Matlab for Finance – Individual Assignment

General instructions

- Submit your solution until December 22nd, 11:59 p.m. on Brightspace.
- This assignment consists of nine tasks, all of which must be completed.
- Create a published m-file for your solution, i.e., an m-file from which an HTML report can be generated using the "Publish" function. The header of the m-file should contain the names of the team members. Use the provided template as a guide for the structure of the files.
- The task m-file must be executable and the evaluation takes place on the basis of the printed output of the "Publish" function. Use markup elements of the publish function to make the report clear (headings, body text, bullet points, etc.). Check the course slides for formatting examples. Comment important parts of the code sufficiently (not excessively).
- The form of the report, programming style and clarity of the code are included in the evaluation. The axes of graphs should be meaningfully labeled, and graphs with multiple curves should have a legend.
- Your submission should consist of a zip file containing all the **m-files** you wrote that are necessary to run the code. Likewise, the **html** folder that was created by publishing should be included in the zip file.
- If you are missing an important piece of information to solve a task, make a plausible assumption and briefly justify it.
- Important: Explain your reasoning behind what you do in your code. Comment on everything that is not self-explanatory.
- Information in brackets represents the maximum number of points you can collect throughout the exercise. All points will sum up to 120.
- *Hint: feel free to use the course script, tasks, Matlab help files, etc. to complete this assignment.*

Learnings from the first assignments:

- Please read the tasks BEFORE you start working in Matlab.
- The best is to extract the assignment folder on your computer and work within this folder. Don't work in the zip-folder.
- Think about what you are doing. The tasks are not meant to be blindly executed. Check whether your result makes sense!
- Please use semicolons to suppress output wherever possible. Rule of thumb: don't show output if it is too long to be seen without scrolling in the command window!
- Read error messages and try to solve the indicated problem(s) first.

Good luck!

M&A research – [120]

The idea of this assignment is to replicate some tables and figures of the paper "The JOBS Act and mergers and acquisitions" by Yongqiang Chu, Ming Liu, and Shu Zhang, published in the Journal of Corporate Finance in 2022. In particular, the idea is to replicate parts of tables 1, 2, 3, and 4 as well as Figure 1. To work on this assignment, please read the paper to understand what you are working on. It will help to work on the following tasks. Whenever "the paper" is mentioned throughout the tasks, please refer to the paper "The JOBS Act and mergers and acquisitions" by Yongqiang Chu, Ming Liu, and Shu Zhang.
Note: the data given in the assignment is retrieved based on the filter criteria given in the paper, i.e., deals in 2010-2013, U.S. acquirers, targets are public or private, percentage of shares owned before acquisition < 50%, percentage of shares after acquisition > 50%, deal value > 5 million U.S. dollar. Furthermore, stock data and control variable data needs to be available. The sample is larger than what is reported in the data. The best explanation is that the authors did not report all filter criteria needed to replicate the sample. You simply work with the data given in the material and see whether your results look similar to the ones reported in the paper. Since the data is different, your results cannot be 100% the same! It is possible that some results are statistically significant in the paper, but not in your analyses here.

Load the data

Load the dataset `"Data.mat"` containing a DealData table and a StockData table. Get familiar with the two files before starting with the analyses below. Note that in the StockData you find excess log-returns for different stocks as well as the CRSP equally weighted index (= market return), both adjusted for the risk-free interest rate.

1. **Sample breakdown (7)**

   Show the distribution of your sample in a table similar to "Table 1" in the paper.
   Hint 1: The variable "PublicTarget" in the data turns to 1 if the target is publicly listed, and to 0 if the target is private. The variable "UStarget" turns to 1 if the target is headquartered in the U.S., and zero if it is foreign.
   Hint 2: the commands "array2table" or "table" can be alternatives to display your results.
   Sufficient code length: 5-10 lines

2. **Event study (36)**

   The regression equation to estimate cumulative abnormal announcement returns (CARs) is as follows: $(r_{Stock} - r_f) = b_0 + b_1 \cdot (r_{Index} - r_f) + b_2 \cdot EventDummy + e$.
   The event dummy is zero during the calibration period and turns to 1/ED during the event window. In the StockData, *rStock_rf* and *rIndex_rf* are already calculated.
   For the present estimation we use an event window ranging from [-1;+1] days around deal announcement (i.e., ED=3). In the paper, the calibration period corresponds to 200 trading days and ends on day 5 before the announcement date (= "day 0"). For simplicity, we'll skip the step of removing some days of data during the "separation period". Hence, the data you use for the event study covers log-returns of overall 207 trading days, ending 1 trading day after the announcement day.

a. For each of the acquisitions of U.S. targets in the DealData table, use an event study to estimate CARs for each acquirer using a [-1;+1] event window. The first step in this task is thus to remove deals with foreign targets. Then CARs can be estimated one after another for each deal using a for-loop. CAR of each event study corresponds to the coefficient of the Event dummy, b_2.
   Hint: Find more information on the required steps in the template.
   Sufficient code length: ~16 lines
b. Show the distribution of acquirer CARs in a histogram and test whether the average CAR can be considered as statistically different from zero. Use 1.96 as the critical t-value for the 5% significance level. Briefly comment on your result.
   Sufficient code length: ~5 lines

3. Descriptive Statistics (19)

Provide an overview of the descriptive statistics of your CARs and the deal characteristic variables included in the DealData.mat file. For this, estimate the mean, median, and standard deviation of each variable. Provide an overview of these statistics by generating a `Descriptives` table similar to "Table 2" in the paper.

Hint 1: `Descriptives= table(variableVec,meanVec,medianVec,stdVec,'VariableNames',{'variable','mean','median','standard deviation'})`, while each input vector is a column vector.

Hint 2: Not all variables in the paper are included in the dataset. So, concentrate only on those available in the given material or estimated throughout the previous task. The variables in the DealData table are: logDealValue, RelativeSize, TenderOfferFlag, AllCash, Compete, and Horizontal.

Sufficient code length: ~10 lines

4. Univariate analyses (<u>similar</u> to "Table 3" in the paper) (22)

a. Create a variable "`PostDummy`" turning to one for all deals that take place on April 5, 2012 or later. The `PostDummy` should be zero for all deals before April 5, 2012.
   Sufficient code length: 1 lines
b. Estimate the means and standard errors of cumulative abnormal returns for the following four categories: deals with private vs. public targets, each divided into the pre- and post-period.
   Sufficient code length: 8-12 lines
c. Estimate t-statistics to check whether the means in each category are different from zero and comment on whether the absolute t-statistics exceed 1.96 (5% significance level)
   Sufficient code length: 4 lines

5. Baseline results (parts of "Table 4" in the paper) (36)

a. Create a private dummy turning to one if the target is private. Furthermore, create an interaction variable PrivateXPost by multiplying the private dummy with the post dummy.
   Sufficient code length: 2 lines
b. Create year dummy variables to control for year fixed effects. The easiest way to generate them is in one matrix. You initiate a matrix consisting of zeros according

to the number of observations and the number of fixed effects. The dummy matrix for years has four columns, the first column turning to one for deals in 2010, the second column turning to one for deals in 2011, and so on.
Sufficient code length: ~5 lines

c. Run each an OLS regression using the following two regression equations. After each regression analysis, comment on your coefficients for the PrivateXPost and the PrivateDummy variables and whether they are significantly different from zero on a 5% level. Then, compare your result with the result in Table 4 in the paper and comment on potential differences.
Hint: To include the fixed effects, you can concatenate the fixed effects matrix next to the other variables in X. *Important*: you need to exclude 1 column (e.g., the first or the last) of each fixed effects matrix! If you do not exclude them, the fixed effects are perfectly explained by the constant and therefore you will have collinearity problems.
Sufficient code length: ~10-14 lines

   i. With year fixed effects, but without control variables (similar to column (1) in Table 4):
   $CAR_i = b_0 + b_1 \cdot PrivateXPost + b_2 \cdot PrivateDummy + b_3 \cdot 2011Dummy + b_4 \cdot 2012Dummy + b_5 \cdot 2013Dummy + e.$

   ii. With year fixed effects and control variables (similar to columns (2) in Table 4): $CAR_i = b_0 + b_1 \cdot PrivateXPost + b_2 \cdot PrivateDummy + b_3 \cdot 2011Dummy + b_4 \cdot 2012Dummy + b_5 \cdot 2013Dummy + b_6 \cdot logDealValue + b_7 \cdot RelativeSize + b_8 \cdot TenderOfferFlag + b_9 \cdot AllCash + b_{10} \cdot Compete + b_{11} \cdot Horizontal + e.$