Calculating Asset Allocation

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This article challenges two features of the traditional approach to calculating an individual or family's asset allocation. The traditional approach includes only financial assets in the portfolio and weighs them according to their market value. For example, suppose Mary and John Stone are saving for retirement and have a $300,000 stock fund held in a deductible pension, a $200,000 bank savings account held in a taxable account, and Mary is entitled to a company pension. The traditional approach ignores the company pension, and it says the Stones' portfolio contains 60% stocks and 40% cash. The traditional approach makes no adjustment for the fact that the deductible pension contains before-tax dollars and the savings account contains after-tax dollars. We recommend calculating the asset allocation based on after-tax values, *because goods and services are purchased with after-tax dollars*. Separately, we also show that the decision of what to include in the family portfolio — the company pension in this example — can dramatically affect the measured asset allocation.

The next section presents the logic of converting market values to after-tax values. Then, for assets in each savings vehicle, we discuss how to convert market values to after-tax values. Next, we present a family's hypothetical portfolio and ask how we should measure its asset allocation. We show that the measurement of the family's asset allocation can vary dramatically depending upon what we include in the portfolio and whether we use market values or after-tax values. The next section explains how this article fits with the other articles in this series, followed by a conclusion.

PRE-TAX AND AFTER-TAX DOLLARS

For simplicity, suppose Sal Acosta has $300,000 in a stock fund held in a deductible pension and $200,000 in bonds held in a taxable account. The cost base and market value of the bonds are $200,000. The funds are to be used to meet his retirement needs. What is his asset allocation? Based on market values, it is 60% stocks and 40% bonds. The use of market values ignores the fact that the deductible pension contains before-tax dollars and the taxable account contains after-tax dollars.

Sal must pay for goods and services with after-tax dollars. Each dollar in the deductible pension will buy fewer goods than a dollar in the taxable account. Since the financial assets are to be used to meet his retirement needs, before we calculate the asset allocation we should first convert the market value of pension assets to after-tax values. This is done by multiplying deductible pension assets by the factor $(1 - t_n)$, where t_n is the expected tax rate in retirement.

Suppose the expected annual return on stocks is k% and the funds will be withdrawn in retirement in n years. The expected pre-tax

EXHIBIT 1

The Stones' Assets in Market and After-Tax Values

Asset	Market Values	After-Tax Values	Savings Vehicle
Financial Assets			
Bonds	$132,000	$129,300	Taxable Account
Bond fund	$68,000	$61,700	Non-qualified Annuity
Stocks	$200,000	$130,000	Deductible Pension
Total	**$400,000**	**$321,000**	
Other Assets			
Bond	$319,600	$207,700	Company Pension

	Asset Allocation	Asset Allocation
Bonds (without comp pension)	50.0%	59.5%
Stocks (without comp pension)	50.0%	40.5%
Bonds (with company pension)	72.2%	75.4%
Stocks (with company pension)	27.8%	24.6%

value of the pension in retirement is $\$300{,}000\ (1 + k)^n$. If the expected tax rate in retirement is 35% then the expected tax liability at time n is $\$300{,}000\ (0.35)\ (1 + k)^n$. To find the present value of this tax liability, we must determine the appropriate discount rate. This tax liability increases and decreases with the market value of the pension asset. So, its risk is precisely equal to the risk of the pension asset. Discounting this expected tax liability at k% for n years reduces its present value to $\$300{,}000\ (0.35)$.[1] We can thus convert before-tax funds in a deductible pension to after-tax funds by multiplying by $(1 - t_n)$.

Similarly, for each $1 of bonds held in the deductible pension, the expected value of the retirement tax liability is $\$0.35\ (1 + y)^n$, where y is the expected annual return on the bonds. Discounting at y% for n years reduces the present value of the expected tax liability to $0.35.[2]

If Sal is retired today and withdraws the $300,000 from the deductible pension, he will owe $105,000 in taxes. In personal correspondence, one thoughtful scholar argued that, if Sal expects to withdraw the funds in say 10 years, the $105,000 liability should be treated as a fixed dollar (that is, interest–free) liability due in ten years. I disagree. The pension liability is not a fixed-dollar obligation. Rather, it is a fixed proportion of the value of the pension asset. The market value of the pension is the individual's asset, its tax liability is his or her liability, and the values of the pension asset and pension liability are *perfectly correlated*. If the value of pension assets triples through time, the liability also triples. Therefore, we can net out the individual's pension asset and pension liability; we can convert before-tax deductible pension values to after-tax values by multiplying by $(1-t_n)$.

If the expected tax rate in retirement is 35%, Sal's after-tax asset allocation is $195,000 stocks and $200,000 bonds, or 49% stocks and 51% bonds. The traditional approach to calculating the asset allocation compares pre-tax funds to after-tax funds; it compares apples to oranges. Before calculating the asset allocation, one must first convert pre-tax funds to after-tax funds. This provides an apples-to-apples comparison. Generalizing, *if the assets are intended for retirement needs, the asset allocation should not be calculated until all asset values have been converted to after-tax funds.*[3]

The next section explains how the market values of financial assets held in the other savings vehicles — non-qualified tax-deferred annuity, non-deductible IRA, Roth IRA, and taxable account — can be converted to after-tax values.

CONVERTING THE STONES' FINANCIAL ASSETS TO AFTER-TAX FUNDS

Exhibit 1 presents the financial assets of John and Mary Stone. They hold $132,000 of bonds held in a taxable account. It has a cost base of $122,000 and $10,000 of long-term unrealized capital gains. They have $68,000 in a bond subaccount held in a non-qualified annuity. They invested $50,000 of after-tax funds in the annuity five years earlier and its current market value is $68,000. They have $200,000 in a stock fund held in a deductible pension.

To repeat, the Stones must buy goods and pay for services with after-tax dollars. Calculating the asset allocation based on market values implicitly assumes that their expected tax rate in retirement will be zero. They may not be certain what their retirement tax rate will be, but an implicit expectation of zero is seldom an optimal estimate. The Stones (and their financial advisor) can provide a better estimate of retirement tax rates than the traditional approach's implicit estimate of zero.

Exhibit 1 presents one method of converting market values to after-tax values. It assumes the Stones will be in a 35% tax bracket during retirement and their com-

bined federal-plus-state capital gains tax rate will be 27%. The $200,000 of deductible pension assets in the stock fund converts to $130,000 of after-tax assets, [$200,000 (1 - 0.35)].

It is clear how the deductible pension funds should be converted to after-tax funds. Unfortunately, there is not a single, undisputed "right" way to make some of the other conversions. The $132,000 of bonds in the taxable account has a cost base of $122,000 and $10,000 of unrealized gains. If the funds will be used to finance retirement income needs, the Stones will eventually recognize the long-term gains. We assume the gains are realized this year and capital gain taxes of $2,700 are paid. This assumption provides an after-tax value of $129,300.

Other tax treatments are possible. Mrs. Stone might sell the bond immediately after the death of Mr. Stone. At his death, the stock receives the stepped-up basis, and no taxes will be paid on the capital gain. Alternatively, the Stones may realize the gains years later, in which case my approach ignores the value of deferring the capital gain taxes. Brunel [1998] discusses the treatment of deferred capital gain taxes and presents a model that should prove useful in such cases. The "right" treatment depends upon how much longer the gains will remain unrealized, which varies from case to case. Although the optimal methods of treating the capital gains may be uncertain, it is usually easy to improve upon the traditional approach's implicit assumption that taxes will never be paid. The client and financial advisor should explicitly consider the tax issue and, when appropriate, make a reasonable adjustment.

The market value of an asset with an unrealized capital loss should be converted to after-tax dollars. Suppose a capital asset has a cost base of $20,000, a market value of $17,000, and this *short-term* loss will be realized this year while the family is in the 35% marginal tax bracket. The after-tax value of the asset is $8,050, that is, $7,000 + $3,000 (0.35).[4]

In this case, the Stones do not have a Roth IRA. Investments in a Roth IRA are made with after-tax dollars and returns are tax exempt. So, there is no difference between market value and after-tax value of assets held in a Roth IRA.[5]

The non-qualified, tax-deferred annuity is a hybrid asset consisting of before-tax and after-tax funds. In essence, it is a bond fund that is subject to the tax structure facing tax-deferred annuities. The original investment of $50,000 is after-tax funds. The $18,000 of tax-deferred return is before-tax funds. Assuming the deferred return is realized this year, it converts to $11,700 of after-tax funds. So, the annuity is worth $61,700 after taxes. Other tax treatments are possible. However, if the annuity is to be used to finance income needs during retirement then taxes must eventually be paid. The assumption that deferred returns are taxed immediately is usually far better than the traditional approach's implicit assumption that they are never taxed.

The Stones do not have assets in a non-deductible IRA. If they did, the non-deductible IRA would also be a hybrid asset, and the method and issues concerning the calculation of its after-tax value would be the similar to those of the annuity.

CALCULATING THE STONES' ASSET ALLOCATION

The asset allocation depends upon 1) whether the calculation uses market values or after-tax values and 2) upon which assets and liabilities are included in the family's portfolio. The family's portfolio includes financial assets. Also, it may include other assets and liabilities such as personal residence; mortgage (as a short bond); post-retirement income from Social Security, company pension, and military retirement; and human capital. An argument could be made for including or excluding each of these.[6]

We only consider one of these "other assets" here — the company pension. But it is sufficient to illustrate that the decision of what to include in the portfolio can dramatically affect the asset allocation. Scott [1995] argues that the company pension should be part of the family portfolio because it affects cash flows. She includes the present value of projected cash flows from the company pension. In Reichenstein [1998] and again here, we recommend including the present value of projected *after-tax* cash flows. As a fixed-income cash flow, it is considered a "bond" in Exhibit 1. Social Security could be considered a "bond," so the issues related to the company pension apply to most families.[7]

Assume John and Mary Stone are 65 years old. The company pension plan promises Mary $25,000 per year for the rest of her life. If she dies first, John receives $12,500 a year for the rest of his life. According to the Joint Life and Last Survivor annuity table, their joint-life expectancy is 25 years. Exhibit 1 assumes John dies first and Mary lives 25 years. The company and its pension plan are healthy, so the projected cash flows are discounted at today's 6%, 20-year Treasury yield. The present value of $25,000 a year for 25 years is $319,600. This is the company pension's before-tax value. Since their ordinary

income tax rate is 35%, its after-tax value is $207,700 or $319,600 (1 – 0.35).[8]

Exhibit 1 presents four measures of the family's asset allocation. The traditional approach calculates the asset allocation using market values and excluding the company pension. It says the asset allocation contains 50% stocks and 50% bonds. Based on market values and including the pension, the asset allocation contains 27.8% stocks. Based on after-tax values and excluding the company pension, it contains 40.5% stocks. Based on after-tax values and including the company pension, it contains 24.6% stocks. The traditional approach says the Stones' asset allocation contains 50% stocks. We argue that the asset allocation should reflect after-tax values and include the company pension, in which case their "true" stock allocation is 24.6%—about half the level indicated by the traditional method.

The traditional approach is used throughout the profession. For example, market values are used throughout *Cases in Portfolio Management*, written by Peavy and Sherrerd [1990], and it never mentions any retirement cash flows such as Social Security benefits or a company retirement plan. *Cases*, with its guideline answer, serves as the capstone to the three-year Chartered Financial Analysts program. This demonstrates that the profession currently advocates calculating the asset allocation using market values, and retirement cash flows are seldom considered.

This example provides important implications, especially for families that hold stocks in deductible pensions. Reichenstein [2000b] and Shoven and Sialm [1999] among others recommend that families hold stocks in deductible pensions. If stocks are held in deductible pensions, the family probably has a smaller stock allocation than they think. If the family will receive post-retirement income — Social Security benefits, company pension, or military retirement — then it has a smaller stock allocation than they think. The questions about what assets "count" and whether to use market values or after-tax values have profound investment implications for many families.

A frequent rule of thumb says that each asset-class weight should remain within 10% of its target weight.[9] By this standard, a deviation of 10% or more is considered "substantial." The traditional approach says the Stones' stock allocation is 50%. If we use after-tax values (while continuing to exclude the company pension), the stock allocation declines by to 40.5%. For the Stones, the inappropriate use of market values alone caused a 9.5% measurement error, 40.5% – 50%. For many individuals and families, this error alone would cause a substantial measurement error. For the Stones, failure to include post-retirement income causes a 14.9% measurement error, 40.5% - 24.6%. The two errors produce a combined 25.4% measurement error.

Based on the arguments in this article, the Stones' "true" stock allocation is 24.6%. If the Stones (or their financial advisor) use the traditional approach then the combination of errors causes them to estimate the family's stock allocation at more than twice its actual level.

RELEVANCE OF THIS CHAPTER TO THE SERIES OF ARTICLES

The discussion on calculating the asset allocation complements the discussion on savings vehicles in the prior articles. It completes the whole. Both areas emphasize the need to compare after-tax dollars to after-tax dollars. In many respects it makes sense to present the material on the asset allocation before the material on savings vehicles. However, this series of articles is primarily about the investment implications of alternative savings vehicles. And the asset-allocation discussion is not necessary to discuss the investment implications of savings vehicles. For example, the asset-allocation discussion is not necessary to convey the idea that the Stones should compare a $1 investment of after-tax funds in a taxable account to a $1.54 or $1/(1 – 0.35) investment of before-tax funds in a deductible pension, where 0.35 is the current year's tax rate. Consequently, this article follows the prior articles in the series.

This article is included in this series for two reasons. First, it is important in its own right. Many readers may view the new approach to calculating the asset allocation as the single most important idea to come out of this series of articles. I would not disagree with them. There is wide agreement among professionals that the choice of asset allocation is an investor's most important decision. Therefore, the argument that the profession has been miscalculating the asset allocation is, indeed, significant. In addition to pointing out problems with the traditional approach, this article presents discussion and recommended procedures to improve upon the traditional approach.

The second reason for this article is it complements the discussion in prior articles on savings vehicles. Financial professionals must distinguish between before-tax and after-tax dollars when calculating the asset allocation and when considering the choice of savings vehicles. We routinely distinguish the tax-exempt interest of municipal bonds from the taxable interest of corporate bonds. Yet, to date the profession has failed to distinguish before-tax and after-tax dollars when calculating the asset allocation.

CONCLUSION

This article rejects two features of the traditional approach to calculating an individual or family's asset allocation. First, the traditional approach fails to distinguish before-tax funds from after-tax funds. If investments are to be used to finance income needs during retirement, the asset allocation should be based on after-tax funds because goods and services are made with after-tax funds. That is, asset's market value should first be converted to after-tax values, and then the after-tax values should be used to calculate the asset allocation. Second, the traditional approach fails to consider the value of post-retirement income, such as those from Social Security, company pension, and military retirement. This article argues that the family portfolio should include the present value of these projected after-tax cash flows.

We present the financial position of a hypothetical family with a simple portfolio. For assets held in each savings vehicle, it then discusses issues related to the conversion of market values to after-tax values, and it presents one conversion procedure. It then discusses a method to calculate the present value of post-retirement income, both before and after taxes. The example suggests that many families have substantially smaller stock allocations than they think, especially if they hold stocks in deductible pensions.

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ENDNOTES

The Research Foundation of the Institute of Chartered Financial Analysts provided research support.

This article is the fourth and last in a series that integrates investments and taxes. In particular, the articles examine the investment implications of the different savings vehicles, such as Roth IRA, deductible pensions (e.g., 401(k), Keogh, etc.), as well as a taxable account. Although this article builds on Reichenstein [1999, 2000a, and 2000b], it is written so it can be read alone.

[1]That is, $\{0.35(1 + k)^n\}/(1 + k)^n$ is \$0.35.

[2]The argument that the discount rate for the tax liability should be k% for stocks and y% for bonds is essentially the same as the traditional capital-structure argument presented by Modigliani and Miller [1958] for which they received the Nobel prize in economics.

[3]The assumption that the assets are intended for retirement needs allows us to ignore estate taxes and intergenerational transfer issues. When these issues are important the optimal solution requires a trade-off between competing objectives. In practice, the "correct" trade-off is seldom clear. I thank Doug Lynch for his insight about the intergenerational issue.

[4]Currently, in the U.S. a family can deduct a maximum net capital loss of $3,000 a year. Suppose the Stones have a $9,000 net capital loss in 2000. They can deduct $3,000 from taxable income in 2000 and carry the remaining $6,000 forward. In this case, the present value of the tax savings would be less than 0.35 ($9,000).

[5]In a Roth IRA, qualified withdrawals are tax exempt, while *returns* are taxable on non-qualified withdrawals. Withdrawals are qualified if they meet two criteria: the Roth IRA has existed for five tax years and the owner is at least age 59 1/2. Withdrawals are also qualified if due to death, disability, and other exceptional situations.

[6]For discussion related to the personal residence and mortgage, see Reichenstein and Delaney [1995], Scott [1995], Reichenstein [1998] and references therein. See Reichenstein [1998] for discussion related to post retirement income and Delaney and Reichenstein [1996] and Scherer and Ebertz (1998) for discussion related to human capital.

[7]Fraser, Jennings, and King [1999] examine the impact on asset allocation of including Social Security as a family asset.

[8]This $207,700 is a present value contingent upon Mary living 25 years. If Mary dies today, John receives $12,500 a year for the rest of his life. If he needs more than $12,500 a year, Mary could buy life insurance to cover the (after-tax present value) shortfall. In essence, the value of the expected cash flow, which is contingent upon Mary living 25 years, can be converted to a certain value through the purchase of life insurance.

[9]Nobel laureate Samuelson [1990] discussed the costs in terms of foregone utility of allowing the stock weight in a stock-bills asset allocation to vary from its optimal weight. The example in the article sets the optimal weight at 50% when the stock market follows a random walk. The loss in utility rises with the square of the stock weight's deviation from its optimal weight. So, a small error causes little loss of utility. He also argues that mean reversion, which produces some predictability of stock returns, would have to be substantial to justify a stock weight outside the 40% to 60% range. Although the example in Samuelson [1990] and here are not precisely the same, it would appear that he would consider a 10% error as a decent benchmark for a "substantial" error.