NORTHFIELD modeling financial markets worldwide

Parameterization of the Tax/Risk Tradeoff for High Net Worth Investors

Dan diBartolomeo

Webinar, August 2018

Introduction

- One of the most vexing questions in the managing the portfolio of highly taxed investors is how to parameterize the tradeoff between improving "after-tax" returns by reducing taxes and financial outcomes for the investor by reducing risk.

- This presentation will provide a relatively simplified analysis of this question which is very tractable in the framework which we use for optimization of taxable portfolios.

- We will also present several nuances of the process which investment professionals should consider in setting numerical parameters for the revision and rebalancing of taxable portfolios.

The Essential Question

- Let's frame the question this way. We will assume that a "tax ignorant" optimal portfolio exists which otherwise meets the investor's objective.

How many dollars in taxes should an investor be willing to pay now in order to reduce the active risk of the portfolio relative to the "tax ignorant" model portfolio by some defined increment X (e.g. from TE 2% to TE 1%) ?

- For the purposes of today's discussion we will define "active risk" and tracking error as synonymous, as the concept of "strategy risk" is not relevant between the tax ignorant and tax aware portfolios. For more information on strategy risk, see diBartolomeo (2010), http://www.northinfo.com/documents/349.pdf.

The Growth Optimal Investor

- If an investor *only* cared about maximizing their wealth at the end of a known horizon, we would refer to this as a *growth optimal investor.* The relevant math is the relationship between expected arithmetic mean returns and volatility and the expectation of the geometric constant return (with compounding). A good reference is Messmore (1995). We'll start in a pre-tax world.

$$G = A - S^2/200$$

Where

G = the expectation of the annually compounded constant return in %

A = the expectation of the arithmetic mean return in %

S = the expectation of portfolio volatility in %

B = the borrowing rate for margin accounts

Risk Averse Investors

- Let's now consider a typical model portfolio with some realistic parameters. We'll assume that A = 7 and S = 10

$$G = 7 - 10^2/200$$

- So the expected constant compound rate of return is 6.5%, which we expect to produce the same terminal wealth as our model portfolio. What we can see that an investor who holds this model portfolio is not a growth optimal investor. Consider what would happen if we used 2 to 1 leverage on this account:

$$A = 7 + (7-4) = 10,\ S = 2 * 10 = 20$$

$$G = 10 - 400/200 = 8$$

- So we could increase our geometric constant equivalent return from 6.5% to 8%. Since our investor has chosen not to take the higher return, they must be less tolerant of risk.

Assessing Pre-Tax Risk Tolerance

- Now we have to assess what is a realistic degree of risk tolerance (RAP in Northfield terminology). There are several ways to do this, but here is the one we typically find easiest to explain to investors.
  - For a typically assumed normal distribution of returns, we can define a "worst case scenario" as being something between a 3 and 4 standard deviation negative event. If we pick a 3.5 standard deviation event, the odds of something worse happening are about 1 in 4000.
  - So we can say that our worst case expectation of an annual return is (7 – 3.5 * 10) or -28%. The corollary to this statement is that given the portfolio we think 72% of our money is safe. We can think of this situation as being a *growth optimal investor with 28% of our money* and having zero risk tolerance with 72% of our money.

$$RAP = (.28 * 200) + (.72 * 0) = 56$$

Absolute and Model Relative Risk

- We have now inferred an pre-tax RAP (Northfield terminology for risk tolerance) of 56 as being economically rational in *absolute risk return space*. This will matter because taxes are levied on absolute gains and losses rather than benchmark relative gains and losses.
- Asset managers will often argue that risk tolerance to active risk (to benchmark or model portfolio) should be a lot lower than the investor's tolerance for absolute risk.
  - Managers are generally judged on relative performance and so are more sensitive to this issue.
  - Investors do not meet their own financial obligations with "market relative money."
  - See Roll (1992) and Chow (1995) for detailed discussions of this issue.
  - Trying to combine risk tolerance for relative and absolute risks is the equivalent of mixing cash into the benchmark portfolio.

The Influence of Portfolio Turnover

- Now let's assume that our annual portfolio turnover is 25%, so our average holding period on a position is 4 years. In four years we will have an effectively new portfolio so any costs incurred to form this portfolio can no longer be beneficial. This would correspond to the Northfield "transaction amortization" parameter (TA) being set to 25%.

- If we wanted to get more sophisticated, we could refine this parameter value in consideration of the issue of "active share." Consider a typical equity only portfolio with a conventional benchmark: A lot of the portfolio will be identical to the benchmark and have almost zero turnover. All of the turnover will occur in the "active share" of the portfolio so that *within that portfolio subset the effective turnover is much higher.* See http://www.northinfo.com/Documents/773.pdf for details.

Our Crude Example

- So if we have pre-tax RAP = 56 and TA = 25%, we can work through our example problem in simple algebra
  - For a full explanation of optimization under taxes with the Northfield Optimizer, see http://www.northinfo.com/Documents/818.pdf.

- We need a couple more inputs:
  - We'll assume the portfolio is $1 million.
  - We'll also assume that tracking error and the absolute volatility of the model portfolio are uncorrelated.
  - Basically, we are saying that the tracking error does not arise from market timing bets. This is not a requirement but will make the arithmetic simpler for our example.

Trading Taxes and Risk

- The absolute volatility of our portfolio is 10 or variance of $10^2 = 100$. If we have 2% tracking error we get $100 + 2^2 = 104$ for the variance. If we get the tracking error down to 1%, we have $100 + 1^2 = 101$ for the variance.
  - If we subtract (104 – 101), reducing the tracking error from 2% to 1% is a reduction of 3 units of absolute variance.
  - Since we know our RAP is 56, an improvement of 3 units of variance is worth 3/56 % of annual return, or around 5 basis points of annual return in terms of return/risk tradeoff.
  - Given our estimate of the TA parameter at 25%, we expect the benefit of the risk reduction to last an average of 4 years or cumulatively (4 *.05) 20 basis points (ignoring the tiny effect of compounding).
  - For a $1 million dollar portfolio, 20 basis points is $2000. This is ***what an investor in this model portfolio*** should be willing to pay in taxes now, all else being equal, to get tracking error down from 2% to 1% for an expected horizon of four years.

Our First Omitted Nuance

- We may consider raising the risk tolerance (RAP)
  - Given that investors can get a tax deduction for losses, the effect of investment risk is muted so taxable investors can afford to be a bit more aggressive.
  - A simple formulation was presented in the CFA book (diBartolomeo, Horvitz and Wilcox, 2006)

$$RAP_{(after\ tax)} = RAP_{(pretax)} * (1 + effective\ tax\ rate)$$

  - The effective tax rate is the not nominal tax rate but the decimal expectation of the nominal tax rate adjusted for the time value of money, effects of deferring taxes to a later date, gifting, investor death, etc.

- Obviously, if we're using after tax return expectations this is more important to get right.

Nuances on the Transaction Amortization Value

- Here we are assuming that the investor's tax rate is constant.
  - If this is 401K money the tax rate might zero now but approach the nominal tax rate close to disbursement period.
  - Tax rates might drop from working years to retirement.
  - We can adjust the transaction amortization constant for these effects, conditional on our expectations.

- We're not making any adjustment to TA for the possibility of either charitable gifts or likelihood of death.

- As previously stated, I have not addressed the "active share" issue in setting TA. However, this should be a small effect as the relation of the tax aware client portfolio to the "tax ignorant" optimal portfolio is passive.

Time Value of Money

- We're ignoring basic issue of the time value of money (i.e. paying one nominal dollar of taxes today is not the same as paying the same dollar a year from now).
- Many people incorrectly characterize tax deferral as "an interest free loan from the tax authority."
  - In reality, the government's financial participation in an investor's profits is more like a limited partnership interest.
  - If an investor can defer tax, they will have cash available to invest which generates new profits in which the government also has a financial interest.
  - The total nominal dollars of deferred taxes will be larger than the nominal dollars of taxes paid in the present.
- Given low interest rates this is not very material except over long (i.e. decades) horizons (see Wilcox and Horvitz, 2003) but would impact the most appropriate value of the transaction amortization parameter (TA).

Single Period Optimization in a Multi-Period World

- The traditional view of portfolio optimization is a "single period" model.
  - The assumption is that transaction costs (including taxes) are zero, so we can define the time period relevant to a portfolio as from "now until things change."
  - If conditions do change I can revise my portfolio at no cost.

- In the real world, taxes are levied in fixed periods called tax years.

- Investment performance is typically evaluated in some rational framework of time passing discrete calendar periods.

- When we choose to make changes to a portfolio we do so because the change is expected to increase returns or reduce risk *in the future,* thereby improving the utility of the portfolio.

More Multi-Period Considerations

- To the extent such a change is has associated costs (i.e. taxes), we have to consider not only the expected magnitude of the improvement but how long we expect the improvement in utility to persist.
  - If I could improve risk adjusted returns of your portfolio for 20 years, it is almost essentially certain that you would be actual experience better eventual outcome and be willing to pay for this.
  - On the other hand, if the expected improvement could only be guaranteed for 20 minutes, we would not want to expend much in taxes because the likelihood that the "better" portfolio would actually provide a better result over 20 minutes is nearly 50/50.

- The Northfield Optimizer has a built-function to automatically handle this issue. It provides an appropriate adjustment to the transaction amortization value. See diBartolomeo (2012, http://www.northinfo.com/Documents/500.pdf).

Conclusions

- The parameterization of the tax/risk tradeoff in managing high net worth portfolios is often problematic for wealth managers.
- The benefit of reduced taxes is far more visible to investors than the longer term benefit of reducing risk.
- The agency conflicts between the perception of risk between managers and investors also clouds the issues.
- Nevertheless, the tradeoff between these two competing financial interests can be managed in economically sensible and transparent ways.
- Once specified in rational economic terms, this tradeoff can be easily characterized in two input parameters for a tax sensitive portfolio management process using routine optimization techniques.