Diversification effects of asset price process parameters – an empirical investigation

Extended abstract

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Higher moments of asset price distributions – especially skewness – have long been recognized as important characteristics in asset pricing and portfolio management. The three-moment capital asset pricing model (3M CAPM) considers skewness in addition to mean and variance, the final asset pricing equation containing the linear factor gamma that describes standardized co-skewness. In an asset management context the assumption of a general preference for positive skewness leads to different efficient sets and portfolio choice.

A less well known fact is the diversification behavior of skewness when several assets are blended in a portfolio. It repeatedly has been found that skewness is not “diversified away” even in large portfolios. In some studies the market portfolio even shows a higher negative skewness than most of the individual asset. Therefore, the expectation of a general diversification benefit for asset characteristics other than variance is misleading. Unwanted portfolio characteristics may even accumulate on the portfolio level.

In our study we investigate the diversification effects of a broad set of asset characteristics in a systematic way. The starting point is the description of asset price behavior as parameterized stochastic processes using a rich set of parameters. We follow the two-step approach frequently used in financial risk management: firstly we estimate the time varying volatility by a GARCH-type model; then, we capture the remaining characteristics by fitting a parameterized probability distribution to the standardized returns. For the latter we use the family of NIG distributions. This provides a set of seven to eight parameters that detailed but systematically describe the asset characteristics. This estimation approach is applied to a broad data set of daily returns of German large and small cap stocks.

In order to study diversification effects we systematically select assets showing distinctive parameter levels and analyze the historical price processes of buy-and-hold-portfolios. We also study the behavior of portfolios created by the aggregation of simulated single asset portfolio returns. The results confirm the observation of non-diversification effects with respect to skewness. Additionally we find interesting and systematic effects on other parameters that give new insights into the behavior of stock returns on an aggregated level.