[](http://www.stuart.iit.edu/)

VPM (MSF 504)

Homework 2: Due MARCH 2

***Place your names in alphabetical order (by last name). I want a hardcopy turned in at the beginning of class on February 25.***

**HW 2 DATA S19.xlsx** contains 60 monthly returns presented in percent: 2.32 a return of 0.0232 in decimal form. So, a $1 investment grew to $1.0232 over the month. There are 5 monthly industry return series on the spreadsheet, along with the monthly returns for the market excess return, SMB, HML and on risk-free Treasury bills:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cnsmr | Manuf | HiTec | Hlth | Other |  |

Data comes from Ken French’s website: <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html>.

1. Use the data of monthly returns for the five industries, and one market index, in the Excel sheet **HW 2 DATA S18.xlsx** and estimate the

1. Sample arithmetic mean **excess return** for each industry
2. Sample standard deviation (that is, volatility) of monthly **excess returns** for each industry
3. Annualized Sharpe Ratio of excess returns for each industry.

2. Create a covariance matrix of monthly returns for the five industries. Discuss how you estimated the covariance matrix?

3. Estimate and report the bmkt, bsize, and bhml betas for each industry using the Fama-French 3-factor model.

4. Create of covariance matrix using the factor betas for off-diagnoal values, and industry variances on the diagonal.

5. Compare the minimum variance portfolios using the covariance matrix found in part (2), and the 3-factor covariance matrix found in part (4).