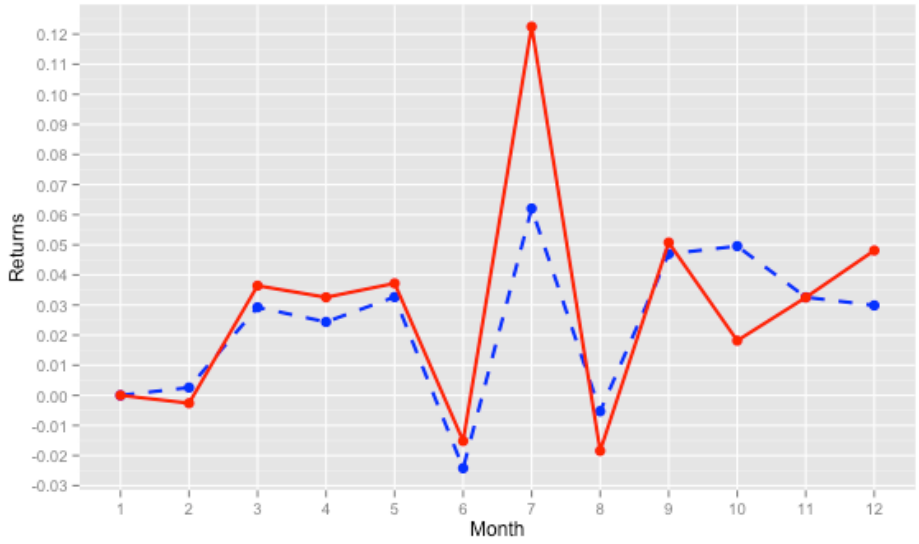
**STA 372-6 Project 2: Index Tracking**

Evan Johnston, Alyjan Data, Albert Mata, Alexander Blasig

Description of Similarity Matrix:

We chose to use the $R^2$ of the given price vector of the 100 stocks in place of a correlations matrix. We thought this to be a better similarity measure as the $R^2$ considers the variance of each stock compared to each other stock rather than just a simple proportion. By considering the variance as well as the relationship among all stocks the $R^2$ may be a better predictor of similarity between the variables, each stock i,j.

Figure 1: Graph of the returns for the NASDAQ 100 and portfolio with the correlations in the similarity matrix




Note: *The blue dashed line indicates the NASDAQ 100 performance, while the red line indicates the performance of the correlations similarity fund.*

Figure 2: Data frame of above returns

```
> #Dataframe with our returns of NASDAQ vs those of the correlation fund.
> fund1
      returns_N portfolio_return1 month
1   0.000000000       0.000000000     1
2   0.002580971      -0.002605184     2
3   0.029252386       0.036421948     3
4   0.024390763       0.032569407     4
5   0.032665614       0.037205094     5
6  -0.024200472      -0.015160124     6
7   0.062066951       0.122468528     7
8  -0.005300645      -0.018433857     8
9   0.046974276       0.050756477     9
10  0.049571189       0.018181218    10
11  0.032592895       0.032523881    11
12  0.029869661       0.048123134    12
```

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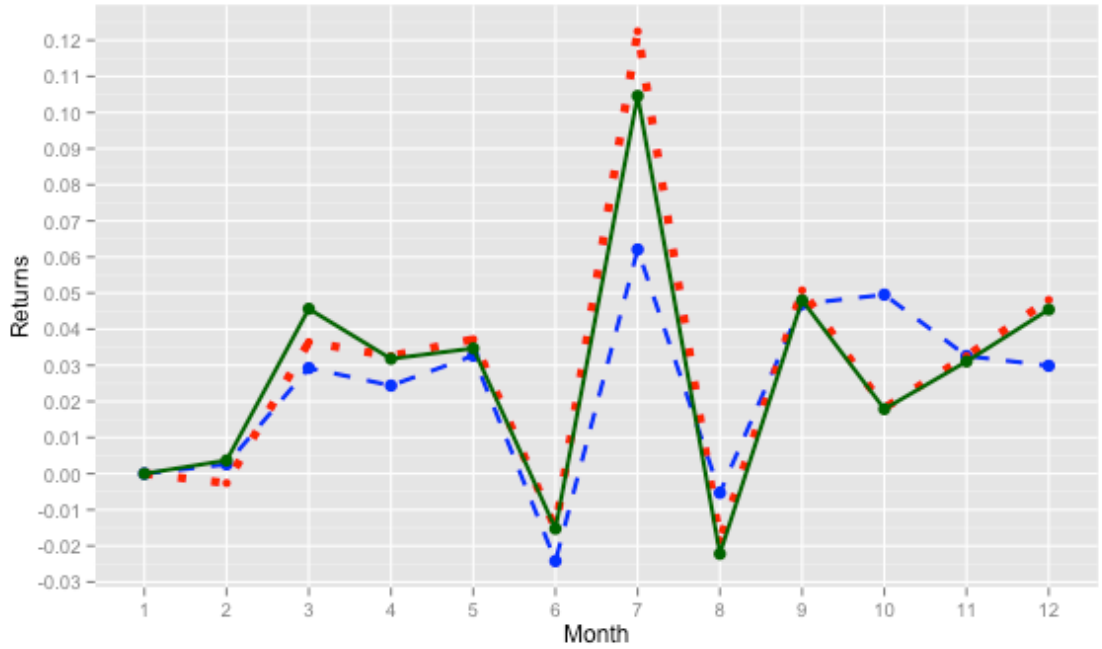
Figure 3: Graph of the returns for the NASDAQ 100 and portfolio with the $R^2$ in the similarity matrix




Note: *The blue dashed line indicates the NASDAQ 100, the red dotted line the correlations similarity matrix, and the green line the $R^2$ similarity matrix performance as an index fund.*

Figure 4: Data frame of above returns

```
> #Dataframe with NASDAQ, correlations matrix, and r-squared matrix returns
> fund2
      returns_N portfolio_return1 portfolio_return2 month
1   0.000000000       0.000000000       0.000000000     1
2   0.002580971      -0.002605184       0.003677262     2
3   0.029252386       0.036421948       0.045649767     3
4   0.024390763       0.032569407       0.031810741     4
5   0.032665614       0.037205094       0.034702940     5
6  -0.024200472      -0.015160124      -0.015234598     6
7   0.062066951       0.122468528       0.104597855     7
8  -0.005300645      -0.018433857      -0.022206133     8
9   0.046974276       0.050756477       0.048020411     9
10  0.049571189       0.018181218       0.017897698    10
11  0.032592895       0.032523881       0.031059612    11
12  0.029869661       0.048123134       0.045442684    12
```