



September 2011

Northfield News

A Newsletter for the Friends and Clients of Northfield Information Services

Managing Portfolio Risk Over Short Horizons

By Dan diBartolomeo

Special Points of Interest:

- ▶ **Main Article: Portfolio Risk over Short Horizons**
- ▶ **Tech Support Tip: Marginal Utility**
- ▶ **Asia Seminar Agenda**
- ▶ **Brazil Seminar Agenda**



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- ▶ **Staff Speaking Engagements**
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- ▶ **Annual Conference Wrap-up**

Over the past few months global equity markets have experienced episodes of extreme volatility over short periods. Many financial market participants ascribe this volatility to specific events such as the Greek debt crisis, the political wrangling over the US Government debt ceiling, the revolution in Libya and the eventual downgrading of the credit rating of US Treasury debt by Standard and Poor's. For the first time since the height of the Global Financial Crisis, our "near horizon" models have been predicting risk values higher than our "long horizon" models for the past few weeks.

The traditional formulation of Modern Portfolio Theory is a single period model where our beliefs about the distributions and correlations of asset returns are fixed. Essentially, there are only two concepts of time, now and the end of time. In the real world market conditions change from day to day and year to year. These changes are often of great magnitude. Our first challenge will be deal with the changing levels of risk over time.

MPT also assumes that all assets are completely liquid so transaction costs are zero. Again, in the real world transaction costs are not zero and in crisis conditions are often extremely large. Our second challenge will be to form a more realistic framework for this issue.

Time Horizon and Risk Assessment

It is the common practice of the investment industry to discuss portfolio return volatility in annual time units. We say "the implied volatility of a stock option is 30 percent per year," or "the tracking error of a portfolio is 3 percent per year." But it is unclear whether we really are assessing the expectation of volatility between today and one year from today or if we describing the annualized value of volatility over some shorter (or longer) period such as the next week or month. Much of the variation in risk assessment provided by various widely used risk systems arises from this ambiguity.

We must address two more issues when we consider time horizons. The first is that the statistical measures that use portfolio volatility can be translated into probabilities of gain or loss in two different ways. The usual approach is to consider the distribution of portfolio values at the end of the horizon period. Let's assume we have a portfolio worth \$1 million with an expected return of zero and a volatility of 10 percent per annum.

We will further assume that the returns are normal and are independently and identically distributed (no serial correlation and constant volatility). In such a case, a three-standard-deviation event downward would equate to a 30-percent loss reducing the portfolio value to \$700,000 at the end of the one-year period. The likelihood of such an occurrence is

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Recent and Upcoming Events

Northfield Asia Seminar Series – Research on Investment Management and Risk Hong Kong • Singapore • Sydney • Tokyo

Northfield will be hosting four one day seminars in Hong Kong, Singapore, Sydney and Tokyo. The purpose of the seminars is to showcase our research on various topics in investment and risk management to our growing list of Australian and Far East clients and prospects.

Sydney:

Wednesday, October 12, 2011, 9:00 am - 4:30 pm • The Quay Restaurant, The Rocks, Sydney

Singapore:

Tuesday, October 18, 2011, 9:00 am – 4:30 pm • The Raffles Hotel, Singapore

Hong Kong:

Thursday, October 20, 2010, 9:00 am - 4:30 pm • Landmark Mandarin , Central, Hong Kong

Tokyo:

Tuesday, October 25, 2011, 9:00 am - 4:30 pm • Mandarin Oriental, Nihonbashi, Tokyo

Agenda:

The agenda will consist of six presentations. Check <http://www.northinfo.com/events.php> for the detailed agendas that include the presentation abstracts.

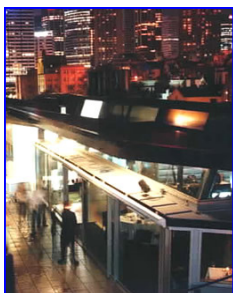
Sydney and Singapore

- The X Factor: Grouping securities, Defining “Similar”, and Forming Estimates First-Passage Probability as a Measure of Intra-Horizon Risk
- Comparing Low Volatility and Minimum Variance Equity Strategies
- A New Paradigm for the Hiring and Evaluation of Institutional Asset Managers
- Beating the Bond Market with No Skill
- Are Diversification Benefits Still to be Found in International Investing?
- High Frequency Trading, Algorithmic Buy-Side Execution and Linguistic Syntax

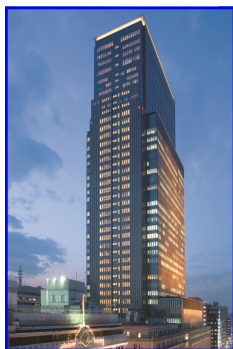
Hong Kong and Tokyo

For the Tokyo and Hong Kong Seminars, “Are Diversification Benefits Still to be Found in International Investing?” will be replaced with “Asia at the Heart of the Storm,” which will be presented by guest speaker Jim Walker, managing director of Asianomics. In addition, at the Hong Kong Seminar, Dan Cardell, Chairman of the Chicago Quantitative Alliance, will be discussing the possibility of setting up a CQA Asia Chapter. The CQA will also sponsor a cocktail reception at the end of the day.

To register, visit <http://www.northinfo.com/events.php>, or contact Nick Wade in Tokyo if you would like to attend, +81.3.5403.4655 or e-mail: nick@northinfo.com. There is no cost for registering for any of the seminars.



Quay Restaurant



Mandarin Oriental



Landmark Mandarin



Raffles Hotel

Northfield São Paulo Research Seminar

São Paulo, Brazil • September 29, 2011

Northfield will be holding its first annual Latin America research conference in São Paulo, Brazil on September 29th. In 2010, Northfield began to provide services in Latin America. The seminar will showcase our research to our growing list of interested prospects in the region.

Agenda:

The agenda will consist of five presentations. Visit <http://www.northinfo.com/events.php> for the detailed agenda that includes the presentation abstracts.

- High Frequency Trading, Algorithmic Buy-Side Execution and Linguistic Syntax
- Risk Management Failures in the Crisis and other Myths
- A Review of Real Estate's Contribution to Institutional Portfolio Risk and Return in the New Global Financial (Disorder)
- A New Approach to Analyzing Credit and Bankruptcy Risk
- A Detailed Examination of Minimum Variance and Low Volatility Equity Strategies

To register, visit <http://www.northinfo.com/events.php>. Contact Ian Bomberowitz if you have any questions, 617.208.2041, ian@northinfo.com.

Northfield European Research Seminar

London • November 17, 2011

Northfield's Europe office will be hosting a one day research seminar on November 17th. The purpose of the seminar is to showcase research on various topics in investment and risk management to our European clients.

Further details will be posted to <http://northinfo.com/events.php> as the agenda and venue become finalized. Contact Northfield's London office for further details, +44-(0)-20-7801-6260, rupert@northinfo-europe.com, or neil@northinfo-europe.com

Northfield Webinar: A Detailed Examination of Minimum Variance and Low Volatility Equity Strategies: A Real Market Inefficiency or Slight of Hand?

July 12, 2011

Northfield President Dan diBartolomeo hosted a webinar on July 12th where he discussed Minimum Variance and Low Volatility Equity Strategies.

The presentation slides are available at <http://www.northinfo.com/documents/467.pdf>. Contact your Northfield Sales Representative if you are interested in viewing the full presentation recording of the event.

Northfield Online Workshop: Recent Product Enhancements from Northfield Research.

September 13, 2011

Northfield's Anish Shah hosted an online workshop on September 13th where he discussed the next generation of Northfield Risk Models and the issues motivating both the models and the most recent enhancements to the Northfield Open Optimizer.

The presentation slides are available at <http://www.northinfo.com/documents/471.pdf>. Contact your Northfield Sales Representative if you are interested in viewing the full presentation recording of the event.

2011 Northfield Annual Research Conference Wrap-up

Williamsburg Lodge • Williamsburg, Virginia • June 24th-26th, 2011

Northfield held its 24th annual research conference at the Williamsburg Lodge in historic Colonial Williamsburg Virginia.

The conference presented recent research and technical advances to a sold out audience of Northfield clients and friends. The agenda consisted of eleven presentations. Topics included: “A New Paradigm for the Hiring and Evaluation of Institutional Asset Managers,” “Are Quants All Fishing in the Same Small Pond with the Same Tackle Box?,” “Financial Averaging,” “Modeling Risk with Limited Internal Data,” “Option Prices Leading Equity Prices: Superior Information Discovery or Superior Information Processing?,” “Representativeness of the New Russell Style Model with Stability,” “Simple and Robust Risk Budgeting Using TEES,” “Tax Update 2011,” “The Myths and Facts of Risk Parity,” “The Rise and Fall of Capitalism in America,” and “Yet Another New Paradigm: Multi-dimensional Strategic Risk Management.”

The conference started on Thursday evening with the “Unofficial” welcome cocktail party and dinner. Friday morning was reserved for recreational pursuits. Conference attendees had a choice of activities including kayaking, a tour of the Jamestown settlement, a boat cruise and tour of Yorktown’s Victory Center, and golf.

Friday evening featured the traditional Northfield elegant “black tie” gala. The final dinner on Saturday evening was a Traditional Virginian Colonial “Groaning Board” Dinner. Prior to dinner, traditional colonial lawn games were set up for the children, and during dinner actors portraying historic colonial figures circulated the crowd answering questions and giving speeches.

The complete seminar proceedings have been posted at <http://www.northinfo.com/research.php>.

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about one in 1,000. Investors often confuse this with the probability that the value of the portfolio will never go below \$700,000 at any point during the year. We call this risk the “first passage” potential for loss compared to the “end of horizon” potential for loss. Because there is always some chance that the portfolio could fall below the floor of \$700,000 at some point during the year yet still end the year at about \$700,000, the first-passage probability of given loss is greater than the probability of the comparable end-of-horizon loss.

As described in Kritzman and Rich (2002), under the most typical assumptions one can express the intra-horizon probability of hitting the boundary value as:

$$\Pr I = \Pr E + N\left(\frac{(\ln(1+L) + \mu T)}{\sigma\sqrt{T}}\right) (1+L)^{2\mu/\sigma^2}$$

Where:

Pr I = the probability of hitting the boundary intra-horizon
 Pr E = the probability of hitting the bound at the end of the time horizon

L = the required loss in asset value to hit the boundary

μ = the growth rate (drift) in asset value per unit time

σ = the volatility of asset value per unit time

T = units of time

Another way of thinking of this problem is to ask how much we would have to reduce the volatility of the portfolio so that the probability of a first-passage loss at the floor would equal the end-of-horizon probability of the same loss, given the original portfolio volatility. In the case of our simple example portfolio above with volatility 10 percent, we would have to reduce the portfolio volatility to 9 percent (i.e., 10/1.11) to get the same roughly one in 1,000 chance of having the portfolio value go below \$700,000 at any time during the year. Numerous papers such as Feller (1971) and Bakshi and Panayatov (2010) suggest scaling divisors ranging from roughly 1.11 to 2.64 depending on the type of assumed return process (normal, *independent and identically distributed*, jumps, stochastic volatility, etc.).

The other issue we must deal with when considering first-passage risk is that the shape of the return distribution may be different depending on whether we are measuring returns on a daily (or intraday) basis or on a monthly or annual basis. In general, the shorter the observation interval (i.e., the higher the observation frequency), the greater the tendency of the observed return distribution to have “fat tails,” meaning that extreme moves up or down are much more frequent than predicted in a normal distribution. An extensive review of this issue is provided by diBartolomeo

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(2007). To the extent we believe that the returns for our portfolio will be fat-tailed we can choose higher values of the scaling divisors described above to compensate. The usual approach for determining the magnitude of the adjustment is the Cornish-Fisher (1937) expansion method.

Conditional Risk Models

Our second weapon to address the time-varying nature of risk is to build risk models that adapt more rapidly to changes in market conditions. The traditional approach to this process is to build the risk model with data observed over a shorter window of history, but with higher frequency of observations. As described in diBartolomeo (2007), high frequency data often has undesirable statistical properties that make estimating such models reliably almost impossible.

A different approach is embodied in the concept of conditional models that are based on a vector of state variables. Rather than simply build our model based on our observations of the past, we can also *include information that is observable right now*. Northfield has used the conditional model concept in our US Short Term model since 1999, and “near horizon” versions of all of our risk models have been available since April of 2009.

This approach allows any chosen model to adapt rapidly to changes in market conditions, but to retain the existing factor definitions and factor exposures. In effect, we ask ourselves how are market conditions today different than they were on average during the period of history used to estimate the usual model. To judge the degree of difference, an information set of state variables are defined that describe contemporaneous aspects of the financial conditions but that are not normally used in the risk model. Such variables might include the implied volatility of options on stock indexes (e.g. VIX) and bond futures, yield spreads between different credit qualities of bonds, and the cross-sectional dispersion of stock returns among different sectors and countries.

In mathematical terms, we can think of this process as built around a vector we’ll call theta. For each important element of the risk model (e.g. the volatility of a factor), there will be a corresponding element in the vector theta. Each element of the vector has a default value of one. We multiply each element of the model by its corresponding element in theta in order to reflect changes in state variables. For example, if a firm’s manufacturing plant were to be destroyed in a flood, it would take many observations of returns to make a new estimate of how the covariance of this firm with returns of other firms had changed due to the changed circumstances.

However, if the firm in question had traded options we might immediately observe a change in the stock volatility implied by the prices of the traded options. The relative change in the implied volatility as compared to past values of implied volatility would be reflected in the theta vector and could help to immediately adjust our risk expectations for this firm, as described in diBartolomeo and Warrick (2005), and refined in Shah (2008).

Using news itself to condition factor risk estimates has also been explored recently. In diBartolomeo, Mitra and Mitra (2009), the content of textual news flows through a news service (e.g. Dow Jones, Bloomberg, Reuters) is analyzed for length, frequency and sentiment. They conclude that conditioning on news content add meaningfully to the responsiveness of risk estimates, even beyond the use of implied volatility for securities with liquidly traded options.

To illustrate how the conditional risk model concept works, we took an example portfolio of 50 stocks drawn at random from the S&P 500 at August 31, 2011. All stocks were equally weighted. We then use our “regular” and “near horizon” US Fundamental Model to make tracking error (against the S&P 500 as benchmark) and absolute risk assessments. During the period from March 31st, 2011 to September 15th, 2011 the tracking error estimates using our usual one year time horizon ranged from a low of 5.07% to a high of 5.89%. Over the same span, the value of forecast absolute portfolio volatility ranged from a low of 24.34% to a high of 25.52%. It should be noted that the high and low values for tracking and error and absolute volatility are not necessarily coincident in time.

The “near horizon” version of the US Fundamental Model has a forecast time horizon of ten trading days. When we evaluated the same portfolio using the near horizon version we get a very different picture. For example, at April 15th, 2011, before most of the volatility inducing events had occurred the near horizon “annualized” tracking error estimate was 3.79% and the absolute volatility value was 14.80%. The lower values show that the near horizon model was paying more attention to the relatively benign post crisis conditions than the longer term model up to April 15th. By the 13th of September, the tracking error estimate had risen to 5.52% but the absolute risk estimate was 30.45%.

Liquidity Risk

As most institutional investors are exempt from taxes, it is customary to think of investment portfolios in terms of total return. The distinctions between income and capital growth and between the market value of a portfolio and

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actual spendable cash are forgotten. For our purposes, let us consider liquidity risks as being those related to the potential to have to bear excessive costs to convert an investment asset into cash available for consumption spending.

The first aspects of liquidity risk to consider are structural impediments. For example, many charitable foundations are legally limited to spending only the income (interest and dividends) derived from their investment portfolio but are not permitted to liquidate portfolio assets into cash for consumption. A less restrictive form of this constraint would be the situation where an endowment can spend income for consumption and also liquidate appreciated assets as long as the market value of the portfolio never declines below the original value of the capital contributed.

Regulators of financial services firms often impose liquidity requirements. For example, the insurance regulators in some European countries require that insurance portfolios contain an amount of very liquid assets (cash and government bonds) to cover the expected claims for the next three years. The assumption here is that over a three year span even illiquid investments such as exotic fixed income securities, real estate and private equity partnerships can be converted to cash without resorting to drastic “fire sale” discounts as were seen in mortgage derivative securities during the recent global financial crisis.

There is a very tractable way to adjust traditional portfolio risk metrics (volatility, tracking error, VaR) to reflect liquidity concerns. We begin by getting the investor to state a liquidity policy as described in Acerbi and Scandolo (2008). Once we our policy is stated we can calculate the cost of a hypothetical liquidation and then build the associated transaction costs into the portfolio risk estimates.

To do this we convert our portfolio volatility estimate to parametric Value-at-Risk for the length of time specified in our liquidity policy. We can then add the expected cost of a potential liquidation to the VaR value, and convert the VaR value back to the equivalent volatility. For example, let us assume that we must be able to liquidate 30% of the portfolio in 10 trading days that our estimated portfolio volatility is 25% per year, and that the expected cost of carrying out the liquidation would be 4% of the portfolio value (12% of the 30% to be converted to cash). *A profound result of this kind of analysis is that portfolio risk is a function, not only of portfolio weights but also of the dollar value of the portfolio, as the larger the positions are the greater the expected costs of liquidation will be.* This means that a \$1 Billion portfolio is riskier than a \$1 Million portfolio even if the security composition and weights are identical.

Under the common parametric assumptions, we can estimate the portfolio volatility measure (probably using a factor model) and then algebraically convert the volatility value to the VaR or CVaR. Given that solvency based risk management is a day to day affair, we must be aware of the “fat tail” issues previously mentioned. To adjust the normal distribution assumption for “fat tails” we can use the Cornish Fisher expansion method (1937) to rescale the volatility value. Alternatively, we could assume that the distribution of asset returns has a fat tailed distribution (e.g. Gamma, Weibull). For the common case of the normal distribution assumption, the transform is:

$$\text{VaR}\$(p,t) = V * \sigma_f * (t/250)^{.5} * Z(p)$$

Where:

V = the dollar value of the portfolio

σ_f = annualized volatility of the portfolio adjusted for fat tails

t = the number of days to the forecast horizon

Z(p) = number of standard deviations below the mean for the cumulative density of P%

For sake of simplicity we will use a 3 standard deviation VaR which covers 99.8% of the density of a normal distribution. In such a case our % parametric VaR would be 14.94% [$25 * 3 * (10/252)^{.5}$]. If we now add our forecast liquidation cost of 4% we get a revised % parametric VaR of 18.94% [$14.94 + 4$]. By reversing our arithmetic, we can convert back to the equivalent value of volatility, 31.70 [$18.94 / 3 * (252/10)^{.5}$]. In our example, the portfolio volatility estimate increased from 25% annually to 31.7%. The increase in variance is from 625%² to 1005%². The 380 unit increase in variance is apt to reduce the geometric mean return by 1.9% relative to the arithmetic mean.

In some sense, a “growth optimal” investor is apt to be more satisfied with this somewhat illiquid portfolio if and only the expected return is at least 1.9% per annum more than a completely liquid portfolio of comparable market risk. Investors who are more conservative than growth optimal, even larger return premiums would be needed to compensate for the liquidity risk. Conversely, in estimating an economically appropriate return premium for liquidity, we must also keep in mind that the probability of having to actually carry out a liquidation process is apt to be substantially less than one.

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Tech Support Tip: Marginal Utility (MU)

By Mike Knezevich

The Northfield optimizer uses a gradient approach method to trade between two assets at a time moving a portfolio from its initial state to an optimal position. This pairwise approach allows users to review the plausibility of each trade made step by step. Marginal Utility (MU) is the catalyst for moving the assets in the direction of optimality. During what is referred to as the Main Loop, the optimizer seeks to maximize the utility function subject to any class 1 constraints (please see Tech Support Tip: Constraints, (<http://www.northinfo.com/Documents/435.pdf>) by ranking assets according to their Marginal Utility, then buying and selling in the direction of increasing utility.

Having a better understanding of Marginal Utility provides users insight into how the optimizer constructs a portfolio. This newsletter article seeks to:

- 1) Mathematically derive Marginal Utility.
- 2) Theoretically interpret Marginal Utility usage in the portfolio construction process.
- 3) Discuss an example using the Advance (Pairwise Trading) function in the Optimizer.

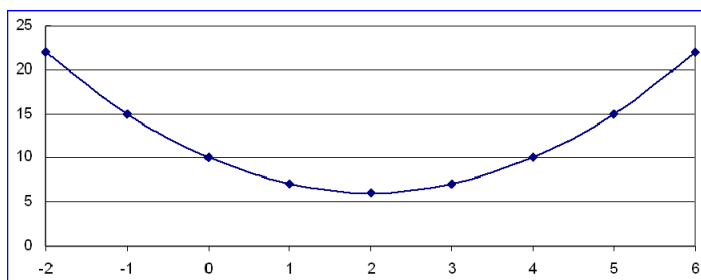
Deriving the Marginal Utility

By definition Marginal Utility is the partial derivative of utility with respect to an asset's weight. Let's break this down.

1.) Derivatives are used to measure the change in a function with the change of an independent variable. The function is minimized or maximized with respect to the variable at an extreme point known as a point of inflection (i.e. where the slope of the tangent to the line changes from one direction to another). Therefore at the very point of inflection the derivative of the function, which calculates the slope of the tangent line at any given point, will be equal to 0.

Borrowing an example from Kritzman Chapter 20 page 160, consider the quadratic function: $y = x^2 - 4x + 10$

Viewing a graphical representation of the function, the extreme minimum point is obvious:



Let's confirm our intuition of the extreme point by taking the derivative of the function:

$$y' = 2x - 4$$

Then setting the derivative equal to 0:

$$0 = 2x - 4$$

Solving for x, we find that the minimum point of the quadratic function is 2, thus confirming what we inferred intuitively from the graph.

Extreme points are not always as obvious as our example and for an optimization there are multiple unknown optimal weights which must be solved for a list of assets. In this case a **Partial Derivative** is used to determine the derivative of a function. Partial Derivatives allow us to determine a solution for a function with more than one unknown variable by solving for one unknown at a time holding all others constant.

2.) Utility measures the attractiveness of an asset and can be represented by a quadratic utility function, the Northfield optimizer's objective is to maximize this utility function. A simple long only unconstrained utility function with no transaction cost is used for the purposes of this discussion since constraints can hinder the ability to find true optimality. Transaction costs introduces a range between increasing utility to buy and sell which we will revisit later. So for now our utility function is represented as:

$$\text{Max } U = \alpha - (\sigma^2 / \text{RAP})$$

Calculating the partial derivative of the components of the utility function determines the Marginal Utility for any particular asset. Our simplified utility function incorporates alpha and variance thus:

$$\text{MU} = \partial U / \partial w_i = \partial \alpha / \partial w_i - \partial \sigma^2 / \partial w_i$$

Where:

$$\text{Marginal Alpha (MA)} = \partial \alpha / \partial w_i = \alpha$$

$$\text{Marginal Variance/RAP (MV/RAP)} = - \partial \sigma^2 / \partial w_i = 2 * \sigma^2 * w_i * (1/\text{RAP})$$

Note: MV/RAP is used to denote the difference between the traditional definition of Marginal Variance (MV) in the Optimizer and MV used in the Marginal Utility calculation which is divided by RAP.

For more information on all factors contributing to Marginal Utility please see Open Optimizer Report Descriptions, <http://www.northinfo.com/Documents/12.pdf>.

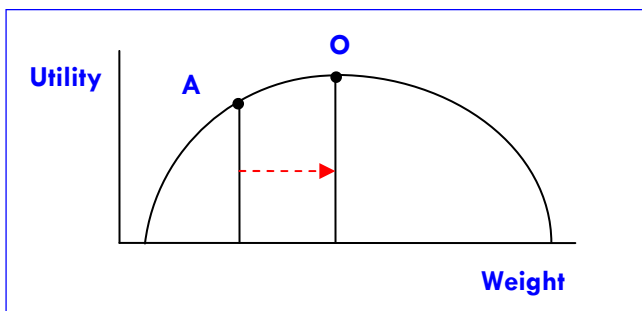
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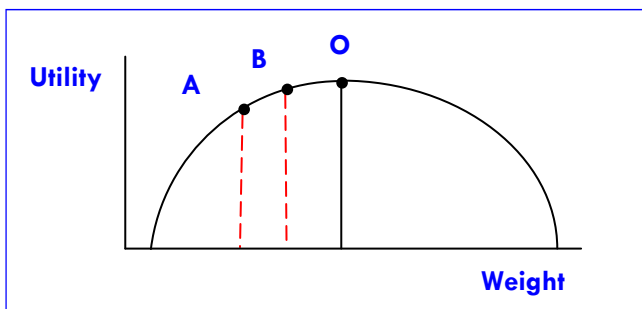
Interpreting the impact of Marginal Utility

With the mathematical derivation of Marginal Utility for our assets how do we use this information to obtain the optimal weight? We compare the impact on utility of small changes to an asset's weight to move the asset in the direction of increasing utility. We can graphically demonstrate the steps of the weight changes and impact on utility. Trades continue until changes in weight no longer increase utility, this is the optimal position.

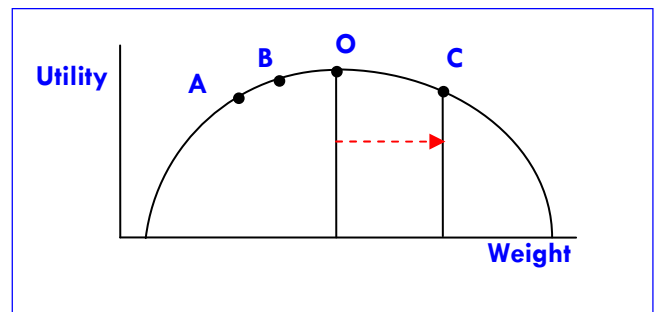
Assume we know in advance an asset's optimal weight is w_0 which corresponds to the point where the asset Marginal Utility is optimal, $MU = MU_0$. This is represented by point O in the graph below. Further assume this asset's weight is currently at w_A with a corresponding MU_A which is represented by point A. Currently $MU_A > MU_0$, meaning that as w_A increases the portfolio utility increases.



We decide to make two equal trades of $w_1 = w_2 = 0.5 \times (w_0 - w_A)$. Making the first trade, w_1 , from point A to point B with corresponding weight w_B , increases the portfolio's utility along the curve. Point B is still below the optimal weight so there is still room for improvement thus $MU_B > MU_0$. Although the two trades are equal weighted $MU_A > MU_B$ because as the asset weight moves closer to the optimal position, the increases to utility decreases. Increasing the asset's weight is preferred until $MU_B = MU_0$.



If the user decided to continue increasing the weight beyond the optimal point, to say point C, the asset begins to decrease the portfolio utility and $MU_C < MU_0$. At this point it is better off for the user to decrease the asset weight.



No matter where the asset weight beings, above or below the optimal position, the relative Marginal Utility ranking leads the asset to the optimal weight. Assets with higher relative Marginal Utility will be purchased while assets with lower relative Marginal Utility will be sold.

Constructing a portfolio using the Marginal Utility

Using the Optimizer's Advanced (Pairwise Trading) feature we can demonstrate the impact of increasing utility by trading based on Marginal Utility. This feature allows the user to fine-tune the optimal portfolio iteration by iteration for specific assets of the user's choice.

The example portfolio consists of three assets and is benchmarked against the S&P 500 with the following utility breakdown:

	Initial	
	Return	Risk(v)
Factor	0.00	47.69
Stock Specific	1.00	62.32
Total	1.00	110.01
Tracking Error	10.49	
Portfolio Utility	-0.10	

$$Utility = 1 - (110.01/100) = -0.1$$

Characteristics of the portfolio constituents are as follows:

ID	Name	InitWt (%)	Alpha	MA	MV	MV/RAP	MU
MPC	Marathon Petroleum	20	5	5	-2.04	-0.02	5.02
MSFT	Microsoft	40	0	0	17.55	0.18	-0.18
MTB	M&T Bank	40	0	0	46.77	0.47	-0.47

Trades are based on the assets' MU which is constructed from the individual components:

$$MU = MA - MV/RAP$$

For MPC:

$$MU = 5 - (-2.04/100) = 5.02$$

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Due to the relative improvement in utility we choose to buy MPC simultaneously selling MTB in the first pairwise trade.

Advanced (Pairwise Trading):

Actions:

Buy: MPC OptWt = 20.0000%; MaxTrade = 80.0000%

Sell: MTB OptWt = 40.0000%; MaxTrade = 40.0000%

Swap: 37.5630% (Optimal = 37.5630%; Max Possible = 40.0000%)

The optimizer calculates the optimal swap weight (37.5630%) between the trade candidates. We run a one-iteration pairwise trade, , increasing utility to 0.93.

	Initial		Optimal	
	Return	Risk(v)	Return	Risk(v)
Factor	0.00	47.69	0.00	144.32
Stock Specific	1.00	62.32	1.00	50.43
Total	1.00	110.01	1.00	194.75
Tracking Error	10.49		13.96	
Portfolio Utility	-0.10		0.93	

Marginal Utility is recalculated at the new weights, notice that the MPC's Marginal Utility has decreased from its previous value.:

ID	Name	InitWt (%)	OptWt (%)	ChgWt (%)	MU
MPC	Marathon Petroleum	20	57.56	37.56	3.91
MSFT	Microsoft	40	40.00	0.00	1.23
MTB	M&T Bank	40	2.44	-37.56	3.91

Due to the relative improvement in utility this time we choose to buy MPC while simultaneously selling MSFT.

Advanced (Pairwise Trading):

Actions:

Buy: MPC OptWt = 57.5630%; MaxTrade = 42.4370%

Sell: MSFT OptWt = 40.0000%; MaxTrade = 40.0000%

Swap: 25.4506% (Optimal = 25.4506%; Max Possible = 40.0000%)

Once again, the portfolio utility has improved.

	Initial		Optimal	
	Return	Risk(v)	Return	Risk(v)
Factor	0.00	144.32	0.00	231.10
Stock Specific	2.88	50.43	4.15	56.84
Total	2.88	194.75	4.15	287.94
Tracking Error	13.96		16.97	
Portfolio Utility	0.93		1.27	

If we were to continue making pairwise trades, at some point no one asset would contribute any additional utility. This is the optimal point.

ID	Name	InitWt (%)	OptWt (%)	ChgWt (%)	MU
MPC	Marathon Petroleum	20	77.03	57.03	2.79
MSFT	Microsoft	40	4.03	-35.97	2.79
MTB	M&T Bank	40	18.95	-21.05	2.79

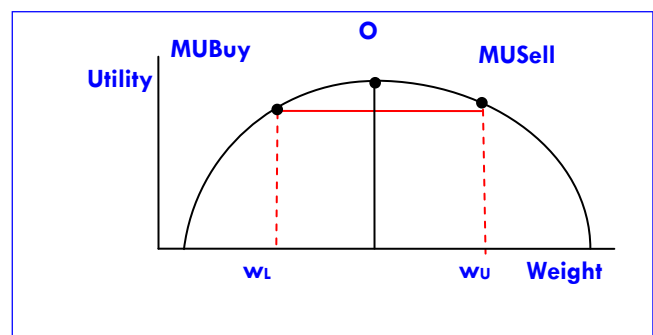
To borrow a familiar analogy, if we can imagine ourselves blind folded standing in a valley with a winning lottery ticket at the top of a hill with each step we attempt to move up feeling the difference in height from our current location to our previous location to our next step. We take each step moving closer to our ultimate goal. Marginal Utility is the measure of increasing height that helps us move in the direction of increasing utility.

Special note on transaction cost in MU

In situations where transaction costs are included, the utility maximizing point is lower than the cost-free maximizing point.

ID	Name	MA	MT Buy	MT Sell	MT Sell	Mu Sell
MPC	Marathon Petroleum	5.00	-0.23	0.23	4.06	4.51
MSFT	Microsoft	0.00	-0.36	0.36	0.36	1.08

The maximizing point becomes a range between the highest achievable utility points when increasing (MUBuy) or decreasing (MUSell) the asset weight once transaction costs are incurred.



If w is below w_L the asset is bought increasing MU to MUBuy. If w is above w_U , the asset is sold until MU increases to the MUSell. If the asset weight w exists between w_L and w_U , no trading will occur as the cost is too prohibitively high for the increasingly smaller improvement to utility.

References:

Kritzman Mark, P. (2003). *The Portable Financial Analyst-What Practitioners Need to Know*. Hoboken. Wiley & Sons Inc.

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References

Bakshi, G., and G. Panayotov. 2010. "First-Passage Probability, Jump Models, and Intra-Horizon Risk", *Journal of Financial Engineering* 95, no. 1 (January): 20–40.

Cornish, E., and R. Fisher. 1937. "Moments and Cumulants in the Specification of Distributions.", *Extrait de la Revue de l'Institut International de Statistique* 4: 1–14.

diBartolomeo, Dan. 2007. "Fat Tails, Tall Tales, Puppy Dog Tails." *Professional Investor*, Autumn.

Feller, W. 1971. *An Introduction to Probability Theory and Its Applications*, Vol. II. (New York: John Wiley & Sons, Inc.)

Kritzman, Mark and Don Rich, 2002. The Mismeasurement of risk. *Financial Analysts Journal* 58, 91-99.

Acerbi, Carlo and Giacomo Scancolo. 2008. "Liquidity Risk Theory and Coherent Measures of Risk", *Quantitative Finance*.

Staff Speaking Engagements

Northfield President Dan diBartolomeo and Chris Kantos presented "Beating the Bond Market with No Skill" at the September 13th London Quant Group meeting at Oxford University. Dan also took part in a panel discussion titled "Suddenly Twenty Five Years Later" at the same meeting on the 14th.

Dan will be presenting "Chasing Bernie Madoff: An Analytical History" at the Inquire UK Seminar in Bristol, United Kingdom on September 25th.

Dan will offer a second presentation at the Inquire UK Seminar on the 27th titled "Credit Risk, Default Correlation and Returns to Corporate Sustainability."

At the November 15th London CFA Society meeting in London, Dan will be presenting "Asset Allocation for Private Client Wealth."

New Optimizer GUI Now Available

As mentioned in the June 2011 newsletter, the standalone version of the Northfield Open Optimizer has a new and improved GUI design. The design has been improved with a focus on offering more user friendly features.

Please note that the new Optimizer GUI is 100% compatible with prior versions, so there will be no conversion tasks for existing files or projects. A new user manual is available for download at www.northinfo.com/emailimages/nisopt2011.pdf. Contact Northfield Technical Support if you have further questions.

The enhancements include:

- Application Button - Click to get a full menu of the system
- Quick Toolbar- User 'favorite buttons,' this will be customizable so you can pick the buttons of your choice
- Launch Buttons-invokes a dialog with more detailed specifications for a group
- Add/Remove Comments- allows users to add comments to the project.
- Predefined Paint Screens
- Autoload Button:- This allows the automatic downloading of the selected risk model files from Northfield's servers.
- Right Mouse Button Context Menus

If you have any suggestions of what you would like to see covered in upcoming issues, please e-mail your ideas to staff@northinfo.com

For a complete index of all former Northfield News articles, visit <http://www.northinfo.com/documents/314.pdf>

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