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A Tax-Induced Clientele for Index-Linked Corporate Bonds

SHALOM HOCHMAN and ODED PALMON*

ABSTRACT

This paper analyzes the circumstances under which tax considerations favor or disfavor the use of index-linked corporate bonds. Using a model similar to Miller's, investors' choices of assets depend on their tax preferences for interest income versus capital gains and their preferences for the timing of returns. It is concluded that the absence of index-linked bonds in the U.S. cannot be attributed solely to tax reasons. However, following the 1986 Tax Reform Act, the tax code is expected to disfavor the use of index-linked bonds.

THE ABSENCE OF INDEX-linked (I-L) bonds in the U.S. is puzzling. Index-linked bonds are common in countries that have experienced persistently high and/or volatile rates of inflation.¹ Both the periodic interest payments and the principal of an I-L bond are linked to a price index. This design provides protection against inflation-induced changes in the nominal interest rate and prevents erosion of the bond's real value during inflationary periods (anticipated or unanticipated). The theoretical literature on I-L bonds has focused primarily on the risk reduction aspect. (See, for example, Sarnat [9], Fischer [3], and Siegel and Warner [11].) The recurrent theme of these studies is that the introduction of I-L bonds reduces inflationary risks to both debtors and creditors. These studies argue that, in a portfolio context, I-L bonds provide investors protection against a risk that cannot be fully hedged otherwise. Fischer [4] conjectured that a possible reason for the absence of I-L bonds in the U.S. may be the tax treatment of the returns on these bonds.²

From a tax point of view, I-L bonds differ from nominal bonds ("bonds" hereafter) in two respects. First, the returns on I-L bonds consist of a combination of interest income and capital gains, whereas the returns on nominal bonds consist (in a steady state) of interest income only. Second, while the compensation for the inflation-induced erosion in the real value of the principal of a nominal bond is part of the periodic interest payments (and hence is taxed every period), the corresponding compensation on an I-L bond is realized and taxed only when the bond is sold. Thus, holding I-L bonds allows a tax deferment that is not possible when nominal bonds are held.

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¹ I-L bonds have been used extensively, primarily by the public sector, in Finland, France, Israel, Sweden, the United Kingdom, and many South American countries. In the U.S., however, the issuance of I-L bonds was illegal prior to 1977. (For details see McCulloch [7].)

² Other possible reasons have been discussed by Fisher [4], Levhari [5], Liviatan [6], and Eden [2]. However, none of the proposed solutions to the puzzle seems to be conclusive.

The purpose of this paper is to examine the circumstances under which tax considerations favor or disfavor the use of corporate I-L bonds. The tax advantage of I-L bonds versus nominal bonds (for some investors) is that, as explained above, they allow the deferment of tax payments. The tax disadvantage is that the investor is compelled to receive returns that are combinations of interest income and capital gains. When (for some investors) the tax advantage of I-L bonds dominates the tax disadvantage, a tax-induced clientele ("clientele" hereafter) for I-L bonds emerges. It is shown that a clientele for I-L bonds emerges when all of the following factors are positive: the tax rate on capital gains, firms' real (after-tax) cost of capital, and the inflation rate. It is concluded, therefore, that the absence of I-L bonds in the U.S. cannot be attributed solely to tax reasons.

I. The Economy and the Tax Environment

We assume a world of certainty with corporate and personal taxes in which firms are financed by combinations of debt and equity and are indifferent to their capital structure. This framework is similar to Miller's [8]. However, the present model includes three additions to Miller's framework. The first addition is inflation, which is assumed to be fully anticipated and to affect all prices uniformly. The second is the possible existence of I-L bonds, and the third involves the explicit consideration of the preference for the timing of returns, using a two-period model. Also, we explicitly incorporate a positive tax on capital gains. Three types of financial assets may exist in this economy: nominal bonds, common stocks, and I-L bonds. Returns on assets are either in the form of interest income, which is taxed at the ordinary personal income tax rate, or in the form of capital gains, which are taxed at a lower rate. It is assumed that all returns that are treated as income at the personal level provide a tax deduction to the corporation but that such a deduction is not allowed for returns that are treated as capital gains at the personal level. In order to facilitate the comparison among assets, it is assumed that returns on nominal bonds are in the form of interest income only.³ Returns on common stocks are assumed to consist of capital gains only, which are realized via stock repurchase.⁴ Returns on I-L bonds are assumed to consist of both interest income and capital gains.

Investors in our model differ only with respect to their personal tax rates and choose to invest in an asset that yields the highest (after-personal-tax) terminal value (at the end of the holding period).⁵ In order to prevent tax arbitrage, it is assumed that investors cannot issue (short sell) securities. It follows that most

³ This is equivalent to assuming that the bond is bought at par and that either interest rates do not change over time or the bond is held to maturity.

⁴ Capital gains are realized either by stock repurchase or by the investor selling the stock in the market. However, a sale of the stock by investor A to investor B is equivalent to the sale of the stock by investor A back to the firm with a simultaneous issuance of (the same amount of) new stock by the firm to investor B. It may be assumed, therefore, that whenever an investor sells a share of stock, it is sold back to the issuing firm. Thus, capital gains may be regarded as actual payments by the issuing firm.

⁵ Reinvestment of intermediate returns is discussed later in the paper.

investors choose to hold one asset only.⁶ Insight into investors' choices of assets may be gained by examining investors' tax preferences for interest income versus capital gains (the tax preference for "type of return") and for assets whose returns are deferred versus assets whose returns are not deferred (the tax preference for "timing").

II. The Model

Because timing cannot be considered in a single-period framework, the analysis is simplified by using a two-period model. The following notation is used:

- π = the inflation rate,
- R = the (periodic) nominal interest rate on nominal bonds,
- r = the (periodic) real rate of interest on I-L bonds,
- i = the (periodic) nominal rate of return on common stocks,
- t_c = the corporate income tax rate,
- t_{pj} = investor j 's (marginal) personal tax rate on ordinary income, and
- t_{gj} = investor j 's (marginal) tax rate on capital gains.

Consider first a setting in which only nominal bonds and common stocks are issued at $t = 0$. A firm is indifferent to its capital structure if

$$(1 - t_c)R = i. \quad (1)$$

Consider investor j , who invests one dollar in common stocks at $t = 0$. The after-personal-tax terminal value (at $t = 2$) is $1 + (1 - t_{gj})[(1 + i)^2 - 1]$ dollars. For the sake of comparison, assume that a holder of nominal bonds reinvests the (after-personal-tax) interest received at $t = 1$ in new nominal bonds. It follows that the net terminal value to bondholder j from a one dollar investment at $t = 0$ is

$$1 + (1 - t_{pj})R + (1 - t_{pj})R[1 + (1 - t_{pj})R] = [1 + (1 - t_{pj})R]^2 \quad (1')$$

dollars. Let t_p^* and t_g^* denote the tax rates of the investor who is indifferent between holding bonds and stocks (the "marginal investor" hereafter). These tax rates satisfy

$$[1 + (1 - t_p^*)R]^2 = 1 + (1 - t_g^*)[(1 + i)^2 - 1]. \quad (2)$$

Using (1), (1)', and (2), it follows that⁷ (when $t_g^* > 0$)

$$(1 - t_g^*) < (1 - t_p^*)/(1 - t_c) < 1. \quad (3)$$

⁶ Schaefer [10] and Auerbach and King [1] have demonstrated that, in a world in which returns are uncertain and investors face different tax rates, no equilibrium exists unless some constraints are imposed on the securities available in the market. They showed that, under certain assumptions, equilibrium in such an economy may be characterized by investors who, for tax reasons, are specialized: investors with tax preferences for bonds hold bonds only, and those with tax preferences for stock hold stocks only. Note that, in our model, a portfolio of various assets may be held if all assets in the portfolio yield the same after-personal-tax return and no other asset yields a higher net return.

⁷ Combining (1) and (2) yields $2 + (1 - t_p^*)R = [2 + (1 - t_c)R](1 - t_g^*)(1 - t_c)/(1 - t_p^*)$. The proof of (3) is by contradiction. Assume that $(1 - t_g^*)(1 - t_c)/(1 - t_p^*) > 1$ (contradicting the left inequality). It follows from this assumption that $(1 - t_c) > (1 - t_p^*)$. These two inequalities contradict (2). The proof of the right inequality is similar.

Note that (3) differs from Miller's specification of the tax rates of the marginal investor. In a single-period model, investors for whom $(1 - t_{gj}) < (1 - t_{pj})/(1 - t_c)$ have a tax preference for bonds over stocks. However, in a two-period model, investors have a tax preference for timing in addition to their tax preference for the type of return. Investors for whom $t_{pj} > t_c$ prefer to defer returns because the investor and the firm combined pay a net tax whenever returns are realized. Thus, the inequalities in (3) imply that the marginal investor has tax preferences for interest income (versus capital gains) and for deferral of returns. It follows that this investor may prefer to hold a security that pays interest income (unlike common stocks) and defers payments (unlike nominal bonds). An I-L bond offers, to some extent, this combination. The returns on a one dollar investment in I-L bonds are as follows. At $t = 2$, the bond is redeemed for $(1 + \pi)^2$ dollars; the repayment of principal in excess of the original face value is assumed to be treated as capital gains.⁸ Interest payments (including the compensation due to indexation), which are assumed to be deductible to the corporation and taxable as interest income to the investor, are r dollars at $t = 1$ and $r(1 + \pi)$ dollars at $t = 2$.⁹ Because the interest payment at $t = 2$ is larger than the payment at $t = 1$, interest payments on I-L bonds are deferred relative to payments on nominal bonds. It should be noted that an I-L bond cannot be duplicated by a portfolio of bonds and stocks. Any such portfolio will generate identical interest payments in the two periods. Note also that the marginal investor is indifferent between holding bonds only, stocks only, and any portfolio of these securities. Because this marginal investor has a tax preference for deferral of returns, the marginal investor prefers I-L bonds over a portfolio of bonds and stocks that provides the same capital gains (given that the returns on these assets are set in a way that firms are indifferent to their capital structures). A firm is indifferent to its capital structure if¹⁰

$$(1 - t_c)R = i = \pi + (1 - t_c)r. \quad (4)$$

Consider now the after-personal-tax terminal value to the marginal investor who invests one dollar in I-L bonds at $t = 0$. Recall that the marginal investor has a tax preference for interest income over capital gains. Thus, at $t = 1$, when the preference for timing plays no role, the after-personal-tax interest income is reinvested in nominal bonds. Therefore, the net terminal value is

$$1 + [(1 + \pi)^2 - 1](1 - t_g^*) + (1 - t_p^*)r(1 + \pi) + (1 - t_p^*)r[1 + (1 - t_p^*)R]. \quad (5)$$

⁸ A distinction between the tax treatments of the periodic interest payments (including the compensation on interest due to indexation) and the repayment of principal in excess of the original nominal face value is common in countries in which I-L bonds are issued. While the former is regarded as income, the latter is a change in the value of an asset that is regarded as a capital gain (or loss). Note also that if it were assumed that the repayment of principal in excess of the original nominal face value is treated as income to the investor and is deductible to the firm, I-L bonds would be even more attractive to the marginal investor (who has a tax preference for interest income).

⁹ An apparently alternative type of contract would set interest payments at $r'(1 + \pi)^2$ at $t = 2$ and $r'(1 + \pi)$ at $t = 1$. However, letting $r = r'(1 + \pi)$, the two contracts are identical.

¹⁰ A proof in a two-period setting is available from the authors upon request.

Using (2), (3), and (4), it can be shown that, for the marginal investor, the net terminal value from an investment in I-L bonds (expression (5)) exceeds (when t_g^* , π , and r are all positive) the terminal values from investments both in nominal bonds (the left-hand side of (2)) and in common stocks (the right-hand side of (2)).¹¹ Thus, we have shown that a clientele for I-L bonds exists.

III. Discussion

In a world where capital gains are not taxed at the personal level (that is, there are only two types of taxes: personal income tax and corporate income tax), investors are segmented into two tax-induced clienteles. Investors for whom $t_{pj} < t_c$ have tax preferences for interest income and for assets whose returns are not deferred; these investors opt for nominal bonds. Investors for whom $t_{pj} > t_c$ have tax preferences for capital gains and for assets whose returns are deferred; these investors opt for common stocks. In contrast, in our model where capital gains are taxed (and thus there are three taxes: t_p , t_g , and t_c), investors are segmented into three clienteles. First, investors for whom $t_{pj} < t_c$ (implying that $(1 - t_{pj})/(1 - t_{gj}) > (1 - t_c)$) have tax preferences for interest income and for assets whose returns are not deferred. Second, investors for whom $(1 - t_{pj})/(1 - t_{gj}) < (1 - t_c)$ (implying that $t_{pj} > t_c$) have tax preferences for capital gains and for assets whose returns are deferred. The third clientele consists of investors for whom $(1 - t_{pj})/(1 - t_{gj}) > (1 - t_c)$ and $t_{pj} > t_c$. These investors have tax preferences for interest income and for assets whose returns are deferred. Some of these investors opt for I-L bonds, and thus a clientele for I-L bonds exists. Note that not all investors in the third group opt for I-L bonds. Investors who opt for I-L bonds are only those who have tax preferences for interest income and for assets whose returns are deferred and for whom (a) the timing advantage dominates the type of return disadvantage of I-L bonds vis-à-vis nominal bonds and (b) the type of return advantage dominates the timing disadvantage of I-L bonds vis-à-vis common stocks. A summary of investors' tax preferences and the resulting tax clienteles is presented in Table I.

Recall that we have assumed that the investor chooses the asset that yields the highest net terminal value. However, I-L bonds may be even more attractive to investors who aim at maximizing an annuity (in real terms). In order to achieve this objective, these investors must maintain the value of their investment fixed in real terms. If these investors held nominal bonds, they would have to use some of their interest income to purchase new nominal bonds each period. Similarly, if they held common stocks, they would have to sell part of their investment each period. Because I-L bonds generate an annuity (in real terms), investors who want to secure a fixed stream of real income and hold I-L bonds need neither to sell their bonds nor to purchase new bonds each period. Thus, capital gains on I-L bonds are never realized and all the returns to these investors are in the form of interest income only. Consequently, the tax disadvantage of I-L bonds is avoided.¹² It follows that, when investors aim at maximizing an

¹¹ A proof is available from the authors upon request.

¹² Note also that, because a stockholder needs to sell a fraction of his or her shares each period, the tax deferral advantage of common stocks over nominal bonds cannot be fully utilized.

Table I
Investors' Tax Preferences and the Resulting Clienteles^a

Investors' Tax Characteristics	Investors' Tax Preferences	Asset Held
$t_{pj} < t_c$, implying that $(1 - t_{pj}) / (1 - t_{gj}) > (1 - t_c)$	early returns and interest in- come	nominal bonds
$(1 - t_{pj}) / (1 - t_{gj}) < (1 - t_c)$, implying that $t_{pj} > t_c$	capital gains and deferred re- turns	common stock
$t_{pj} > t_c$, and $(1 - t_{pj}) / (1 - t_{gj}) > (1 - t_c)$	deferred returns and interest income	I-L bonds, nominal bonds, or common stock

^a t_c is the corporate income tax rate, t_{pj} is investor j 's (marginal) personal tax rate on ordinary income, and t_{gj} is investor j 's (marginal) tax rate on capital gains.

annuity, more investors who have tax preferences for interest income and for assets whose returns are deferred opt for I-L bonds.

IV. Conclusions

Index-linked (I-L) bonds have been issued in countries that have experienced persistently high and/or volatile rates of inflation. In the U.S. the issuance of indexed bonds was illegal prior to 1977. It is puzzling that, since then, in spite of the risk-related advantages of I-L bonds (for both borrowers and lenders), these bonds have not been issued by the private sector. Tax considerations have been suggested as a possible explanation for the nonissuance of corporate I-L bonds. In this paper, we have analyzed the conditions under which a tax-induced clientele for I-L bonds is likely to exist. It has been shown that the absence of I-L corporate bonds in the U.S. could not be attributed solely to tax reasons.

It should be noted that, following the 1986 Tax Reform Act, the marginal corporate income tax rate of most corporations will exceed the top marginal income tax rate of individuals. Because the tax deduction to the corporation will exceed the investor's tax liability, it will not be attractive to defer interest payments. In other words, under the new tax code the tax preference will be for bonds whose returns are not deferred. It appears, therefore, that the new tax law will discourage the use of I-L bonds.

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