

12-3-2009

Retirement Investing: Analyzing the Roth Conversion Option

Robert M. Dammon

Carnegie Mellon University, rd19@andrew.cmu.edu

Follow this and additional works at: <http://repository.cmu.edu/tepper>

 Part of the [Economic Policy Commons](#), and the [Industrial Organization Commons](#)

This Working Paper is brought to you for free and open access by Research Showcase @ CMU. It has been accepted for inclusion in Tepper School of Business by an authorized administrator of Research Showcase @ CMU. For more information, please contact research-showcase@andrew.cmu.edu.

Retirement Investing: Analyzing the Roth Conversion Option*

**Robert M. Dammon
Tepper School of Business
Carnegie Mellon University**

12/3/2009

* The author thanks Chester Spatt for valuable discussions. The author, however, is solely responsible for the content.

Abstract

Beginning in 2010, all individuals, regardless of income level, will have the opportunity to convert their traditional IRAs into a Roth IRA by paying the ordinary income tax on the market value (at the time of conversion) of the assets being converted. Many individuals are contemplating whether a Roth conversion is in their best interest and need guidance in making this important decision. This paper discusses the costs and benefits of converting to a Roth IRA, derives the conditions under which a Roth conversion is beneficial for an individual, and provides some numerical examples.

I. Tax Effects of a Roth Conversion

The decision to convert a traditional IRA into a Roth IRA ultimately depends upon whether the Roth conversion leads to higher after-tax wealth for the individual at retirement. In this section, we derive the after-tax wealth at retirement for a traditional IRA and for a Roth conversion. Section II evaluates the conditions under which a Roth conversion is beneficial for the individual.

Strategy 1: Retain the Traditional IRA

To begin our analysis, let's first consider a traditional IRA, with current market value of V_0 . Without a Roth conversion, the after-tax value of the traditional IRA at retirement is:¹

$$\begin{aligned} \text{After-Tax Value of Traditional} &= [V_0(1+r)^N](1-T_{p,N}) \\ \text{IRA at Retirement} & \end{aligned} \quad (1)$$

where N is the number of years until retirement, r is the **realized** (geometric) average annual pre-tax rate of return on the assets held in the IRA account, and $T_{p,N}$ is the individual's ordinary tax rate during retirement. Equation (1) captures the fact that the individual earns the pre-tax rate of return, r , on assets held in the IRA account until the account is liquidated in retirement. Distributions from the traditional IRA are then taxed at the individual's ordinary tax rate during retirement, $T_{p,N}$.

Strategy 2: Convert to a Roth IRA

Now suppose the individual converts the traditional IRA to a Roth IRA and pays the ordinary income tax on the market value of the IRA assets. There are two cases to consider: (A) individual liquidates assets held in the IRA account to pay the tax (and any penalty) and (B) individual liquidates assets held outside the IRA account to pay the tax. Each of these cases has a different effect on the after-tax value of the individual's retirement wealth.

Case A: *Finance the tax (and penalty) on the Roth conversion from the IRA assets.*

If the individual is forced to finance the tax (and penalty) on the Roth conversion from the IRA assets, the after-tax retirement wealth is:

¹ Here we assume that the IRA is liquidated in its entirety at the retirement date, even though individuals are allowed to defer withdrawals until age 70½. (Any withdrawals after age 59½ are not subject to the 10% early withdrawal penalty.) However, assuming a constant tax rate during retirement, the present value of the annual tax payments is the same regardless of the timing of the withdrawals. This is because the government has a claim on the fraction $T_{p,N}$ of the value of the IRA account at all times.

$$\begin{aligned} \text{After-Tax Value of Roth Conversion} &= V_0[(1 - T_{p,0} - q)/(1 - q)](1+r)^N & (2A) \\ \text{Financed with IRA Assets} & \end{aligned}$$

where $T_{p,0}$ is the individual's current ordinary tax rate² and q is the penalty for early withdrawal when assets from the IRA are used to pay the tax (and penalty) on the conversion. Under current tax law, the penalty is $q = 10\%$ for individuals younger than 59½ and $q = 0\%$ for investors older than 59½.³

The after-tax retirement wealth under a Roth conversion captures the fact that the tax (and penalty) on the Roth conversion is paid immediately, with no further taxes due on the Roth distributions in the future.⁴ If the individual uses IRA assets to pay the tax and penalty, then the value of the Roth IRA immediately falls to $V_0[(1 - T_{p,0} - q)/(1 - q)]$ after the conversion. The assets left in the Roth IRA then earn a tax-free return of r over the next N years.

Case B: Finance the tax on the Roth conversion from non-IRA assets.

If the individual makes a Roth conversion and uses non-IRA assets to finance the tax payment, then the after-tax value of the investor's wealth at retirement is:⁵

$$\begin{aligned} \text{After-Tax Value of Roth Conversion} &= \\ \text{Financed with Non-IRA Asset} & \end{aligned}$$

$$V_0(1+r)^N - \left[\frac{V_0 T_{p,0}}{1 - gT_g} \right] [1 + r(1 - T_i)]^N \quad (2B)$$

where g is the unrealized capital gain (as a percentage of current market value) on the assets sold to finance the tax payment on the Roth conversion, T_g is the capital gains tax rate, and T_i is the effective tax rate on investment income when assets are held in a taxable account (see Appendix A for a derivation of the effective tax rate).

² The current ordinary tax rate must be the individual's marginal tax rate, including the effect of including V_0 in adjusted gross income on the individual's allowable personal exemptions and itemized deductions, the taxable portion of Social Security payments, and other tax related items. The progressivity of marginal tax rates may make it optimal to spread the Roth conversions across multiple tax years. This issue is not addressed here.

³ If an individual who is younger than 59½ converts to a Roth IRA and then withdraws funds from the Roth IRA within 5 years of the conversion, and before reaching age 59½, the early withdrawal penalty will apply (with some hardship exceptions).

⁴ The tax on Roth conversions made in 2010 can actually be spread over two years. The analysis here makes the simplifying assumption that the tax on a Roth conversion is paid immediately.

⁵ If the individual uses non-IRA assets to finance the tax payment on a Roth conversion, then, regardless of age, there is no penalty for early withdrawal.

If the individual uses non-IRA assets to pay the tax, the value of the Roth IRA remains V_0 after the conversion, which then earns a tax-free return of r over the next N years. This is captured in the first term in Equation (2B). To finance the payment of the tax on the Roth conversion, however, the individual must sell non-IRA assets worth $V_0 T_{p,0}$ after capital gains taxes are paid on the sale. These non-IRA assets would have earned the individual an annual after-tax return of $r(1 - T_i)$ over the next N years when held outside the IRA.⁶ This is captured in the second term of Equation (2B).

II. Evaluating the Roth Conversion Option

To determine whether it is beneficial for an individual to convert an existing traditional IRA into a Roth IRA it is necessary to compare the after-tax value of retirement wealth with a Roth conversion (Equation (2A) or (2B)) to the after-tax value of retirement wealth without a Roth conversion (Equation (1)).

Case A: *Finance the tax (and penalty) on the Roth conversion from the IRA assets.*

For an individual who is forced to use IRA assets to pay the tax (and penalty), a Roth conversion is beneficial only if the after-tax wealth in Equation (2A) is greater than the after-tax wealth in Equation (1). After some algebra, a Roth conversion is beneficial in this case provided the following condition is satisfied:

$$\frac{T_{p,N}}{T_{p,0}} > \frac{1}{1-q} \quad (3A)$$

Equation (3A) says that the ratio of the expected future ordinary tax rate to the current ordinary tax rate must be greater than $1/(1-q)$ in order for a Roth conversion to benefit an individual who is forced to liquidate IRA assets to pay the tax (and penalty) on the conversion. Interestingly, notice that this condition is independent of the individual's planned retirement date, N . For all individuals younger than 59½ (where $q = 10\%$), the ratio of tax rates must be greater than $1/(1-.10) = 1.11$, while for all individuals older than 59½ (where $q = 0\%$), the ratio of tax rates must be greater than 1.0.

However, even if Equation (3A) is satisfied currently, the individual may still be better off delaying the Roth conversion to a future year if $[1/(1-q)]T_{p,0}$ is expected to fall prior to retirement. This implies that a Roth conversion should be delayed

⁶ To keep the individual's portfolio composition unchanged, we assume that the non-IRA assets that are sold to finance the tax payment are the same as those the individual holds in the IRA account. See Dammon, Spatt, and Zhang (2004) for an analysis of the optimal allocation and location of asset classes across taxable and tax-deferred accounts. In general, it is more tax-efficient to hold high-taxed assets (e.g., taxable bonds) in tax-deferred accounts.

to a future year for (1) individuals younger than age 59½ who are currently subject to the $q = 10\%$ penalty for early withdrawal and (2) individuals older than 59½ who expect their ordinary tax rate to decline further prior to retirement. It is also likely that delaying the Roth conversion will be beneficial if it allows the individual to accumulate sufficient non-IRA assets to pay the tax on the conversion. This is the case we consider next.

Case B: Finance the tax on the Roth conversion from non-IRA assets.

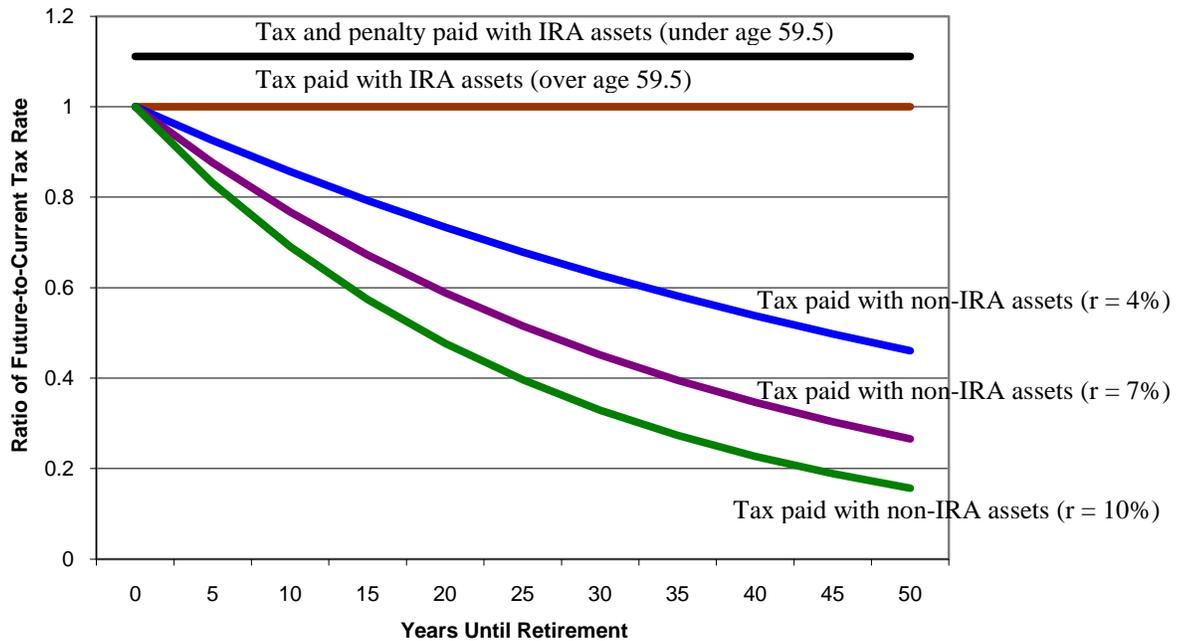
For an individual who can finance the tax payment using non-IRA assets, a Roth conversion is beneficial provided the after-tax wealth in Equation (2B) is greater than the after-tax wealth in Equation (1). After some algebra, the Roth conversion is beneficial in this case provided the following condition is satisfied:

$$\frac{T_{p,N}}{T_{p,0}} > \left[\frac{1}{1 - gT_g} \right] \left[\frac{1 + r(1 - T_i)}{1 + r} \right]^N \quad (3B)$$

Equation (3) says that a Roth conversion, where the tax is financed from non-IRA assets, makes sense only if the ratio of the future ordinary tax rate to the current ordinary tax rate is above some critical level. When the embedded capital gain is $g = 0\%$, the critical ratio of tax rates is less than 1.0. This means that the individual may find it beneficial to convert to a Roth IRA even though the expected future tax rate is less than the current tax rate. The reason a Roth conversion can be beneficial, even when the tax rate during retirement is expected to be below the current tax rate, is because the payment of the tax from non-IRA assets is akin to allowing the individual to scale up his/her tax-deferred savings. The critical ratio of tax rates increases when an individual is forced to liquidate assets with an embedded capital gain to finance the tax payments. According to Equation (3B), the critical cutoff ratio of tax rates is likely to be lower for individuals who are younger (with more time until retirement), hold assets with higher expected returns and effective tax rates, and have the liquidity to fund the tax liability without triggering an embedded capital gain.

Figure 1 below shows the critical cutoff ratio of tax rates for different retirement horizons and different asset returns. When applicable, the penalty for early withdrawal is 10%. When non-IRA assets are used to fund the tax liability, it is assumed that the embedded capital gain is $g = 0\%$ and that $T_i = 40\%$ (i.e., interest income). It is beneficial for the individual to convert to a Roth IRA provided the ratio of the expected future ordinary tax rate to the current ordinary tax rate is above the critical ratios shown in Figure 1.

Figure 1: Critical Tax Ratios for Roth Conversion



III. Examples

Example 1: Young individual (younger than 59½) who is in the 28% tax bracket, has a traditional IRA, but has no non-IRA savings or ability to borrow.

For this individual, a Roth conversion will generate both a tax liability and an early withdrawal penalty that is financed with the assets held in the IRA account. For this individual, the Roth conversion is optimal only if the expected ordinary tax rate in retirement is greater than $T_{p,N} > 28\% \times 1.11 = 31.11\%$ (see Eq. (3A)).

To see this directly, suppose the individual has $V_0 = \$30,000$ in a traditional IRA, is expected to earn a pre-tax return of $r = 7\%$ on assets held in the retirement account, has an expected retirement date in 25 years, and an ordinary tax rate of $T_{p,N} = 31.11\%$ during retirement. If this individual continues to hold the traditional IRA, then, according to Equation (1), the after-tax value of the traditional IRA at retirement is:

$$\text{After-Tax Value of Traditional IRA at Retirement} = [\$30,000(1.07)^{25}](1-.3111) = \$112,168$$

If the individual converts to a Roth IRA and pays the tax and penalty from the assets held in the IRA account, then, according to Equation (2A), the after-tax value of the Roth IRA at retirement is:

$$\begin{aligned} \text{After-Tax Value of Roth Conversion} &= \$30,000[(1-.28-.10)/(1-.10)](1.07)^{25} \\ \text{Financed with IRA Assets} &= \$112,168 \end{aligned}$$

Consequently, with an expected ordinary tax rate of 31.11% in retirement, the individual is indifferent to a Roth conversion. Only if the individual's expected ordinary tax rate in retirement is above 31.11% will a Roth conversion be beneficial. Moreover, these conclusions do not depend upon the assumed pre-tax return, r , or the planned retirement date, N .

Example 2: High-taxed individual ($T_{p,0} = 40\%$) who can pay the tax on a Roth conversion using non-IRA assets with no embedded capital gain, $g = 0\%$. The individual holds high-yield corporate bonds ($T_i = 40\%$) in a traditional IRA with an expected pre-tax yield of 7%. The individual has a planned retirement date in 20 years.

According to Equation (3B), it is beneficial to convert to a Roth IRA provided the individual's expected ordinary tax rate in retirement is greater than 23.536% (i.e., $.5884 \times 40\% = 23.536\%$).

To see this directly, suppose the individual has \$50,000 in a traditional IRA and expects to have a 23.536% ordinary tax rate in retirement. If the individual does not make a Roth conversion, then, according to Equation (1), the after-tax value of the traditional IRA at retirement is:

$$\begin{aligned} \text{After-Tax Value of Traditional} &= [\$50,000(1.07)^{20}](1-.23536) = \$147,945 \\ \text{IRA at Retirement} & \end{aligned}$$

If the individual converts to a Roth IRA and pays the tax from non-IRA assets, then, according to Equation (2B), the after-tax value of the Roth IRA at retirement is:

$$\begin{aligned} \text{After-Tax Value of Roth Conversion} &= \$50,000\{(1.07)^{20} - (.40)[1+.07(1-.40)]^{20}\} \\ \text{Financed with Non-IRA Assets} &= \$147,945 \end{aligned}$$

Consequently, with an expected ordinary tax rate of 23.536% in retirement, the individual is indifferent to a Roth conversion. Only if the individual's expected ordinary tax rate in retirement is above 23.536% will a Roth conversion be beneficial.

Example 3: High-taxed individual ($T_{p,0} = 40\%$) who can pay the tax on a Roth conversion by liquidating non-IRA assets with an embedded capital gain of $g = 15\%$. The capital gains tax rate is $T_g = 20\%$. The individual holds high-growth stocks in a traditional IRA with an expected pre-tax return of $r = 10\%$ and an effective tax rate on investment income of $T_i = 16.2\%$. The individual has a planned retirement date in 20 years.

Once again, Equation (3B) tells us that this individual should convert to a Roth IRA as long as the expected ordinary tax rate in retirement is greater than 30.649% (i.e., $.7662 \times 40\% = 30.649\%$).

To see this directly, suppose the individual has \$50,000 in a traditional IRA and expects to have a 30.649% ordinary tax rate in retirement. If the individual does not make a Roth conversion, then, according to Equation (1), the after-tax value of the traditional IRA at retirement is:

$$\begin{aligned} \text{After-Tax Value of Traditional} &= [\$50,000(1.10)^{20}](1-.30649) = \$233,279 \\ \text{IRA at Retirement} & \end{aligned}$$

If the individual converts to a Roth IRA and pays the tax from non-IRA assets, then, according to Equation (2B), the after-tax value of the Roth IRA at retirement is:

$$\begin{aligned} \text{After-Tax Value of Roth Conversion} & \\ \text{Financed with Non-IRA Assets} & \\ &= \$50,000\{(1.10)^{20} - [.40/(1-(.15)(.20))][1+.10(1-.162)]^{20}\} \\ &= \$233,279 \end{aligned}$$

Consequently, with an expected ordinary tax rate of 30.649% in retirement, the individual is indifferent to a Roth conversion. Only if the individual's expected ordinary tax rate in retirement is above 30.649% will a Roth conversion be beneficial.

IV. Additional Benefits of a Roth Conversion

A Roth conversion has some additional important benefits that are worth discussion. They are: (1) the recharacterization option, (2) estate tax reduction, and (3) no required minimum distributions.

Recharacterization Option⁷

One important benefit of a Roth conversion is the ability to reverse the transaction without penalty any time before October 15th of the year following the conversion. This is called a *recharacterization*. A recharacterization can be particularly valuable when asset values decline following the original conversion. Recall that the tax on the Roth conversion depends upon the value of the assets held in the IRA account at the time of the conversion. If asset values subsequently decline, the individual may wish to reverse the transaction and execute (after a mandatory waiting period) a new Roth conversion using the lower asset values to compute the tax liability.⁸

Reduction in Estate Taxes

Estate taxes are computed on the pre-tax value of the individual's estate, including the pre-tax value of any IRAs. If the IRA is a traditional pre-tax IRA, the beneficiary will also be required to pay income taxes on the IRA assets as they are withdrawn from the IRA account. A Roth conversion can potentially reduce the value of an individual's estate, thereby reducing the estate tax liability, by selling assets to pay the income tax on the conversion. However, the benefit that comes from reducing the estate tax is offset, at least in part, by a potential increase in income taxes.

There is an important, but often overlooked, deduction in the tax code that allows a beneficiary to reduce the impact of estate taxes on traditional pre-tax IRA accounts. This deduction is called an ***income in respect to a decedent (IRD)*** deduction and it allows the beneficiary to deduct the estate taxes paid on IRA assets against future taxable withdrawals from the IRA account.⁹ The purpose of the IRD deduction is to reduce the burden of double taxation (income and estate taxes) on IRA assets, but it can also reduce the value of a Roth conversion.

The following two examples illustrate how the IRD deduction works, how estate and income taxes interact, and how a Roth conversion affects the total tax liability. In Example 4, the individual has non-IRA assets that exceed the estate tax exclusion. In Example 5, the individual has non-IRA assets that are worth less than the estate tax exclusion, but total estate assets (non-IRA plus IRA) that exceed the estate tax exclusion. From these two examples it is clear that a Roth conversion allows an individual to reduce the impact of estate taxes only when the value of non-IRA assets is less than the estate tax exclusion, but the total value of the estate (non-IRA plus IRA) exceeds the estate tax exclusion.

⁷ A detailed analysis of the recharacterization option can be found in Dammon, Spatt, and Zhang (2009).

⁸ An individual who reverses a Roth conversion may not reconvert until the later of (1) January 1st of the year following the original conversion, or (2) 30 days after the recharacterization.

⁹ IRD deductions are not subject to the 2% of AGI limitation.

Example 4: Non-IRA assets exceed the estate tax exclusion.

Suppose an individual has a \$5 million estate: \$4 million of non-IRA assets and \$1 million of traditional pre-tax IRA assets. If the estate tax exclusion is \$3.5 million, the beneficiary must pay estate taxes on \$1.5 million.¹⁰ With an estate tax rate of 45%, the total estate tax liability is \$675,000 (45% x \$1.5 million). Without the IRA assets, the estate tax liability would have been \$225,000 (45% x \$500,000). Therefore, the IRS treats the remaining \$450,000 of estate taxes as having been generated by the \$1 million of IRA assets and allows the beneficiary a \$0.45 IRD deduction on each \$1 withdrawn from the IRA account (up to a total deduction of \$450,000).

Assuming that the beneficiary has an ordinary income tax rate of 30%, the total tax liability (estate and income) on the inherited estate is:¹¹

$$\begin{aligned}\text{Total tax liability} &= \text{Estate Taxes} + \text{Income Taxes} \\ &= [0.45 \times (\$5.0 - \$3.5)] + [0.30 \times (\$1.0 - \$0.45)] \\ &= \$675,000 + \$165,000 = \$840,000\end{aligned}$$

Now suppose the individual converts his/her IRA assets to a Roth IRA immediately before death. Assuming that the individual has the same ordinary tax rate as his/her beneficiary (i.e., 30%), the Roth conversion generates an immediate income tax liability of \$300,000 (30% x \$1.0 million). Assuming the individual liquidates non-IRA assets (with no embedded capital gain) to pay the income tax, the individual's remaining estate will be composed of \$3.7 million of non-IRA assets and \$1.0 million in a Roth IRA. The total tax liability (estate and income) paid by the individual and his/her beneficiary in this case is:

$$\begin{aligned}\text{Total tax liability} &= \text{Estate Taxes} + \text{Income Taxes} \\ &= [0.45 \times (\$4.7 - \$3.5)] + [0.30 \times \$1.0] \\ &= \$540,000 + \$300,000 = \$840,000\end{aligned}$$

¹⁰ As of the time of this writing, the estate tax exclusion is \$3.5 million for 2009 (with a maximum estate tax rate of 45% on the amount in excess of the exclusion), becomes unlimited in 2010 (i.e., no estate taxes), and reverts back to \$1 million in 2011 and after (with a maximum estate tax rate of 55% on the amount in excess of the exclusion). Current proposals in the U.S. Congress would extend the 2009 estate tax exclusion and tax rate to 2010 and beyond; however, these proposals have not yet been voted on.

¹¹ The income tax liability and IRD deduction are realized at the time the beneficiary withdraws assets from the IRA account, or makes a Roth conversion. Here we assume that the beneficiary makes an immediate Roth conversion upon taking ownership of the estate. This is likely to be optimal since deferring the Roth conversion reduces the present value of the IRD deductions, which are fixed in dollar terms, but has no effect on the present value of the government's tax claim (absent the IRD deduction) to the IRA assets.

Despite having reduced the estate tax, the total tax liability (estate and income) paid by the individual and his/her beneficiary is the same with and without a Roth conversion.

Example 4 is based upon the assumptions that (1) the individual and his/her beneficiary have identical ordinary income tax rates and (2) the non-IRA assets that are used to finance the income tax on a pre-death Roth conversion have no embedded capital gain. More generally, when an individual's estate includes non-IRA assets that are worth more than the estate tax exclusion, a Roth conversion immediately prior to death reduces total taxes (estate and income) provided the following condition is satisfied:

$$\frac{T_b}{T_p} > \left[\frac{1}{1 - gT_g} \right] \quad (4)$$

where T_p is the individual's ordinary income tax rate, T_b is the beneficiary's ordinary income tax rate, T_g is the capital gains tax rate, and g is the embedded capital gain (as a percentage of current market value). Note that this condition is independent of the estate tax rate.

Example 5: Non-IRA assets worth less than the estate tax exclusion, total estate (non-IRA plus IRA) worth more than estate tax exclusion.

Now consider the same set of facts as in Example 4, except that the individual's \$5 million estate is composed of \$2.5 million in non-IRA assets and \$2.5 million in a traditional pre-tax IRA. At the time of the individual's death, the estate tax liability is again equal to \$675,000. Absent the IRA assets, the individual's estate tax liability would have been \$0, since the non-IRA assets (\$2.5 million) are worth less than the \$3.5 million estate tax exclusion. Consequently, the IRS would consider the full \$675,000 as attributable to the IRA assets and would allow the beneficiary a \$0.27 IRD deduction on each \$1 withdrawn from the IRA account (up to a maximum deduction of \$675,000).¹²

The total tax liability (estate and income) paid by the beneficiary is:

$$\begin{aligned} \text{Total tax liability} &= \text{Estate Taxes} + \text{Income Taxes} \\ &= [0.45 \times (\$5.0 - \$3.5)] + [0.30 \times (\$2.5 - \$0.675)] \\ &= \$675,000 + \$547,500 = \$1,222,500 \end{aligned}$$

If the individual converts his/her IRA assets to a Roth IRA immediately before death, then the income tax liability is \$750,000 (30% x \$2.5 million). Assuming

¹² The \$0.27 IRD deduction for each \$1 withdrawn from the IRA account is determined by dividing the total estate tax attributable to the IRA (\$675,000) by the total dollar value of the IRA (\$2.5 million).

the individual liquidates non-IRA assets (with no embedded capital gain) to pay the tax, the individual's remaining estate will be composed of \$1.75 million of non-IRA assets and \$2.5 million in a Roth IRA. The total tax liability (estate and income) paid by the individual and his/her beneficiary in this case is:

$$\begin{aligned} \text{Total tax liability} &= \text{Estate Taxes} + \text{Income Taxes} \\ &= [0.45 \times (\$4.25 - \$3.5)] + [0.30 \times \$2.5] \\ &= \$337,500 + \$750,000 = \$1,087,500 \end{aligned}$$

In this case, the total tax liability (estate and income) is reduced by making a Roth conversion before death, even when the ordinary income tax rate is the same for the individual and his/her beneficiary. In contrast to Example 4, the individual's non-IRA assets are worth less than the estate tax exclusion. This reduces the amount of the IRD deduction per dollar of IRA assets and makes a pre-death Roth conversion more attractive.

More generally, when the value of non-IRA assets is less than the estate tax exclusion, but the total estate is worth more than the estate tax exclusion, the condition under which a Roth conversion immediately prior to death will reduce the total tax payments (estate and income) for the individual and his/her beneficiary is:

$$T_b \left[1 - \frac{(V - X)T_e}{V_R} \right] + \left[\frac{(V - X)T_e}{V_R} \right] > \left[\frac{T_p}{1 - gT_g} \right] \quad (5)$$

where T_p and T_b are the ordinary income tax rates for the individual and his/her beneficiary, respectively, T_e is the estate tax rate, T_g is the capital gains tax rate, V is the total value of the estate (non-IRA plus IRA assets), and V_R is the value of the IRA assets. The right-hand side of Equation (5) is the total tax paid per dollar converted to a Roth IRA prior to death, where the ordinary income tax payment is financed by selling non-IRA assets with an embedded capital gain of g . The left-hand side is the total tax paid (estate and income) by the beneficiary if the Roth conversion is delayed until after death. The first term captures the ordinary income tax on the Roth conversion (net of the IRD deduction) and the second term captures the estate tax payment per dollar of IRA assets.

No Required Minimum Distributions

Traditional IRA accounts are required to make annual minimum distributions (based upon remaining life expectancy) starting at age 70½. These required minimum distributions inherently limit the benefits of tax-deferred investing for traditional IRAs. In contrast, there are no required minimum distributions from Roth IRAs. This means that a Roth IRA allows the individual to earn pre-tax returns on assets for a longer period of time. This benefit extends to the

individual's beneficiaries as well, who must withdraw funds from the Roth IRA based upon their own life expectancy.

The fact that Roth IRAs do not have a required minimum distribution means that a conversion from a traditional IRA to a Roth IRA is likely to be beneficial for most individuals once they have reached retirement age (if not before), when their tax rates are the lowest. To avoid the required minimum distributions the Roth conversion must take place before reaching age 70½. Of course, if the individual plans to donate their IRAs to a tax-exempt institution, then delaying the conversion, even in retirement, may still be the best course of action.

V. Concluding Remarks

The benefits of a Roth conversion depend upon a variety of factors. This paper attempts to identify the most important factors that influence the tradeoff between the immediate tax cost and future tax benefits of a Roth conversion. A Roth conversion is shown to be beneficial as long as the ratio of the expected future ordinary tax rate to the current ordinary tax rate is above some critical cutoff level.

When the individual is liquidity constrained and is forced to use IRA assets to pay the tax (and penalty) on the Roth conversion, the critical ratio of tax rates is equal to 1.0 for individuals older than 59½ and equal to $1/(1-q)$ for individuals younger than 59½, where q is the penalty for early withdrawal. Interestingly, in this case the critical ratio of tax rates does not depend upon the asset returns or the individual's planned retirement date.

When the individual can finance the payment of the tax on the Roth conversion with non-IRA assets, the critical ratio of tax rates depends upon a number of factors, including: (1) the expected pre-tax rate of return, (2) the magnitude of the embedded capital gain on assets that are sold to finance the tax payments, (3) the capital gains tax rate, (4) the effective tax rate on investment income (dividend, interest, and capital gains), and (5) the individual's planned retirement date. In this case, a Roth conversion can be beneficial even if the ordinary tax rate in retirement is expected to be less than the current ordinary tax rate. The reason is that the payment of the tax on the Roth conversion using non-IRA assets is equivalent to allowing the individual to scale up his/her IRA savings, which has the advantage of earning pre-tax returns.

A Roth conversion also has the potential to reduce the impact of estate taxes for some individuals. However, the benefit of a Roth conversion for estate tax purposes is offset, at least in part, by an increase in ordinary income taxes. The ability to deduct the estate tax payments on IRA assets (IRD deduction) reduces the benefit of a Roth conversion. For individuals with non-IRA assets that are worth more than the estate tax deduction, estate taxes have no effect on the

benefits and costs of a Roth conversion. For individuals with estates that include non-IRA assets that are worth less than the estate tax exclusion, but total estates (non-IRA plus IRA) that exceed the estate tax exclusion, a Roth conversion has the potential to reduce total taxes (estate and income) and may be beneficial.

The results of our analysis suggest that a Roth conversion is more likely to be beneficial for:

- Individuals who can finance the payment of the tax on the Roth conversion using non-IRA assets with no (or small) embedded capital gains.
- Individuals who have more time until retirement and can avoid the tax for early withdrawal by using non-IRA assets to fund the tax payment.
- Individuals who do not anticipate a significant decline in their ordinary income tax rate prior to retirement. (If the ordinary tax rate is expected to decline in the future, it may be better to delay the Roth conversion to a future year.)
- Individuals who do not anticipate a significant reduction in their ordinary tax rate after retirement.
- Individuals who do not need to draw on their retirement savings and wish to stretch out the benefits of tax-free investing for as long as possible.
- Individuals concerned about reducing estate taxes and have non-IRA assets that are less than the estate tax exclusion, but total assets (non-IRA plus IRA) that exceed the estate tax exclusion.

While we have attempted to provide useful guidance regarding the costs and benefits of Roth conversions, the tax code is highly complex. Moreover, each individual's tax situation is uniquely different. The decision to make a Roth conversion depends upon a variety of individual-specific factors. The decision is also inherently dynamic in nature and requires an analysis of the optimal timing of the conversion. Therefore, it is important to consult a tax expert before making the decision on a Roth conversion.

References

Dammon, R., C. Spatt and H. Zhang, "Optimal Asset Location and Allocation with Taxable and Tax-Deferred Investing," *Journal of Finance* 59 (June 2004) 999-1037, <http://wpweb2.tepper.cmu.edu/spatt/location.pdf>

Dammon, R., C. Spatt and H. Zhang, "Asset Location and Roth and Traditional Tax-Deferred Investing," November 2009, working paper.

Dammon, R., J. Poterba, C. Spatt, and H. Zhang, "Maximizing Long-Term Wealth Accumulation: Its Not Just About "What" Investments To Make, But Also "Where" To Make Them," Research Dialogue of TIAA-CREF Institute, September 2005, 1-12, http://www.tiaa-crefinstitute.org/pdf/research/research_dialogue/85.pdf

Appendix A: Derivation of the Effective Tax Rate on Investment Income

The effective tax rate on investment income, T_i , is a weighted average of the tax rates on interest income, dividend income, and capital gain income, where the weights depend upon the proportion of asset returns that come from each source. Since the expected return on taxable bonds is composed entirely of interest income, the effective tax rate on taxable bonds is the ordinary tax rate.

For equities, the effective tax rate is affected by the proportion of dividends and *realized* capital gains. In particular, the effective tax rate on equity returns is equal to the following:

$$T_i = \frac{dT_d + g(\alpha T_g)}{r} \quad (A1)$$

where d is the dividend yield, T_d is the tax rate on dividends, g is the expected capital gain return, T_g is the tax rate on dividend income, $r = d+g$ is the total pre-tax return, and α is a present value adjustment to take into account the fact that capital gains taxes can be deferred.

The present value adjustment, α , depends upon the individual's average holding period, h . The value of α satisfies the following condition:

$$(1+g)^h - T_g \left[(1+g)^h - 1 \right] = \left[+g(1-\alpha T_g) \right]^h \quad (A2)$$

The left-hand side of Equation (A2) is the after-tax value of the individual's equity holding after h periods. Notice that the left-hand side takes into account that capital gains taxes are paid only at the end of h periods. The right-hand side of Equation (A2) is the value of the individual's equity holding after h periods assuming that capital gains taxes are paid annually at the effective tax rate of αT_g . The value of αT_g that satisfies Equation (A2) is the effective capital gains tax rate that is needed in Equation (A1).

Solving the Equation (A2) for αT_g yields:

$$\alpha T_g = \frac{(1+g) - [(1+g)^h (1-T_g) + T_g]^{1/h}}{g} \quad (A3)$$

To illustrate, suppose an asset pays a 2% dividend yield and an average capital gain of 8% for a total pre-tax return of $r = 10\%$. Assume that the tax rate on both dividends and capital gains is 20%. The average holding period for the individual is $h = 10$ years. In this case, Equation (A3) gives the effective capital gains tax rate as:

$$\alpha T_g = \frac{(1.08) - [(1.08)^{10}(1 - .20) + .20]^{\frac{1}{10}}}{.08} = 15.246\% \quad (\text{A4})$$

The effective tax rate on total equity returns, T_i , can now be determined using Equation (A1):

$$T_i = \frac{.02(.2) + .08(.15246)}{.10} = 16.2\% \quad (\text{A5})$$