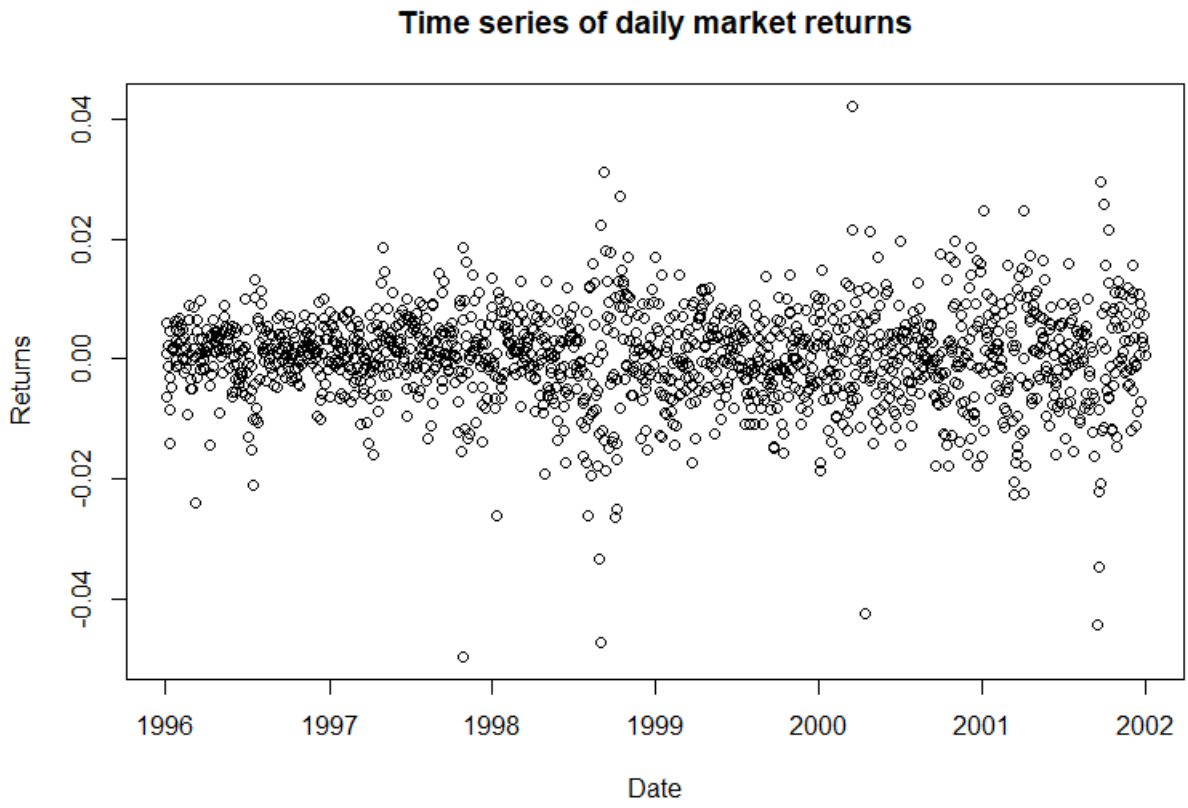
Project B

Dan Barnes | Eric Walpert | James Patteson

Question 1: Strategy Simulation

a)



b) The annualized mean return of the strategy is 217%, compared to the market average of 6.16%. The volatility of our strategy is 27.8%, compared to the market average of 16.4%. The Sharpe ratio (assuming a risk free rate of 0% as the portfolio is self-funded) of our strategy is 7.8, compared to the market average of 0.4.

c) The returns of the portfolio using our strategy are more stationary than the market returns, and are generally consistent over time. When regressing our model's returns against the date, a p-value of .004 indicates the model is stationary. There are more largely positive outlier events than there are largely negative events.

d) There are a handful of outlier events—about one per year. These occur infrequently enough that they don't have much of an impact on the overall model. These events are also positive results, so they only serve to enhance the model's results. In terms of stocks, Bioamerica, Elec Communications, Rand Capital, Hanover Direct, Nature Vision, Research Inc, and Orbit International fluctuate the most in terms of the

standard deviation of their returns, but they only have standard deviations of about 0.075-0.085. What we would expect to throw our model off more would be large jumps in one direction, preceded by rises or falls in the same direction the previous day, because our model would try to compensate for that in the opposite direction. But what we see is that interestingly, the top ten stocks that have the largest standard deviations actually have fewer "momentum events" than the stocks with the lowest standard deviations. In the time period we track, the stocks with large standard deviations continue moving in the same direction 2+ days in a row about 20-25% of the time, compared to 30-40% of the time for stocks with lower standard deviations. It's possible that there are some individual stocks that are consistently trending upwards or downwards for a long period in a row, but these stocks do not appear as outliers in the ways we would look for them, and it appears that there is enough randomness in the overall portfolio to compensate for any individual stock's abnormal performance.

e) The correlation between the market average and our strategy is 11.56%. While certainly low, this relationship indicates there is still some correlation between our strategy and the market, which is more consistent with a dollar-neutral strategy than a perfectly market-neutral strategy.
f) There is a correlation of 86.3% between the long and short sub-portfolios (assuming we are not weighting either of the sub-portfolios, and instead are simply comparing the performance of the underlying stocks).
g) Besides ignoring the realities of transaction costs and market impact, our strategy does not assume a very realistic simulation because we are assuming we can get the first trade in at the beginning of each day before the market has moved at all. For our model to succeed, we have to believe that our trade will be the first to go through at the beginning of the next day, before each stock regresses to the mean due to other trading activity. The actual returns would still likely *track* the expected returns (still assuming no transaction costs), but they will likely not be as large as expected. In terms of data integrity, M&A or bankruptcy declarations need to be monitored closely. For example, if our model automatically takes a strong long position on a stock the day after that company declared bankruptcy (and its stock tanked), our returns would be severely hurt. Conversely, if a company's stock just rose because of a positively-received acquisition announcement, it's unlikely the stock will drop significantly by the next day.

Question 2: Strategy R&D

Our second strategy is based on momentum trading - effectively, it maintains dollar neutrality, but allocates the long positions amongst stocks that have had positive returns for at least 2 days in a row, and the short positions amongst stocks that have had negative returns for at least 2 days in a row.

The financial logic behind this idea is predicated on the idea that stocks that do well, tend to do well over consistently long periods of time and vice versa. However, our strategy does not play

out well in the data. Our average daily return is -0.3%, or -75.6% annually. Thus, were to allocate our hypothetical $10,000, we would likely choose to allocate it entirely to the first strategy. As a result, the strategy clearly does not achieve the desired result.

Question 3: A Family of Strategies

a) Below is a table showing the annualized mean return, volatility and Sharpe ratios for scenarios k = 1 to k = 10. Note that by changing k, we are maintaining the same weights we calculated in Question 1, but shifting them by one day. For instance, the weights used for 1/3/1996 for k = 1 will be used for 1/4/1996 for k = 2:

k	Mean Annualized Return	Mean Annualized Volatility	Sharpe Ratio
1	217.5%	27.8%	7.82
2	47.6%	19.7%	2.42
3	19.1%	19.1%	1.00
4	12.8%	17.3%	0.74
5	2.3%	17.5%	0.13
6	22.9%	17.8%	1.29
7	-0.5%	16.1%	-0.03
8	12.2%	16.1%	0.76
9	5.7%	16.7%	0.34
10	1.7%	16.1%	0.11

Based on the table, we can see that returns broadly go down with increasing lag, although not in linear fashion. This appears to suggest that market overreactions are resolved within about one week of trading, with returns closer to the market average observed after that point. We see from the sharpe ratios that the risk-adjusted returns are also optimal with a lower value of k. While the sharpe ratios at k = 1 (7.82), k = 2 (2.42) and k = 3 (1.00) are attractive relative to the market average sharpe ratio of 0.4, there is less predictability in the sharpe ratio after k = 3. With this in mind, k = 1 is the optimal lag for this strategy, where k = 2 would be the next best option.

b) See uploaded flat file in part d.
c) See uploaded flat file in part d.
d) See uploaded flat file.
e) See uploaded flat file in part d.
f) See uploaded flat file in part d.