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From: Analysis Group

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Re: Instructions for Replicating Sensitivities of Azar, Schmalz, and Tecu (2018)

Overview and Setup

This memorandum describes the steps necessary to reproduce our sensitivities of the baseline market-carrier regression results obtained by Azar, Schmalz, and Tecu ("AST") in their 2018 paper "Anti-Competitive Effects of Common Ownership."[1] This analysis was submitted to the Federal Trade Commission ("FTC") by BlackRock in a letter dated January 14, 2018.[2]

AST published a replication package containing the code necessary to replicate the results from their paper.[3] This memorandum is supplemental to their replication package. In particular, the reader is assumed to have (1) downloaded AST's replication package, (2) acquired the requisite proprietary and publicly available data, and (3) followed the steps in AST's "READ ME.docx" file in order to prepare to execute AST's replication code.

The instructions below describe the necessary steps to modify AST's replication package in order to run their code and reproduce these sensitivities.[4] All of the do-files that require modification are located in the "Code" folder of the AST replication package. Section I contains instructions to run AST's replication package, including details on downloading raw input data and other minor adjustments to code files. Section II contains instructions pertaining to the "control" during bankruptcy sensitivity as well as the financial incentive sensitivity. Section III contains detail on the process used to identify asset managers in the ownership dataset used by AST.

I. Modifications Necessary to Run AST's Replication Package

While AST provide a file ("READ ME.docx") that contains instructions for replicating their results, it omits several essential details (*e.g.*, pertaining to the proper downloading and processing of input data). This section contains a description of the additional steps necessary to

[1] *See* Table III, Specification (3) in José Azar, Martin C. Schmalz, and Isabel Tecu, "Anticompetitive Effects of Common Ownership," *The Journal of Finance*, 2018.

[2] A copy of this letter can be found at https://www.blackrock.com/corporate/literature/publication/ftc-hearing-8-competition-consumer-protection-21st-century-011419.pdf.

[3] AST's replication package, as provided by the authors and available for download here, contains the requisite "temporary files" needed to run their final regressions without the raw data. However, these temporary files alone are not sufficient to perform AG's sensitivities. As such, Section I of this memorandum includes the adjustments for setting up and executing AST's entire replication package after acquiring the necessary input data.

[4] Mentions of specific line numbers are in reference to locations within AST's original code. Once a section of code is added to one of the files, subsequent line numbers will shift. For clarification on where lines of code should be inserted, reference an unedited version of AST's files. All modifications to AST's replication package in Section I that allow their code to run are necessary to replicate each sensitivity in Section II, and should not be removed. In addition, to run any sensitivity in Section II, it is necessary to remove any changes made to AST's code for previous sensitivities. That is, each sensitivity is distinct and does not build off of any other sensitivity.

execute AST's replication package, which must be completed prior to performing the sensitivities described in Section II.

A. Downloading Requisite Data

1. Thomson Reuters WRDS

AST downloaded a now-archived version of the Thomson Reuters WRDS proprietary holdings dataset that includes holdings data through 2015. These data contained significant errors, including many missing holdings and improper reports of other holdings.[5] In order to match AST's results (and AG's replication results), it is necessary to download an archived version of the WRDS data that does not include the updates meant to fix these errors.[6]

2. T-100

AST do not provide precise instructions for which T-100 dataset to download. It appears that AST use data from the T-100 Segment (US Carriers Only) dataset, available here. Download all years and variables from 2001 through 2015. It is necessary to unzip and rename the downloaded files to match AST's specified filenames.[7]

3. DB1B

AST download each quarter of the DB1BCoupon and DB1BTicket datasets for 2001Q1 through 2015Q4 available here. When downloading, select the "Prezipped File" option.

B. Prepare Stata Code Files

This section describes the changes implemented to allow AST's code to run once all necessary inputs have been gathered.

1. "master.do"

- Install the ivreg2, outreg2, and ftools packages.
  - Insert the following code directly after line 14:

```
ssc install ivreg2, replace
ssc install outreg2, replace
```

[5] *See* "Research Note Regarding Thomson-Reuters Ownership Data Issues," Wharton Research Data Services, available at https://wrds-www.wharton.upenn.edu/pages/support/research-wrds/research-guides/research-note-regarding-thomson-reuters-ownership-data-issues/.

[6] In June 2018, WRDS published an update to its Thomson Reuters 13F dataset meant to correct some of its data quality problems. In order to replicate the results in the AST paper, the archived data (as it existed at the end of 2015) can be obtained via request from WRDS.

[7] AST's replication package accepts T-100 data files following the naming convention "T100D_SEGMENT_US_CARRIER_YYYY.csv", where "YYYY" ranges from 2001 to 2015. The Bureau of Transportation Statistics data files each represent one year of data, but the filenames are download-specific and do not indicate which years they represent. (For example, "989613123_T_T100_SEGMENT_US_CARRIER_ONLY.csv" might represent 2015.) Inspection of each file's "year" variable will indicate the correct year for renaming.

```
ssc install ftools, replace
```

- Change the working directory to the correct folder.
  - Replace the pathway in line 28 with the pathway to the folder that master.do is located in.
- In line 23, rename the global “Input” to “input” in order to match the folder name.

2. **“Prepare T100 data RP.do”**

- Convert T100 data to .dta format.
  - Insert the following code directly above line 17:

```
local k = 1
forvalues y = 2001/2015 {
      insheet using
            "$inputs/Airline/T100/T100D_SEGMENT_US_CARRIER_`y'.csv",
            clear
      drop quarter
      save "$inputs/Airline/T100/T100D_SEGMENT_US_CARRIER_`y'.dta",
      replace
}
```

3. **“Prepare Data - Ownership RP.do”**

- Drop holdings with a reporting date after 2015.
  - Replace line 158 with the following code:

```
keep if year(rdate)>=2001 & year(rdate)<=2015
```

  - Replace line 597 with the following code:

```
drop if date<yq(2001,1) | date>yq(2015,4)
```

- Drop observations for 2015 that do not match with a manager number.
  - Insert the following code directly above line 200:

```
drop if _m==1 & year==2015
```

4. **"Prepare Data - Ownership - City RP.do"**

- Drop observations for 2015 that do not match with a manager number.
  - Insert the following code directly above line 196:

```
drop if _m==1 & year==2015
```

II. Bankruptcy and Financial Incentive Sensitivities

As discussed above, the sensitivities described in Section II below require a working version of AST's replication package, including all requisite input data. See Section I above for instructions for setting up AST's replication package.

A. No Control Rights During Bankruptcy Periods

This sensitivity sets the control rights of shareholders of bankrupt airlines to zero.

1. **Preparation**

- File Alterations:
  - Insert the following code after line 590 in "Prepare Data - Ownership RP.do":

```
replace gamma = 0 if tkcarrier == "DL" & date>=yq(2005,4) &
      date<=yq(2007,1)

replace gamma = 0 if tkcarrier == "UA" & date>=yq(2002,4) &
      date<=yq(2005,4)

replace gamma = 0 if tkcarrier == "US" & date>=yq(2002,3) &
      date<=yq(2005,3)

replace gamma = 0 if tkcarrier == "AA" & date>=yq(2011,4) &
      date<=yq(2013,4)

replace gamma = 0 if tkcarrier == "NW" & date>=yq(2005,4) &
      date<=yq(2007,1)

replace gamma = 0 if tkcarrier == "YV" & date>=yq(2010,1) &
      date<=yq(2011,1)
```

2. **Execution**

- Run the file "master.do".
- The regression output is found in the file "price_regressions.xls" in the "Output" folder.[8] The relevant regression results are stored in column D (specification (3)).

B. **Financial Incentive of Investment Managers at 1%**

This sensitivity sets the financial incentives for investment managers to 1% of their ownership share.

1. **Preparation**

- File Alterations:
  - Insert the following lines of code into "Prepare Data - Ownership RP.do" immediately after line 495 ("save "$path_temp/institutionalholdings", replace"):

```
preserve

do "$code/Manager Types - Fin_Inc_1Pct.do"

restore

merge m:1 mgrno date using $path_temp/fin_inc_multiplier.dta

drop if _merge ==2

drop _merge

replace beta = beta*fin_inc_multiplier if fin_inc_multiplier != .

save "$path_temp/institutionalholdings", replace
```

- Added Files:
  - Save "Manager Types - Fin_Inc_1Pct.do" in the "Code" folder in the replication package.
  - "AST Asset Manager Mapping.xlsx" can be saved in any path and is called in the file "Manager Types - Fin_Inc_1Pct.do". Line 6 of "Manager Types - Fin_Inc_1Pct.do" must be altered to reflect the location of that file path. See Section III of this

[8] Each of the sensitivities in this section overwrites the same column of the output file "price_regressions.xls." Therefore, only one sensitivity can be run at one time, without making further modifications to AST's replication package.

memorandum for further detail on the construction of "AST Asset Manager Mapping.xlsx".

2. **Execution**

   - Run the file "master.do".
   - The regression output is found in the file "price_regressions.xls" in the "Output" folder. The relevant regression results are stored in column D (specification (3)).

III. Identifying Asset Managers in AST's Data

In order to carry out the sensitivity described in Section II.B, it is necessary to identify the investors in the ownership dataset used by AST that are asset managers. In their publicly available replication package, AST provide a list of all unique investors in their Thomson Reuters Spectrum ("WRDS") airline holdings data in the file "mgrno cleaned.xlsx."

To identify the asset managers in AST's sample, we collect airline holdings data from the S&P Capital IQ ("CapIQ") platform,[9] which include information on each shareholder's type (*e.g.*, whether investors are asset owners, hedge funds, government pension plans, etc.). We then create a variable that identifies asset managers in the CapIQ holdings data by flagging any manager with shareholder type of "Traditional Investment Manager."

We then perform a merge between AST's WRDS holdings data and the CapIQ holdings in order to identify asset managers in AST's sample.

To do so, we first create a mapping of manager names between CapIQ (*holder*) and AST's WRDS data (*mgrname_clean*). To create this mapping between manager names in the CapIQ and WRDS holdings data, we do the following:

1. We first match values of *holder* (CapIQ) and *mgrname_clean* (WRDS) that have identical names (ignoring spaces and punctuation).
2. We then match the remaining managers that report the exact same number of shares in both datasets within any one carrier-quarter. We manually check that the values of *holder* (CapIQ) and *mgrname_clean* (WRDS) are similar for these matches in order to ensure that the matches are not due to the chance that multiple managers hold the same number of shares within a quarter.
3. Due to discrepancies in the numbers of shares reported across CapIQ and WRDS, some managers remain unmatched. For these remaining managers, we manually map *holder* (CapIQ) to *mgrname_clean* (WRDS).

[9] We downloaded CapIQ holdings data for Alaska Airlines, Allegiant Air, American Airlines, Delta Air Lines, Hawaiian Airlines, JetBlue Airways, Mesa Airlines, SkyWest Airlines, Southwest Airlines, and United Airlines for the period from 2004Q1 onwards. This data is unavailable prior to 2004Q1.

Following this process, most, but not all, values of *mgrname_clean* in AST's WRDS data are mapped to a *holder* in CapIQ, allowing us to identify which investors in AST's sample are asset managers.[10]

The final mapping provides each *mgrno_new* in AST's dataset with either the investor type "Asset Manager", "Other Investor Type" (for WRDS investors that we mapped to an investor in the CapIQ data that is not an asset manager), or a missing value (for WRDS investors that could not be mapped to the CapIQ data). This final mapping is saved as "AST Asset Manager Mapping.xlsx".

[10] If one investor name is associated with multiple shareholder types in the CapIQ holdings data (either because the investor type changes over time, or because AST associate multiple investor names in the raw WRDS data (*mgrname_clean*) with one investor number (*mgrno_new*)), we assign the shareholder type that accounts for the largest share of CapIQ holdings for the *mgrno_new* across airlines since 2004Q1.