The following example illustrates the high tax rates on real interest income that can occur when inflation interacts with the current tax system. If the inflation rate is 11 percent annually and a taxpayer in the 50 percent bracket buys a $1,000 bond yielding a market rate of 15 percent interest, at the end of one year he has earned $150 interest, and paid tax of 50 percent of that amount ($75). He is left then with his initial $1,000 and $75 of after-tax interest. Just to keep the purchasing power of his $1,000 bond even with inflation, however, the investor would have had to receive $110 of interest after taxes ($1,000 x 1.11), so he has earned no real interest after paying taxes and actually lost $35 of his principal ($1,110 -$1,075). Before taxes, the investor earned real interest (over and above that needed to preserve the purchasing power of his bond) of $40:

$$\text{Real Interest Income} = \$1150 - (\$1{,}000 \times 1.11) = \$1{,}150 - \$1{,}110 = \$40.$$

Since $75 tax was paid on this real income of $40, the tax rate on real income was 187 percent.

The taxation of real interest income is heaviest when the rate of inflation is very high, as in the example just cited, but rates of tax exceeding 100 percent can occur at any positive inflation rate. Table 14 presents tax rates on real interest income for investors in the 11, 30, and 50 percent tax brackets holding bonds yielding 4 percent real interest (before tax) under conditions of high, moderate, and no inflation. The high inflation example, denoted as Case A in the table, is the same as that of the last paragraph. In that case, tax as a percentage of real interest income ranges from 41 percent for bondholders in the 11 percent bracket to 187 percent for those in the 50 percent bracket.[16] In the moderate inflation (5 percent) example of Case B, tax ranges from 25 percent of real interest income for bondholders in the 11 percent bracket to 112 percent for those in the 50 percent bracket. When there is no inflation (Case C), all bondholders are taxed on real interest income at the same rate as they are taxed on other income.

This heavy taxation of real interest income is especially severe over extended periods of inflation, particularly for high-bracket investors. After ten years of 11 percent inflation, a 50 percent bracket investor--receiving interest of 15 percent annually but being taxed annually on the entire amount of interest received (without indexing for inflation)--would

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16 Unfortunately, there is no evidence as to whether high-bracket taxpayers have reduced their net saving as a result of the interaction of inflation and the tax system.

TABLE 14. EXAMPLES OF TAX DUE UNDER CURRENT LAW AS A PERCENTAGE OF REAL INTEREST EARNED, BY BONDHOLDER'S MARGINAL TAX RATE[a]

(1) Bondholder's Marginal Tax Rate (In percents)	(2) Nominal Bond Interest (In dollars)	(3) Interest Needed to Maintain Bond's Real Value (In dollars)	(4) Real Interest (2)-(3) (In dollars)	(5) Tax Due on Nominal Interest (1)x(2) (In dollars)	(6) Tax as Percentage of Real Interest Income (5)÷(4) (In percents)
Case A: Inflation Rate = 11%, Bond Interest Rate = 15%					
11	150	110	40	16.5	41
30	150	110	40	45.0	112
50	150	110	40	75.0	187
Case B: Inflation Rate = 5%, Bond Interest Rate = 9%					
11	90	50	40	9.9	25
30	90	50	40	27.0	67
50	90	50	40	45.0	112
Case C: Inflation Rate = 0%, Bond Interest Rate = 4%					
11	40	0	40	4.4	11
30	40	0	40	12.0	30
50	40	0	40	20.0	50

a. Examples are all for a bond costing $1,000 and represent one year's interest and taxes. They assume that nominal interest rates rise one percentage point for each percent of inflation.

be left with the purchasing power of only 73 percent of his initial investment.[17]

Just as taxpayers face penalties for investing in interest-bearing assets during inflationary periods, they are now granted bonuses for borrowing, because they are allowed to deduct all nominal interest that they pay, even though only a fraction of that is real interest. If a taxpayer in the 50 percent bracket borrowed $1,000 for one year at an interest rate of 15 percent, for example, he would owe $1,150 at the end of the year. If there had been 11 percent inflation during that period, $110 of the payment would be needed to maintain the lender's principal, while the remaining $40 would be a payment of real interest. Since the taxpayer is currently allowed to deduct all nominal interest paid, however, he can deduct all $150, bringing his after-tax interest payment down to $75 ($150 x 0.5). Since he is not even paying the $110 needed to keep the loan principal intact, it can be said that he faces a negative real interest rate for borrowing. Of course, the lender does receive the $150 of nominal interest, but the borrower pays only $75 after tax.

The interaction of inflation and the current unindexed income tax thus creates a perverse situation in which savers are taxed at higher than statutory rates (sometimes even higher than 100 percent), while debtors are subsidized. The tax system would not produce this result if the income tax base was indexed for inflation, so that only real interest was taxable and deductible, leaving out in both cases the portion of interest that represents inflation.

Mechanics of Interest Indexation

Indexing interest income and expense would entail breaking down interest into two parts--the real component, which would be taxed, and the inflation component needed to maintain the purchasing power of the principal, which would not be taxed.[18]

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17 If the 50-percent-bracket taxpayer invested $1,000 at 15 percent interest and annually reinvested the principal and after-tax interest, at the end of the 10th year he would have $2,061 after taxes ($1{,}000 \times (1 + (.15)(.5))^{10} = 2{,}061$), although he would have needed $2,839 ($1{,}000 \times (1.11)^{10}$) to hold unchanged the purchasing power of his principal.

18 Inflation erodes the real value of all monetary assets, including those that do not bear interest, such as cash, accounts receivable, and demand deposits. In theory, the tax system should recognize real losses and gains experienced on these as well as on interest-bearing

The indexation of interest income can be illustrated with the example used earlier, that of an investor who purchases a bond for $1,000 that pays 15 percent interest during a year when the inflation rate is 11 percent. Nominal interest is $150 in this example, of which $110 ($1,000 x .11) is needed to maintain the purchasing power of the bond, and the remaining $40 is real interest. If interest income were indexed, the investor would owe tax only on the $40 of real interest. If he were in the 50-percent tax bracket, he would pay tax of $20, which is 50 percent of this real interest income. When filing his tax return, the bondholder would include in taxable income the full $150 of nominal interest received from this bond, which he would add to nominal interest received on other bonds, and list the total on one line of his tax return as is done currently. On a separate line, he would deduct the product of his bond principal ($1,000 for this bond plus the principal of his other bonds) multiplied by the inflation rate published by the IRS (11 percent in this example). Similarly, corporations repaying debt, homeowners repaying mortgages, and all other taxpayers who paid interest would deduct the full nominal interest payments for the year, and on a separate line on their tax returns they would include in taxable income their outstanding debt multiplied by the inflation rate published by the IRS.[19]

Even during periods of stable prices, interest rates fall and rise, which causes the prices of existing interest-bearing assets, such as bonds, to fluctuate. The associated capital gains and losses are now taxed on sale,

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monetary assets during inflation. As a practical matter, however, indexing these items would be extremely difficult and costly. Moreover, cash and demand deposits yield a nonmonetary return in the form of liquidity, which is not taxed, so the failure to index noninterest-bearing monetary assets and liabilities is probably not too serious on balance.

19 When the inflation rate exceeds the nominal interest rate, borrowers effectively earn income from their debts, since the annual interest that they pay is less than the annual decline in the real value of their debt. With indexing in this situation, borrowers' interest deductions would be less than the amount added into taxable income to represent the decline in the value of the debt. On net, therefore, borrowers would have to declare income from their debt, rather than get a deduction as they do under current law. Since lenders would be in the reverse situation, they would get a net tax deduction rather than have to declare income when their bonds lost value faster than they earned interest.

rather than annually as they accrue.[20] Under the interest indexing approach just described, capital gains and losses on bond sales would continue to be taxed on realization as they currently are. In effect, interest indexing would allow annual deductions for losses in real bond principal caused by general price inflation, while relative changes in bond prices would be taxed on realization. This treatment would be a move toward accrual taxation. The same result--taxation of real interest income and expense--could be accomplished by using two other indexation approaches: full annual accrual taxation of all real income (interest and capital gains) from interest-bearing assets and indexation of realized capital gains and losses from interest-bearing assets with annual taxation of nominal interest income and expense.[21]

Approximation of Inflation Indexing

A relatively simple approximation of indexing interest would be to tax only a percentage of interest earned and allow only a percentage of interest paid to be deducted. The percentage would be an approximation of the share of interest that is truly interest--in the above example, this would be 26.7 percent, since, with an inflation rate of 11 percent, only 4 percentage points of the 15 percent interest rate represents real interest (4/15 = .267).

Rather than set the inclusion percentage at a different rate for each transaction, the Congress could establish an imprecise but easy-to-admin-

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20 If it were possible to tax income from bonds on accrual, it would be unnecessary to distinguish between capital gains and interest income. Indexing the two for inflation would be done annually in one calculation. Tax would be imposed on real bond income, the increase in the real net worth of the bond investment, which would be calculated annually as the value of the bond at the end of the year plus the interest earned on it during the year minus the value of the bond at the beginning of the year expressed in the dollars prevailing at the end of the year. Taxing bond income on accrual is probably administratively infeasible, however, since it requires annual valuation of all bonds. Bond income, therefore, is not currently taxed on accrual, but rather is broken down somewhat artificially into interest income, which is taxed annually, and capital gain, which is taxed on sale.

21 The approaches are equivalent only if capital gains are taxed in full (not if 60 percent of gains are excluded from tax as under current law). The equivalence of the approaches is described in Tanzi, Inflation and the Income Tax, pp. 54-59.

ister rule whereby a certain percentage of interest earned would be subject to tax and the same percentage of interest paid would be deductible. The percentage to be included could be fixed by law or determined each year by the IRS according to a legislated formula.[22]

A version of the above approach was enacted as part of the Economic Recovery Tax Act of 1981. Beginning in 1985, taxpayers will be allowed a tax deduction for 15 percent of their net interest income (interest income over and above interest paid).[23] This amounts to taxing only 85 percent of nominal interest income and allowing deductions of only 85 percent of nominal interest payments.[24]

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22 One possible formula would be 4/(4 + percentage change in CPI experienced during the year). For example, if the inflation rate were 8 percent, this formula would call for taxing 33 percent of nominal interest and allowing only 33 percent of nominal interest payments to be deducted. If interest income was indexed for inflation for tax purposes, market forces would be expected to push the nominal interest rate to the sum of the real interest rate (which has historically been about 4 percent) and the expected inflation rate. The formula suggested above for the inclusion percentage would be equivalent to the rigorous indexing for inflation outlined above only if inflationary expectations were always correct and real interest rates were always 4 percent or if all bonds were variable interest rate bonds earning nominal interest at a rate calculated annually as 4 percentage points above the inflation rate. As a practical matter, bonds held in any given year earn widely different real interest rates. To be equivalent to rigorous indexing, the percentage inclusion rate would have to vary to reflect these differences, so no single annual inclusion rate could replicate or be as nondistortionary as rigorous indexing.

23 Mortgage interest, trade or business interest, and interest not itemized for tax purposes will not enter into this calculation. The maximum exclusion will be $450 (15 percent of $3,000 net interest) for single returns and $900 for joint returns. (Joint Committee on Taxation, General Explanation of the Economic Recovery Tax Act of 1981 (December 31, 1981), p. 194.)

24 For example, a single taxpayer who earned $1,000 of interest income and paid $600 of interest on consumer loans would be entitled to a $60 deduction (.15 x ($1,000 - $600) = $60), so that he would owe tax on $340, which is $1,000 of interest income minus $600 of interest deductions minus $60 of net interest exclusion. This is equivalent to

Market Adjustment

Lenders demand higher nominal interest rates when they anticipate inflation than when they anticipate stable prices, and borrowers are willing to pay the higher rates because they expect to repay their debts in dollars with less purchasing power.

Without income taxes, inflation should push up nominal interest rates one percentage point for each percent of anticipated inflation.[25] With an unindexed income tax, nominal interest rates would have to rise more than one percentage point for each percent of inflation to retain the same real after-tax interest rate, thus compensating both for inflation and for the extra tax on the higher nominal interest.[26]

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taxing 85 percent of the $1,000 interest income ($850) and allowing a deduction of only 85 percent of the $600 interest paid ($510), thereby taxing the same $340 ($850-$510 = $340).

25 For a good explanation of these market adjustments, see Tanzi, Inflation and the Personal Income Tax, pp. 107-117. Irving Fisher first predicted that nominal interest rates would rise in response to anticipated inflation, but he did not consider the effects of income taxes. (Irving Fisher, The Rate of Interest (1907), pp. 270-280). See also Michael Darby, "The Financial and Tax Effects of Monetary Policy on Interest Rates," Economic Inquiry (June 1975), pp. 271-273.

26 Suppose, for example, that all lenders and borrowers are taxed at a rate of 20 percent, and that the interest rate would be 4 percent if prices were expected to remain stable. In this case, the after-tax interest rate would be 3.2 percent (4 x (1-.2)). If inflation of 8 percent is suddenly universally anticipated, lenders will want to receive the same after-tax real rate of return of 3.2 percent, but in order to do so will need a pretax nominal interest rate of 14 percent. Borrowers will be willing to pay this higher rate, since it leaves their after-tax real borrowing costs unchanged (deducting the 14 percent interest reduces the effective borrowing cost to 11.2 percent (14 x (1 - .2) = 11.2), and subtracting the 8 percent inflation rate reduces it to 3.2 percent). Had the interest rate risen one percentage point for each percent of inflation, the new rate would have been 12 percent (8 + 4 = 12). The 14 percent rate is higher by enough to pay the extra tax on the inflation premium in the interest rate. In fact, in this special case, if the expected inflation of 8 percent materializes, the market adjustment leads to precisely the same after-tax real rates of interest as would prevail if interest income and expense were indexed.

This "perfect" market adjustment would obviate the need for indexing interest income and expense, but it could occur only if all borrowers and lenders were taxed at the same rate and they correctly predicted the rate of inflation (or if all interest-bearing assets were indexed for inflation.)[27] The more progressive the income tax, the less the market could be expected to compensate for the lack of indexing. Even a partial market adjustment, however, would increase interest rates enough to compensate partly for the lack of indexation and effectively reduce somewhat the very high rates of tax on real interest income discussed above.[28] The examples cited in Table 14 and elsewhere in this section were all based on a percentage-point-for-percentage-point market adjustment and hence probably overstate somewhat the heavy taxation of lenders and tax subsidization of borrowers caused by the interaction of inflation with the tax system.[29] In any event, because tax rates are graduated and inflation is

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27 Even under these circumstances, inflation could affect the supply and demand for credit in other ways, so that the interest rate might rise by more or less than implied by the perfect market adjustment described above. (See Tanzi, Inflation and the Personal Income Tax, pp. 115-116).

28 Under a progressive income tax, the partial market adjustment predicted by economic theory would push up nominal interest rates by enough to leave middle-income lenders and borrowers with the same after-tax real interest rate that they faced before inflation and would face if indexing were in place. Higher-income taxpayers would face lower after-tax real interest rates than previously, and lower-income taxpayers would face higher after-tax real interest rates. Since some borrowers and lenders are tax exempt, even a proportional or flat-rate income tax would not establish a perfect market adjustment. (See Assa Birati and Alex Cukierman, "The Redistributive Effects of Inflation and of the Introduction of a Real Tax System in the U.S. Bond Market," Journal of Public Economics (1979), pp. 125-139).

29 A study of interest rates in the United States between 1952 and 1975 concluded that rates did not rise by enough to compensate for inflation and to offset the interaction of inflation and the tax system, even for middle-income investors. Although these results run counter to theory, they could be explained by taxpayers' unfamiliarity with inflation and its effects on the income tax. (See Vito Tanzi, "Inflationary Expectations, Economic Activity, Taxes, and Interest Rates," American Economic Review (March 1980), pp. 12-21). A more recent study of interest rates between 1959 and 1979 found evidence that the market had adjusted both for inflation and the interaction of the tax system with inflation. (Joe Peek, "Interest Rates, Income

often incorrectly anticipated, indexing would be needed to hold real tax rates on interest income to statutory rates.

Transitional Considerations

If indexation was imposed on interest on existing debt, taxes of those who were borrowers at the time of enactment would rise and taxes of lenders would fall. Indexation would allow borrowers to deduct only a portion of nominal interest payments during subsequent inflationary periods. This could cause hardship, since taxpayers who itemized deductions would be repaying debt that they incurred expecting to deduct all of their nominal interest payments.

Suppose, for instance, that a homeowner in the 30 percent bracket was paying 12 percent interest annually on a $50,000 mortgage when indexation was imposed. If the inflation rate was 8 percent the following year, the homeowner would deduct interest of $6,000 (.12 x $50,000) as usual but with indexation would have to declare as taxable income $4,000 (.08 x $50,000), the reduction in the real value of his $50,000 liability. Thus, his net deduction would be only $2,000 ($6,000 - $4,000) rather than the $6,000 that he had anticipated.

Although inflation would have benefitted the homeowner in the above example and other borrowers by lessening the real value of their debt, many taxpayers would not consider themselves to be any better off than previously, and they might not be able to capitalize on their gain to raise the money to pay the higher tax.

In addition, if interest rates have risen to higher levels than would have prevailed under tax base indexing, lenders have already in effect received some of the relief that would be provided by indexing, and borrowers have already in effect lost some of the advantage that they otherwise enjoy when the tax base is unindexed. Under these circumstances, therefore, it might be unfair to index interest income and expense on existing debt. Since the evidence suggests that a full market adjust-

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Taxes, and Anticipated Inflation," American Economic Review (December 1982), pp. 980-991). Another study found that inflationary expectations did not influence interest rates in the 1970s. (Lawrence Summers, "The Nonadjustment of Nominal Interest Rates: A Study of the Fisher Effect," National Bureau of Economic Research Working Paper #836 (January 1982)). Results of all of these studies are tentative, because they are based on assumptions about anticipated inflation rates which are necessarily unobservable.

ment has probably not taken place, however, this may not be a serious problem.[30] Moreover, it would not be a problem for indexing interest income and expense for future transactions.

Interest income and expense on existing debt could be exempted from indexation. In that case, however, taxpayers could manipulate their finances and attempt to classify new debts as "old debt" to avoid losing part of their interest deductions. At the same time, they could try to assign interest income to newly made investments to get the benefit of indexation.[31] Alternatively, to ease the transition, taxpayers could initially be allowed to continue deducting nominal interest in full up to the amount that they deducted in the year prior to enactment. This full deduction could then gradually be phased out over a number of years.[32]

DEPRECIATION

During inflation, unindexed depreciation deductions erode in value because they are spread over many years and are based on an initial (historical) cost expressed in the worth of currency at the date of purchase. The tax law allows a specified percentage of this nominal acquisition cost to be deducted each year until the asset is fully depreciated--that is, until the sum of the depreciation deductions equals the historical cost. If depreciation schedules are designed to approximate the annual declines in asset values that would occur with no inflation, owners would not be able to recover the real cost of plant and equipment during inflationary periods. Under these circumstances, the income tax would be partially a tax on capital.

Suppose, for instance, that an asset costs $100, loses one-tenth of its real value in each of the ten years of its physical life, and that tax law allows the owner to deduct one-tenth of the value each year. If depreciation deductions are not indexed for inflation, deductions of $10 ($100 x .10) are allowed each year. With inflation of 12 percent annually, the $10 depreciation deductions are less than the annual real loss in value.

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30 Moreover, if interest rates dropped upon enactment of tax-base indexing, borrowers could refinance at the more favorable terms--albeit usually only after paying substantial prepayment penalties.

31 See, for example, John Bossons, "Indexation after the Lortie Report," (Toronto: University of Toronto, Institute for Policy Analysis, November 1982), pp. 18-19.

32 Ibid.

Measured in the dollars prevailing at the end of the first year, for example, the initial cost of the asset is $112, rather than $100, so a loss of 10 percent of the initial value requires a deduction of $11.20 ($112 x .10), rather than $10.[33] Unless the owner is allowed to deduct $11.20 in the first year, the expenses of earning his income are understated, and his income is overstated.

Mechanics of Depreciation Indexing

Depreciation indexing would adjust annual depreciation deductions to reflect changes in the price level from year to year. Under current law, specified percentages of an asset's initial cost (its basis) are deducted each year until the full nominal cost has been deducted. Maintaining the real value of depreciation deductions during inflation would entail indexing the basis of each asset every year for the inflation that occurred in the previous year and then calculating depreciation deductions in the normal way. The basis for the current year would be determined by multiplying the basis for the previous year by the ratio of the current price level to the previous year's price level. In the above example, the value (basis) of the asset would have been updated to $112 ($112 = $100 x 1.12) before the first year's depreciation was calculated, so that a depreciation deduction of $11.20 would have been allowed. Gain on sale would be calculated by reference to the indexed adjusted basis, rather than the unindexed adjusted basis as under current law.[34]

An alternative method for indexing depreciation deductions would be to calculate the present value of the stream of depreciation deductions and allow that amount to be deducted in the year an asset is purchased.[35]

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33 This example is based on the assumption that tax is due at the end of the year.

34 Real gain on sale would be the difference between the sale price and the amount of the indexed purchase price that had not been depreciated. Taxpayers would calculate this undepreciated amount by referring to a table published by the IRS giving the percentage of the real initial purchase price that had already been taken in depreciation deductions. This percentage would depend on how many years the asset had been depreciated and the schedule of deductions that had been followed.

35 See Alan J. Auerbach and Dale W. Jorgenson, "Inflation-Proof Depreciation of Assets," Harvard Business Review (September-October 1980), pp. 113-118.