**Kendrick Winata**

**QF600 – Asset Pricing**

**Homework 4**

Part 1: Minimum-Tracking-Error Frontier

Plot the minimum-tracking-error frontier generated by the ten industry portfolios. This graph must have expected (monthly) return deviation on the vertical axis vs (monthly) tracking error on the horizontal axis. This graph must cover the range from 0% to 0.1% on the vertical axis, in increments of 0.005% (or less). Also plot the line starting from the origin that is tangent to the upper half of the minimum-tracking-error frontier.

A graph with a line and a red line

Description automatically generated with medium confidence

Calculate the information ratio and portfolio weights for the "tangency" portfolio.

**Information ratio = 0.452487539619932**

A table of numbers and symbols

Description automatically generated

Part 2: Minimum-Variance Frontier w/o Short Sales

* Plot the data points with mean return on the vertical axis vs standard deviation of return on the horizontal axis. -> With normalized **w**

A graph with blue dots

Description automatically generated

* Plot the new data points (on a separate graph) with mean return on the vertical axis vs standard deviation of return on the horizontal axis -> With normalized **1/w**
* A graph showing a blue arrow

  Description automatically generated with medium confidence