Problem Set 9

Instructions: Work in a group of 1-3 people. Each group hands in one electronic copy of their answers. Try to make your answers readable. Be brief and to the point, but be sure to explain your logic. Do not print data, entire spreadsheets, or programs – instead, copy the relevant statistics to a table. All tables and charts should have legends and explanations. Answer text (excluding tables and figures) should be typed and a maximum seven pages long. Exceeding these limits will result in penalty points.

This problem set explores trading costs and capacity (e.g., fund size) analysis applied to many of the anomalies/factor portfolios we have explored in class.

In order to proceed you need the Microsoft Excel file "ProblemSet9.xls". This file contains only one spreadsheet:

1) A simple table with formulas to calculating total trading costs on a strategy, returns net of trading costs for the strategy, and break-even fund sizes that equate trading costs with average returns.
   a. The input or "choice" variables into any analysis of trading and implementation costs are:
      i. The type of stocks chosen to trade (i.e., liquid vs. illiquid)
      ii. The amount of trading activity (fast/high turnover vs. slow/low turnover)
      iii. The size or Net Asset Value (NAV) of the fund itself.
   b. Using these inputs you will evaluate a set of anomaly/factor portfolios from a trading cost perspective and use these choice variables to optimize trading costs, net returns, and total dollar profits to these strategies.

a) <u>Conceptual questions:</u>
   i. What are the costs of implementing a real-world portfolio and what are the costs of failing to implement? How should you think about the tradeoff between these two costs?
   ii. For a large institutional trader, what are the different components of the cost of trading they face? Which cost is the most important and how can this cost be managed? What factors influence the size of these costs? Can you name three types of factors that affect this primary trading cost?
   iii. What can a firm/trader/manager do to mitigate these costs?

<u>Using the spreadsheet:</u>

The spreadsheet contains information on five portfolios: SMB, HML, UMD, a combination portfolio that is an equal-weighted average of those three (COMBO), and STREV. The information provided for each portfolio are statistics on the gross

mean returns to each strategy, its annual turnover per share, the number of stocks, the calibration inputs of the price impact cost function estimated from Frazzini, Israel, and Moskowitz (2015), and a set of formulas to calculate average dollars traded, average fraction of daily volume traded, average market impact per trade, and total trading costs in both dollars and returns (percentage of NAV) based on the information provided.

You will use this spreadsheet to calculate trading costs, net returns, net dollar profits, and break-even fund sizes of each anomaly/factor portfolio. A useful Excel tool will be the "solver" in data analysis, but you may need to make sure that package has been imported from "add-ins" in Excel. Search help for "solver" if you don't see it in the data analysis section and it will tell you how to install the solver add-in (takes two seconds).

Two sets of mean gross returns are provided for each anomaly: 1) means estimated over the full century of data from 1926 to 2015 and 2) means estimated over the more recent sample period from 1990 to 2015.

b) Using the more recent gross mean return estimates (from 1990 to 2015), calculate the total trading costs, net returns, and dollar net profits of each of the strategies provided: SMB, HML, UMD, COMBO, and STREV, assuming a portfolio size (NAV) of $1 billion dollars for each portfolio. (This is super-easy since I set up the spreadsheet for you and already put in $1 billion for SMB. You just need to copy the formulas over, but please try to understand them as they will help you answer all of the questions below.)

c) Now, repeat b) for a fund size (NAV) of $2 billion. Explain why the trading costs are not exactly double those in b). Also, please explain why there are sizeable differences across the anomalies in terms of the change in trading costs and net returns when going from $1 billion to $2 billion.

d) Calculate the break-even fund size of each portfolio, which is the fund size at which net average returns = 0.

e) Repeat d) using the full sample means from 1926 to 2015 as the gross return estimates instead of the more recent sample means. For which anomalies/factors does the capacity/break-even size respond the most to an increase in mean returns? For which does capacity respond the least?

f) Now, using the full sample's mean returns for the portfolios (from 1926 to 2015), find the fund size that maximizes dollar profits and report those profits. The last row of the table has a place holder for dollar profits. Use the "Solver" in Excel to find the fund size (NAV) that maximizes this value and report that fund size and report it along with its total dollar profits for each anomaly portfolio. What does this analysis tell you? What can you say about the different anomalies in terms of

total dollar profitability and how does that compare to their differences in average returns? That is, are the anomalies that produce the highest returns the ones that necessarily generate the largest profits? Why not?

g) Assume the mean gross returns stay the same, if turnover could be reduced by 25 percent (*not* percentage points) for each strategy (e.g., new turnover = 0.75(old turnover)), how much net return improvement would there be assuming a $1 billion fund size (NAV)? How much larger break-even capacity is there for each strategy?

h) Now, assume that if turnover is reduced by 25 percent (*not* percentage points) for each strategy, that the mean gross return of each strategy drops by 0.25 *x* (original turnover%), then how much net return improvement would there be assuming a $1 billion fund size (NAV)? How much larger break-even capacity is there for each strategy? What can you say about the tradeoff between trading costs and opportunity costs for each strategy under the assumptions given?

i) Go back to the original turnover numbers and the full sample mean returns. Suppose you could increase the daily volume by twice (e.g., by focusing on more liquid stocks), and assuming the mean gross returns stay the same, then how much net return improvement would there be assuming a $1 billion fund size (NAV)? How much larger break-even capacity is there for each strategy in this case? For which strategies is liquidity more important? Why?

j) Now repeat i) but assuming the mean gross returns to SMB, HML, UMD, COMBO, and STREV are reduced by 1/2, 1/3, 1/6, 1/3, and 5/6, respectively. These numbers come from actual calculations for each anomaly/factor portfolio using a more liquid universe of stocks (e.g., SMB and STREV are, not surprisingly, the most hurt by focusing on a more liquid universe, which is why their mean returns are cut by 1/2 and 5/6, respectively). What tradeoffs do you see in terms of liquidity versus expected returns for each strategy? What can you say about the tradeoff between trading costs and opportunity costs for each strategy under the assumptions given?