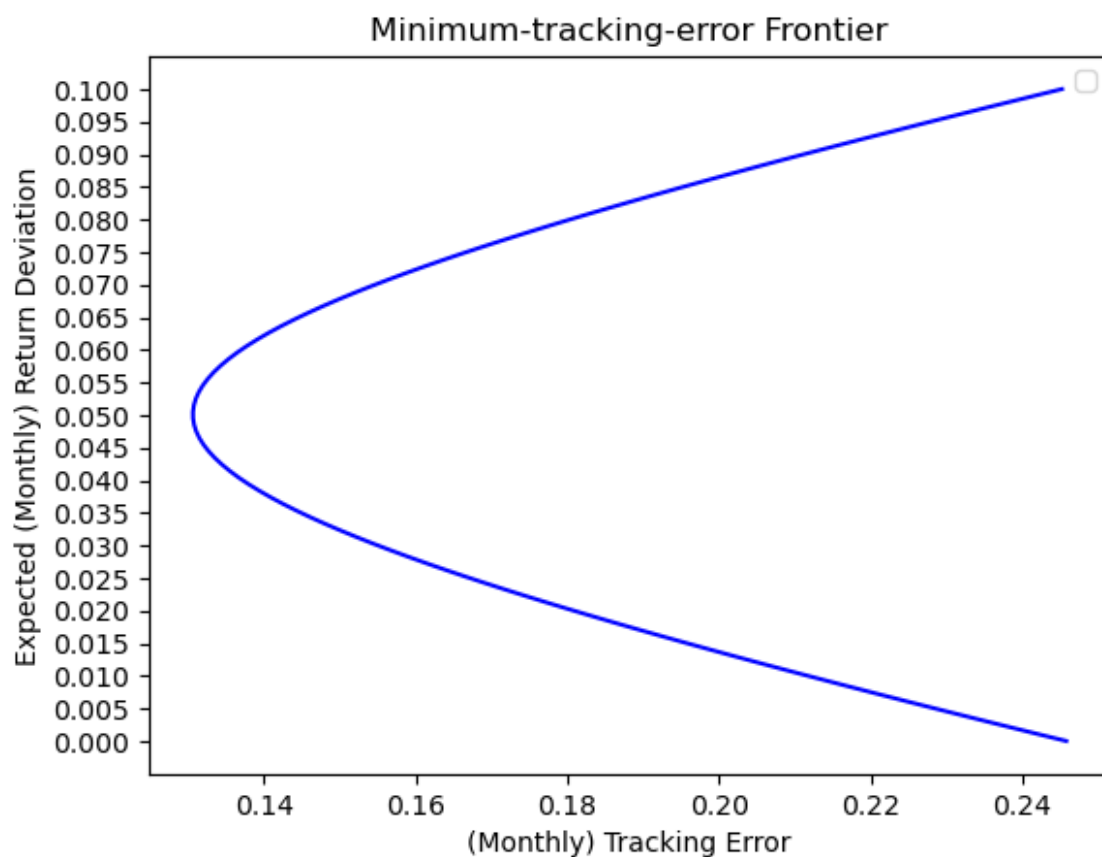# 1.Part 1: Minimum-Tracking-Error Frontier

## 1.1.Plot the minimum-tracking-error frontier generated by the ten industry portfolios.

In [8]:

```
No artists with labels found to put in legend.  Note that artists whose l
abel start with an underscore are ignored when legend() is called with no
argument.
```

## 1.2.Also plot the line starting from the origin that is tangent to the upper half of the minimum-tracking-error frontier.

In [9]:

```
No artists with labels found to put in legend.  Note that artists whose l
abel start with an underscore are ignored when legend() is called with no
argument.
```



Minimum-tracking-error Frontier
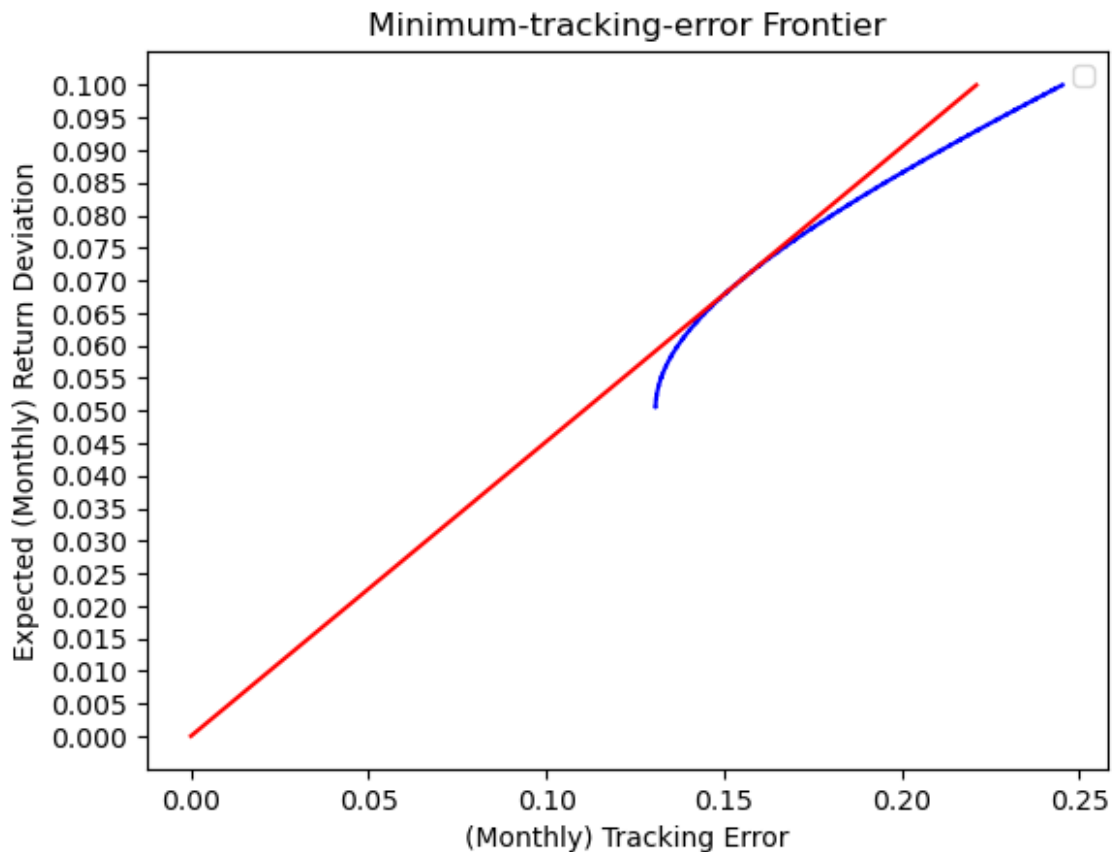
## 1.3.Calculate the information ratio and portfolio weights for the "tangency" portfolio.

In [11]:

Out[11]:  0.4524875396199334

In [87]:

Out[87]:
```
NoDur-Rm    0.052634
Durbl-Rm    0.000153
Manuf-Rm    0.137627
Enrgy-Rm    0.087032
HiTec-Rm    0.179353
Telcm-Rm    0.071074
Shops-Rm    0.106884
Hlth-Rm     0.102776
Utils-Rm    0.040162
Other-Rm    0.222304
dtype: float64
```

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

### 2.1.Plot the data points with mean return on the vertical axis vs standard deviation of return on the horizontal axis.

In [159]:
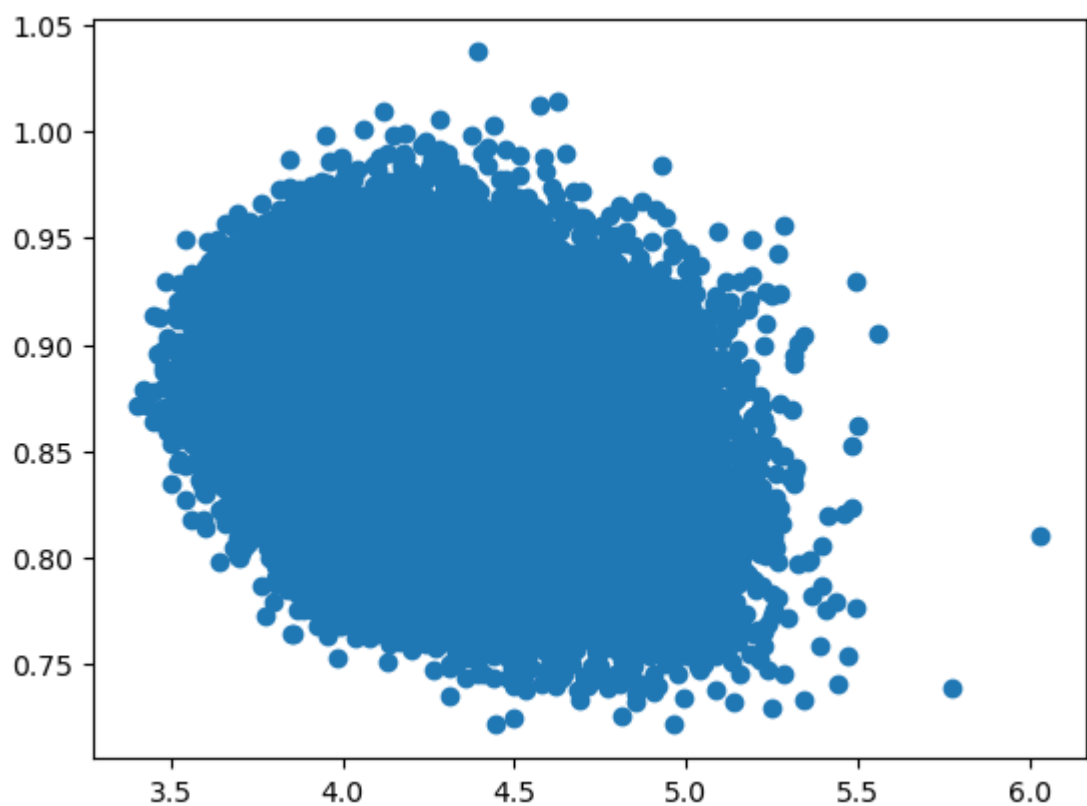
## 2.2.Plot the new data points (on a separate graph) with mean return on the vertical axis vs standard deviation of return on the horizontal axis.

In [171]: