THE BUDGETARY IMPLICATIONS OF INDEX BONDS

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This brief study addresses the budget implications of hypothetical Treasury bonds linked to an inflation index. Index bonds are attracting attention as a possible means of reducing the government's net interest costs. The study describes the ways by which it is argued that index bonds could reduce interest costs. It discusses the budgetary treatment of index bonds and the related question of tax treatment. It concludes that while budget savings may result from issuing index bonds, these savings are impossible to estimate in advance. Furthermore, index bonds would cost more than conventional financing in some circumstances. This study does not address the important macroeconomic management issues posed by index bonds, such as these bonds' possible effects on savings incentives, monetary policy, and the prices of other financial assets.

WHAT ARE INDEX BONDS?

Index bonds are designed to protect investors against the erosion of interest and principal due to inflation. Nominal interest rates may be viewed as having three components: an inflation premium, reflecting the expected erosion of principal; a risk premium which compensates the lender for the uncertainties of default, unexpected inflation, or adverse market developments; and a real interest rate, which is the return on a riskless asset in an inflation-free world. Typically the risk premium is larger for longer maturities because of the greater uncertainties.

At present, short-term Treasury bills carry interest rates of about 8 percent. With actual and expected inflation (measured by the GNP deflator) running at about 4 percent, and with risk premiums negligible for this type of investment, the short-term real interest rate is about 4 percent. Treasury bonds maturing in ten years, in contrast, currently carry interest rates of about 11.5 percent --about 3.5 percentage points above the Treasury bill rate. It is impossible to say how much of this spread is due to expectations that inflation may accelerate and how much is simply compensation for the additional risk and illiquidity incurred by lending long.

Index bonds would remove one source of uncertainty for investors by guaranteeing a real interest rate to lenders who hold the bond to maturity. Index bonds could take one of two basic forms. The two forms have different payment streams but the same budgetary effect, as shown below.

- In one variant, the government could issue bonds with a coupon of, say, 4 percent accompanied by a promise to adjust the principal in full at maturity. The coupon, in turn, would also increase with inflation so that the investor's real interest income remains constant. If inflation runs at 5 percent annually, the coupon on a $1,000 bond would grow from $40 initially to $49 in the fifth year, while the government would repay $1,276 at maturity. This approach is similar to the various types of index bonds which have been sold in Britain since the mid-1970s.

- An alternative form of index bonds would involve paying the bondholder an annual or semiannual coupon equal to the rate of inflation plus a real rate. Since the coupon payment already includes an adjustment for inflation, the bondholder would be repaid his original principal at maturity. If inflation is 5 percent, as in the first example, and the real rate of interest is set at 4 percent, the total annual interest cost would equal 9 percent.

Index bonds protect lenders against unanticipated inflation if the bond is held to maturity, but do not protect against other risks. A bondholder selling an index bond before maturity would take a capital loss (that is, would receive less than its adjusted face value) if real interest rates have shifted upward in the meantime. Under current tax law, too, the real after-tax rate of return -- the figure of concern to investors -- would not be precisely guaranteed, as discussed below. Nevertheless, index bonds would offer a brand of risk protection that is currently unavailable in the market.

HOW COULD INDEX BONDS SAVE MONEY?

Index bonds could reduce the government's net interest costs if:

- Lenders' current expectations of inflation prove to be too high, or
- Lenders expect continued moderate inflation but are nevertheless highly uncertain about the outlook and would accept lower rates to insure against uncertainty.

Are investors' inflation expectations too high? No one knows, of course. If lenders expect inflation of, say, 6 percent but inflation instead remains at 4 percent, then current interest rates are too high. The government could save two percentage points on its costs of financing while still affording lenders their desired real rate of return.

Most current projections of inflation fall in a fairly narrow range from 3.5 to 4.5 percent in 1985 and 4.0 to 5.5 percent in 1986. Historical analysis suggests that average expectations of near-term inflation tended to prove too low during the 1970s. Since 1981, though, inflation has generally fallen below expectations by one to two percentage points. Whatever the accuracy of their short-term forecasts, few market participants have solid ground for projecting inflation rates ten or thirty years into the future. These expectations are almost surely too high or too low. By definition, however, the savings -- or cost -- of index bonds resulting from inaccurate inflation expectations cannot be projected in advance.

The inherent uncertainty of inflation projections creates the second potential source of savings from index bonds. Even if investors' current expectations prove accurate, they are uncertain. Lenders may expect inflation to average 4 percent over the next thirty years but they know there is a risk that inflation could equal 6, 10, or even 100 percent. A premium is tacked on to longer-term interest rates to compensate lenders who assume this risk. An inflation-indexed security would reduce this risk premium.

Other risks would remain for holders of medium- and long-term indexed securities. While the risk of default is negligible for U.S. government securities, all bond buyers incur the risk that real interest rates may rise in the future for reasons unrelated to inflation, thereby reducing the value of their bond. Even with constant inflation, for example, interest rates could rise because of burgeoning credit demands, Federal Reserve tightening, or other reasons. Foreign holders of Treasury securities also incur an exchange rate risk. The risk premium in longer-term interest rates is not exclusively attributable to inflation, though this is undoubtedly one of its most important components.

Empirical estimates of the current inflation risk premium in the U.S. are not available. The premium is probably not constant over time or across countries but varies depending on the nature and magnitude of the risks perceived by investors. The current outlook for moderate inflation is contingent on the dollar remaining strong and commodity prices remaining stable, as well as --in the longer run --continued restraint by the Federal Reserve in the face of large federal deficits.

Neither source of potential savings from index bonds can be estimated in advance. The savings from erroneous inflation expectations occur only if investors overestimate inflation. If they underestimate inflation, index bonds would cost -- not save -- money. Reducing the risk premium unambiguously saves money. However, the savings from this source are not quantifiable and could be offset by costs resulting from unanticipated inflation.

Over the very long run -- a period spanning decades, not years -- index bonds could be expected to save the government money because investors are risk-averse and are willing to pay for protection against inflation. This conclusion, however, does not hold for a conventional five-year budgeting horizon because the savings could be offset by errors in investors' inflationary expectations. Over the budget period usually focused on by Congress and the President, neither the amount nor the direction of index bonds' budgetary effects can be gauged.

BUDGETARY TREATMENT OF INDEX BONDS

Cash Flow Consequences of Index Bonds

Table 1 illustrates the cash flow consequences for the federal government of three hypothetical Treasury securities. The first is a conventional five-year Treasury note. The second is an index bond, with the Treasury paying an annual coupon of 4 percent (increased annually to reflect inflation) and repaying the inflation-adjusted principal at maturity. The third is an index bond paying an annual coupon of 4 percent plus the inflation rate, with no adjustment of principal at maturity. These illustrations assume an annual inflation rate of 5 percent and a real rate of interest of 4 percent. Investors are assumed to anticipate the inflation rate correctly, so that the interest rate on five-year conventional financing is 9 percent.1/

In the conventional financing case, annual interest payments of 9 percent on a $1,000 bond are $90. The Treasury repays $1,000 to the holder at maturity.

In the second case -- representing one variant of index bonds -- the government's first annual interest payment is 4 percent of $1,000, or $40. At the end of the first year, the bond's value is adjusted upward by $50 to reflect the 5 percent erosion due to inflation. (This $50 adjustment is recorded as accrued interest in the budget, as discussed below, but does not represent an immediate cash outlay for the Treasury.) In the second year, the coupon payment is increased to $42 ($40 times 1.05) to preserve its real value, while the bond's value is further adjusted to $1,102.50. These adjustments continue for five years. At maturity, the government repays $1,276.28 to the bondholder. Actual cash payments by the government -- coupons and principal repayment -- are lower than in the conventional financing case in the early years but considerably higher in the final year.

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1. This example incorporates several simplifying assumptions for illustration purposes. Actual interest payments on index bonds would likely be made semiannually, while maturities would range up to 30 years. These simplifying assumptions do not affect the conclusions.

TABLE 1. CASH FLOW CONSEQUENCES OF FIVE-YEAR CONVENTIONAL AND INDEX BONDS (ANNUAL INFLATION 5 PERCENT, REAL INTEREST RATE 4 PERCENT)

	Conventional Coupon	Index Bond A[a] Coupon	Index Bond B[b] Coupon
Cash Interest in Year			
1	$ 90.00	40.00	90.00
2	90.00	42.00	90.00
3	90.00	44.10	90.00
4	90.00	46.31	90.00
5	90.00	48.62	90.00
Principal Repayment	1,000.00	1,276.28	1,000.00
Present value[c]	1,000.00	1,000.00	1,000.00

a. Index bond A pays an annual coupon of 4 percent (inflation-adjusted) and repays inflation-adjusted principal at maturity.

b. Index bond B pays an annual coupon based on the inflation rate (assumed to be 5 percent) plus a real rate (4 percent), for a total of 9 percent.

c. The present value formula converts future streams of interest and principal repayments into current asset equivalents, allowing them to be compared. The formula here is based on an interest rate of 9 percent. The formula is

$$PV = \left(\sum_{t=1}^{5} \frac{\text{coupon}_t}{(1.09)^t} \right) + \frac{\text{principal repayment}}{(1.09)^5}$$

The third case -- another variant of index bonds -- requires the government to pay an annual coupon based on the inflation rate plus a real interest rate, totaling 9 percent in this illustration. The costs to the government under these assumptions are identical to the conventional financing case.

Although the time streams of interest and principal repayments differ in these three examples, the present discounted value of the payments is equivalent. Under the assumptions used here -- where inflation is correctly anticipated by lenders and any inflation risk premium is negligible -- index bonds result in no costs or savings to the government.

How might budget savings result from index bonds? An example is shown in Table 2. Suppose that lenders expect inflation of 5 percent as in the previous examples but actual inflation is only 4 percent. Both the annual coupon payments and the adjustments to principal are smaller than investors expected. The present value of coupon and principal repayments is $958.14 (instead of $1,000 as in the conventional financing case), proving the common-sense conclusion that index bonds would save money for the government if inflation falls below expectations.

TABLE 2. ILLUSTRATIVE INDEX BONDS ASSUMING INACCURATE INFLATIONARY EXPECTATIONS (EXPECTED INFLATION 5 PERCENT, REAL INTEREST 4 PERCENT)

	Actual Inflation 4 Percent Coupon	Actual Inflation 5 Percent Coupon	Actual Inflation 6 Percent Coupon
Cash Interest a/ in Year			
1	40.00	40.00	40.00
2	41.60	42.00	42.40
3	43.26	44.10	44.94
4	44.99	46.31	47.64
5	46.79	48.62	50.50
Principal Repayment	1,216.65	1,276.28	1,338.23
Present Value	958.14	1,000.00	1,043.42

a. Illustrations use Index Bond A method described in Table 1.

However, inflation might exceed expectations. The second example in Table 2 shows the budgetary impact if inflation is 6 percent rather than the 5 percent anticipated by lenders. Both coupon and principal repayments are higher than expected, with the present value of these payments equaling $1,043.42 -- substantially greater than the conventional financing case.

While these illustrations use a $1,000 bond for simplicity, the government issues massive amounts of debt. Annual borrowing by the Treasury totals about $200 billion, of which slightly over half carries maturities of 5 years or more. If only one quarter of these longer-term issues were replaced by indexed debt, index bonds outstanding would reach $25 billion after one year and $125 billion after five years. Potential budgetary savings or costs based on these volumes of borrowing are huge -- but unpredictable.

Accrual Accounting of Index Bonds

Interest on the public debt is recorded on an accrual basis in the federal budget. This practice recognizes the fact that interest on the government's borrowing accrues continuously, even though actual cash payments occur only on certain dates (usually semiannually). Consistency with current practice requires that the interest costs of index bonds also be treated on an accrual basis.2/

Under accrual accounting, changes in the eventual redemption value of an index bond would be recognized as they occur. Budget net interest would include these changes, as shown in Table 3. This illustration again utilizes the five-year, $1,000 bond with a 4 percent coupon originally shown in Table 1. The annual adjustments to the principal value of the bond (assuming 5 percent inflation) grow from $50 in the first year to $61 in the fifth year, totaling $276 over the entire five year period. Only at the end of five years do these adjustments result in an actual cash payment by the government. In the interim, the adjustments would be counted in budget outlays and the deficit, but would not actually have to be borrowed by the Treasury.

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2. The President's Commission on Budget Concepts in the 1960s recommended that accrual accounting be extended to other budget outlays and receipts. Enormous practical obstacles have blocked this effort, however. Interest on the public debt is one of the relatively few government activities where accrual accounting is both eminently practical and results in a better measure of the economic flows generated by government transactions.

   Among economic and accounting theorists, considerable discussion is taking place concerning the best way to present business firms' or the government's interest costs during inflationary periods. Some argue that current accounting practices overstate interest costs because they do not reflect the erosion in the real values of debt attributable to inflation. Government issuance of index bonds would facilitate the measurement of this erosion. Real savings -- or costs -- attributable to index bonds, however, must be clearly distinguished from accounting savings which could result from changes in bookkeeping procedures.

TABLE 3. ACCRUAL ACCOUNTING TREATMENT OF FIVE-YEAR CONVENTIONAL AND INDEX BONDS (ANNUAL INFLATION 5 PERCENT, REAL INTEREST RATE 4 PERCENT)

	Conventional	Index Bond		
	Coupon	Coupon	Principal Adjustment	Total Budget Interest
Accrued Interest a/ in Year				
1	90.00	40.00	50.00	90.00
2	90.00	42.00	52.50	94.50
3	90.00	44.10	55.12	99.22
4	90.00	46.31	57.88	104.19
5	90.00	48.62	60.78	109.40
Total	450.00	221.03	276.28	497.31

a. Illustrations use Index Bond A method described in Table 1.

The Timing of Interest Payments and Treasury Borrowing Requirements

Table 3 seems to imply that cumulative government outlays and, hence, the government's debt would be higher after the first issue of index bonds reached maturity in five years than under conventional financing. Index bonds thus seem to compare unfavorably with current financing practices. This conclusion, however, ignores the fact that interest costs themselves are an important determinant of Treasury borrowing requirements. The government must borrow to pay interest on its existing debt. When these second-round effects are included, cumulative outlays and the federal debt end up at the same level whether financed conventionally or through index bonds.

Table 4 illustrates how the different timing of interest costs for conventional financing versus index bonds would affect Treasury borrowing needs. Annual interest costs on a conventional five-year note at 9 percent amount to $90. This $90 adds to the debt, causing interest costs to increase by another $8.10 (9 percent of $90) in the second year.[3] In the third year, the government would pay interest on an extra $188.10 ($90 plus $90 plus $8.10) borrowed to pay the two previous years' interest costs. By the end of five years, total borrowing by the Treasury -- the original $1,000 plus five years of interest -- reaches $1,538.62.

The timing of interest costs and principal repayments on the index bond is very different, but after five years, total Treasury borrowing is equal to the first case. The first-year coupon on a 4 percent, $1,000 bond is $40. The cash to finance this coupon payment must be borrowed, leading to higher interest outlays of $3.60 (9 percent of $40) in the second year. (For simplicity, money to pay the coupon on the index bond is assumed to be borrowed conventionally.) This process continues for five years. In the fifth year, though, the government must borrow an extra $276 to adjust the principal for inflation. Total borrowing by the end of the five year period equals $1,538.62 -- exactly the same as in the first case.

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3. For simplicity, this illustration assumes that all interest payments occur on the last day of the year. Thus, the $90 interest payment in the first year does not cause additional borrowing -- or interest costs -- until the second year.

TABLE 4. SECOND-ROUND EFFECTS ON TREASURY BORROWING OF FIVE-YEAR CONVENTIONAL VERSUS INDEX BONDS (ANNUAL INFLATION 5 PERCENT, COUPON RATE 4 PERCENT)

	Interest on Original Bond	Interest on Additional Borrowing	Total Cash Interest	Cumulative Borrowing
		Conventional Bond		
Cash Interest in Year				
1	90.00		90.00	1,090.00
2	90.00	8.10	98.10	1,188.10
3	90.00	16.93	106.93	1,295.03
4	90.00	26.55	116.55	1,411.58
5	90.00	37.04	127.04	1,538.62
Principal Adjustment				0.00
Total				1,538.62
		Index Bond		
Cash Interest a/ in Year				
1	40.00		40.00	1,040.00
2	42.00	3.60	45.60	1,085.60
3	44.10	7.70	51.80	1,137.40
4	46.31	12.37	58.67	1,196.08
5	48.62	17.65	66.27	1,262.34
Principal Adjustment				276.28
Total				1,538.62

a. Illustrations use Index Bond A method described in Table 1.

Index bonds clearly would have important cash flow consequences for the government. By deferring any adjustment of principal for inflation until maturity, these bonds would lessen the Treasury's cash needs in the intervening years. This interim period could be much longer than illustrated here. Conventional Treasury bonds have maturities of as long as 30 years. By the end of their holding period, however, index bonds have exactly the same consequences for interest outlays and debt as do conventional bonds -- assuming that inflationary expectations prove accurate. In the long run, savings from index bonds can occur only if investors' inflation expectations prove to be too high or if risk premiums can be reduced.

HOW SHOULD THE REAL COUPON RATE ON INDEX BONDS BE SET?

All of the examples in this study have assumed a real interest rate of 4 percent. This is close to the current real interest rate on short-term Treasury securities. The real short-term interest rate, though, has varied widely and was negative during much of the 1970s. The current 4 percent rate, while high by historical standards, is down from the very high levels -- approaching 10 percent -- which prevailed during much of the 1981-82 period.

The real interest rate on index bonds could be set at competitive auction just as rates are determined on conventional Treasury securities. That is, investors would bid a real rate of interest and the bonds would be sold to those bidding the lowest rates. Because of the novelty of this approach, it is difficult to gauge prospective participation. Index bonds may prove immensely popular especially with risk-averse investors. On the other hand, index bonds' novelty and the initial thinness of the secondary market might hinder participation by the major government securities dealers who currently purchase huge blocks of Treasury issues for resale to their customers.

Rather than determine the real interest rate at auction, the Treasury could, of course, set it in advance -- at 4, 2, or even 0 percent. If this rate does not accord with what the market would have bid, however, the issue will not sell at par.[4] The government would then amortize the premium or discount (the difference between the par value and the selling price) over the life of the security, counting this as part of interest costs. There thus would be no savings associated with setting a real coupon rate of, say, 2 percent if the market demands 4 percent.

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4. The government could also set both the price and the coupon rate. The bonds would then be sold to any investors who found these terms sufficiently attractive, instead of at competitive auction. This is similar to the approach used to sell U.S. savings bonds. While this approach might be suitable to a relatively small-scale issuance of index bonds, large-scale issuance virtually demands the competitive auction process.

TAX TREATMENT OF INDEX BONDS

Index bonds pose tricky questions for the current tax system, which sometimes treats inflation-induced investment returns as ordinary income and sometimes as capital gains.

If index bonds were treated analogously to zero-coupon bonds, both the coupon income and any periodic principal adjustments would be taxed as ordinary interest income, even though the investor will not realize the increase in principal until the bond matures or is sold. The index bonds shown in Table 1 again provide an illustration. The holder of index bond A would pay income tax on $40.00 in coupon income and $50.00 in principal adjustments in the first year. In the second year, tax would be owed on $42.00 in coupon income and $52.50 in adjustments to principal, as well as on additional interest earned by reinvesting the first year's coupon. The holder of index bond B would pay tax on $90.00 in the first year and on larger amounts in subsequent years as he reinvests coupon income. The annual taxes owed on these two types of index bonds are equal once the reinvestment of coupon income is taken into consideration.

The interaction of inflation rates with the current tax system makes it impossible to guarantee the real after-tax rate of return -- the figure of concern to investors -- even with index bonds. Index bond B in Table 1 again supplies an illustration. Suppose that during the second year, inflation unexpectedly accelerates from 5 to 10 percent. The coupon payments would increase from $90 in the first year to $140 in the second. Under the current tax system, the entire $140 would be taxed, even though the increased income is intended purely to compensate the investor for unanticipated erosion of principal. The real after-tax rate of return declines for this bondholder.5/ Because of such interactions, index bonds would not fully protect investors against unanticipated inflation, once taxes are taken into account.

These inflation-induced changes in the real tax burden could be eliminated through various proposals to modify the tax system's treatment of investment income. The recently-unveiled Treasury tax package, for example, includes a proposal to exempt from taxation that portion of interest income from any source -- conventional bonds, index bonds, or other instruments -- which is deemed to compensate for the erosion of principal by inflation. (The Treasury package would also generally limit the deductibility of borrowers' interest costs in a similar manner, except for home mortgages.)

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5. The real after-tax rate of return (RATR) is defined as

$$RATR = ((1-t) \times r) - p$$

where t is the investor's marginal tax rate, r is the nominal interest rate, and p is the inflation rate. If the investor in this example faces a marginal tax rate of 33 percent, it can be shown that his RATR drops from 1 percent in the first year to -0.7 percent in the second.

Some index bond proposals envision issuing the bonds only to tax-exempt buyers such as pension funds, or changing the tax code selectively for this type of investment (e.g., by exempting the annual principal adjustments on index bonds from tax). If index bonds receive more favorable tax treatment than other types of investment, this would be reflected in their interest rate. Instead of a real rate of 4 percent, for example, index bonds might carry a real rate of 2.5 percent. It is important to recognize, however, that the Treasury would lose at least as much in revenues as it would save in interest costs if index bonds received such special tax treatment.6/ While federal government interest costs would be lower, federal government revenues would also be less.

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6. This is because, if large amounts of index bonds were freely traded, the price would be determined at the margin by an investor who is indifferent between a tax-favored index bond and a conventional taxable security. For buyers with higher tax rates, the tax savings more than compensate for the lower interest rate.