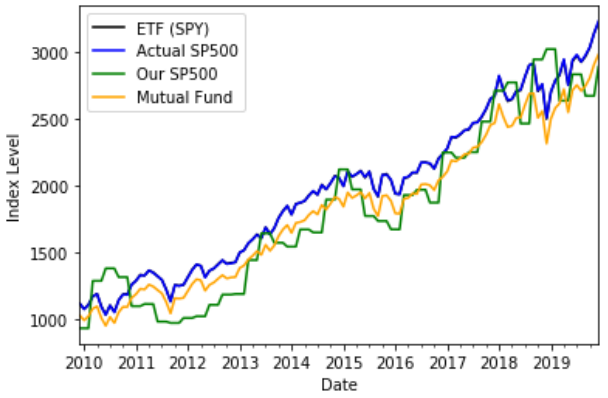
Pete Davis – pmd734 (Worked With**:** Shan Ali, Dylan Nikol, Matthew Streichler, David Cruz)

Assignment 1: Index Replication

SP500 Replication: First, we needed to replicate the SP500 index. We had to extract data from WRDS. We used all data from CRSP, specifying the exchange codes (EXCHCD) 1-3, only including stocks traded on the NYSE, AMEX, and NASDAQ. From this list of stocks, we adjusted the price and the shares, accounting for splits. We grouped the stock information by month, reconstituting our index yearly, only including the stocks with a market cap that falls in the top 505 of sorted market caps. We rebalanced the index quarterly, recalculating the weights for each stock by dividing the market cap of an individual stock by the sum of all 505 market caps that would contribute to our index value. We then had to group the index value by date, summing the weighted index value (cap weight * adjusted price) of each stock on that date. We found the annual return, standard deviation, and sharpe ratio of the replicated portfolio's index value. We compared these metrics with those of the actual SP500, an ETF (SPY), and a mutual fund (VFIAX). The comparison of the metrics, the correlation matrix for the index values, and the plot of the trajectory of each index value since 2009 are pictured on the right. The SPY and the SP500 perfectly overlap in the plot, so that is why the ETF does not appear. Our replicated index had a highest return, highest standard deviation, and lowest sharpe ratio of the funds. The index value had a correlation of over .95 with the other funds.

	return	sd	sharpe
My SP500	0.145297	0.222691	0.562649
Mutual Fund	0.144832	0.124058	1.006236
Actual SP500	0.121668	0.124094	0.819283
SPY (ETF)	0.120438	0.124805	0.804758

	My S&P 500	Mutual Fund (VFIAX)	Actual S&P 500	ETF (SPY)
My S&P 500	1.000000	0.954931	0.954969	0.954747
Mutual Fund (VFIAX)	0.954931	1.000000	0.999986	0.999997
Actual S&P 500	0.954969	0.999986	1.000000	0.999985
ETF (SPY)	0.954747	0.999997	0.999985	1.000000



DJIA Replication: Next, we needed to replicate the DJIA index. We extracted data of all the companies that have been in the DJIA over the last decade. We grouped the stock information by month, reconstituting our index yearly, only included stocks with price in the top 30 of price-sorted stocks in each month. We rebalanced the index quarterly, recalculating the weights for each stock by dividing the price of an individual stock by the sum of all 30 stocks that would contribute to our index value. We then had to group the index value by date, summing the price of each stock on that date. We found the annual return, standard deviation, and sharpe ratio of the replicated portfolio's index value. We compared these metrics with those of the actual DJIA, an ETF (DIA), and a mutual fund (RYDHX). The comparison of the metrics, the correlation matrix for the index values, and the plot of the trajectory of each index value since 2009 are pictured on the right. The DIA and the DJIA perfectly overlap in the plot, so that is why the ETF does not appear. Also, the RYDHX was originated in 2015, so that is why the data starts in the middle of the plot. Our replicated index had a slightly lower return, slightly higher standard deviation, and lower sharpe than that of its counterparts. However, the index value had a correlation of over .96 with each of the other funds.

	return	sd	sharpe
Our DJIA	0.100301	0.126463	0.634979
Actual DJIA	0.113861	0.120673	0.777812
ETF	0.114020	0.121036	0.776788
Mutual	0.145314	0.116831	1.072608

	My DJIA	Mutual Fund (rydhx)	Actual DJIA	ETF (DIA)
My DJIA	1.000000	0.963118	0.985508	0.985264
Mutual Fund (rydhx)	0.963118	1.000000	0.996317	0.996351
Actual DJIA	0.985508	0.996317	1.000000	0.999995
ETF (DIA)	0.985264	0.996351	0.999995	1.000000