

## Assignment 4

FIN 525, Spring 2019

Due: April 12<sup>th</sup>, Midnight

### 1. Assignment details

In this assignment, you will be asked to analyze the determinants of corporate investments (capital expenditures) for US public firms. When regressing investments on Tobin's Q and cash flows, the (beta) coefficient on cash flows (called the investment-cash flow sensitivity) is often interpreted as an indicator of the presence of financial constraints (i.e. the firm has difficulty securing financing for all its investment projects). The logic behind this interpretation is as follows: If the investment-cash flow sensitivity is high, this means the firm tends to invest less when internally generated cash flow levels are low. If the firm could easily raise financing from outside sources (debt or equity) it wouldn't have to rely on internally generated cash as much. Therefore, if this interpretation is correct, the investment-cash flow sensitivities (i.e. the beta on the cash-flow variable) should be lower for firms with easy access to external financing. In this assignment, we will use two ways of measuring the firm's ease of access to external financing: the firm's size, and the firm's dividend paying status. If a firm is large, or if the firm pays a dividend, we would say that the firm is not financially constrained (or at least less likely to be). The instructions in this section will guide you through the process of testing if the coefficient on the cash flow variable can be interpreted as an indicator for the presence of financial constraints. You will only need to use the Compustat data for this assignment.

- Calculate main regression variables:
  1. Investments = capital expenditures ("capx") divided by lagged total assets
  2. Cash-flows = net income before extraordinary items ("ib") plus depreciation ("dp"), everything divided by lagged total assets
  3. Tobin's Q = total assets minus book equity plus market equity, everything divided by total assets. Market equity is price ("prcc\_f") times number of shares ("csho"). Book equity is shareholder's equity ("seq") minus preferred stock ("pstkrv") plus deferred taxes ("txdite" with missing values replaced by 0).
- Calculate proxies for financial constraints:
  1. *Based on firm size*: Calculate the firm's size using its market capitalization. Every year, sort firms into two size groups, based on whether they are below or above the 75<sup>th</sup> percentile (p75) of market capitalization that year. Create a variable called Size\_Dummy, which equals to 1 if the firm is large (above the 75<sup>th</sup> percentile) and 0 if the firm is small (below the 75<sup>th</sup> percentile).
  2. *Based on dividend payout status*: Create a variable called "Dividend\_Dummy" which equals to 1 if the firm pays a dividend that year and 0 if it does not. The "dvc" variable in Compustat records the amount of dividends paid by the firm.

- Main regressions:
  1. Regress investments on lagged Tobin's Q and lagged cash-flows using your entire sample. Report these results in Table 1. Your sample should go from 1970 to 2016. Keep only observations with positive total assets.
  2. Repeat your regression from point (1), using the same variables but this time adding the lagged Size\_Dummy variable as well as a lagged interaction term between Size\_Dummy and cash-flows. Report these results in Table 2.
  3. Repeat your regression from point (1), using the same variables but this time adding the lagged Dividend\_Dummy variable as well as a lagged interaction term between Dividend\_Dummy and cash-flows. Report these results in Table 3.
  4. Repeat point (1) above, separately for the 1970 to 1995 period and for the 1996 to 2016 period. Report results in Table 4.
  5. Repeat point (2) above separately for the 1970 to 1995 period and for the 1996 to 2016 period. Report results in Table 5.
  6. Repeat point (3) above separately for the 1970 to 1995 period and for the 1996 to 2016 period. Report results in Table 6.
- Details:
  1. You should winsorize all your variables (except for Size\_Dummy and Dividend\_Dummy) at the 1 and 99 percentile.
  2. All your regressions should have standard errors clustered by both firm and year.
  3. All your regressions should control for industry fixed effects (use the "sic" variable to identify industries).

## 2. Submission instructions

You need to submit your SAS code and a written report on D2L before the deadline. Please see the details below:

1. On D2L, please upload a SAS file containing the code you used to generate your results (click on the NAME of this assignment on D2L, not on the attachment. That should take you to a screen where you can upload files).
  - a. Make sure you comment your code properly. It should be very clear what you are doing by just reading your comments.
  - b. If your code does not compile properly (i.e. if the log shows errors) you will lose 10% of your points so please make sure you check your log every time you run your code.
  - c. The title of this file should have the following format: <Last names of group members, separated by underscores>\_Assignment04. So, for example, if I did the project together with your TA, our file would be titled "Ion\_Beggs\_Assignment04".
2. On D2L, please upload a written report (either Word or PDF document) which includes a description of your analysis:
  - a. Your report should have the following structure:

- i. Intro: a paragraph or two about what this analysis will cover
  - ii. Data: a paragraph about your data sources and the filters you put on it.
  - iii. Results:
    1. Using the results in Table 1, do you find that Tobin's Q and cash-flows are significant determinants of corporate investment decisions?
    2. Using the results in Tables 2 and 3, do you find that investment-cash flow sensitivities are significantly larger for more constrained firms?
    3. Using Tables 4, 5 and 6, do you find that any of your answers to the above two questions has changed over time?
  - iv. Conclusion: Summarize the main findings of your analysis (1-2 paragraphs).
  - v. Tables (properly titled).
  - vi. Figures, if any (properly titled).
  - vii. Appendix1: the SAS code you used to produce your results
- b. From intro to conclusion (excluding tables, figures and appendix), the report should be no longer than 4 pages, Times New Roman, one and a half line spacing, 12 pt font.
  - c. Tables should be exported and then formatted in excel (i.e. your SAS code should have a portion where you export results into excel). It is NOT OK to copy and paste SAS output.
  - d. Make sure your graphs are properly labeled so that it is easy to understand what is being plotted and what the axes are.
  - e. The formatting of your report accounts for 10% of your score. It needs to look professional and it needs to read as if you are explaining your results to your boss/client who may not know much about finance.
3. Please make one submission per group and make sure that the names of all the group members show up both in the SAS file and on the written report.

**IMPORTANT:** Please make sure you do not delete (of later modify) the data or code you used to produce your results. We might ask you to send it to us if we need to re-run your tests. Also, make sure you keep an electronic copy of the written report you hand in during class, just in case we lose your copy and need you to send us another one.

If you have any questions regarding the instructions above, please email me at [mihaiion@email.arizona.edu](mailto:mihaiion@email.arizona.edu).