**Markets**

Quantitative Section

Data – 1yr Daily Returns for 100 stocks and a Market Index in StockReturns.csv and IndexReturns.csv. A Price, MarketCap ($MM), SharesOutstanding(MM), EPS and Factor Z-Score for each stock is provided in StockData.csv.

Calculation to be performed in Python, present all results formatted in a PDF or Excel. Please provide your python script.

1. What is the annualized return, volatility, Sharpe Ratio, P/E Ratio, and the Factor loading Z-Score of an Equal, MarketCap and Volatility weighted portfolio of the 100 stocks? (*Assume that MarketCap and Volatility are held constant as of the beginning of the stock return period for portfolio weight calculations.)*
2. What is the beta, correlation and annualized tracking error of each of the 3 portfolios constructed in (1) to the provided market index?
3. Consider the following formula: Expected Return (Er) = Stock Beta(b) \* (Market Index Return(Mr) – Risk Free Rate(Rf)). Given an Rf = 2%, using the data provided calculate each stock’s beta and plot the security market line vs each stock’s realized return in one chart.
4. Using the results from (3) what are the top 5 best/worst performing stocks relative to their Expected Returns.
5. Using your results from 3), calculate the residual volatility of each stock, where residual volatility is the volatility of each stock’s returns residualized for beta.
6. Plot the distribution of the 100 stock’s annualized return. What does the charted distribution tell you relative to your own expectations?
7. Chart the Factor Z-Score (x-axis) vs. each stocks realized annual return (y-axis). Considering this chart what does the Factor Z-Score represent?

Essay Questions

1. Using data from your answers in the quantitative section, choose a stock you believe performed best and explain why.
2. Explain how you would measure TSLA’s contribution to the volatility of the equal weighted portfolio and how could you use this information?
3. How would you estimate a portfolio’s exposure to?
   1. The Overall Market
   2. Business Sectors
   3. The portfolio’s valuation relative to the market
4. What is an equity risk model and how and why would you use one?
5. How would you calculate an orthogonal factor and why might it be useful in equity portfolio risk management?
6. What do you think are the most important factors in assessing the risk of an equity portfolio?
7. How would you recommend reducing a portfolio’s exposure to an undesirable risk?
8. What firms would you consider to be the best asset managers? why?

**Position Sizing**

A portfolio manager claims he is excellent at sizing his positions. Using the sample data “Sizing Data”, determine if his claim is true. (Returns are for the evaluation period, position capital is as of beginning of this period).