

Risk Parity, Factor Investing and US DOL Regulation of Defined Contribution Retirement Plans



Dan diBartolomeo
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Motivation

- Regulators in numerous countries (USA, UK, Switzerland, etc.) have strengthened the fiduciary obligations on providers of financial services, whether they be an individual financial advisor, or a large asset management firm offering hundreds of mutual funds.
 - One of the most interesting requirements has been put forth by the US Department of Labor as part of the regulation of defined contribution retirement plans regarding the distinction between “open and closed platforms”.
 - For example, if a mutual fund group provides administration of defined contribution retirement accounts (e.g. 401K plans), it must either allow investors to invest in outside funds that are not managed by the fund group, or *be able to demonstrate that the range of internally managed funds offered is sufficient to meet all the needs of their investor clients.*
 - While legally binding only on retirement plans, this rule is having widespread impact on mutual fund marketing. We believe this issue has related implications for asset managers in many countries.

Introduction

- Northfield has been engaged by fund groups to assess their preparedness with respect to this regulatory issue. In carrying out these analyses, we have determined that two ideas play a critical role.
 - To the extent that these sorts of common properties exist across asset classes, we can also describe them in terms of common factor structure as described in diBartolomeo (2015).
 - The first concept is *asset allocation by risk parity*. For example, the return properties of a portfolio consisting of an investment in a long maturity bond fund, and a money market fund be closely replicated by holding a larger quantity of an intermediate maturity bond fund, and a smaller position in cash.
 - In this presentation, we will both illustrate the analytical methods we have employed to make determinations of “sufficiency” of a fund family to meet needs of investors as defined by the DOL regulation, and provide an intuitive understanding of the outcomes.

Misclassification

- Many retail mutual funds do not declare explicit benchmarks. To understand a fund's objectives investors must rely on the fund prospectus or by third party classifications (e.g. Morningstar, Lipper)
- Three published studies showed that funds not following stated objectives is widespread and often intentional.
 - diBartolomeo, Dan and Erik Witkowski. "Mutual Fund Misclassification: Evidence Based On Style Analysis," *Financial Analyst Journal*, 1997, v53(5,Sep/Oct), 32-43. This study showed that the economic cost to investors from lost diversification was in the \$Billions per annum.
 - Kim, Moon, Ravi Shukla and Michael Thomas. "Mutual Fund Objective Misclassification," *Journal of Economics and Business*, 2000, v52(4,Jul/Aug), 309-324.
 - Brown, Stephen J. and William N. Goetzmann. "Mutual Fund Styles," *Journal of Financial Economics*, 1997, v43(3,Mar), 373-399.
- A recent update of the Northfield study found that misclassification is still widespread, <http://www.northinfo.com/documents/718.pdf>.

Historic Correlation and the Lack Thereof

- Obviously, for a family of funds to offer investors sufficient diversification we should be able to show that the pairwise return correlations among the funds are not uniformly high and positive.
 - The sample was monthly returns for the entire period over which all funds of the fund group have been in existence.
 - The historical average of the pairwise correlations of return (off diagonal) across all the funds of the group was .34.
 - The maximum value of correlation was .97 indicating at least two of the funds had extremely similar behavior
 - The minimum value of correlation was -.24 indicating the potential for some fund combinations to demonstrate a “hedging effect” that would have been stronger than random diversification.

Ex-Ante Correlation Matrix

- Our next task was to produce an ex-ante correlation matrix for the funds in the subject fund group.
 - For this purpose, we used our Everything, Everywhere multi-asset class risk model in two processes.
 - The first is based on most recent holdings reported to Lipper.
 - The second is a returns based method, <http://www.northinfo.com/Documents/508.pdf>.
 - The resulting risk output is combined via Bayes's Theorem.
 - All retail funds available globally are evaluated monthly.
- For the same fund group described historically, the average of the ex-ante correlation estimates was .40
 - Minimum expectation of pairwise correlation was -.07
 - Maximum expectation of pairwise correlation .93
 - The “shrinking” of the extreme values should be intuitive

Efficient Frontier Analysis

- Under the concepts of Modern Portfolio Theory (Markowitz, 1952) investments can be combined into “efficient” portfolios.
 - An efficient portfolio is the portfolio which offers the highest expectation (not certainty) of return for a given level of perceived risk (expected portfolio volatility).
 - The purpose of the analysis is to determine whether combinations of funds of a particular fund family can be formed into portfolios that can be considered efficient for a wide range of investors.

The Strawman Efficient Frontier

- To begin the analysis, we selected a financial market benchmark index that we considered applicable to the investment mandate of each fund under study.
 - For completeness we also included some asset classes for which no corresponding fund existed (e.g. N + 4 benchmark indices for N funds)
 - To formulate the expected return for an asset class, we considered the historical return on the index over the sample period minus risk free return over the sample period, plus the current risk free yield.
 - The analysis was biased in favor of the index portfolios as no expenses were assumed.

The Fund Group Efficient Frontier

- To formulate the expected return for a subject fund, we took the return on the corresponding asset class index plus the Northfield PWER value (which may be positive or negative).
 - PWER is a Northfield statistical estimate of manager skill expressed as a “certainty-equivalent expectation of active return”
 - <http://www.northinfo.com/Documents/535.pdf>
 - It should be noted that the PWER values were positive on average (.21% per annum) for the subject funds, illustrative of likely management skill relative to peer funds.
 - The expectation of slightly positive alpha had the effect of balancing the “no expenses” head-start given to the index portfolio.

Comparing Frontiers

- For both the index portfolio frontier and the subject fund frontier, a set of 40 portfolios with matching tangency slopes were created.
 - Our task was now to determine if either of the frontiers was statistically significantly better for investors
 - Several papers provide statistical metrics to determine if one efficient frontier is sufficiently distinct from another. Jobson and Korkie (1981), Jobson (1991) and Ledoit (2008).
 - In some regions of the frontier, the index portfolios were slightly better, in others the fund portfolios were slightly better.
 - We could reject the hypothesis that either frontier offered investors the expectation of statistically significant advantage of one frontier over the other.
 - *In short, the fund efficient frontier was “close enough”*

A Pleasing But Perhaps Unintuitive Result

- When presented with our study, fund group executives were pleasantly *surprised* at the outcome. How could it be that a group of N funds could offer retirement investors a full spanning of the efficient frontier formed from N + 4 carefully chosen indices?
 - It could not have been our crediting of the PWER values to expected fund returns as the magnitude was less than the average expense ratio of the subject funds
- We attribute the “virtual tie” to two issues.
 - The first is the influence of common factors which pervade all asset classes.
 - The second is the “risk parity” benefit which arises when we assume that markets are incomplete.

Factors Spanning Multiple Asset Classes

- It should be obvious that a long list of macroeconomic risks pervade *the returns associated with all financial assets to a lesser or greater degree*. Arbitrage Pricing Theory (Ross, 1970).
 - Interest rates
 - Exchange rates
 - Expectations of volatility
 - Investor confidence
 - Expectations of economic activity
- During the GFC, macro considerations dominated the behavior of financial markets both liquid and illiquid, as discussed in diBartolomeo (2015), <http://www.northinfo.com/Documents/543.pdf>.
- If two sets of investments span the same ranges of factor exposures, *their efficient frontiers will be almost the same, irrespective of the number of available investments*.

Introduction to Risk Parity

- Risk parity is one of several asset allocation strategies that do not require explicit forecasts of asset class returns
 - There are still return forecasts involved, **they are just implicit in the portfolio formation procedure**
- Qian (2011) describes risk parity allocation as “capturing risk premiums from a risk diversified portfolio”
- Other allocation approaches without return forecasts
 - Equal Weighted
 - Global Minimum Variance
 - Most Diversified
- Risk parity formally (**subject to leverage constraint**)

$$W_i\beta_i = W_j\beta_j = 1/N$$

Literature on Risk Parity Allocation

- Two basic industry pieces from consultants
 - Allen (Callan, February 2010)
 - Foresti and Rush (Wilshire, February 2010)
- A good overview of risk based allocation strategies
 - Lee (*Journal of Portfolio Management*, Summer 2011)
- Empirical analysis of risk based strategies
 - Bhansali (*Journal of Investing*, Spring 2011)
- The most practical Powerpoint
 - Qian (2011)
 - <http://www.northinfo.com/documents/458.pdf>

Risk Parity Basics

- Most of the risk in investor portfolios comes from high risk assets (e.g. equities)
 - Depending on calculation method, 90% or more of the risk of a typical 60/40 portfolio comes from equities
- Empirically observed Sharpe ratios are higher for low risk assets than high risk assets
 - Low risk equities are better than high risk equities
 - Bonds are better than equities
 - Illiquid asset classes *look really good*
- Restructure asset allocations so that an equal (*or more*) amount of the risk comes from low risk assets
 - Normally requires the *use of leverage* with some asset classes

Estimation Error and Implicit Leverage

- In forming our efficient frontiers, the 40 portfolios on each of the two frontiers for the same tangency slope often had widely different constituent weights.
 - Given that our parameters for forming efficient frontiers are estimates of unknown future events, there is wide evidence that many different portfolios can be formed to which an investor would be statistically indifferent. See Broadie (1993), Gold (1995) and Michaud (1998).
 - Lochoff (JPM, 1998), <http://www.northinfo.com/Documents/130.pdf> shows that long maturity Treasury bonds persistently underperform a *risk equivalent position* created by leveraging short maturity Treasury bonds.
 - For example, an intermediate maturity bond portfolio would be a good substitute for a combination of a money market fund and a long maturity bond portfolio.

Evidence of Incomplete Markets

- In theory, if markets were wholly efficient all asset classes should offer the same Sharpe ratio
 - In the real world where leverage is not infinite, liquidity is not infinite, taxes are not zero, there is no reason for this to be true.
 - The segmentation of markets allows investors with different preferences to be the marginal investors in different assets.
 - Conservative investors have steep tangency slopes demanding large incremental returns per unit of risk. They tend to hold less volatile investments.
 - Aggressive investors have flatter tangency slopes demanding smaller incremental returns per unit of risk. They tend to hold more volatile investments.
 - If leverage is available (explicit or implicit), leveraging a low risk investment to “risk parity” with a volatile investment wins.

Conclusions

- Increased regulation of asset managers is placing fund management companies under additional scrutiny as fiduciaries. Regulators want to insure that fund company platforms allow investors a full range of acceptable investment options.
- While no explicit standards exist, there is a wealth of industry research suggesting how the hypothesis that a given fund family does or does not offer that full range of investment choices may be tested and illustrated.
- A key finding of our consulting studies to date is that a fund family need not have a fund of every conceivable kind in order to fulfill the idea of a full range of investment opportunities.
- The concepts of factor investing, estimation error, implicit leverage and particularly risk parity all play a part in showing how a frontier formed from N asset classes can span the same frontier as a larger set of asset classes or investment objectives.