Ideas @ Edelweiss Multi Strategy Funds – Generalised Optimisation

The classic mean variance optimization as laid out by Markowitz states that the vector of optimal weights equals (1/lambda) x Sigma^-1 x mu where lambda is the investor's risk aversion, sigma is the covariance matrix of asset returns and mu is a vector of asset expected returns. One of the valid criticisms of mean-variance optimization is that it does not account for higher moments in asset returns - the so called crash risk or for other risk factors that are not captured by asset means and variances. In this month's Ideas @ Edelweiss Multi Strategy Funds we look at ways in which Markowitz original framework can be extended to incorporate other risk factors.

One way to do this would be to introduce constraints on portfolio leverage, liquidity and fundamental characteristics. However, that often has the undesired effect of destroying solutions because a constraint is a boundary condition that kicks in at a particular point. Take the example of a constraint on portfolio leverage = 2x. At a leverage of 1.9999x there is no impact of the constraint, but at 2x the constraint all of a sudden kicks in even though the two scenarios are not very different. A smarter solution would be to incorporate all constraints into the optimization function itself as penalty just like the original Markowitz function uses variance as a penalty on expected returns. For example, a constraint on leverage would look like w'w; a constraint on liquidity would look like w'D where D is a vector of volume estimates and a constraint on valuation would look like w'V where V is a vector of earnings yields or some other user defined valuation metric. The downside of the penalty approach is the calibration of more aversion parameters but the upside is a smoother more economically intuitive portfolio and optimization surface.

Authors like Jacobs & Levy have already written about leverage aversion and we owe a debt to them for their fundamental contribution. Our formulation is a generalization of mean-variance optimization that can be applied to any portfolio characteristic that is undesirable and could lead to interesting future areas of research.