2] Finally, a simple but rigorous two-factor model (which explains returns on individual bonds not only by the usual general market-betas of these bonds but also by a second beta coefficient which measures the covariance of the bond's returns with that part of the returns in the bond market which is independent of returns in the general market again points to segmentation between the stock and bond markets associated with signficantly lower returns on bonds.[3]

There are several possible explanations for this apparent segmentation of

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[1] See Friend and Westerfield (1981); Blume and Friend (1973); and Stambaugh (1982).

[2] Friend and Westerfield, op. cit.

[3] See Friend, Westerfield and Granito (1978).

the corporate stock and bond markets but perhaps the most plausible is the unwillingness of management to issue sufficient bonds to eliminate the difference between risk-adjusted bond and stock returns. Thus, if there is segmentation on the demand side by investors in corporate securities, perhaps because of deficiencies in the short-selling mechanism, there may be no action on the demand side which would correct for this disequilibrium. However, it is not clear under the assumption of stockholder optimization by management why corporate issuers have not largely eliminated such a market imperfection by their actions on the supply side. The apparent opportunity for management to enhance their stockholders' interests by taking advantage of the low after-corporate tax cost of bond versus stock financing is totally apart from the additional incentive provided by the corporate tax advantages of corporate bonds. An inadequate reliance on debt financing from the viewpoint of stockholders' interests may be explained, at least in significant part, by concern of management for its own interests.

It has been observed frequently that the debt ratios characterizing most corporations in the United States are well under those in Japan and in most European countries. This fact also is consistent with expectations of a capital structure determined to a significant extent by management optimization considerations constrained by the degree of active stockholder participation in the different countries. Thus, control of corporations in Japan and other European countries is, to a much greater extent than in the U.S., dominated by a few large financial corporations. This reflects not only the greater institutional ownership of stock in these other countries but more importantly their more active involvement in management decisions. In all of these countries, of course, the large stock holdings by institutions tend to be well diversified.

Our paper reexamines the usual econometric relationship between the capi-

tal structure and theoretically relevant explanatory variables but with one major extension. We incorporate in the analysis variables which measure, admittedly imperfectly, one aspect of the special investment interest which insiders have in the continued viability of the corporation with which they are associated. By using such variables as the value of the maximum dollar investment in the stock of the company owned by a corporate insider and related measures of size of insider holdings, we investigate whether there is any systematic relationship between such insider holdings and the debt ratio, holding constant other relevant variables. We find generally significant negative correlations between the size of these holdings and the debt ratio, though these results are not completely uniform. While the size of the insider variable is consistent with the relevance of management optimization, as distinguished from stockholder optimization, we still find (as did all of our predecessors) that using both stockholder and, in our case, management optimization variables, we still can explain only well under half of the variance of the debt ratio, with a relatively small proportion being explained by the specific management optimization variables that we used. However, our results seem more satisfactory than those obtained in earlier studies, not only from the point of view of the investigation of the apparent effect of management optimization considerations, but also by the fact that the signs of the coefficients of the other variables conform to theoretical expectations.

Our new source of data consists of monthly data on the holdings and changes in holdings of individual corporate insiders -- that is officers, directors, and principal stockholders -- for each corporation listed on any U.S. exchange as well as those OTC corporations which are required by law to register with the U.S. Securities and Exchange Commission. These data cover the period from 1973 to 1984 and provide the actual date of the transaction as well as end of month holdings. While these data provide a measure of the spe-

cial investment interest which management has in the continued viability of the corporations they control, the data clearly have a number of deficiencies for this purpose. Specifically, insider stock holdings are only part of the information which bears on the cost to management of losing control over the company. The present value of future expected wages and other benefits provided by the company (in excess of the competitive benefits likely to be available elsewhere) and the other marketable wealth of the insider in addition to his stock holding in the company in which he is part of management would also be expected to affect his management decisions to the extent that he optimizes his own objective function rather than that of stockholders.

While a positive correlation would be expected between the size of an insider's holdings and his net wealth both exclusive and inclusive of his human wealth, so that the size of holdings may serve only as a very rough measure of the potential divergence between management and stockholder interests, it seems plausible to assume that the larger the size of an insider's stock holdings the larger his special interest in the company and as a consequence the larger his desire to minimize capital structure and other risks. It is true, of course, that even with minimal or no stock holdings by insiders there might still be a conflict between management and stockholder interests in setting the appropriate capital structure, with management preferring a lower debt ratio. Under such circumstances, the size of the debt ratio desired by an insider optimizing his own interests would be determined by such variables as the size and return of his human wealth invested in the company and the size of his total net worth. These variables are also relevant to the debt ratios desired by insiders with large stock holdings of the companies which they manage. Additional tests designed to incorporate human wealth and net worth into the analysis of the effect of management on debt policy will be discussed briefly at the end of this paper.

There is one other respect in which the size of insiders' holdings might impact the debt ratio. Insiders would be expected to have superior information on the company's prospects than other investors generally and some economists seem to believe that the debt ratio is used, at least in some circumstances, as a signalling device to convey this information to the market. However, regardless of the validity of this signalling hypothesis, there is no obvious reason why superior insider information should lead to the negative correlation between the size of insider stock holdings and the debt ratio which is the finding of this paper. To the extent that there is any validity to this type of signalling hypothesis, presumably a positive correlation would be anticipated. In the absence of a signalling hypothesis, a positive correlation might still be expected since it is likely that superior prospects would be associated with both larger insider holdings and higher debt.

2. Prior Empirical Evidence

This section summarizes the results of prior empirical studies relevant to the present analysis. Closest in methodology to the present study are cross-sectional analyses of the determinants of debt ratios: Gordon (1962), Schwarz and Aronson (1967), Gupta (1969), Lev (1969), Scott (1972), Toy, Stonehill, Remmers and Beekhuisen (1974), Remmers, Stonehill, Wright and Beekhuisen (1974), Scott and Martin (1975), Carlton and Silberman (1977), Ferri and Jones (1979) and Auerbach (1984). The cross-sectional analyses have generally been set up as linear models with a leverage measure (usually total debt/book value of assets) as the dependent variable. Explanatory data have been primarily drawn from the observable asset characteristics and accounting data (income and balance sheets) related to firm assets.

Within the usual set of explanatory variables, asset risk is perhaps most appealing on theoretical grounds, and is hypothesized to be negatively related

to leverage due to agency and bankruptcy costs. In the empirical analysis, this has been typically proxied by the degree of operating leverage, or by historically estimated variance in operating income or return on assets. The direction of the estimated effect is a matter of some dispute. With profitability variability as proxy, Gordon found a negative relationship, and Ferri and Jones found no effect. Toy et.al. found a surprising positive effect, for which no rationale was advanced. Ferri and Jones did find, however, a negative relationship to operating leverage. Auerbach (in his Table 4) uses two risk variables: variance of value, which enters in a negative direction, and variance of earnings, which enters positively, although neither is statistically significant.

Firm size is hypothesized to be positively related to leverage on the grounds that larger firms have better access to credit markets. Positive size dependencies were found by Ferri and Jones, Gordon, and Scott and Martin; no effect was found by Remmers, and a negative effect was found by Gupta. Asset composition data (relative amount of land, plant, equipment, etc.) bears on the collateral value of the assets, with an obvious link to the debt capacity, and was found empirically significant by Auerbach.

Industry classes have also been found to be related to leverage. In fact, many of the early studies were primarily analyses of industry-related variation using analysis of variance techniques. They are almost certainly related to the aforementioned variables, but may possess additional explanatory power in capturing the effects of omitted variables.

Profitability measures (such as return on assets) are employed in several of the cross-sectional studies (Carlton and Silberman, Toy et.al. and Gordon). Where included, they have invariably been found to be strongly negatively related to leverage. The mechanism at work here is most probably retention: holding constant dividends and investment, more profitable firms will borrow

less. Growth (typically in sales) has often, though by no means always, been found to be positively related to leverage, although the interpretation and significance of this is unclear.

It is striking that despite the wide range of models and independent variables utilized, the overall explanatory power of the cross-sectional models is quite low. Carlton and Silberman report an unadjusted R^2 of .3 (.1 when the profitability measure is dropped from the specification). The adjusted R^2 in Auerbach's cross-sectional regression is .15.[1]

In addition to the cross-sectional studies, relevant evidence may also be obtained from analyses addressed at various dynamic aspects of the capital structure issue: Baxter and Cragg (1970), Martin and Scott (1974), Taub (1975), Marsh (1982) and Auerbach (1984). The dynamic studies typically either attempt to model choice of security (debt or equity) issue in a qualitative response model, or postulate some sort of adjustment process toward a target. Most importantly for the present purpose, when the variables discussed above are incorporated in the dynamic studies, their effects are usually in conformance with those found in the cross-sectional analyses, although the evidence of a negative relationship between risk and leverage seems stronger than in the cross-sectional studies. In addition, some of the dynamic models employ variables that are of distinctly transient nature, such as interest rates and firm-specific tax rates and carry-forwards.

3. Description of Data

This section describes the data sources and computational procedures used

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[1] In his Table 5, Auerbach reports an adjusted R^2 of approximately .5, but his "alternative assets definition" is a market value measure. Since market value is also a component of the goodwill independent variable, there is an methodologically-induced relationship between the dependent and independent variables.

to construct the variables used in this study. The population in this study is the set of all non-financial, non-utility U.S. corporations possessing financial statements through 1983. For the accounting figures, the primary source of data was the Compustat file, and for the insider holding measures, the SEC filings were used. Variable definitions are summarized in Table 1, and are discussed in detail below.

Accounting Data

As the Compustat data base is a common and well-documented source, it will suffice to indicate the precise definitions of the variables and the motivation for these definitions.

The primary focus of this study is the debt/asset ratio (DRT), defined on a book value basis, where trade credit and short-term accruals are excluded from debt. One might prefer for the deflator (denominator) a firm market value, but the actual market value is almost certainly correlated with financial structure and an implied "unlevered" market value can only be computed by adoption of one of the equilibrium models of capital structure. However, the relevant debt ratio may be intermediate between the book and market ratios. Asset composition is measured by the ratio of net property, plant and equipment to book assets (RPPEA). The firm size variable (LA) is the logarithm of the book assets.

A return on assets measure was constructed for each year as the ratio of net operating income (earnings before interest and taxes) to year-end assets. The mean of this series over 1974-1983 was used as a measure of profitability (ROAM), and the standard deviation (ROAS) as a proxy for risk.

Insider Holding Data

The insider holding measures used in this study were derived from records filed with the U.S. Securities and Exchange Commission. In accordance with

the Securities Act of 1934, officers, directors, trustees and principal stockholders are required to report holdings, acquisitions and dispositions of securities of corporations in which they are insiders and have had transactions during the month. These reports, dating from 1975 to the present, are available in machine-readable form on the SEC ownership reporting system master file.[1] Each record in the file corresponds to a statement filed with the SEC and identifies the insider (by name and code number), the corporation and security (by CUSIP number), and end-of-month security holdings. There are roughly 1.8 million records, covering approximately two hundred thousand insiders. The vast majority of these transactions involve common stock holdings (the only class of insider security considered in this study), but all securities (including bonds and options) are covered by the reporting requirement and are present on the tape.

From these records, it is possible to compile for each insider and company a month-by-month series of stock holdings. This compilation was performed in the following manner. Reporting records were sorted by CUSIP (company and security), insider identification, and time. An end-of-month holding for a particular insider was taken to constitute a balance that persisted until the date of the next filing, or until December 1983 (the last date considered in this study) if no later filings were encountered.

Several additional aspects of these data are relevant to the study. First, insider relationships are summarized in 24 categories. As this study sought to capture the interest of those insiders with close proximity to managerial decision-making, certain of these categories were excluded.[2] In addi-

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[1] The tape is available from the National Archives and Record Service, General Services Administration, Washington, D.C. 20408.

[2] Specifically, the included categories were: chairman of the board, controlling person, director and officer. Excluded categories were: affiliated person, beneficial owner, investment advisor, limited partner, shareholder

tion, the nature of the holding was classified as "direct" or "indirect," with the latter reflecting holdings in trusts and other similar vehicles. There is no strong theoretical presupposition for differentiating between these categories, but on methodological grounds, based on the problematic quality of the indirect holding data, it was decided to exclude these holdings from consideration. Specifically, it appeared that in situations involving trusts with multiple beneficiaries, the filings did not reflect pro rata shares, indicating a great potential for over-counting. The SEC places on the transaction records an inconsistency code when holdings cannot be reconciled with acquisition and disposition data. Records so marked were dropped.

A final limitation of the data concerns investors who leave the insider population. As noted above, our compilation assumes insider holdings persist unless a subsequent filing indicates otherwise. If by virtue of retirement or other separation, the individual loses insider status, dispositions will not be reported. This may lead to a systematic upward bias in our insider holding counts, but we can conceive of no plausible reason why this error might be related to capital structure.

For each firm, insider holding variables were computed using either an aggregate for all insiders or simply focusing on the largest single insider. As both approaches yielded highly similar results, only the latter are reported. Ideally, we would like to quantify the extent to which the insider's holding is an undiversified position, and it would therefore seem logical to use the value of insider holdings relative to insider wealth, i.e. the insider portfolio weight. Lacking knowledge of insider wealth, however, we were forced to rely on two cruder measures: the absolute market value of holdings (MV) and this value as a fraction of total equity value (FR). MV would be a perfect proxy if personal wealth were constant across insiders,

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and trustee.

while FR would be if personal wealth and total market value of equity were perfectly correlated. An analysis of intermediate cases is contained in the appendix, which suggests that, given reasonable parameter values, MV will be the preferred proxy.

4. New Tests and Results

Descriptive statistics for the variables discussed in the last section are presented in Table 2, and their bivariate correlations are given in Table 3. The correlations involving the debt ratio (DRT) are in a preliminary fashion supportive of the hypothesized relationships. Most importantly, there is a negative correlation with the market value insider holding measure (MV). The fractional holding appears, however, to possess little effect. The other correlations suggest relationships consistent with the findings of earlier studies: negative for ROAS (the risk proxy), strongly positive for RPPEA (asset composition), weakly positive for LA (size), and strongly negative for ROAM (mean return on assets). As for correlations between the explanatory variables, it is perhaps noteworthy that LA is negatively correlated with FR and positively correlated with MV; for smaller firms, proportional insider interests are relatively large, but absolute insider interests are relatively small.

A large number of multivariate relationships for the debt ratio were estimated using ordinary least squares, and a representative sample of the results is reported in Table 4. The most important feature of these estimations is that the negative significance of the market value measures noted in the correlation matrices generally persists in the presence of other variables. (In alternative unreported specifications, the only instances in which the insider market value measures were insignificant were those in which the logarithm of the value was used together with ROAM and ROAS.)

More precisely, it appears that when the fractional and absolute insider holding measures are included in the same specification, the former becomes significantly positive, while the latter becomes more negative. As a statistical artifact, this is not surprising in view of the positive correlation between these variables, but from an economic viewpoint the positive effect on leverage of the fractional insider holding is somewhat perplexing. It should be noted that the explanatory power of MV dominates that of FR. We examined (but do not report) the results of estimating the specifications sequentially, i.e. by entering one variable at a time. When MV is entered first, it has a negative coefficient and the associated increment in the explained sum of squares is significant, as is that associated with subsequently adding FR. Reversing the order, when FR is entered first the associated increment in explained sum-of-squares is insigificant (and the coefficient is positive), while that associated with subsequently adding MV is highly significant (and the coefficient is negative).

Further evidence on the relationship among these variables is given in Table 5, which presents sample means for quartile subgroups ranked in order of ascending values of DRT. The pattern of MV means is much more suggestive of a monotonic relationship than that of the FR means. Indeed, the latter seem to exhibit something closer to a "U"-shape. It should also be noted that the positive relationship between FR and DRT is primarily a consequence of a relatively small number of firms with very high debt ratios, and does not appear to characterize the entire population.

The robustness of these results was further examined by introducing industry dummy variables at the 2-digit SIC level. These results are reported in Table 6, although for the sake of brevity the dummary variable coefficients are not given. The overall explanatory power of the regressions is elevated somewhat: the R^2s are improved by about .1 over the counterpart estimations

in Table 4, a statistically significant contribution to explanatory power. The coefficients on other variables, however, are little affected.

These results are generally supportive of our hypothesized relationship between managerial holding and capital structure policy, but it remains to be considered as to whether these findings might have arisen as a consequence of some methodological shortcomings. The possibility must first be raised of contamination via informational effects. Specifically, insider investment may be motivated by favorable insider information. Such information would in turn, however, motivate insiders to increase the leverage of their holdings. Any such action on the corporate (as opposed to personal) account would thus be prejudicial to our hypothesis; the absence of any such effects would only strengthen our findings.

Another consideration involves correlation induced by measurement error. The dependent variable here (DRT) is the ratio of debt (D) to book assets (A). As discussed in Section 3, a more relevant measure might be D/V_u, where V_u is the unlevered market value of the firm. If D/V_u is the "true" dependent variable in our specification, use of D/A will lead to a measurement error correlated with the market value of the firm, and therefore the market value of insider holdings. This correlation (like that induced by informational effects) may be shown to be of a direction prejudicial to our hypothesis.[1]

A final problem involves simultaneity. In our specification, we are implicitly assuming that causality runs from the insider holding measures to the debt ratio. In this view, managers set their insider holdings based on exogenous considerations (including perhaps control issues), and then address the capital structure problem. It is possible that other mechanisms may lead

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[1] Suppose that the true relationship between leverage and the insider holding variable is $D/V_u = MV$, and the relationship actually estimated is $D/A = aMV + u$, where $u = (D/A - D/V_u)$. If $Cov(MV,V_u) > 0$, $Cov(MV,u) > 0$, leading to estimates of α biased upwards.

to a reversed causality. A high level of debt, for example, increases (certeris paribus) the risk of a stock, motivating the reduction of undiversified holdings. An attempt was made to illuminate the causality for a small number of firms in this study. Using annual data, however, changes in the two variables appeared to occur within the same year. The possibility of reversed causality remains an open question, although such a mechanism would not be inconsistent with our hypothesized relationship between managerial holdings and capital structure.

5. Concluding Comments

In view of the limitations of the insider data used in this paper as a measure of management incentive to maintain a low debt ratio, the obvious question is whether these limitations can be corrected. It is possible to obtain annual data on the total renumeration paid to the top corporate insiders from which their human wealth invested in the company could be approximated, and we plan to do this in the future. It is more difficult to obtain data on the total marketable wealth of corporate insiders so that the size of their insider stock holdings can be put into an appropriate perspective for measuring the severity of the diversification problem posed by large insider holdings. There are, however, several sources which should permit at least rough estimates to be made of the net worth of the total marketable wealth for a sample of corporate insiders. The most comprehensive of these sources are the 1962 and 1963 Federal Reserve Board Surveys of the Financial Characteristics of Consumers and Changes in Family Finances. Another more recent source concerning the net worth of respondents is the Retirement History Survey carried out every two years in the 1969-79 period by the U.S. Census Bureau for the Social Security Administration. We hope to be able in the future to exploit this information (as well as similar information from

other sources) to supplement the data on insider holdings and human wealth.

Totally apart from the relevance of the data on insider holdings to analysis of the capital structure, they can be used to investigate other questions in the area of corporate finance. (These data have already been used in analysis of market efficiency and the superiority of the management information set.) They should be useful for testing a number of differnt signalling hypotheses. So far, in addition to the relationship of insider holdings to the capital structure, we have examined their relationship only to dividend pay-out policy. We have found no correlation between pay-out and the size of insider holdings, but there is no obvious reason why there should be.

Appendix

As indicated in the text of this paper, the market value (V) of insider holdings is the primary measure used to represent the risk of undiversified concentrations of holdings in a single asset. However, the fraction (FR) of total equity constituted by insider holdings is also used and, though we state that it is not likely to be as satisfactory a measure as MV of the risk associated with an insider's position, it is necessary to point out the analytical basis for this conclusion.

It is clear that V is much more closely related than FR to the absolute risk entailed in an insider's holdings. However, since investors' behavior seems to be much better characterized by constant relative risk aversion than by absolute risk aversion (Friend and Blume, 1975) the relevant question to raise is whether V or FR is a better proxy for V/W, where W is the insider's wealth. In other words, is V or FR more highly correlated with V/W? It will be recalled that FR = V/M, where M is the market value of outstanding shares of the stock including shares owned by the public as well as by insiders. For the sake of convenience, we shall deal with the logs of the relevant variables, i.e. $v = \log V$, $w = \log W$ and $m = \log M$, so that $\log (V/W) = v-w$ and $\log (V/M) = v-m$. Then

$$\rho\,(v,\ v - w) \;=\; \frac{\sigma_v^2 - \sigma_{vm}}{\sigma_v \sigma_{v-m}}$$

and

$$\rho(v - m, v - w) \;=\; \frac{\sigma_v^2 - \sigma_{vw} - \sigma_{vm} + \sigma_{mw}}{\sigma_{v-m}\sigma_{v-w}} \quad .$$

The circumstances under which V is a better proxy than FR for V/W can be written as $\rho(v,v-w) > \rho(v-m,v-w)$ or

$$\frac{\sigma_v^2 - \sigma_{vm}}{\sigma_v} > \frac{\sigma_v^2 - \sigma_{vw} - \sigma_{vm} + \sigma_{mw}}{\sigma_{v-m}} .$$

All of these statistics, with the exception of those involving w, can be estimated from our sample results for the 1468 corporations covered. Then $\sigma_v = 1.7526$, $\sigma_m = 1.7200$, $\sigma_{vm} = 1.5153$ and $\sigma_{v-m} = 1.4913$ (since $\rho_m = .5027$). To determine whether this inequality holds, it is necessary to estimate $\sigma_{vw} = \sigma_v\sigma_w\rho_{vw}$ and $\sigma_{mw} = \sigma_m\sigma_w\rho_{mw}$. We know σ_v and σ_m and we can estimate σ_w (i.e., the standard deviation of the log of wealth) or at least put plausible bounds on its value from the data on wealth and related information compiled from the Federal Reserve Board's 1983 Survey of Consumer Finances, covering a sample of 3824 families, 282 of whom indicated that they owned stock of corporations for which they worked. For the subsample of 282 families, $\sigma_w = 1.35$. Since this subsample includes both corporate insiders and other employees who are stockholders in the corporation for which they work, in an attempt to separate those families who are more likely to be corporate insiders or to resemble corporate insiders in their wealth characteristics, σ_w was also computed for the 61 families in this subsample with annual income over $50,000, for the 11 families with income over $100,000, for the 124 families with net worth over $100,000 and for the 13 families with net worth over $500,000. For these groups, σ_w is .86, .91, .63 and .40 respectively. Of the entire sample of 3824 families, for the 26 with wealth in excess of $1 million, $\sigma_w = .30$; for the 90 families with wealth in excess of $500,00, $\sigma_w = .44$. Thus, while to ensure that we don't bias the results in favor of our hypothesis we shall use $\sigma_w = 1.35$ as our estimate of the standard deviation of the log of wealth for corporate insiders, the evidence suggests this is an overstatement.

Information on ρ_{vw} and ρ_{mw} is not available, but so long as

$\rho_{mv} < .638 + .0134\ \rho_{vw}$, $\rho(v,v-w) > \rho(v-m,v-w)$. Since there is no necessary relationship between m and v, though V would be expected to be fairly highly correlated with W of which it is a part, ρ_{mw} would be expected to be lower than ρ_{vw} and well below the critical level of .65 for $\rho_{mw} = \rho_{vw}$. For the more realistic assumption $\rho_{mw} < \rho_{vw}$, the critical level for ρ_{mw} would be even higher. It might be noted that if ρ_{vw} and ρ_{mw} were both .5, $\rho(v,v-w) > \rho(v-m,v-w)$ so long as $\sigma_w < 1.75$, which is much higher than the upper bound of 1.35 suggested above as the critical level for σ_w. With a more plausible relation between ρ_{vw} and ρ_{mw}, with correlations of .75 and .25 respectively, $\rho(v,v-w) > \rho(v-m,v-w)$ so long as $\sigma_w < 3.59$.

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TABLE 1:

Variable Definitions

DRT	Debt/assets (book value). ("Debt" here does not include trade credit or short-term accruals).*
RPPEA	Net property, plant and equipment/assets (book value).*
ROAM	Return on assets (EBIT/assets), average from 1974-1983.
ROAS	Standard deviation of return on assets, 1974-1983.
LA	Logarithm of assets (book value).*
FR	Fraction of equity held by dominant insider.*
MV	Market value of equity held by dominant insider (millions of $).*

* Five-year average, 1979-1983.

TABLE 2:

Variables Used in the Study - Summary Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
DRT	0.247	0.145	0.0	0.827
RPPEA	0.350	0.177	0.0	0.886
ROAM	0.105	0.064	-.091	0.551
ROAS	0.051	0.034	0.003	0.318
LA	5.359	1.686	1.296	10.980
FR	0.115	0.133	2×10^{-5}	0.862
MV	29.870	94.456	0.003	1190.0

1470 observations (companies) were included in the sample.

TABLE 3:

Variables Used in the Study - Bivariate Correlations

	DRT	RPPEA	ROAM	ROAS	LA	FR
RPPEA	.28**					
ROAM	-.42**	-.05*				
ROAS	-.06**	-.14**	-.11**			
LA	.04*	.37**	.11**	-.39**		
FR	.01	-.08**	-.08**	.18**	-.33**	
MV	-.09**	.10**	.15**	.09**	.31**	.26**

* Significant at .10 level (two-tailed).
** Significant at .05 level (two-tailed).

TABLE 4:

Capital Structure Regressions (Without Industry Dummies)

Equation	Constant	RPPEA	FR	MV	ROAM	ROAS	R^2
1.	.157	.248	.007	-.00021			.097
	(17.84)	(12.08)	(2.72)	(-5.25)			
2.	.298	.215	.035	-.00011	-.926	-.342	.254
	(24.56)	(11.41)	(1.32)	(-2.84)	(-17.56)	(-3.46)	
3.	.302	.213		-.00009	-.934	-.318	.256
	(25.74)	(11.34)		(-2.56)	(-17.80)	(-3.26)	

Dependent variable in all specifications is DRT; variables are defined in Table 1; T-statistics are given in parentheses; 1470 observations; R^2 is adjusted for degrees of freedom.

TABLE 5:

The Debt Ratio and Insider Holdings: Results Grouped by Debt Ratio Quartiles

DRT Quartile	DRT Mean	MV Mean	FR Mean
1	.075	45.4	.136
2	.192	30.7	.095
3	.277	24.8	.103
4	.443	18.7	.127

TABLE 6:

Capital Structure Regressions (With Industry Dummies)

Equation	Constant	RPPEA	FR	MV	ROAM	ROAS	R^2
1.	.111	.166	.036	-.00017			.218
	(2.96)	(5.69)	(1.30)	(-4.29)			
2.	.225	.161	-.003	-.00007	-.887	-.228	.343
	(6.26)	(6.01)	(-.12)	(-1.98)	(-16.32)	(-2.23)	
3.	.224	.161		-.00007	-.887	-.231	.343
	(6.40)	(6.06)		(-2.12)	(-16.41)	(-2.30)	

Dependent variable in all specifications is DRT; dummy variables were included at the 2-digit SIC level (56 groups) but coefficients values were not reported; variables are defined in Table 1; T-statistics are given in parentheses; 1470 observations; R^2 is adjusted for degrees of freedom.