

Problem Set #7: Difference-In-Differences

Empirical Methods in Corporate Finance

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At the end of 1989, early 1990 a perfect storm in credit markets appeared. Drexel Burnham, the key player in the junk bond market went bankrupt. The Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) was passed, forcing all savings and loans to eliminate and speculative grade debt from their balance sheets. The national association of Insurance Companies changed their ratings scale in such a way as to incentivize insurance companies — significant investors in corporate bonds — to sharply reduce their junk bond holdings. Finally, a crash in real estate prices in the Northeast lead to a severe contraction of bank lending, often referred to as a “capital crunch.”

Undertake a difference-in-differences analysis of nonfinancial corporate behavior, using a data window encompassing 1985 through 1994 and the end of 1989 as the “event date.” Condition on firm-year observations with a valid credit rating, and nonmissing values for the data items to be used in the analysis (see table at bottom). Note, the controls will be lagged one period relative to the outcome variables, so condition on nonmissing data for the outcome variables in period t , but nonmissing data for the controls in period $t - 1$.

1. How many firms are present during each year of data? Graph this number against time. What is the average number of time series observations per firm? Why should we concern ourselves with these questions?
2. Winsorize all ratios (outcomes and controls) at the upper and lower one percentiles. Create a table of summary statistics for all of the variables showing the number of observations, mean, median, sd, min and max.
3. Define treatment and control groups as firms with a speculative-grade, i.e., junk, rating and investment-grade rating, respectively. Speculative-grade is defined as an

S&P rating below BBB-. Graph the outcome variables against time for these two groups.

4. Compare the summary statistics of these two groups in the pre-event period. Do they seem comparable? Check the parallel trends assumption more formally by comparing the pre-event growth rates, after Winsorizing at upper and lower one percentile, in the outcome variables across treatment and control groups. Are they statistically (economically) different?
5. Run a dif-in-dif regression of net debt issuance on an indicator equal to one if the firm is junk rated, an indicator equal to one if the year is after 1989, and an interaction of these two variables. Be sure to cluster the standard errors by firm to account for within firm dependence. Interpret your results.
6. Being concerned with identification, you decide to focus on the firms close to the investment-grade boundary: BBB (control) and BB (treatment). Examine the summary statistics of these two groups, as well as the growth rates for the outcome variables in the pre-event period. Are these groups comparable? Run a dif-in-dif regression using these treatment and control groups. How do they compare the previous results.

Variable Definitions

Outcome Variables:

$$\text{Investment}(t) = (\text{CAPXV}(t) - \text{SPPE}(t)) / \text{PPENT}(t-1)$$

$$\text{TD}(t) = \text{DLC}(t) + \text{DLTT}(t)$$

$$\text{Net Debt Issuances}(t) = (\text{TD}(t) - \text{TD}(t-1)) / \text{AT}(t-1)$$

$$\text{Net Equity Issuances}(t) = (\text{SSTK}(t) - \text{PRSTK}(t)) / \text{AT}(t-1)$$

Controls:

$$\text{Book Leverage}(t) = \text{TD}(t) / \text{AT}(t)$$

$$\text{Profitability}(t) = \text{OIBDP}(t) / \text{AT}(t)$$

$$\text{Tangibility}(t) = \text{PPENT}(t) / \text{AT}(t)$$

$$\begin{aligned} \text{Market-to-Book}(t) &= ((\text{PRCC.F}(t) * \text{CSHO}(t)) + \text{DLC}(t) \\ &+ \text{DLTT}(t) + \text{PSTKL}(t) + \text{TXDITC}(t)) / \text{AT}(t) \end{aligned}$$

$$\text{Firm Size}(t) = \text{Log}(\text{AT}(t))$$