Basics of Financial Market Risks

Problem #1

Select 15 best performing mutual funds in the category “Industrials”, based on 3-year returns (use Yahoo! Finance: Market Data->Mutual Funds -> View funds by Family and Category). For those of them, where the historical data is available, calculate sensitivity of the fund to the market, SMB and HML factors (for market returns, SMB and HML time series use the data from the Kenneth French website). Calculate Sharpe ratios of these funds using 1, 2 and 3 years of historical data.

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Problem #2

Using 30 stocks that constitute DAX (Yahoo: ^GDAXI) at the present day, under the assumptions that short sales are allowed, construct the minimum variance set and the tangent portfolio. Calculate Sharpe ratios, VaR and ES (using historical simulation method) for the tangent portfolio and the minimum variance portfolio. For the historical data consider the horizon of the last 3 years.

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Problem #3

For the 30 stocks that constitute the Dow Jones Industrial Average (Yahoo: ^DJIA) at the present day: using daily data, estimate the cross correlation over the following periods: 2006-2007, 2008-2009, 2010-2011 and 2012-2013. In all four periods select two stocks that have minimal correlation, construct the equally-weighted portfolio of them and calculate the Sharpe ratio the portfolio.

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Problem #4

Construct the minimum variance portfolio and tangent portfolio using 15 best performing stocks in US at the present day (use Yahoo! Finance: Market Data -> Market Stats -> Market Movers -> % Gainers). Assume that short-selling is allowed. For the historical data consider the horizon of the last 2 years. Estimate the tail exponent for the returns of this portfolio. Compare with the tail exponent of the S&P 500 index considered at the same horizon of 2 years.

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Problem #5

For the 30 stocks that constitute the Dow Jones Industrial Average (Yahoo: ^DJIA) at the present day, find (a) the stock with the maximum P/E ratio, (b) the stock with the minimum P/E ratio and (c) the stock, which P/E ratio is the closest to the average value among all 30 components. Calculate annual returns, annual volatility, daily VaR and daily ES (using historical simulation method) for these stocks for the periods of 2010-2012 and 2005-2007. Calculate correlations between these 3 stocks in both of periods.

FIY: My feedback to MiFIT-2012 students on the common issues of their project reports:

1. **Know your portfolio!** As a portfolio manager you should know every single asset you invest to. Almost nobody of you even checked (presented) which companies/funds are hidden behind the tickers. And nobody presented a single fundamental characteristic of these companies.
2. **Explain details.** Every notation or symbol that you introduce, you need to explain explicitly in text. All figures should contain captions or legends explaining what is presented. If your analysis is Year-To-Date, then state explicitly the date of your analysis. Etc, etc, etc…
3. **Think! Analyze!** What do these numbers mean? Why do they change in time? Why different measures give different results and which one would you trust? You calculated performance of different assets: which is the least risky one? Which performs the best? You calculated correlation matrices: which assets are correlated and which are not? Does this have something to do with the industrial sector? Though many questions may be beyond your present “feeling” of the system, but you need to at least document them for yourself. The goal of you as a future manager is not to calculate some numbers, but to make a decision using these numbers.
4. **Check your code!** If you submit the code – run it first. Many of the files you’ve submitted have syntax typos and errors that even prevent them from running. Which makes me think – how did you perform the analysis when your code does not work?
5. **Mind the precision!** You give values with up to 7-10 “significant” digits. Do you really think that this precision is important?
6. **Returns and volatility have scales.** You should clearly state if returns are daily or annual or monthly. The standard way is to present returns in “percent per annum”.
7. **“I” versus “we”.** The projects were common for 2-3 students. If you write “I”, shall I think that only one student contributed to the report?   
   For the same reason of joint projects, objections of “we wrote reports separately and should be graded separately” will not be considered.

Finally, though it was the case only in one work, I would like to warn everybody about the **plagiarism**. It is much easier to detect it than you thought, even when the text is changed, not speaking about cases when the text is copied-and-pasted. Penalties for the plagiarism are always severe and may even lead to failure to obtain a degree.