MIS 381N Stochastic Control and Optimization: Project 2

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Similarity Metric

Given the information available is **price per share** and **number of outstanding shares** on each transaction day in 2012, we decided to define the similarity metric using market capitalization of each stock. We consider that price volatility for companies with different sizes (market caps) would be different (i.e. stock price for companies with smaller market cap might be more volitile). Therefore, by calculating similarity of market caps and use it to construct a portfolio of stocks in different sizes, we could diversify the risk of investment.

Hence, we first calculated the market capitalization for each stock on each transaction day, that is on a given date for stock i

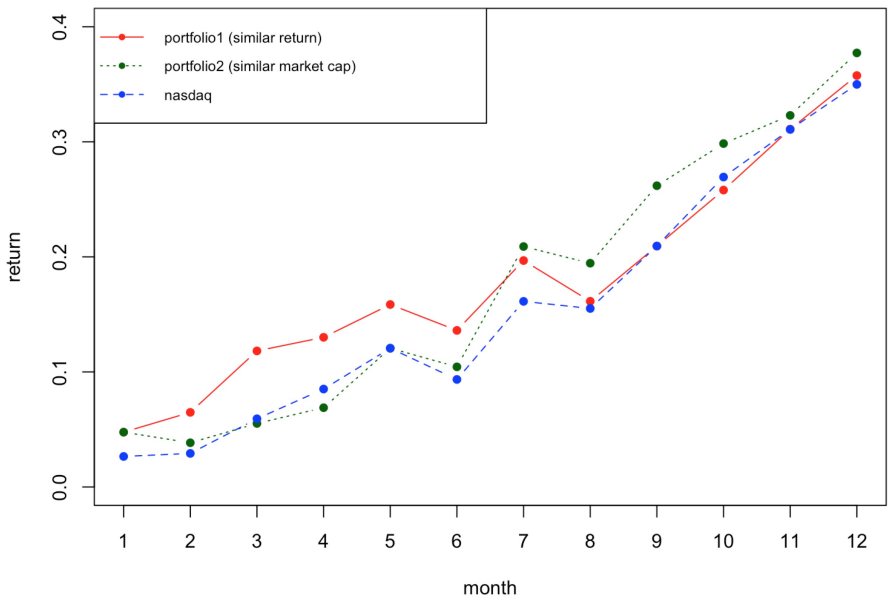
$$\text{market cap}_i = \text{price per share}_i \times \text{number of outstanding shares}_i$$

Then, we calculated the correlation between the market caps of stocks and use it as the similarity between each pair of stocks, that is for each pair of stock i and j,

$$\rho_{ij} = corr(\text{market caps}_i, \text{market caps}_j)$$

Comparing Returns

Returns in portfolios using two different similarity metric (daily returns vs. market caps) and NASDAQ 100 are plotted below (exact values can be find in the table at the end).



We can see that portfolio 1 out-performs portfolio 2 and NASDAQ 100 during first six months of 2013. However, in the second half of the year, portfolio 2 yields higher returns than the other two.

To summarize, portfolio 1 is a relatively "safe" investment, which consists of stocks with different returns. Hence it diversifies the risk during down-times but absorbs potential high returns during up-times.Portfolio 2 is a relatively "aggressive" investment, which consists of stocks with different sizes. Hence it performs similar to NASDAQ during down-times but out-performs the other investments during up-times.

Month	NASDAQ 100	Portfolio 1	Portfolio 2
Jan	0.02653	0.0476	0.0477
Feb	0.0292	0.0649	0.0384
Mar	0.0593	0.1183	0.0552
Apr	0.0851	0.1301	0.0689
May	0.1206	0.1586	0.1206
Jun	0.0935	0.1361	0.1044
Jul	0.1613	0.1968	0.2090
Aug	0.1552	0.1614	0.1945
Sep	0.2094	0.2094	0.2618
Oct	0.2694	0.2581	0.2985
Nov	0.3108	0.3110	0.3230
Dec	0.3499	0.3576	0.3773