FINANCIAL SERVICES REVIEW, 6(4): 243–256
ISSN: 1057-0810


# An Analysis of Nondeductible IRA Contributions and Roth IRA Conversions

Stephen M. Horan
Jeffrey H. Peterson
Robert McLeod

*On average investors have an income replacement rate of 64% of their pre-retirement income, which in many cases results in a lower tax rate in retirement. We analyze the impact of declining withdrawal tax rates on the choice between taxable mutual fund investments and nondeductible IRAs. The relative attractiveness of the taxable mutual fund option declines significantly when withdrawal tax rates decline. Converting existing IRAs to Roth IRAs is generally beneficial for investors who remain in the same tax bracket upon withdrawal. For short (long) time horizons and low (high) expected returns, the marginal value of conversion in 1998 is greater (less) than the marginal value of optimal conversion. For investors dropping into the 15% tax bracket, conversion is generally not beneficial unless the conversion is done optimally, the time horizon is long, and the expected return is high. Investors in the 15% tax bracket should convert existing IRA assets.*

## I. INTRODUCTION

Disagreement exists about the true tax advantages of traditional IRAs. Some have suggested that traditional IRAs have tax advantages only if the investor's marginal tax rate upon withdrawal is lower than the investor's marginal tax rate upon contribution (e.g., Kaiser, 1990). Others have argued that the deferral of tax payments on investment returns over time yields a tax advantage to IRAs even if current and terminal marginal tax rates do not differ (see Bodie & Merton, 1998). The significance of this tax-deferment value has been called into question however. Crain and Austin (1997) analyze the tradeoff between tax-deferment value in IRAs and the preferential treatment of capital gains in a taxable investment enacted in the Taxpayer Relief Act of 1997 (hereafter, the Act) for mutual fund investors in the 31% tax bracket. In this paper, we seek to extend their analysis in two ways.

**Stephen M. Horan** and **Jeffrey H. Peterson** • School of Business, St. Bonaventure University, St. Bonaventure, New York 14778; *e-mail*: shoran@sbu.edu, or *e-mail*: peterson@sbu.edu. **Robert McLeod** • Department of Economics, Finance and Legal Studies, University of Alabama, Tuscaloosa, Alabama 35487-0224; *e-mail*: rmcleod@cba.ua.edu.

First, we allow investors to drop into lower tax brackets upon withdrawal of retirement assets. This possibility has a significant effect on an investor's choice between nondeductible IRA contributions and taxable mutual fund investments. Second, we analyze the option to convert existing IRA assets to Roth IRA assets.

According to the Panel Study of Income Dynamics (PSID) as interpreted by Bernheim, Skinner and Wienberg (1997), on average, retirement income is about 64% of pre-retirement income, suggesting that marginal tax rates for retirees are likely to fall over their investment horizon. Many of these individuals face the decision of making nondeductible IRA contributions (in which earnings will be taxed upon withdrawal as ordinary income) or taxable mutual fund investments (in which a portion of earnings will be taxed each year at a lower capital gains tax rate). We compare the after-tax future values of nondeductible IRA contributions and taxable mutual fund investments for investors whose marginal tax rate falls from 31% during the term of investment to 28% upon withdrawal. Meanwhile, the Act has also given taxpayers in lower tax brackets the option to convert traditional IRAs to Roth IRAs, a retirement account in which contributions are not deductible, but all earnings are excluded from tax. Although the conversion permits tax-free earnings into the future, it requires all deductible contributions and earnings being converted from the traditional IRA to be added to taxable income, creating an opportunity cost in that the tax paid is not able to accumulate earnings. The Act also creates a one-time incentive to convert (or a one-time tax revenue advance) by allowing those who convert in the 1998 tax year to spread the additional taxable income over four years. We analyze the conversion option both with and without the 1998 conversion incentive.

The following section reviews the literature on IRA investing. Section III analyzes the decision between nondeductible IRA and taxable mutual fund investments for tax rates that decline upon retirement using the model in Crain and Austin (1997). We analyze the Roth IRA conversion decision in Section IV. The final section concludes and offers avenues for further investigation.

## II. IRA LITERATURE AND METHODOLOGY

There exists a debate over whether tax-deferred savings programs actually increase savings rates. Some estimate that IRAs have had little, if any, impact on savings (e.g., Gale & Scholz, 1994). Others report evidence that IRAs have stimulated savings (e.g., Hubbard & Skinner, 1995, 1996). Perhaps the ambiguity over whether IRAs increase savings rates stems from the complexity of the tax code, which creates ambiguity over whether investors will have greater after-tax accumulations in taxable or tax deferred accounts. For example, O'Neil, Saftner, and Dillaway (1983) examine the impact of the 10% premature withdrawal penalty. They find that the penalty outweighs the tax deferment for short investment horizons, but not for long horizons. In fact, Yaari and Fabozzi (1985) find that the indifference point may be as short as two years.

Ragdsdale, Seila, and Little (1993, 1994) incorporate many tax code complexities in a mathematical programming model for optimal withdrawal policies from tax-deferred retirement accounts based on investment returns, life expectancy, and beneficiary designations. They demonstrate that their model significantly improves upon results of proposed hueristic rules (see Saftner & Fink, 1990, and Sage, 1988), which can produce large finan-

cial losses in certain circumstances. Ragdsdale, Seila, and Little highlight the usefulness of mathematical models for optimal decision making.

Similarly, Crain and Austin (1997) develop a mathematical model to analyze the choice between taxable investments, deductible IRAs, nondeductible IRAs and Roth IRAs. Making a distinction between ordinary income tax rates and capital gain tax rates, they build on the work of Randolf (1994) who examines similar issues with mutual funds that make periodic taxable distributions. Although Randolf makes no distinction between ordinary and capital gains tax rates, he demonstrates that mutual funds with high turnover and distributions (such as some aggressive growth funds) should be in IRAs, while mutual funds with low turnover and distributions (such as index funds) should be placed in taxable accounts when both tax deferred and taxable savings accounts are used. Crain and Austin establish that when investors expect to be in a lower (higher) tax bracket upon withdrawal than upon contribution, deductible IRAs accumulate more (less) than Roth IRAs. They also find that Roth IRAs accumulate more than nondeductible traditional IRAs.

Crain and Austin examine the break-even points for the percent of return distributed as capital gains which make investors indifferent between nondeductible IRA investments or a taxable investment in the same mutual fund. They recognize that a trade-off exists between deferring a tax liability or accepting a lower capital gains tax sooner. Their analysis is limited to investors facing a 31% marginal tax rate throughout the investment horizon and upon withdrawal. Our initial analysis is similar except that we analyze the impact of investors facing lower tax rates upon withdrawal. Investors facing 28% tax rates are not forced to choose between nondeductible IRAs and taxable mutual fund investments since deductible IRAs and Roth IRAs are always preferable (see Crain & Austin) and the phase-out limits for Roth IRA are well into the 31% tax bracket. Hence, investors in the 28% tax bracket should not make nondeductible IRA contributions at all. However, many investors in the 31% tax bracket that must choose between nondeductible IRAs and taxable mutual fund investments are likely to fall into lower tax brackets upon retirement. This scenario is the setting for the first part of our analysis.

The Act also permits taxpayers to convert an existing IRA to a Roth IRA. Any pre-tax contributions and tax-deferred earnings at that point are considered a taxable distribution, although the 10% penalty for early withdrawal will not apply. Eligibility for conversion is limited to taxpayers—married or single—whose AGI is under $100,000. Those converting in 1998 can spread the taxable income evenly over four years. We examine the value of conversion for taxpayers in the 15 and 28% tax brackets. Generally, individuals facing a 31% marginal rate are not eligible for conversion. The analysis in this paper permits tax rates upon contribution and withdrawal to vary. The after-tax accumulations of converting in 1998 and post-1998 are also compared, illustrating that the advantage to converting in 1998 is significant.

## III. CHANGING TAX RATES

### A. The Foundations

Comparing future values of taxable investments and nondeductible IRA investments requires establishing the formulas governing their after-tax accumulations. For

a nondeductible IRA contribution, all returns are taxed at the ordinary rate upon withdrawal, while the nondeductible contribution is excluded from withdrawal tax. Hence, the after-tax future value of a dollar invested in a nondeductible IRA for $n$ years is

$$FV_{nIRA} = 1 + [(1 + r)^n - 1](1 - T_n) \quad (1)$$

where

$T_n$ = the ordinary marginal tax rate on income upon withdrawal;
$r$ = the expected rate of return on the investment; and
$n$ = the number of years until withdrawal of the contribution.

Equation (1) will hold assuming the investor does not take a 10% penalty for withdrawal before age 59 1/2. It is important to note that even when IRA withdrawals commence in the near future, the investment horizon is not necessarily short. For example, suppose a 55-year old investor will start making withdrawals at age 60. Suppose further, that other assets are already in place such that withdrawals would begin at age 60, whether or not the considered investment was made. In this case, $n$ is not equal to five years. Rather, $n$ is equal to the time until the *marginal* IRA withdrawal is made. If marginal withdrawals (as a result of the investment made at age 55) begin at age 70, $n$ = 15 years.

Mutual funds are required to distribute interest income, dividend income, and short-term capital gains to fund shareholders on a prorata basis as dividends, which are taxable to the investor at the ordinary income tax rate. Long-term capital gains realized by selling appreciated stock are distributed to shareholders on a prorata basis as well and are taxable to investors at the long-term capital gains rate. Crain and Austin show that for a taxable mutual fund investment, a dollar invested for $n$ years has a before-withdrawal tax future value of

$$FV_{TXb} = (1 + r - rp_{oi}t_{oi} - rp_{cg}t_{cg})^n \quad (2)$$

where

$t_{oi}$ = the intermediate marginal tax rate on ordinary income over the term of the investment;
$t_{cg}$ = the intermediate marginal tax rate on capital gains over the term of the investment;
$p_{oi}$ = the percent of annual return distributed to shareholders as ordinary income; and
$p_{cg}$ = the percent of annual return distributed to shareholders as capital gains.

A capital gain is also recognized when mutual fund shares are sold. The tax is based on the before-withdrawal tax future value in equation (2) less the adjusted basis, which is composed of the initial investment plus dividend and capital gain distributions (on which tax has already been paid) less the income tax on those distributions. The after-withdrawal tax future value of a taxable mutual fund investment is

$$FV_{TXa} = (1 + r - rp_{oi}t_{oi} - rp_{cg}t_{cg})^n$$

$$-t_{cg}\begin{bmatrix} (1 + r - rp_{oi}t_{oi} - rp_{cg}t_{cg})^n - 1 \\ -rp_{oi}(1 - t_{oi})\dfrac{(1 + r - rp_{oi}t_{oi} - rp_{cg}t_{cg})^n - 1}{(r - rp_{oi}t_{oi} - rp_{cg}t_{cg})} \\ -rp_{oi}(1 - t_{oi})\dfrac{(1 + r - rp_{oi}t_{oi} - rp_{cg}t_{cg})^n - 1}{(r - rp_{oi}t_{oi} - rp_{cg}t_{cg})} \end{bmatrix} \quad (3)$$

Crain and Austin (1997) present a more thorough development of equation (3). The term inside the brackets represents the before-withdrawal tax accumulation less the adjusted basis. There exists a tradeoff between the taxable mutual fund investment and the same investment in a nondeductible IRA. Investors may be willing to forgo the tax deferral offered by IRAs in exchange for paying the lower capital gains tax of 20% established by the Act. In addition, since capital gains are not distributed until the fund sells appreciated stock, the taxable mutual fund investment has an inherent, albeit partial, tax deferral element.

## B. Taxable Mutual Funds vs. Nondeductible IRAs for Falling Tax Rates

Our objective in this section is to determine the percent of capital gains distribution that makes investors indifferent between a taxable mutual fund investment and the same investment in a nondeductible IRA. This exercise provides guidance to investors in deciding between the two options under different conditions. Our analysis highlights the impact of declining marginal tax rates during retirement years. Since Roth IRAs are always preferable to either taxable investments or nondeductible IRAs (see Crain & Austin) and the phase-out limits for Roth IRA are well into the 31% tax bracket, investors facing a 28% tax rate should always choose deductible IRAs or Roth IRAs. Investors with 31% marginal tax rates may have to choose between nondeductible IRAs and taxable investments. However, it is likely that investors' tax rates will decline during retirement. Allowing the tax rate upon withdrawal to decline to 28% greatly affects an investor's decision. As the withdrawal tax rate ($T_n$) decreases, the advantage of paying the lower 20% capital gains tax early is reduced. Hence, the relative attractiveness of the taxable mutual fund is reduced and the nondeductible IRA becomes relatively more attractive than when the withdrawal tax rate remains constant.

The proportion of return distributed as ordinary income ($p_{oi}$) is initially set at .07, the average for growth funds reported in Crain and Austin (1997). Further, the tax rate on ordinary income during the term of the investment ($t_{oi}$) is set at 31%, and the tax rate on capital gains over the term of the investment ($t_{cg}$) is set at 20%. For a given return ($r$) and time horizon ($n$), we set equation (1) equal to equation (3) and solve for the percent of return distributed as capital gain ($p_{cg}$) subject to the constraint that $0 < p_{cg} < 1$. Algebraically,

$$1 + [(1 + r)^n - 1](1 - T_n) = (1 + r - rp_{oi}t_{oi} - rp_{cg}t_{cg})^n$$

$$-t_{cg}\begin{bmatrix} (1 + r - rp_{oi}t_{oi} - rp_{cg}t_{cg})^n - 1 \\ -rp_{oi}(1 - t_{oi})\dfrac{(1 + r - rp_{oi}t_{oi} - rp_{cg}t_{cg})^n - 1}{(r - rp_{oi}t_{oi} - rp_{cg}t_{cg})} \\ -rp_{oi}(1 - t_{oi})\dfrac{(1 + r - rp_{oi}t_{oi} - rp_{cg}t_{cg})^n - 1}{(r - rp_{oi}t_{oi} - rp_{cg}t_{cg})} \end{bmatrix} \quad (4)$$

$$s.t.\ 0 < p_{cg} < 1.$$

Table 1 displays the results for various expected returns and investment horizons. The approximate average $p_{cg}$ for growth funds are in bold print to highlight the indifference point for an average growth fund. The table is interpreted as follows. For 20-year investment horizons and mutual funds with an 8% expected return, investors will accumulate the same after-tax future value in a taxable account and a nondeductible IRA if the fund dis-

**TABLE 1**

Typical Taxable Growth Mutual Fund Investment vs. Nondeductible IRA Indifference Points of Percentage of Investment Return Taxed as Capital Gain ($p_{cg}$) for Selected Returns ($r$) and Time Horizons ($n$) with the Percentage of Return Distributed as Ordinary Income ($p_{oi}$) = .07

| | *Investment Horizon in years (n)* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *r* | *5* | *10* | *15* | *20* | *25* | *30* | *35* | *40* |
| 1% | * | * | * | * | * | * | * | * |
| 2% | * | * | * | * | * | * | * | * |
| 3% | * | * | * | * | * | 0.886 | 0.722 | 0.601 |
| 4% | * | * | * | * | 0.788 | 0.614 | **0.492** | **0.403** |
| 5% | * | * | * | 0.804 | 0.591 | **0.453** | 0.357 | 0.286 |
| 6% | * | * | 0.946 | 0.639 | **0.462** | 0.347 | 0.268 | 0.210 |
| 7% | * | * | 0.785 | 0.522 | 0.371 | 0.274 | 0.207 | 0.158 |
| 8% | * | * | 0.665 | **0.435** | 0.303 | 0.219 | 0.161 | 0.120 |
| 9% | * | * | 0.572 | 0.368 | 0.252 | 0.178 | 0.127 | 0.090 |
| 10% | * | 0.894 | 0.498 | 0.315 | 0.211 | 0.145 | 0.100 | 0.068 |
| 11% | * | 0.799 | **0.438** | 0.272 | 0.178 | 0.119 | 0.079 | 0.050 |
| 12% | * | 0.719 | 0.389 | 0.237 | 0.152 | 0.098 | 0.061 | 0.035 |
| 13% | * | 0.653 | 0.347 | 0.207 | 0.129 | 0.080 | 0.047 | 0.023 |
| 14% | * | 0.596 | 0.312 | 0.183 | 0.110 | 0.065 | 0.035 | 0.023 |
| 15% | * | 0.547 | 0.282 | 0.161 | 0.094 | 0.053 | 0.025 | 0.004 |
| 16% | * | 0.504 | 0.255 | 0.143 | 0.081 | 0.042 | 0.016 | ** |
| 17% | * | **0.466** | 0.232 | 0.127 | 0.069 | 0.032 | 0.008 | ** |
| 18% | * | 0.433 | 0.212 | 0.113 | 0.058 | 0.024 | 0.001 | ** |
| 19% | * | 0.403 | 0.194 | 0.100 | 0.049 | 0.017 | ** | ** |
| 20% | * | 0.377 | 0.178 | 0.089 | 0.041 | 0.011 | ** | ** |

*Notes:* *Taxable mutual fund investment yields a greater after-tax future value than the nondeductible IRA.

**Nondeductible IRA yields a greater after-tax future value than the taxable mutual fund investment.

**Bold** figures indicate approximate average capital gain distribution as a percent of return for the growth mutual funds in Crain and Austin (1998).

**TABLE 2**

Typical Taxable Growth and Income Mutual Fund Investment vs. Nondeductible IRA Indifference Points of Percentage of Investment Return Taxed as Capital Gain ($p_{cg}$) for Selected Returns ($r$) and Time Horizons ($n$) with the Percentage of Return Distributed as Ordinary Income ($p_{oi}$) = .20

| | *Investment Horizon in years (n)* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *r* | *5* | *10* | *15* | *20* | *25* | *30* | *35* | *40* |
| 1% | * | * | * | * | * | * | * | * |
| 2% | * | * | * | * | * | 0.938 | 0.739 | **0.591** |
| 3% | * | * | * | 0.970 | 0.681 | **0.493** | **0.361** | **0.264** |
| 4% | * | * | * | 0.630 | **0.414** | 0.274 | 0.176 | 0.103 |
| 5% | * | * | 0.726 | **0.428** | 0.256 | 0.144 | 0.066 | 0.009 |
| 6% | * | * | 0.543 | 0.294 | 0.151 | 0.059 | ** | ** |
| 7% | * | 0.867 | **0.412** | 0.200 | 0.077 | ** | ** | ** |
| 8% | * | 0.714 | 0.315 | 0.129 | 0.023 | ** | ** | ** |
| 9% | * | 0.596 | 0.240 | 0.075 | ** | ** | ** | ** |
| 10% | * | **0.501** | 0.181 | 0.032 | ** | ** | ** | ** |
| 11% | * | **0.424** | 0.132 | ** | ** | ** | ** | ** |
| 12% | * | 0.360 | 0.092 | ** | ** | ** | ** | ** |
| 13% | * | 0.306 | 0.059 | ** | ** | ** | ** | ** |
| 14% | * | 0.260 | 0.030 | ** | ** | ** | ** | ** |
| 15% | 0.991 | 0.220 | 0.006 | ** | ** | ** | ** | ** |
| 16% | 0.911 | 0.185 | ** | ** | ** | ** | ** | ** |
| 17% | 0.841 | 0.155 | ** | ** | ** | ** | ** | ** |
| 18% | 0.778 | 0.128 | ** | ** | ** | ** | ** | ** |
| 19% | 0.722 | 0.104 | ** | ** | ** | ** | ** | ** |
| 20% | 0.672 | 0.083 | ** | ** | ** | ** | ** | ** |

*Notes:* *Taxable mutual fund investment yields a greater after-tax future value than the nondeductible IRA.
**Nondeductible IRA yields a greater after-tax future value than the taxable mutual fund investment.
**Bold** figures indicate approximate average capital gain distribution as a percent of return for the growth and income mutual funds in Crain and Austin (1997).

**TABLE 3**

Instances in which the After-tax Future Value of a Taxable Investment in 10 Randomly Selected Mutual Funds from Crain and Austin (1997) Exceeds the After-tax Future Value in a Nondeductible IRA under Varying Terminal Tax Rates

| | $T_n$ = 31% | $T_n$ = 28% |
|---|---|---|
| Aggressive Growth | 5 | 2 |
| Growth | 2 | 1 |
| Growth and Income | 2 | 1 |
| Balanced | 0 | 0 |

tributes 43.5% of its return as capital gains. If the fund distributes less as capital gains, the nondeductible IRA is preferred. If the fund distributes more as capital gains, the taxable investment is preferred.

The results differ significantly from those reported in Crain and Austin (1997). For example, given an investment horizon of 20 years and a tax rate of 28% upon withdrawal, an investor requires an expected return of 8% to be indifferent with the typical growth

fund. Crain and Austin (1997) report an 11% expected return is required when the withdrawal tax rate remains at 31%. Alternatively, given an expected return of 11%, a 15-year investment horizon is required to be indifferent. Crain and Austin (1997) report that a 20-year investment horizon is required with a 31% withdrawal tax rate. Hence, investors that anticipate a lower tax rate during withdrawal will favor a wider range of growth mutual funds in nondeductible IRAs. Since growth funds in the Crain and Austin sample have a mean return of 14.58%, growth fund investors with horizons of at least ten or fifteen years should choose nondeductible IRAs, on average.

The results for growth and income funds having an average $p_{oi}$ = .20 are similar. According to Table 2, given an investment horizon of 15 years and a tax rate of 28% upon withdrawal, an investor requires an expected return of 7% to be indifferent with the typical growth and income fund. Crain and Austin (1997) report that a 10% return is required when the withdrawal tax rate remains at 31%. Table 2 shows that, given an expected return of 10%, a 10-year investment horizon is required to be indifferent. Crain and Austin (1997) report that a 15-year investment horizon is required with a 31% withdrawal tax rate. Hence, investors that anticipate a lower tax rate during withdrawal will favor a wider range of growth and income mutual funds in nondeductible IRAs. Since growth and income funds in the Crain and Austin sample have a mean return of 13.44%, growth and income fund investors with horizons of at least ten years should choose nondeductible IRAs, on average.

Using the fund-specific data reported by Crain and Austin, we determine the instances in which the after-tax future value of a taxable investment in ten randomly selected mutual funds exceeds the after-tax future value in a nondeductible IRA assuming a 20-year investment horizon and the fund's specific five-year mean return, mean $p_{oi}$ and $p_{cg}$. These results are reported in Table 3. For ten aggressive growth funds, Crain and Austin find that five would accumulate a larger amount as a taxable investment after 20 years if the withdrawal tax rate remains at 31%. If the withdrawal tax rate declines to 28%, the instances fall to two. Similarly, for growth funds, only one (instead of two) would have accumulated larger amounts in taxable accounts if the withdrawal tax rate drops to 28%. The same is true for growth and income funds. No balanced funds would have yielded larger amounts as taxable investments under either scenario.

For investors that fall into the 15% tax bracket, the nondeductible IRA will always yield a higher after-tax future value. Since the capital gains tax rate is 20%, there exists no tradeoff between paying a lower capital gain tax early or a higher withdrawal tax later.

## IV. CONVERTING ROTH IRAS

The new Roth IRA allows all future earnings and withdrawals to be free from tax. The tax-free nature of withdrawals associated with the Roth IRA is contingent upon the account having been establish for more than five years and the account holder being $59\frac{1}{2}$ years old, permanently disabled, purchasing a first home, or dead upon withdrawal. The contribution, however, is taxable at the time of contribution. As such, the future value of an after-initial tax dollar invested in a Roth IRA is

$$FV_{Roth} = \$1(1 - T_o)(1 + r)^n \tag{5}$$

where

$T_0$ = the initial marginal tax rate upon contribution.

The future value of a dollar in an existing IRA account is

$$FV_{IRA} = \$1(1 + r)^n(1 - T_n). \tag{6}$$

Investors with adjusted gross incomes of no more than $100,000 may convert existing traditional IRAs to Roth IRAs. All deductible contributions and earnings increase taxable income. For the 1998 tax year only, the amount converted is taxed as income evenly over four years. If the tax liability is paid from the IRA assets in the year of conversion then investors should convert when

$$\frac{FV_{ConvRoth}}{FV_{IRA}} = \frac{(1 - T_o)(1 + r)^n}{(1 - T_n)(1 + r)^n} > 1 . \tag{7}$$

Hence, investors should convert when their withdrawal tax rate is expected to be less than their current tax rate. When the initial tax rate is greater than or equal to the terminal tax rate, it is beneficial to convert existing traditional IRAs to Roth IRAs. Equation (5) assumes that all assets being converted are deductible contributions and earnings and, hence, subject to tax. We use this assumption throughout the analysis because there is no way to know what contributions were not deductible when made.

Paying the tax liability from the IRA assets is sub-optimal, however, because the tax liability triggered by the conversion can be paid with dollars that would not qualify for tax deferment. For example, make the simplifying assumption that the converted amount is taxed entirely in the year of conversion at the initial tax rate, $T_0$. The conversion tax can be deducted from the assets being converted or paid directly by the investor. Paying the tax liability out of the assets being converted decreases the principal in the new Roth IRA. In this case, the future value of the converted Roth IRA is simply $(1 - T_0)(1 + r)^n$. Alternatively, the tax liability can be paid from assets that would not qualify for tax-deferred status, leaving the principal in the new Roth IRA unchanged from the traditional IRA. This technique has the effect of lowering the opportunity cost associated with paying the conversion tax. In this case, the future value of a converted IRA dollar is equal to the future value of the new Roth IRA dollar less the after-tax future value of conversion tax, $T_0$, or

$$FV_{RothConv} = (1 + r)^n - T_o[FV_{TXa}] \tag{8}$$

where $FV_{TXa}$ is the after-tax future value of a taxable mutual fund investment from equation (3). The first term represents the future value of a dollar in the new Roth IRA. The second term represents the lost future value of the $T_0$ dollars used to pay the conversion tax. The latter tax-payment method is the preferred method of conversion and

is assumed in our subsequent analysis. Substituting equation (3) into equation (8), we have

$$FV_{RothConv} = (1+r)^n - T_0\left[\begin{array}{l}(1+r-rp_{oi}t_{oi}-rp_{cg}t_{cg})^n \\ -t_{eg}\left[\begin{array}{l}(1+r-rp_{oi}t_{oi}-rp_{cg}t_{cg})^n - 1 \\ -rp_{oi}(1-t_{oi})\dfrac{(1+r-rp_{oi}t_{oi}-rp_{cg}t_{cg})^n - 1}{(r-rp_{oi}t_{oi}-rp_{cg}t_{cg})} \\ -rp_{oi}(1-t_{oi})\dfrac{(1+r-rp_{oi}t_{oi}-rp_{cg}t_{cg})^n - 1}{(r-rp_{oi}t_{oi}-rp_{cg}t_{cg})}\end{array}\right]\end{array}\right] \quad (9)$$

Hence, the conversion should be made when

$$\frac{FV_{RothConv}}{FV_{IRA}} = \frac{(1+r)^n - T_o[FV_{TXa}]}{(1-T_n)(1+r)^n} > 1\ . \quad (10)$$

Since the Act permits the tax liability of IRAs converted in 1998 to be paid over four years, the value of converting is higher in 1998. To reflect this conversion incentive, we adjust the second term in the numerator to be the present value of a four-year annuity with payments equal to one-fourth of the second term. The discount rate is the required return

**TABLE 4**

After-tax Future Values of Converted Roth IRAs divided by After-tax Future Values of Traditional IRAs When the Tax Rate on Ordinary Income is 28%

| | *Investment Horizon in years (n)* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *r* | *5* | *10* | *15* | *20* | *25* | *30* | *35* | *40* |
| | 1.070* | 1.086 | 1.100 | 1.112 | 1.123 | 1.133 | 1.142 | 1.151 |
| 6% | 1.021** | 1.039 | 1.055 | 1.069 | 1.082 | 1.093 | 1.104 | 1.114 |
| | 1.052*** | 1.052 | 1.052 | 1.052 | 1.052 | 1.052 | 1.052 | 1.052 |
| | 1.089 | 1.108 | 1.124 | 1.137 | 1.149 | 1.160 | 1.170 | 1.179 |
| 8% | 1.027 | 1.050 | 1.068 | 1.085 | 1.099 | 1.112 | 1.125 | 1.136 |
| | 1.067 | 1.067 | 1.067 | 1.067 | 1.067 | 1.067 | 1.067 | 1.067 |
| | 1.107 | 1.127 | 1.144 | 1.159 | 1.171 | 1.183 | 1.193 | 1.203 |
| 10% | 1.033 | 1.059 | 1.080 | 1.098 | 1.114 | 1.129 | 1.142 | 1.155 |
| | 1.081 | 1.081 | 1.081 | 1.081 | 1.081 | 1.081 | 1.081 | 1.081 |
| | 1.122 | 1.144 | 1.162 | 1.177 | 1.190 | 1.202 | 1.213 | 1.223 |
| 12% | 1.038 | 1.067 | 1.090 | 1.110 | 1.127 | 1.143 | 1.158 | 1.171 |
| | 1.094 | 1.094 | 1.094 | 1.094 | 1.094 | 1.094 | 1.094 | 1.094 |
| | 1.137 | 1.160 | 1.178 | 1.193 | 1.207 | 1.219 | 1.230 | 1.241 |
| 14% | 1.043 | 1.074 | 1.099 | 1.121 | 1.139 | 1.156 | 1.171 | 1.186 |
| | 1.106 | 1.106 | 1.106 | 1.106 | 1.106 | 1.106 | 1.106 | 1.106 |
| | 1.150 | 1.174 | 1.192 | 1.208 | 1.222 | 1.234 | 1.245 | 1.256 |
| 16% | 1.047 | 1.081 | 1.108 | 1.130 | 1.150 | 1.168 | 1.184 | 1.199 |
| | 1.117 | 1.117 | 1.117 | 1.117 | 1.117 | 1.117 | 1.117 | 1.117 |

*Notes:* *Top figures indicate optimally converted IRAs in 1998.
**Middle figures indicate optimally converted IRAs after 1998.
***Bottom figures indicate sub-optimally converted IRAs in 1998.

**TABLE 5**
After-tax Future Values of Converted Roth IRAs divided by After-tax Future Values of Traditional IRAs When the Tax Rate on Ordinary Income Drops from 28% to 15% upon Withdrawal

| | *Investment Horizon in years (n)* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *r* | *5* | *10* | *15* | *20* | *25* | *30* | *35* | *40* |
| | 0.907* | 0.920 | 0.932 | 0.942 | 0.951 | 0.960 | 0.967 | 0.975 |
| 6% | 0.865** | 0.880 | 0.894 | 0.906 | 0.916 | 0.926 | 0.935 | 0.943 |
| | 0.891*** | 0.891 | 0.891 | 0.891 | 0.891 | 0.891 | 0.891 | 0.891 |
| | 0.923 | 0.938 | 0.952 | 0.963 | 0.973 | 0.983 | 0.991 | 0.999 |
| 8% | 0.870 | 0.889 | 0.905 | 0.919 | 0.931 | 0.942 | 0.953 | 0.962 |
| | 0.904 | 0.904 | 0.904 | 0.904 | 0.904 | 0.904 | 0.904 | 0.904 |
| | 0.937 | 0.955 | 0.969 | 0.981 | 0.992 | 1.002 | 1.011 | 1.019 |
| 10% | 0.875 | 0.897 | 0.915 | 0.930 | 0.944 | 0.956 | 0.968 | 0.978 |
| | 0.915 | 0.915 | 0.915 | 0.915 | 0.915 | 0.915 | 0.915 | 0.915 |
| | 0.951 | 0.969 | 0.984 | 0.997 | 1.008 | 1.018 | 1.028 | 1.036 |
| 12% | 0.879 | 0.904 | 0.924 | 0.940 | 0.955 | 0.968 | 0.981 | 0.992 |
| | 0.926 | 0.926 | 0.926 | 0.926 | 0.926 | 0.926 | 0.926 | 0.926 |
| | 0.963 | 0.982 | 0.998 | 1.011 | 1.022 | 1.033 | 1.042 | 1.051 |
| 14% | 0.883 | 0.910 | 0.931 | 0.949 | 0.965 | 0.979 | 0.992 | 1.004 |
| | 0.937 | 0.937 | 0.937 | 0.937 | 0.937 | 0.937 | 0.937 | 0.937 |
| | 0.974 | 0.994 | 1.010 | 1.023 | 1.035 | 1.045 | 1.055 | 1.064 |
| 16% | 0.887 | 0.916 | 0.938 | 0.957 | 0.974 | 0.989 | 1.003 | 1.015 |
| | 0.946 | 0.946 | 0.946 | 0.946 | 0.946 | 0.946 | 0.946 | 0.946 |

*Notes:* *Top figures indicate optimally converted IRAs in 1998.
**Middle figures indicate optimally converted IRAs after 1998.
***Bottom figures indicate sub-optimally converted IRAs in 1998.

on the investment. Table 4 shows the value of conversion when the tax rate on ordinary income remains at a constant 28%. For each return and investment horizon, three ratios are provided. The top figure is the value (relative to an unconverted traditional IRA) of an optimally converted IRA in 1998 (i.e., tax liability paid with non-IRA assets). The middle figure is the relative value of a sub-optimally converted IRA in 1998. The bottom figure is the value of an optimally converted IRA after 1998. The calculations are made using the average $p_{oi}$ and $p_{cg}$ for growth funds reported by Crain and Austin earlier.

The ratios should be interpreted as the value of conversion relative to nonconversion. For example, given a 20-year investment horizon and 10% return, an optimally converted IRA will have a 15.9% greater value than a nonconverted IRA. Several observations can be made from the trends in Table 4. First, for investors who are likely to remain in the 28% tax bracket, conversion is almost always advisable. Second, the value of converting from a traditional IRA to a Roth IRA increases as the investment horizon, $n$, and rate of return, $r$, increase. For short time horizons and low expected returns, the marginal value of conversion in 1998 is greater than the marginal value of optimal conversion. The effect reverses itself for higher returns and longer time horizons. In other words, for long time horizons or high returns, it is more important to optimally convert than it is to convert sub-optimally in 1998.

Table 5 illustrates the effect of investors falling into the 15% tax bracket upon retirement. The difference is significant. For investors dropping into the 15% tax rate conversion is generally not beneficial unless three conditions are met: 1) the conversion is done opti-

**TABLE 6**
After-tax Future Values of Converted Roth IRAs divided by After-tax Future Values of Traditional IRAs When the Tax Rate on Ordinary Income Increases from 15% to 28% upon Withdrawal

| | *Investment Horizon in years (n)* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *r* | *5* | *10* | *15* | *20* | *25* | *30* | *35* | *40* |
| | 1.218* | 1.227 | 1.234 | 1.241 | 1.246 | 1.252 | 1.257 | 1.261 |
| 6% | 1.192** | 1.202 | 1.210 | 1.218 | 1.224 | 1.231 | 1.236 | 1.241 |
| | 1.208*** | 1.208 | 1.208 | 1.208 | 1.208 | 1.208 | 1.208 | 1.208 |
| | 1.228 | 1.238 | 1.247 | 1.254 | 1.260 | 1.266 | 1.272 | 1.277 |
| 8% | 1.195 | 1.207 | 1.217 | 1.226 | 1.234 | 1.241 | 1.247 | 1.253 |
| | 1.216 | 1.216 | 1.216 | 1.216 | 1.216 | 1.216 | 1.216 | 1.216 |
| | 1.238 | 1.249 | 1.258 | 1.266 | 1.272 | 1.278 | 1.284 | 1.289 |
| 10% | 1.198 | 1.212 | 1.223 | 1.233 | 1.242 | 1.250 | 1.257 | 1.263 |
| | 1.224 | 1.224 | 1.224 | 1.224 | 1.224 | 1.224 | 1.224 | 1.224 |
| | 1.246 | 1.258 | 1.267 | 1.275 | 1.283 | 1.289 | 1.295 | 1.300 |
| 12% | 1.201 | 1.216 | 1.229 | 1.240 | 1.249 | 1.257 | 1.265 | 1.272 |
| | 1.231 | 1.231 | 1.231 | 1.231 | 1.231 | 1.231 | 1.231 | 1.231 |
| | 1.254 | 1.266 | 1.276 | 1.284 | 1.291 | 1.298 | 1.304 | 1.310 |
| 14% | 1.203 | 1.220 | 1.234 | 1.245 | 1.255 | 1.264 | 1.272 | 1.280 |
| | 1.237 | 1.237 | 1.237 | 1.237 | 1.237 | 1.237 | 1.237 | 1.237 |
| | 1.261 | 1.274 | 1.284 | 1.292 | 1.299 | 1.306 | 1.312 | 1.318 |
| 16% | 1.206 | 1.224 | 1.238 | 1.250 | 1.261 | 1.270 | 1.279 | 1.287 |
| | 1.243 | 1.243 | 1.243 | 1.243 | 1.243 | 1.243 | 1.243 | 1.243 |

*Notes:* *Top figures indicate optimally converted IRAs in 1998.
**Middle figures indicate optimally converted IRAs after 1998.
***Bottom figures indicate sub-optimally converted IRAs in 1998.

mally, 2) the time horizon is long, and 3) the expected return is high. Otherwise, many of the same trends are present. For example, the value of conversion increases with the time horizon and return. For short time horizons and low expected returns, the marginal value of optimal conversion is less than the marginal value of conversion in 1998. For long time horizons or high returns, it is more important to convert optimally than it is to convert sub-optimally in 1998.

Investors with 31% tax rates generally do not have the option to convert since the AGI limit is $100,000. According to Table 6, however, investors in the 15% tax bracket who expect to be in the 28% bracket upon withdrawal should almost always convert traditional IRAs to Roth IRAs. Again, the same trends prevail.

## V. CONCLUSION

According to the Panel Study of Income Dynamics (PSID) as interpreted by Bernheim, Skinner, and Wienberg (1997), on average, retirement income is about 64% of pre-retirement income, suggesting that marginal tax rates for retirees are likely to fall over their investment horizon. In this paper, we analyze the effect of declining withdrawal tax rates on an investor's choice between taxable mutual fund investments and similar investments in a nondeductible IRA. We assume capital gains are taxed at 20%, the new rate established by The Act and find that as the withdrawal tax rate decreases, the advantage of paying the

lower 20% capital gains tax early is reduced. Hence, the relative attractiveness of the taxable mutual fund is reduced and the nondeductible IRA becomes relatively more attractive than when the withdrawal tax rate remains constant. Investors that anticipate a lower tax rate during withdrawal will favor a wider range of mutual funds in nondeductible IRAs rather than taxable accounts. With an expected return of approximately 15%, fund investors with horizons of at least ten or fifteen years should choose nondeductible IRAs. For investors that fall into the 15% tax bracket, the nondeductible IRA will always yield a higher after-tax future value.

Regarding conversion of traditional IRAs to Roth IRAs, we find it is optimal for investors to pay the conversion tax with dollars that would not qualify for tax deferment rather than using IRA assets. Investors who are likely to remain in the 28% tax bracket should almost always convert. Also, the value of converting from a traditional IRA to a Roth IRA increases as the investment horizon and rate of return increase. For short time horizons and low expected returns, the marginal value of conversion in 1998 is greater than the marginal value of optimal conversion. For long time horizons or high returns, it is more important to convert optimally than it is to convert sub-optimally in 1998. For investors dropping into the 15% tax bracket, conversion is generally not beneficial unless the conversion is done optimally, the time horizon is long, and the expected return is high. Young investors already in the 15% tax bracket who expect tax rates to rise would almost always find conversion beneficial.

The analysis present here is limited in that it ignores the uncertainty associated with future tax rates, nor does it account for the premature 10% withdrawal penalty. Further investigations can also focus on options that IRA investors receive and give up. By using an IRA account, the investor gives up the option to sell an asset to realize a capital tax loss. Future research can focus on these issues. Nonetheless, this paper serves as a useful guide for individual retirement planning and for making decisions under the new tax laws.

## REFERENCES

Bernheim, B.D., Skinner, J.S., & Wienberg, S. (1997). *What accounts for the variation in retirement wealth among U.S. households?* Unpublished mimeo, Stanford University.

Bodie, Z., & Merton, R.C. (1998). *Finance* (Preliminary ed.). Englewood Cliffs, NJ: Prentice-Hall, Inc.

Crain, T.L., & Austin, J.R. (1997). An analysis of the tradeoff between tax deferred earnings in IRAs and Preferential Capital Gains. *Financial Services Review, 6*(4), 227-242.

Gale, G., & Scholz, J.K. (1994). IRAs and household saving. *American Economic Review, 84*(5), 1233-1260.

Hubbard, G.R., & Skinner, J.S. (1995). The effectiveness of savings incentives. Mimeo, Columbia University, November.

Hubbard, G.R., & Skinner, J.S. (1996). Assessing the effectiveness of saving incentives. *Journal of Economic Perspectives, 10*(4), 73-90.

Kaiser, R.W. (1990). Individual Investors, *Managing Investment Portfolios: A Dynamic Process* (2nd ed.). New York, NY: Warren, Gorham & Lamont, Inc.

O'Neil, C.J., Saftner, D.V., & Dillaway, M.P. (1983). Premature withdrawals from Individual Retirement Accounts: A break-even analysis. *Journal of American Taxation Association 4,* 35-43.

Randolf, W. L. (1994). The impact of mutual fund distributions on after-tax returns. *Financial Services Review, 3*(2), 127-141.

Ragsdale, C.T., Seila, F.S., & Little, P.L. (1993). Optimizing distributions from tax-deferred retirement accounts. *Personal Finanical Planning, 5*(3), 20-28.

Ragsdale, C.T., Seila, F.S., & Little, P.L. (1994). An optimization model for scheduling withdrawals from tax-deferred retirement accounts. *Financial Services Review, 3*(2), 93-108.

Saftner, D., & Fink, P. (1990). Timing withdrawals from retirement accounts can increase tax savings. *Taxation for Accountants, 44*, 172-178.

Sage, J.A. (1988). Selection of qualified retirement plan distribution options reflection TRA '86. *Taxes*, (April), 301-310.

Yaari, U., & Fabozzi, F.J. (1985). Why IRA and Keogh Plans should avoid growth stocks. *Journal of Financial Research, 8*(3), 203-215.