UNIVERSITY OF PENNSYLVANIA
The Wharton School

Investments   Project 1: Diversification
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Goal: Use the Wharton Portfolio Backtester (available via Canvas) to explore diversification effects and the role of market capitalization in those effects.

Computation: For the ten-year period from the end of December 2006 through the end of December 2016, compute the monthly returns on each of three portfolios of stocks selected from NYSE/AMEX/NASDAQ. Have each portfolio contain N stocks, selected randomly from the bottom (portfolio 1), middle (portfolio 2), and top (portfolio 3) third of all stocks sorted by market capitalization at the end of each year. Rebalance each portfolio quarterly to re-establish equal weights across the stocks in the portfolio. Use the monthly returns to compute the

   (a) arithmetic mean return of each portfolio
   (b) standard deviation of return of each portfolio
   (c) geometric mean return of each portfolio
   (d) correlations between the portfolio returns

Repeat the above for N=1, 2, 4, 10, 20, 30, 40, 70, 100. As you move to each value of N, retain the securities selected for the previous (lower) N value and simply add additional stocks to construct the new portfolio. (Backtester does that automatically when you either Edit or Copy a previous run.)

Repeat the above for two earlier ten-year periods: Dec. 1986–Dec. 1996 and Dec. 1996–Dec. 2006.

Analysis:

   1. Describe the general effects of diversification on (a), (b), and (c). Can you approximate these effects by simple formulas or "rules of thumb"?
   2. What role does market capitalization play in these effects?
   3. Are there common patterns that you would expect to repeat in additional periods?
   4. How does diversification affect the correlations between the portfolios? Provide a simple model/explanation that can account for the pattern you observe.