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Source: *The Journal of Business*, Vol. 54, No. 1 (Jan., 1981), pp. 65-85
Published by: The University of Chicago Press
Stable URL: http://www.jstor.org/stable/2352633
Accessed: 05-06-2017 19:33 UTC

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Evidence on the Impact of Exchange Offers on Security Prices: The Case of Income Bonds*

In this paper we examine the impact of exchange offers in which income bonds are issued in exchange for preferred stock on the issuing company's equity securities. Because there is no potential for bankruptcy with income bonds, these exchange offers represent an ideal "experiment" for isolating the tax effects of debt financing from the bankruptcy-costs effects. In general we find that the results are not consistent with the Modigliani-Miller corporate tax model. We interpret the results as being more consistent with Miller's tax equilibrium hypothesis.

I. Introduction

The question of whether the value of a firm is affected by its debt-equity ratio is still an unresolved one. In the Modigliani-Miller (1963) corporate tax model, the value of a firm is a positive function of its debt-equity ratio because of the tax deductibility of interest payments on debt financing. On the one hand, several authors (Kraus and Litzenberger 1973; Scott 1976; and Kim 1978) have shown that the introduction of bankruptcy costs in the Modigliani-Miller model implies that there will exist an optimum debt-equity ratio for each firm and that the use of either more or less debt than the optimum amount will lead to a decrease in firm value. On the other hand, Miller (1977) has shown that, under certain circumstances, introduction of personal taxes implies that the value of an individual firm will be independent of its debt-equity ratio.

The question ultimately is an empirical one. Masulis (1979) provides evidence on the question by examining the stock returns of firms that

* Thanks are due to James Ang, Henry Barker, Michael Brennan, Tim Campbell, Eugene Comiskey, John Howe, Robert Johnson, Han Kim, and Michael Long; to the finance workshops at Dartmouth College, the Georgia Institute of Technology, the University of Houston, the University of Michigan, Southern Methodist University, Texas Christian University, and Washington University for their helpful comments and suggestions; and to Kenneth Dunn and Scott Linn for assistance in data collection.

(*Journal of Business*, 1981, vol. 54, no. 1)

0021-9398/81/5401-0002$01.50

have issued debt securities in exchange for equity securities and vice versa. He finds that, on average, common stocks earn "abnormal" positive returns when firms increase their use of debt financing through an exchange offer or recapitalization and that the reverse is true when debt financing is reduced. He interprets this evidence as being consistent with the optimal capital structure models and with a positive corporate tax effect and inconsistent with the tax neutrality proposition.

However, the effect of an exchange offer of fixed-interest bonds for equity on the issuing company's equity securities cannot be predicted a priori within the corporate tax with bankruptcy cost theories of optimal capital structure. If a firm is already at its optimal debt-equity ratio, any change in the capital structure should have a negative effect on firm value. In contrast, if a change in the firm's operations had dictated a change in its optimal debt-equity ratio, an exchange offer may represent a movement toward the new optimum. In this case, the predicted effect on firm value is positive. This problem makes it difficult to interpret the evidence based on these exchange offers, as Masulis acknowledges.

In this paper we conduct a test of the tax effects of debt financing that is free of the ambiguity caused by the potential bankruptcy costs associated with fixed-interest bonds. We do so by examining the equity returns of firms that have issued "income" bonds to retire preferred stock.[1] Unlike fixed-interest bonds, when an interest payment is omitted on an income bond because the firm has insufficient accounting earnings, bondholders may not force the firm into bankruptcy.[2] However, when interest payments are made, they are deductible for tax purposes against the firm's income and thus act to reduce its taxes just as do interest payments on fixed-interest bonds.[3] For these reasons,

1. In a companion paper (McConnell and Schlarbaum 1981) we provide a complete description of the characteristics of income bonds.

2. As Miller (1977) points out, income bonds do have a fixed maturity date at which time bondholders can force the firm into bankruptcy if principal payments on the bonds are not forthcoming. However, the maturity date can be made arbitrarily distant so as to reduce the present value of the potential bankruptcy costs to (near) zero at the time of the security issue. E.g., the Elmyra and Williamsport Railroad issued an income bond with a 1,000-year maturity. The median term-to-maturity of the bonds included in our sample is 50 years and the mean term-to-maturity is 55 years. The present value (at the time of issuance) of any costs associated with potential bankruptcies at those distant dates is zero for all practical purposes.

3. In order for interest payments on income bonds to be deductible in computing taxes, the firm must establish that the bonds are, in fact, debt. Unfortunately, neither the U.S. Congress nor the tax courts have defined precisely what features are necessary to distinguish an income bond from a preferred stock. However, based on tax court cases and IRS rulings, experts on the question have identified two important (and usually dominating) characteristics. First, the bonds must have a fixed maturity. Second, contingent interest payments cannot be discretionary. The second requirement is typically interpreted to mean that interest payments must be paid if earned, and omitted payments must be cumulative and due in any event at the maturity date of the debt. In some

and because exchange offers leave the firm's investments unchanged, exchange offers in which income bonds are issued to retire preferred stock provide an ideal "experiment" for isolating the tax effect associated with debt financing.[4]

In the following section we provide a precise statement of the hypotheses to be tested. Section III contains a description of the data. In Section IV we describe the empirical methodology. The results are presented in Section V. A final section contains a summary and conclusion.

II. Statement of Alternative Tax Hypotheses

According to the Modigliani-Miller (1963) corporate tax model, once a firm has established its investment policy, any increase in the use of debt financing by the firm will lead to an increase in the value of its equity securities. This increase in value comes about because the interest payments on corporate debt reduce the firm's taxes. Furthermore, for bond issues with distant maturities, the increase in value will be approximately equal to the market value of the debt multiplied by the corporate tax rate. Although Modigliani and Miller developed their model with default-free debt, Stiglitz (1969) has shown that the same result obtains if debt is not default free, but bankruptcy is costless.

In an attempt to explain why the observed use of debt financing is much less than predicted by the Modigliani-Miller and Stiglitz models,

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instances, two other tests have been applied in lieu of the cumulation of omitted interest. The first is that income bondholders rank equally with the corporation's other creditors in liquidation. The second is that the bonds must have been issued in an arms-length transaction. Conversations that we have had with the treasurers and tax attorneys of the corporations in our sample confirm the experts' opinions. For further discussion, see the *Commercial and Financial Chronicle* (September 2, 1954), Malloy (1957), Maxfield and Lyons (1958), Plumb (1971), and Barnes (1976). For the purposes of our study, the relevant question is whether the interest payments on the bonds in our sample were in fact deductible from income before taxes. For each of the companies in our sample, we were able to determine—either from conversations with the corporate treasurer or controller, examination of corporate annual reports, or reading of published accounts of the bond issue—that the interest payments were deductible and deducted.

4. There may, of course, be other "leverage-related" costs associated with income bonds that are not incorporated in the bankruptcy-cost models of optimal capital structure. The potential for these costs arises because of conflicts of interest between stockholders and income bondholders over the proper computation of accounting earnings. In the companion paper, we argue that the magnitude of the costs associated with these conflicts is trivial when compared with the tax advantage of debt financing within the Modigliani-Miller (1963) model and that there exist mechanisms that minimize the incentives for stockholders to underreport accounting earnings. One easily implementable mechanism is to make omitted contingent interest payments cumulative. Indeed, that typically is a requirement necessary for the interest payments on the debt to be tax deductible. An additional feature of our study is that all but three of the exchange offers in our sample occurred outside of the time period considered by Masulis. Thus, our study serves to supplement his, as well as to provide a potential independent validation of his results.

several authors have incorporated costly bankruptcy explicitly into the analysis of corporate capital structure decisions (Kraus and Litzenberger 1973; Scott 1976; and Kim 1978). According to these models, value-maximizing firms, which have already fixed their investment plans, will issue debt up to the point where the marginal present value of future bankruptcy costs just offsets the marginal present value of the future tax savings associated with the debt. However, if a firm were to issue debt that is free of potential bankruptcy costs (which income bonds are) to retire equity securities (e.g., preferred stock), the Modigliani-Miller, Stiglitz, and bankruptcy-cost models would unanimously predict an unambiguously positive change in the value of the firm equal to the corporate tax rate times the present value of the future, promised interest payments on the debt. Furthermore, if the firm's already outstanding debt securities are default free, the total increase in value will be reaped by the owners of the firm's already outstanding equity securities.[5] We label this the "corporate tax incentive hypothesis."

While each of the models described above includes corporate taxes, none includes personal taxes on income from securities. Miller (1977) has shown that, under certain circumstances, when personal taxes are included, in equilibrium, the value of an individual firm is again independent of its debt-equity ratio, once its investment decision has been determined. Although Miller developed his analysis with default-free debt, Chen and Kim (1979) show that the same result holds when debt is not default free, but bankruptcy is costless. Thus, according to the Miller and Chen-Kim models, if a firm were to issue debt that is free of potential bankruptcy costs to retire equity, the value of the firm would be unchanged. Furthermore, if the firm's already outstanding debt secrurities are protected by me-first rules, the value of each of the firm's individual classes of securities will also be unchanged (i.e., there will be no wealth transfers among individual classes of security holders). We label this the "tax equilibrium hypothesis."

If we assume that the capital market is efficient, the empirical predictions of the two tax hypotheses are straightforward. When a firm announces its intention to issue income bonds in exchange for preferred stock, the corporate tax incentive hypothesis predicts that the firm's equity securities will increase in value by an amount equal to the present value of the future tax shield provided by the soon-to-be-issued

5. If the firm's already outstanding debt is risky, the change in its value caused by such an exchange offer is indeterminate. On the one hand, the value of the old debt can increase because of the tax shield provided by the new debt. On the other hand, if the existing debt is not completely protected by me-first rules (Fama and Miller 1972; Kim, McConnell, and Greenwood 1977) the value of the old debt can decline because of wealth transfers among classes of security holders (see Masulis 1979).

debt. The tax equilibrium hypothesis predicts no change in the values of the firm's already outstanding securities.[6]

III. Stock Sample and Selection Procedure

To construct our sample, we first identified all issues of income bonds by publicly held corporations during the period 1945–76.[7] If the bond were issued in an exchange offer for preferred stock, the "observation" was added to our sample. This procedure produced a sample of 24 exchange offers representing 24 separate companies.[8]

Determinations of the first public announcement date of the exchange offer is crucial to the analysis undertaken here. The *Commercial and Financial Chronicle* and the *Wall Street Journal* were our primary sources of first public announcement dates. Once we identified the first published announcement date, we confirmed that date by writing to the issuing companies requesting copies of the press releases concerning the original announcement, as well as copies of the original prospectuses. Typically, the companies were quite cooperative, but in those cases wherein no response was forthcoming to our written request, we subsequently telephoned the company and made the same request verbally. This procedure allowed us to identify the month of the first public announcement of the proposed exchange offer in all but two cases. Thus, our final sample contains 22 observations.[9]

Of the 22 companies in the sample, the common stocks of 19 were traded on the NYSE at the time of the announcement of the exchange

6. We should emphasize again that these predictions are based on the assumption that the value of the firm's already outstanding debt is unchanged by the exchange offer. In addition these predictions assume that the firm's production-investment decisions are unaffected by the exchange offer. In fact, several of the exchange offers in our sample included small cash distributions to the preferred stockholders. However, in no case were the cash distributions greater than 5% of the market value of the securities involved in the exchange.

7. This period was chosen in part because of the availability of monthly returns on the CRSP files, although we did augment those files with hand-collected prices on stocks not listed on the NYSE.

8. Source documents used in this search included the Moody's *Manuals* "Blue pages," the *Bank and Quotation Record*, the *Commercial and Financial Chronicle*, and Standard and Poor's *Security Owner's Bond Guide*.

9. In 20 of the 22 exchange offers we identified the exact date of the first published public announcement. However, in two cases the first public announcement appeared in the *Commercial and Financial Chronicle*. Since this is a weekly publication, the actual public announcement may have occurred on any of the previous 7 days. Our procedure for identifying the first public announcement date is similar to the one employed by Masulis (1979). As Masulis indicates, most offerings actually involve a series of announcements including the original proposal, approval by the stockholders and/or board of directors, filing with the Securities Exchange Commission or the Interstate Commerce Commission, changes in the offering and, finally, the offering itself. As he also indicates, in some instances the issue may lag the first announcement by a considerable length of time. In our sample, the longest time delay from original announcement to actual issue was 18 months.

TABLE 1 Dollar Amounts and Relative Sizes of Security Classes Involved in Exchange Offers

Company (1)	Bond Issue Date (2)	Market Value of Common Stock (Thousands $) (3)	Market Value of Preferred Stock (Thousands $) (4)	Market Value of Preferred Stock Retired (Thousands $) (5)	Column 5 ÷ Column 3 (%) (6)	Total Market Value of Income Bonds (Thousands $) (7)	Column 7 ÷ Column 3 (%) (8)
1. Armour & Co.	1954	48,284	47,500	47,500	98.4	48,390	100.2
2. Boston & Maine Railroad Co.		9,042	12,100	5,981*	66.1	n.a.	...
3. Budget Finance Corp.	1960	4,335	6,101	1,007	23.2	1,666	38.4
4. Chicago & Eastern Illinois Railroad Co.	1954	7,244	9,192	7,296	100.7	8,813	121.7
5. Chicago, Milwaukee, St. Paul & Pacific Railroad Co.	1955	48,564	64,235	34,350	70.7	40,895	84.2
6. Chicago Railway Equipment Co.	1956	2,100	2,255	2,255	107.4	n.a.	...
7. Chicago, Rock Island & Pacific Railroad Co.	1955	131,037	67,773	67,773	51.7	63,239	48.3
8. Curtis Publishing Co.	1956	27,224	37,670	20,297	74.6	9,598	35.3
9. Erie Railroad Co.	1955	58,188	32,744	17,631	30.3	20,995	36.1
10. General Baking Co.	1966	17,161	8,265	8,265	48.2	7,268	42.4
11. General Cigar Co.	1957	19,452	6,300	6,300	32.4	5,583	28.7
12. Gulf, Mobile & Ohio Railroad Co.	1957	16,621	18,961	6,030	36.3	4,986	30.0
13. Maine Central Railroad Co.	1959	3,360	3,060	2,142	63.8	1,950	58.0
14. Michigan Sugar, Inc.	1964	3,705	6,670	n.a.	...	1,648	44.5
15. Missouri-Kansas-Texas Railroad Co.	1958	7,686	38,186	38,186	496.8	27,347	355.8
16. Monon Railroad Co.	1958	2,548	6,364	4,329	169.9	2,730	107.1
17. New York, Chicago & St. Louis Railroad Co.	1955	71,008	39,349	39,349	55.4	36,000	50.7
18. Norfolk & Western Railroad Co.	1965	1,154,904	22,091	22,091	1.9	3,502	.3
19. Pittsburgh Brewing Co.	1958	3,278	4,428	3,966	121.0	4,042	123.3
20. St. Louis & San Francisco Railway Co.	1956	55,781	54,593	26,942	48.3	43,428	77.9
21. Virginian Railway Co.	1958	85,993	33,203	27,764	32.3	30,304	35.3
22. Western Pacific Railroad Co.	1954	28,831	32,538	32,538	113.9	23,794	82.5
Mean					87.8		75.0

*Exchange offer subsequently canceled. Estimate based on terms of proposed exchange offer.

offer. For these stocks, rates of return were obtained from the Center for Research in Security Prices (CRSP) monthly stock file. Monthly rates of return for the remaining common stocks were calculated using prices, dividends, and split data taken from Standard and Poor's *Security Owner's Stock Guide* and *Security Owner's Dividend Record.* Additionally, monthly rates of return for the preferred stocks of each of these companies were computed using data from these same two sources.[10]

The companies included in the sample are listed in table 1 along with the bond issue dates and the dollar amounts of securities involved in the exchange offers. Chronologically, the earliest exchange offers were those of Armour and Company, the Chicago and Eastern Illinois Railroad, and the Western Pacific Railroad in 1954, and the most recent one was the Norfolk and Western issue in 1965. The table indicates a concentration of issues in the latter half of the 1950s and a disproportionate representation of railroad companies, with 14 from that industry.

The market value of the preferred stocks and income bonds issued in the exchange offer can be used to estimate the increase in value predicted by the Modigliani-Miller (1963) model. Column 6 gives the market value of the preferred stock retired in each exchange offer as a proportion of the market value of the common stock of the issuing company. Column 8 gives the market value of the income bonds issued in each exchange offer as a proportion of the same company's common stock. The preferred and common stocks were valued as of the date of the initial announcement of the proposed exchange offer and the income bonds were valued according to the first available market price. It is likely that the estimated market value of the preferred stock slightly overstates the potential tax shield associated with the bond issue, because several exchange offers also involved some small payments of cash, warrants, or fractional shares of common stock. The estimated market value of the debt probably understates the importance of the potential tax shield at the time of the exchange offer because there was often a lag between the actual bond issuance and the first market price. In the period of generally rising interest rates, the bond values may have tended to decline during this interval.

In any event, the means of the two measures of the potential tax shield are of the same order of magnitude. The mean of the market value of preferred stock to common stock ratios is 87.8%, and the mean

10. Month-end prices were collected from Standard & Poor's *Stock Guide*. If a transaction price was not available a bid price was substituted. Ex-dividend dates and dividend amounts were taken from the *Stock Guide* and cross-checked with Standard and Poor's *Security Owner's Dividend Record.* Missing prices were collected from the appropriate *Bank and Quotation Record* or *Wall Street Journal.* In this way it was possible to construct continuous price series over the relevant time periods.

of the market value of debt to common stock ratios is 75.0%. If we assume that the entire tax shield is received by the holders of the firm's common stock, then based on the Modigliani-Miller (1963) tax model, with a corporate tax rate of 50%, these mean ratios translate into predicted increases in common stock value of about 44% and 37.5%, respectively. However, it is possible that these increases in value will be shared with the firms' preferred stockholders. In any event, these numbers represent benchmarks with which any actual increases in value can be compared.

IV. Methodology

The examination of common and preferred stock returns around the time that a firm announces its plan to issue income bonds in exchange for preferred stock is an "events-time" analysis. The method used here is the familiar one of estimating abnormal returns by computing "average residuals" and "cumulative average residuals" in a manner analogous to Fama et al. (1969). The period of time encompassed by the analysis extends from 36 months prior to the month of announcement, which is designated as month zero, to 36 months subsequent to that month. We first estimate the risks of the common and preferred stocks of the firms planning to issue income bonds. These estimates are then used in conjunction with a two-factor market model and a three-factor market model which adjusts for railroad industry effects to estimate the abnormal returns on the equity securities of firms which announce exchange offers of income bonds for preferred stock. Tests of significance are performed using probability tests of the sort first introduced by Jaffee (1974).

a. Estimation of Risk

Within the context of the two-parameter asset-pricing model, the relevant measure of risk for any security is its "systematic" risk defined as the covariance of the security's return with the return on the market portfolio of all risky assets divided by the variance of the return on the market portfolio. If it is assumed that the return-generating process is stationary and multivariate normal, the market model provides an appropriate approach for estimating the risk of any security or portfolio.[11]

The systematic risk of each common stock and each preferred stock included in our sample was estimated as

$$\tilde{R}_{j\tau} = \hat{\alpha}_j + \hat{\beta}_j \tilde{R}_{m\tau} + \hat{e}_{j\tau}, \quad j = 1, 2, \ldots, N, \tag{1}$$

11. Fama (1976, pp. 63–132) provides a complete discussion of this model and estimation technique.

where $\tilde{R}_{j\tau}$ = rate of return on security j in month τ; $\tilde{R}_{m\tau}$ = rate of return on CRSP value-weighted portfolio of NYSE common stocks in month τ; $\hat{e}_{j\tau}$ = estimate of the stochastic disturbance in the return on security j in month τ; and $\hat{\beta}_j$ = estimated systematic risk of security j. An estimate of systematic risk for an equally weighted portfolio of railroad common stocks was also obtained in this manner.[12] We use this estimate to adjust for railroad industry effects as described in the next subsection.

For each of the common stocks, the market model was estimated using data from event months −36 through −13 and +13 through +36. Observations from these same months were used to estimate the market model for the preferred stocks except in those cases wherein the entire preferred stock issue was retired when income bonds were issued. In those cases, returns for months −36 through −13 only were used. For the equally weighted portfolio of railroad stocks, the market model was estimated using data for the entire period 1951–65, the period during which all of the announcement months occurred.

Three factors motivated our choice of months −36 through −13 and months +13 through +36 for estimating the market model. First, we wanted to obtain an estimate for each security that was timely, as there may be shifts in the beta of a security over an extended period of time. This was the reason for limiting the observations used in the estimating process to those months falling within 3 years of the time of announcement. Second, there is no apparent reason to expect a systematic shift in the beta of the common stock of a firm issuing bonds to retire preferred stock. Therefore, it is reasonable to believe that the assumption of stationarity holds for the common stocks for the months prior to and subsequent to the month of announcement. Third, we wanted to avoid the potential contaminating effects of possible abnormal returns in the months immediately surrounding the month of announcement. This was the reason for excluding the data for months −12 through +12 when estimating the market model.

The estimates of beta for the individual common stocks range from 0.20 to 1.98, and the average of these estimates is 1.06. In the case of the individual preferred stocks, the estimates range from 0.20 to 0.79, and the average is 0.31. The estimate of beta for the portfolio of railroad common stocks is 1.25.

12. The portfolio of railroad stocks is an equally weighted portfolio comprised of all the railroad stocks in the CRSP monthly files. The portfolio was constructed for the period 1936–76. It was reformed every 5 years. All railroad stocks which had a complete return history for the period 1936–40, except those of companies issuing income bonds within this period or within 36 months before or 36 months after this period, were included in the portfolio for the years 1936–40. This same procedure was then used for each of the subsequent 5-year periods. The resulting series were spliced together to form a railroad-stock portfolio return series for the entire period 1936–76.

b. Estimation of Abnormal Returns

Using the $\hat{\beta}_j$'s described above, we computed two sets of abnormal return estimates. The first set was obtained using, as a benchmark, a two-factor market model. The model, which has worked well in explaining security returns and is consistent with the Black (1972) version of the capital asset pricing model, is[13]

$$\tilde{R}_{j\tau} = \tilde{\gamma}_{0\tau} + \tilde{\gamma}_{1\tau}\beta_j + \tilde{\eta}_{j\tau}, \quad j = 1, 2, \ldots, N, \tag{2}$$

where $\tilde{R}_{j\tau}$ = rate of return on security j in month τ; $\tilde{\gamma}_{0\tau}$, $\tilde{\gamma}_{1\tau}$ = market determined variables representing the ex post relationship between rates of return and risk in time period τ; they can vary stochastically from period to period, but $E(\tilde{\gamma}_0) = E(\tilde{R}_0)$ and $E(\tilde{\gamma}_1) = E(\tilde{R}_m) - E(\tilde{R}_0)$ is the expected rate of return on any asset that is uncorrelated with the market portfolio; $\tilde{\eta}_{j\tau}$ = stochastic disturbance term in the return on security j in month τ, assumed to be independent of β_j and uncorrelated across j and τ; And β_j = relative risk of security j. According to this model, the return on security j in month τ is a function of the overall market parameters, $\tilde{\gamma}_{0\tau}$ and $\tilde{\gamma}_{1\tau}$, and the security-specific variables β_j and $\tilde{\eta}_{j\tau}$. In order to use this model to estimate abnormal returns, we obtained estimates of $\tilde{\gamma}_0$ and $\tilde{\gamma}_1$ for every calendar month over the period 1951–68 using the procedure developed by Fama and MacBeth (1973). Using these estimates and the estimates, $\hat{\beta}_j$, described in Section IV*a*, we computed the abnormal return on security j in month τ as

$$\hat{\eta}_{j\tau} = R_{j\tau} - \hat{\gamma}_{0\tau} - \hat{\gamma}_{1\tau}\hat{\beta}_j, \quad j = 1, \ldots, N; \tau = -36, \ldots, +36, \tag{3}$$

where $\hat{\eta}_{j\tau}$ = estimated abnormal return on security j in event-related month τ; $R_{j\tau}$ = realized rate of return on security j in event-related month τ; $\hat{\gamma}_{0\tau}$, $\hat{\gamma}_{1\tau}$ = estimated market parameters in the calendar month corresponding to event month τ; and $\hat{\beta}_j$ = estimate of systematic risk for security j.

The second set of abnormal return estimates was obtained by adjusting for railroad industry effects using a procedure similar to the one described by Langetieg (1978). The first step in the adjustment process was to estimate abnormal returns for the portfolio of railroad common stocks as

$$\hat{\eta}_{R,j\tau} = R_{R,j\tau} - \hat{\gamma}_{0\tau} - \hat{\gamma}_{1\tau}\hat{\beta}_R, \quad j = 1, \ldots, N; \tau = -36, \ldots, +36, \tag{4}$$

where $\hat{\eta}_{R,j\tau}$ = estimated abnormal return on the portfolio of railroad common stocks in event-related month τ for security j; $R_{R,j\tau}$ = realized rate of return on the portfolio of railroad common stocks in event-related month τ for security j; and $\hat{\beta}_R$ = estimate of systematic risk for the portfolio of railroad stocks; and $\hat{\gamma}_{0\tau}$ and $\hat{\gamma}_{1\tau}$ are as defined above. Note that there is an estimate $\hat{\eta}_{R,j\tau}$ which corresponds to every estimate

13. See Mandelker (1974) for a discussion of the assumptions underlying this model.

$\hat{\eta}_{j\tau}$. The abnormal returns on the individual securities were assumed to be linearly related to those on the portfolio of railroad stocks as

$$\eta_{j\tau} = C_j \eta_{R,j\tau} + \eta'_{j\tau} \quad j = 1, 2, \ldots, N, \tag{5}$$

where C_j measures the relationship between abnormal returns for an individual security and abnormal returns for the portfolio of railroad common stocks. The coefficient C_j was then estimated for each of the individual securities by regressing the estimates of abnormal performance for each security against those for the portfolio of railroad stocks using data for the same months used to estimate the β_j's.[14] The adjusted estimates of abnormal performance were computed as

$$\hat{\eta}'_{j\tau} = R_{j\tau} - \hat{\gamma}_{0\tau} - \hat{\gamma}_{1\tau}\hat{\beta}_j - \hat{C}_j\hat{\eta}_{R,j\tau} \quad j = 1, \ldots, N; \quad \tau = -36, \ldots, +36, \tag{6}$$

where $\hat{\eta}'_{j\tau}$ is the industry-adjusted estimate of abnormal performance for security j in month τ, and all other terms are as defined above.

For both the two-factor and the industry-adjusted abnormal return estimates, the abnormal returns were averaged across all firms to obtain the mean abnormal return for event-related month τ as

$$\bar{\hat{\eta}}_{j\tau} = \frac{1}{N}\sum_{j=1}^{N}\hat{\eta}_{j\tau}, \quad \tau = -36, \ldots, +36, \tag{7}$$

where $N \leq 22$. The mean abnormal return estimates were summed over event time to obtain the cumulative abnormal returns.

c. *Probability Tests of Significance*

To conduct tests of statistical significance on the cumulative abnormal returns, we used probability tests of the sort first introduced by Jaffe (1974) and subsequently adapted by Mandelker (1974), Ellert (1976), and Dodd and Ruback (1977). The virtue of this method is that it takes into account the cross-sectional correlation in the residuals of different securities in the same calendar months.

The particular procedure employed here is similar to the one used by Ellert and Dodd and Ruback, in that weighted-average standardized residuals are used. The measure of portfolio variability used to standardize the portfolio residuals was the standard deviation of the residuals for the portfolio held in month t over the most recent 36 months

14. The estimates of C_j range from -0.96 to 1.97 in the case of the common stocks. Five are negative, and the average of the estimates is 0.61. The estimates are positive and statistically significant for eight of the 14 railroad stocks in the sample. Only one of the nonrailroad stocks in the sample has C_j that is statistically significant. The estimates of C_j for the preferred stocks range from -0.62 to 1.58. The average of these estimates is 0.39. Again the estimates are positive and statistically significant for eight of the 14 railroad preferreds. None of the other estimates is significantly different from zero.

prior to t. The procedure allowed us to determine the statistical significance of the cumulative average residuals over various time intervals around the time of announcement of a proposed exchange offer.[15]

V. Empirical Results

a. Common Stock Returns

Percentage estimates of the monthly average abnormal returns for the common stocks of firms announcing their intention to issue income bonds in exchange for preferred stock are presented in table 2.[16] The monthly average abnormal returns over the period of time extending from 36 months before to 36 months after the month of announcement

TABLE 2 **Percentage Monthly Average Abnormal Return Estimates and Sample Sizes ($\bar{\hat{\eta}}$) for Common Stocks of Firms Issuing Income Bonds in Exchange for Preferred Stock for 36 Months before and after the Month of Announcement**

Month	$\bar{\hat{\eta}}$	N	Month	$\bar{\hat{\eta}}$	N	Month	$\bar{\hat{\eta}}$	N
−36	3.06	22	−12	0.11	22	+13	−.74	22
−35	2.70	22	−11	1.35	22	+14	.75	22
−34	−.99	22	−10	.73	22	+15	2.18	22
−33	1.39	22	−9	−2.74	22	+16	−1.22	22
−32	−.54	22	−8	2.17	22	+17	−1.22	22
−31	.62	22	−7	.47	22	+18	1.48	21
−30	.08	22	−6	.61	22	+19	.13	20
−29	.54	22	−5	−1.39	22	+20	−.84	20
−28	−1.72	22	−4	−1.78	22	+21	1.14	20
−27	.72	22	−3	.74	22	+22	−1.13	20
−26	3.03	22	−2	.91	22	+23	−.19	20
−25	.60	22	−1	−2.34	22	+24	−.95	20
−24	.31	22	0	.25	22	+25	.27	20
−23	.11	22	+1	−.35	22	+26	.06	20
−22	1.11	22	+2	·1.25	22	+27	3.20	19
−21	−.29	22	+3	−1.18	22	+28	−2.16	19
−20	.59	22	+4	−2.03	22	+29	−.35	19
−19	1.31	22	+5	−.49	22	+30	−2.44	19
−18	−.30	22	+6	1.41	22	+31	1.37	19
−17	−.24	22	+7	−.53	22	+32	−.02	19
−16	.22	22	+8	.06	22	+33	−.16	19
−15	−3.09	22	+9	−1.14	22	+34	−.68	19
−14	−1.94	22	+10	1.03	22	+35	−2.17	19
−13	4.22	22	+11	−.11	22	+36	1.46	19
			+12	2.28	22			

15. For a complete description of the probability tests of significance, see Dodd and Ruback (1977).

16. Only the industry-adjusted abnormal returns are presented formally, but any differences between these results and those obtained using the unadjusted (two-factor) model will be noted where warranted.

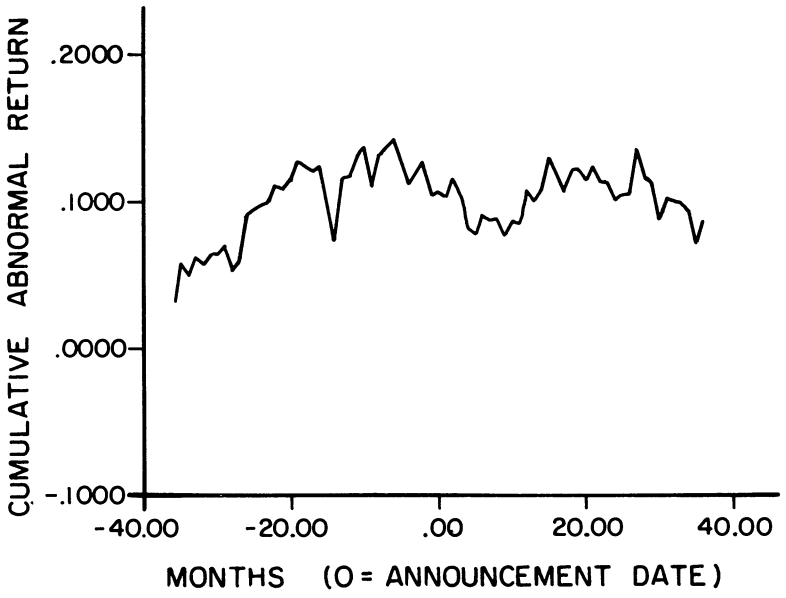

FIG. 1.—Cumulative abnormal returns for the 73 months surrounding the month of first public announcement of an exchange offer (common stock sample).

vary from −3.09% to 4.22%. The average of the 73 monthly, cross-sectional mean abnormal returns contained in table 2 is 0.07%. While there are some "large" positive and negative abnormal returns, these are scattered randomly over the period. There is no clustering of large, positive abnormal returns around the month of the announcement, and the average abnormal return in the month of announcement is relatively small in magnitude. Thus, these results do not appear to be supportive of the tax incentive hypothesis. The announcement that income bonds are to be issued in exchange for preferred stock appears to have little impact on the return of the issuing firm's common stock.

Cumulative monthly abnormal returns for the entire 73-month period are depicted in figure 1, and cumulative monthly abnormal returns for selected holding periods around the time of announcement are presented in table 3. The table presents t-statistics obtained using the procedure described in Section IV*c* which make it possible to formally test the null hypothesis of no tax effect (H_0: $\bar{\eta}_{j0} = 0$).[17] Evidence consistent with the corporate tax incentive hypothesis would consist of significant positive abnormal returns at the time of announcement.

17. The standardized portfolio average residuals used to obtain the t-statistics are similar to, but not identical with, the average residuals given in table 1. In our discussion, we relate the t-statistics to the cumulative average residuals, but the distinction between the two methodologies and the indirect nature of the relationship should be kept in mind.

TABLE 3 **Percentage Cumulative Monthly Abnormal Returns for Common Stocks for Selected Holding Periods around the Announcement of an Exchange Offer**

Holding Period	Months in Period	Cumulative Abnormal Return (%)	t-Value
1	M−36 to M−13	11.48	1.11
2	M−12 to M−1	− 1.16	−.56
3	M	.25	.20
4	M+ 1 to M+12	.23	.04
5	M+13 to M+36	− 2.24	−.28

Moreover, given the relative importance of the capital structure changes under consideration, the abnormal returns predicted by the tax incentive hypothesis are large.

The results contained in table 3 are not supportive of the hypothesis. The abnormal returns are, on average, positive in the month of announcement and in the year following that month, but they are small and not statistically significant. The t-value associated with the positive abnormal return of 0.25% in the month of announcement is only 0.20.

The results presented here are robust to the technique used to measure abnormal returns. When the two-factor model is used with no adjustment for industry effects, the abnormal return in the month of announcement is 0.03% with an associated t-value of 0.02.[18] The use of control portfolios (Warner 1977) results in an abnormal return of 1.54% in the month of announcement with an associated t-value of 1.15. Finally, using "raw" returns (Brown and Warner 1979), with the abnormal return for a firm in the month of announcement measured as the difference between the realized rate of return in that month and the mean of the time series of monthly realized returns, we find the average monthly return in month zero to be approximately 1.00% higher than the average of the time series of monthly returns. The associated t-value is 0.6. Thus, while there is some slight variation in the measured abnormal returns produced by these different techniques, none provides a measure of abnormal return that is statistically significant.[19] Certainly none

18. The only noteworthy difference in the results produced by the three-factor model and the two-factor model is in months +13 through +36. While the three-factor model produced a cumulative average residual of −2.24%, the two-factor model yielded an estimate of −15.80% which was statistically significant. The difference found in these months indicates that the three-factor model is more appropriate, as there was clearly an important industry effect.

19. In conducting our tests we have focused on the first "published" public announcement. However, there is some possibility that the information concerning the exchange offer actually reached the market a short time before the actual public announcement. To check that possibility, we selected, from event months −6 through 0, the largest abnormal return for each company (i.e., the one most favorable to the tax incentive hypothesis). The mean of these (maximum) abnormal rates of return was

yield returns of the magnitude predicted by the Modigliani-Miller (1963) corporate tax model.

In sum, we find no support for the corporate tax incentive hypothesis here. If there is a positive effect on corporate valuation that results from the corporate tax subsidy, it is not captured by the common stockholders. However, there is still the possibility that such an effect exists, but that the gains are captured by the preferred stock owners. That possibility is examined next.

b. Preferred Stock Returns

Results analogous to those presented for the common stocks of the firms undertaking exchange offers are presented for the preferred stocks of these firms in figure 2 and tables 4 and 5.[20] An examination of table 4 reveals that the preferred stock average abnormal returns varied from a minimum of −2.11% to a maximum of 2.45%. As in the case of the common stocks, the large positive and negative abnormal returns were scattered randomly through the event months considered. Surprisingly, the average abnormal return is negative in the month of announcement. In addition, the cumulative abnormal return displays a substantial, though not statistically significant, negative drift in the year following the announcement.

The evidence presented in this section does not support the corporate tax incentive hypothesis. All of the cumulative average returns for the various holding periods shown in table 5 are negative. Even the abnormal return in the month of announcement is negative, which is surprising as one would expect the preferred stockholders to require some inducement to participate in the exchange offer. None of the cumulative average returns shown in table 5 is statistically significant.

Again, the results are robust to the technique used to measure abnormal returns. The two-factor model yielded an estimated abnormal return in the month of announcement of −0.70%. Abnormal returns were also calculated using a control portfolio of other preferred stocks designed to have approximately the same industry composition as the sample of issuing companies. An abnormal return was taken to be the difference between the return on the preferred stock of an issuing company and the return on the control portfolio. This procedure also

+10.7%. This number is, of course, statistically significant, but it is easily within the range of values that would be generated by a random sampling procedure. As a test of this, for each company, we numbered event months −82 to +36 from 1 to 129, and, with the aid of a random number table, selected one month at random from this series. We then selected from this month, plus the previous six, the one with the largest positive abnormal return. The mean of these was +11.26%. Thus, even this procedure provided no evidence in support of the corporate tax incentive hypothesis.

20. The number of preferred stocks publicly traded declined subsequent to the actual exchange offers. By month +6, the number had declined to 12; by month 13, it had declined even further. For that reason, we discontinued the series after month +12.

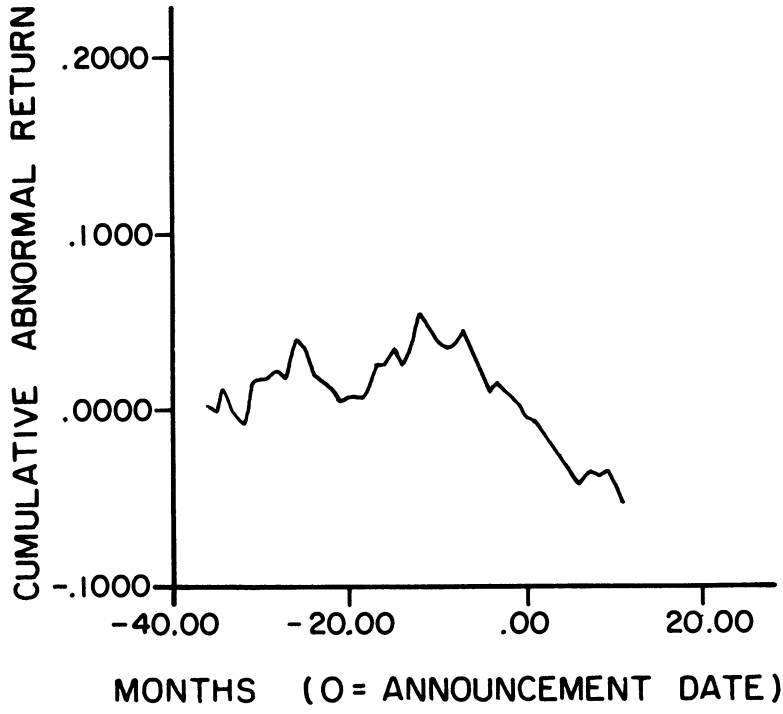

FIG. 2.—Cumulative abnormal returns for 49 months surrounding the month of first public announcement of an exchange offer (preferred stock sample).

produced a slightly negative average abnormal return in the month of announcement. The raw return method described in Section V*a* produces a more intuitively pleasing positive abnormal return of 0.38%, but the associated *t*-value is only 0.32.

Taken as a whole, the evidence in this section and in Section V*a* provides no support for the corporate tax incentive hypothesis. It is not possible to reject the hypothesis of no corporate tax effect when income bonds are issued in exchange for preferred stock.

c. Daily Returns

It is useful to compare our results with those of Masulis (1979). In the comparable set of analyses, Masulis examined 34 cases where fixed-interest bonds were issued in exchange for preferred stock. He presents mean cross-sectional daily (raw) returns for the common and preferred stocks of the companies in his sample for the announcement date and for 60 trading days before and after that date.[21]

21. Due to data limitations, Masulis's preferred stock sample encompasses only 22 of the 34 events.

TABLE 4 **Percentage Monthly Average Abnormal Return Estimates and Sample Sizes ($\bar{\hat{\eta}}$) for Preferred Stocks of Firms Issuing Income Bonds in Exchange for Preferred Stock for 36 Months before and 12 Months after the Month of Announcement**

Month	$\bar{\hat{\eta}}$	N	Month	$\bar{\hat{\eta}}$	N
−36	2.19	21	−12	−.48	22
−35	−.36	21	−11	−.48	22
−34	−1.61	21	−10	−.90	22
−33	−.30	21	−9	−.24	22
−32	−.45	21	−8	−.72	22
−31	−.81	21	−7	−.51	22
−30	.26	22	−6	−1.02	22
−29	−.07	22	−5	−.62	22
−28	.28	22	−4	−.69	22
−27	1.50	22	−3	.76	22
−26	.13	22	−2	−.25	22
−25	.98	22	−1	.29	22
−24	−1.07	22	0	−.63	22
−23	1.16	22	+1	−1.24	20
−22	1.85	22	+2	−1.18	20
−21	−.67	22	+3	−1.96	18
−20	−.94	22	+4	−.95	16
−19	−.36	22	+5	1.25	14
−18	.24	22	+6	−2.11	12
−17	.78	22	+7	−1.62	12
−16	−1.34	22	+8	−1.44	12
−15	−1.09	22	+9	−2.11	12
−14	−1.11	22	+10	2.45	12
−13	.48	22	+11	−.81	12
			+12	−1.00	12

On the announcement day, the mean return on the common stocks of the issuing companies was 1.50%. This number is statistically significant at the .01 level. Masulis indicates that the day after the announcement is also important because the information may have been released after the close of the market on the announcement day. On day plus one he finds a mean return of 0.63%. This number is not statistically significant at the .05 level. For the preferred stocks Masulis finds a mean return on the announcement day of 1.97% and on day plus one he finds a mean return of 1.64%. Both of these are significant at the .05 level.

Unfortunately, we do not know the sizes of the exchange offers in Masulis's study as he does not report them. In our sample the mean ratio of the dollar amount of debt issued to common stock outstanding is about 80%. If we assume that the entire value of the tax shield is received by the owners of the firm's common shares then, according to the Modigliani-Miller corporate tax model with a corporate tax rate of 50%, this implies an average increase in common stock value of about 40%. It is possible that the use of monthly data has obscured an effect

TABLE 5 **Percentage Cumulative Monthly Abnormal Returns for Preferred Stocks for Selected Holding Periods around the Announcement of an Exchange Offer**

Holding Period	Months in Period	Cumulative Abnormal Return (%)	t-Value
1	M−36 to M−13	−.32	−.01
2	M−12 to M−1	−4.85	−.28
3	M	−.63	−.33
4	M+ 1 to M+12	−10.73	−.59

that would be manifest with more refined data, though given the sizes of the exchange offers involved in our study that seems unlikely to us.

To provide results that are directly comparable with those of Masulis, we collected, from the *Wall Street Journal,* daily prices for both the common and preferred stocks of the 18 companies in our sample for which such data were available.[22] We then computed the mean cross-sectional rates of return separately for the common and preferred stocks for the day of the exchange offer announcement and for the 5 days preceding and following the announcement date. These results are presented in table 6 along with the comparable results for the common and preferred stocks of the 34 cases considered by Masulis.[23]

Interestingly, the results for our sample are very similar to those of Masulis. For the common stocks, on the day of the first published public announcement we find a cross-sectional mean return of 1.45% and a mean return of 0.73% on day plus one. For the preferred stocks, we find a mean return of 1.01% on the day of announcement and a mean return of 1.47% on day plus one.

To calculate t-statistics, we estimated the mean and standard deviation of the time series of daily returns using all of the returns shown in table 6, except those for day zero and day plus one (a total of nine observations). The t-values for the average returns on the common stocks are 2.16 and 1.09 for the announcement day and day plus one, respectively. The comparable t-values for the preferred stocks are 2.08 and 3.03. These t-values indicate that the announcement-day returns for both the common and preferred stocks are significantly greater than average at the .05 level. This conclusion also holds for the preferred stocks on day plus one, but not for the common stocks on day plus one.

22. For two companies it was not possible to determine the exact announcement date (see n. 8 above). The stocks of two other companies were not traded on a sufficiently regular basis to compute reliable daily returns.

23. Masulis's results are taken from his table A7 (common stock returns) and table A12 (preferred stock returns).

TABLE 6 **Percentage Daily Average Returns for Common Stocks and Preferred Stocks of Firms Issuing Bonds in Exchange for Preferred Stock for 5 Days before and after the Day of Announcement**

	Common Stocks		Preferred Stocks	
Day	Income Bond Exchange Offers	Masulis's Exchange Offers	Income Bond Exchange Offers	Masulis's Exchange Offers
−5	−.31	.39	−.90	−.16
−4	.39	.84	−.22	.05
−3	−.72	1.35	.56	.52
−2	1.14	−.14	−.16	.33
−1	.11	−.40	.76	.09
0	1.45	1.50	1.01	1.97
+1	.73	.63	1.47	1.64
+2	−.64	−.17	−.28	.36
+3	−1.09	−.43	−.18	−.25
+4	.22	.76	−.04	.21
+5	.04	−.26	.14	−.04

Nonetheless, the estimated abnormal returns are not consistent with those predicted by the corporate tax incentive hypothesis. Thus, while the results indicate that, on average, there was a positive, albeit small, incentive for stockholders to undertake the exchange offers which we examined, the resulting gains were not consistent with those predicted by the Modigliani-Miller, Stiglitz, and bankruptcy-cost theories of corporate capital structure.[24] The results are more consistent with the predictions of the Miller and Chen-Kim tax equilibrium models.

VI. Summary and Conclusion

In this paper we test the hypothesis that the value of any firm is a positive function of its debt-equity ratio because of the tax deductibility of interest payments on debt, versus the hypothesis that in equilibrium the value of any individual firm is independent of its debt-equity ratio because taxes on security returns at the personal level offset the deductibility of interest payments at the corporate level. We do so by examining returns on the common and preferred stocks of companies that announce plans to issue income bonds to retire preferred stocks. This sample provides an ideal experiment for isolating the tax effects associated with debt financing from any bankruptcy-cost effects.

We interpret the results as being more consistent with the Miller (1977) tax equilibrium theory of corporate capital structure than with

24. It is possible that the small increases in stock value are a wealth transfer from the companies' already outstanding debts. The wealth transfer may have resulted because several of the newly issued income bonds were not subordinated to those already outstanding (see Kim et al. 1977).

the Modigliani-Miller (1963) corporate tax model. Furthermore, it seems to us that the results in this paper, in combination with those in a companion paper that examines the pricing and use by U.S. corporations of income bonds (McConnell and Schlarbaum 1981) provide strong evidence inconsistent with the recent corporate-tax-with-bankruptcy-cost models of optimal capital structure. If there are characteristics that uniquely determine optimal capital structures for individual firms, it seems to us that researchers will have to look elsewhere (e.g., Jensen and Meckling 1976; Myers 1977; and Ross 1977) to find them.

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