Empirical Banking and Finance
Tutorial 6

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Tutorial 6

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This Lecture

Tutorial 6 Solutions

Data & Descriptives

a) Data & Descriptives

a) Have a look at the dataset and provide some descriptive statistics. For the next steps replace the largest and smallest 5% of the continuous variables in the dataset by missing values.

- Quarterly firm level data from 1994q1 - 2005q4

Table: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
networth	19253	656.331	3373.664	0	159568
diff_net_worth	19253	222.31	2252.225	-122698	48911
investment	18515	.062	.173	-1.361	21.13
macroq	16272	11.828	26.801	.556	916.172
cashflow	17597	.189	.732	-30.37	11.996
covenantbreach	19253	.151	.358	0	1
firstcovenantbreach8	19253	.007	.081	0	1
relativecovenantbreach8	1640	-1.69	4.29	-8	8

Data & Descriptives

a) Data & Descriptives (continued)

b) How many firm-quarter observations are firms breaching a covenant?

- 15% (2902 firm-quarters out of 19253)

c) Compare the characteristics of firm-quarters breaching a covenant against the others. This is similar to Table IV in Chava and Roberts (2008).

Table:

covenantbreach	**diff_n h**	**invest t**	**macroq**	**cashflow**
0 Mean	143.10	0.06	8.37	0.17
0 Median	67.80	0.05	5.61	0.12
1 Mean	-12.15	0.05	7.92	0.14
1 Median	-8.46	0.04	5.17	0.10

Regression Discontinuity Design

b) Regression Discontinuity Design:

a) We want to study the causal impact of a covenant breach on a firm's investment. Why is it not enough to just compare investment between the two groups of firms? Refer to what you have found in Question 1)c).

- The problem is that the two groups of firms are not comparable (Pears vs Apples Problem).
- Firms not breaching covenant are doing better as measured by the variables in Question 1). They have higher investment, macro Q and cash flow than firms breaching a covenant. (Could run a t-test of whether the differences are significant)
- Even if they were similar in terms of observable variables (which they are not) it is likely that the two groups of firms differ in ways that are not observable.

Regression Discontinuity Design

b) Regression Discontinuity Design: (continued)

b) How does RDD allow us to find the causal effect of a covenant breach on investment?

- The net worth covenant threshold is a discontinuity: when firms pass **below** the threshold their bank (bank syndicate) can in prinicple call back the loan
- Whenever firms are **above** the threshold they have relatively unrestricted access to the credit agreed in the contract
- RDD takes advantage of the fact that firms just below/just above the covenant threshold are very similar, except in their access to credit
- The assumptions required are discussed below

c) Is this a sharp or a fuzzy design?

- This is a sharp design because when the firm passes the threshold the covenant is breached with probability 1.

RDD Assumptions

c) RDD Assumptions

a) Using only 8 quarters before and 4 quarters after *firstcovenantbreach*8 create a graph of average *inv*, *macroq* and *cashflow*.

b) Assumption 1: For RDD to work, how should the control variables *macroq* and *cashflow* evolve around the time of the covenant breach? Do you think the assumption about the other control variables is satisfied when you look at the graph?

- *Note:* Because of the time dimension of the problem this is hard to test and the suggested graph is probably not good enough.
- A better idea might be to compare pairs of firms at certain levels of net worth: 1 firm has a threshold there, the other does not.
- This is inconclusive

RDD Assumptions

c) RDD Assumptions (continued)

   c) Assumption 2: Create a histogram of *diff_networth* excluding *diff_networth* > 200. Describe what you observe and how this is a threat to RDD.

      - Bunching of firms close to the threshold
      - Firms can probably manipulate their net worth to avoid breaching the covenant
      - This is bad news for RDD because this affects the composition of firms close to the threshold
      - They are no longer comparable: firms **above** the treshold can be there just because they manipulated their accounting or because they are "truly" at that level of net worth

Regression 1

d) Regression 1

a) Run the following three regressions with *inv* as LHS variable and *covenantbreach* as the RHS variable of interest including year and firm FE. Cluster standard errors at the firm level.

i) $inv = covenantbreach + networth$

ii) $inv = covenantbreach + \sum_i^4 networth^i$

iii) $inv = covenantbreach \times \sum_i^4 \text{diff\_networth}^{i\,1}$

b) Briefly discuss the assumptions of models i) to iii) concerning the relationship between *inv* and *networth* and how the model below is relaxing the assumption.

- i) Linear relationship between inv and networth + same above and below threshold
- ii) Non-linear relationship between inv and networth + same above and below threshold
- iii) Non-linear relationship between inv and networth + different above and below threshold + using the normalization

[1] This is an interaction term

Regression 1

d) Regression 1 (continued)

c) Compare the size and significance of the coefficient of interest across the three models.

- i) -0.0058***
- ii) -0.00428**
- iii) 0.00148
- Interpretation: change in investment at x_0

d) How different are the coefficients to the *Bind* coefficients from Table V of Chava and Roberts (2008)?

- Note: Chava and Roberts (2008) include other controls, and current ratio covenants therefore the coefficients are not exactly comparable
- i) -0.0058*** vs Specification (1) -0.015***
- ii) -0.00428** vs Specification (7) -0.008***
- iii) 0.00148
- Interpretation: change in investment at x_0

Regression 2

e) Regression 2

a) Compute the absolute distance in % of *networth* to the covenant threshold

b) Re-run regressions i) and ii) of the previous question restricting the sample to only firm-quarters where the absolute distance is less than 15% of *networth*

- i) -0.0055***
- ii) - 0.0053***
- iii) 0.0036
- Mixed results: coefficients with specification i) and ii) are stable compared to the previous question. With iii) there are not a lot of degrees of freedom left

c) What is the motivation for restricting the sample in this particular way?

d) Compare the coefficients obtained using the restricted sample to the ones above and provide a short comment.

Regression 2

e) Regression 2 (continued)

   b) What is the motivation for restricting the sample in this particular way?
      - The key assumption that all other variables are similar is more likely to hold for a sample of firms who are close to the threshold

   c) Compare the coefficients obtained using the restricted sample to the ones above and provide a short comment.
      - See above, quite similar results

Chava, S. and Roberts, M. R. (2008). How does financing impact investment? the role of debt covenants. *The journal of finance*, 63(5):2085–2121.