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Index Replication Report

In this assignment, we successfully created a portfolio that tracks the returns of the Dow Industrial Average by reconstituting security membership annually and reweighting quarterly. However, since we worked with real-world data from WRDS, we encountered several ambiguities that required assumptions. We chose to annually reconstitute the membership of our fund on October 1st because this date was after all index changes occurred each year and was as close to the changes as possible. Another key assumption was that rebalancing occurs on the first day of every quarter with the weights for that day, rather than looking backwards to a day from the previous quarter to get weights.

Overall, the basic procedure was as follows. First, we found the stocks that at one point or another were in the Dow during our time frame. Next, we got the adjusted returns for only these stocks when they were in the Dow and got their corresponding weights for each quarter. Finally, the weighted returns were aggregated to get our portfolio return for each day, which was then compared against relative indices.

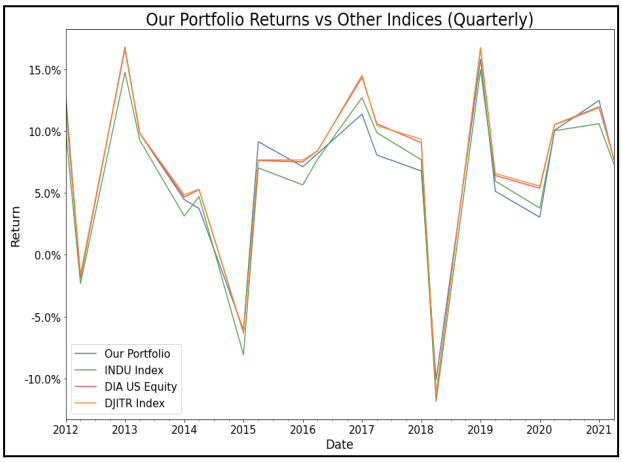

Figure 1: Our Portfolio Returns vs. Relevant Indices

	Our Portfolio	DJITR Index	DIA US Equity	INDU Index
Mean Return	0.0535%	0.0584%	0.0577%	0.0489%
Standard Deviation	1.0628%	1.0507%	1.0445%	1.0508%
Tracking Error	-	0.0959%	0.1044%	0.0982%
R Squared	-	0.9919	0.9905	0.9915
Standard Error of Regression	-	0.0958%	0.1037%	0.0980%

Figure 2: Metric Analysis of Tracking Performance

To analyze the performance of our index replicating portfolio, we plotted our portfolio returns against the relevant indices (JITR Index, DIA US Equity, INDU Index) to visualize their comovement. To analyze our performance further, we looked at the five metrics detailed in **Figure 2**. Looking first at the mean and standard deviation of our portfolio returns compared to the 3 indices, we see our portfolio tracks closely in these measures (roughly 0.05% and 1.05%, respectively). Looking next at tracking error, the standard deviation of the differences between our portfolio and each of the indices, we get measures around one tenth of a percent (0.1%), which indicates that our fund closely tracks the Dow.

Lastly, we fit 3 linear regression models with our portfolio returns as the regressor and each of the 3 index returns as the dependent variable. We obtained R^2 values in excess of 0.99, indicating that more than 99% of the variation in the indices' returns was explained by our portfolio's returns. The standard error of the regression (SER) of each linear model closely resembles the respective tracking errors as each remains around 0.1%. This metric represents the average distance between observed values and the regression line. The extremely low values confirm that our portfolio returns predict the other indices' returns with a very high degree of accuracy.