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PORTFOLIO MANAGEMENT

Time Diversification and Estimation Risk

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Abstract

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We analyzed whether mean-variance-efficient portfolio weights for stocks and bills vary significantly with the investment horizon for a buy-and-hold strategy. In this analysis, we kept the risk price, the slope of the efficient frontier, constant while varying the investment horizon from 1 year to 5 years to 10 years. The data were real U.S. return data from 1900 to 1997 for a well-diversified stock portfolio and a short-term, nominally risk-free rate.

We presupposed that investors form optimal investment strategies based only on historical estimates of the following parameters or inputs to the optimization problem—means, variances, and covariances. The model we used is an unconditional model in the sense that agents do not explicitly try to model any possible time-series relationships among the assets. We implicitly accounted for any possible time dependencies in the observed return-generating processes, however, by resampling a great number of return series from the original data through the use of a computer-intensive method called "bootstrapping." In particular, we used a nonparametric moving block bootstrap with a block length of 60 months in which serial dependence and cross-sectional correlation were preserved within the blocks. The real bonus of the bootstrap approach is the possibility of generating empirical distributions of optimal weights. Thus, we could not only analyze the existence of time diversification but could also test whether time diversification is significant in a statistical sense (i.e., if significant statistical differences exist between the optimal weights for different investm

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for certain investment horizons, the return-generating process for stocks is mean reverting and/or the process for bills is positively autocorrelated. Because the return spread between stocks and bills is almost constant over the investment horizons, the change in portfolio weights might stem from the fact that with longer investment horizons, the standard deviation for stocks falls whereas the standard deviation for bills increases.

Our evidence supports the existence of time diversification: The weights for stock in efficient portfolios are significantly higher for long investment horizons than for a one-year horizon.

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