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# ASSET ALLOCATION IN TAXABLE PORTFOLIOS

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*Windham Investment Review*

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June, 2008

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Taxes can consume a substantial portion of returns in an individual's portfolio. Considering assets on an after-tax basis is important for two reasons. First, it allows us to find an individual's optimal portfolio which may vary significantly from person to person. Second, it allows us to estimate the future value of a portfolio.

In this paper, we will outline the steps to convert pre-tax return and risk into after-tax values. Next, we will identify optimal portfolios on a pre- and after-tax basis. Finally, we will simulate future wealth on a pre- and after-tax basis.

## 01

### Calculating after-tax return and risk

For US based investors, not all investments are created equal when it comes to taxes. Realized gains and income are classified and taxed at different rates. After-tax expected return and risk should be used when making asset allocation decisions.

The effective tax rate is the average annual percentage of total return that will be paid in taxes. Total returns include both income and capital appreciation. In a taxable account, income can be taxed at a qualified dividend rate or an individual's marginal tax rate. Capital appreciation can be taxed at short-term capital gains rates or long-term capital gains rates depending on the holding period and turnover rate.

In a tax-deferred 401k or traditional IRA account, all distributions are taxed as income during retirement. Both the principal and the gains are taxed. When making asset allocation decisions, investors should consider assets in all investment accounts. We will show in a later example how to discount the value of the 401k in order to consider it simultaneously with taxable accounts.

For this example we will use the tax assumptions summarized in Table 1 to calculate the effective tax rates in a taxable account.

Table 1: Tax assumptions

| Tax Assumptions                       |          |
|---------------------------------------|----------|
| Qualified dividends tax rate          | 15%      |
| Marginal tax rate                     | 35%      |
| Long-term capital gains tax rate      | 15%      |
| Short-term capital gains tax rate     | 35%      |
| Average holding period of asset class | 10 years |

We will use five asset classes and assume an average holding period of 10 years. The asset classes and their characteristics are shown in Table 2. We have assumed commodities are taxed annually at a blended rate of 60% long-term capital gains and 40% short-term capital gains. We have also assumed the annual turnover of passive strategies to be negligible.

Table 2: Investment Assumptions

| Asset                     | Annual turnover | Pre-tax expected total return | Dividends & realized long-term capital gains | Unqualified dividends & short-term capital gains |
|---------------------------|-----------------|-------------------------------|--|--|
| Passive US Stock Index    | 0%              | 9.6%                          | 2.0%   | 0.0%   |
| Active Foreign Stock Fund | 100%            | 10.3%                         | 5.3%   | 5.5%   |
| Commodities               | 100%            | 6.7%                          | 4.0%   | 2.7%   |
| Passive REIT Index        | 0%              | 7.5%                          | 3.0%   | 2.0%   |
| Passive US Bond Index     | 0%              | 5.1%                          | 0.0%   | 5.1%   |

Using the assumptions in Table 1 and Table 2, we can calculate an effective tax rate. These values are summarized in Table 3.

Table 3: Effective tax rates

| Asset                     | Taxable Account | Tax-deferred |
|---------------------------|-----------------|--------------|
| Passive US Stock Index    | 12%             | 0%           |
| Active Foreign Stock Fund | 25%             | 0%           |
| Commodities               | 23%             | 0%           |
| Passive REIT Index        | 19%             | 0%           |
| Passive US Bond Index     | 35%             | 0%           |

With the effective tax rate, we can estimate after-tax return and risk for each investment in the taxable account. These values are shown in Table 4.

Table 4: After-tax return and risk

| Asset                     | After-tax return | After-tax risk |
|---------------------------|------------------|----------------|
| Passive US Stock Index    | 8.5%             | 13.5%          |
| Active Foreign Stock Fund | 7.7%             | 12.2%          |
| Commodities               | 5.2%             | 10.8%          |
| Passive REIT Index        | 6.0%             | 12.9%          |
| Passive US Bond Index     | 3.3%             | 2.6%           |

With these tax adjusted capital market forecasts we can now perform an optimization or calculate the after-tax returns of a given portfolio.

## 02 Asset Allocation

Let's assume we have the same asset classes and tax characteristics as used above. Let's also assume we have \$400,000 in a taxable account and \$500,000 in a 401k account, and we plan to retire in 10 years. Our objective is to maximize our after-tax wealth for a given level of risk.

As mentioned before, we must make adjustments to the value of the 401k account to consider it simultaneously with the taxable portion of our portfolio. In a 401k, the principal and the gains are taxed at the time of distribution. We can calculate the after-tax present value of the 401k account by deducting the present value of the tax paid in retirement. The net worth of the 401k becomes  $(1 - \text{effective tax rate in retirement}) \times (\text{401k account balance})$ . We will assume a 20% effective tax rate during retirement. The value of the 401k on an after-tax basis is now \$400,000. Our after-tax wealth is \$800,000.

We will first find an optimal portfolio on a pre-tax basis. Then we will allocate equally in both accounts. See Table 5 for the resulting optimal portfolio.

Table 5: Pre-tax optimal portfolio

| Asset  | Taxable | 401K  | Total |
|--|---------|-------|-------|
| Passive US Stock Index                                 | 17.4%   | 17.4% | 17.4% |
| Active Foreign Stock Fund                              | 24.6%   | 24.6% | 24.6% |
| Commodities  | 10.6%   | 10.6% | 10.6% |
| Passive REIT Index                                     | 7.2%    | 7.2%  | 7.2%  |
| Passive US Bond Index                                  | 40.2%   | 40.2% | 40.2% |
| Pre-tax expected return (\$900,000 pre-tax wealth)     |         |       | 7.5%  |
| After-tax expected return (\$800,000 after-tax wealth) |         |       | 6.6%  |
| After-tax expected risk                                |         |       | 6.5%  |

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We will first find an optimal portfolio on a pre-tax basis. Then we will allocate equally in both accounts. See Table 5 for the resulting optimal portfolio.

Table 6: After-tax optimal portfolio

| Asset  | Taxable | 401K  | Total |
|--|---------|-------|-------|
| Passive US Stock Index                                 | 55.4%   | 0.0%  | 27.7% |
| Active Foreign Stock Fund                              | 0.0%    | 26.2% | 13.1% |
| Commodities  | 28.5%   | 0.0%  | 14.2% |
| Passive REIT Index                                     | 16.1%   | 0.0%  | 8.0%  |
| Passive US Bond Index                                  | 0.0%    | 73.8% | 36.9% |
| Pre-tax expected return (\$900,000 pre-tax wealth)     |         |       | 7.4%  |
| After-tax expected return (\$800,000 after-tax wealth) |         |       | 6.8%  |
| After-tax expected risk                                |         |       | 6.5%  |

The expected return for the after-tax optimal portfolio is 0.2% higher than the pre-tax optimal. This excess return is gained primarily from a reduction in taxes.

Since we typically can't access our 401k until we turn 59½, we may be tempted to create a portfolio that has an aggressive allocation in the 401k account and a conservative allocation in the taxable account. Table 7 shows a portfolio that was optimized on a pre-tax basis to be conservative in the taxable account and aggressive in the 401k account.

Table 7: Pre-tax optimal with aggressive 401K

| Asset  | Taxable | 401K | Total |
|--|---------|------|-------|
| Passive US Stock Index                                 | 8%      | 27%  | 17.5% |
| Active Foreign Stock Fund                              | 11%     | 38%  | 24.5% |
| Commodities  | 8%      | 13%  | 10.5% |
| Passive REIT Index                                     | 4%      | 10%  | 7.0%  |
| Passive US Bond Index                                  | 70%     | 10%  | 40.0% |
| Pre-tax expected return (\$900,000 pre-tax wealth)     |         |      | 7.5%  |
| After-tax expected return (\$800,000 after-tax wealth) |         |      | 6.5%  |
| After-tax expected risk                                |         |      | 6.5%  |

If both accounts are to be used for retirement, this strategy will further reduce return for a comparable level of risk.

## 03 Wealth Planning

We adjust returns for taxes to generate more accurate estimates of future expected wealth. Using the portfolio from Table 6, we perform a Monte-Carlo simulation of wealth 10 years from today. If we ignore taxes and perform a simulation, we find that we are 70% certain that the portfolio will be worth at least \$1,199,000 adjusted for inflation. This value overstates wealth because it is pre-tax and ignores any tax payments that may occur during the 10 year period.

Using the after-tax present value of the \$800,000 and the after-tax expected return and risk we are 70% certain the portfolio will be worth at least \$1,017,000 after taxes and adjusted for inflation. In this example, ignoring taxes overestimates future wealth by 18%.



## 04 Conclusion

We have shown that taxes impact expected return, expected risk, and the optimal asset allocation for a taxable investor. We have also shown that, by ignoring taxes, we may be misled to overestimate the investor's future wealth. Further, we should consider all investment accounts simultaneously and resist the temptation of taking excessive risk in our 401k accounts.