Problem Set #6 --Credit

Due Wednesday, April 28, 2004 by 6pm, Outside E52-243C

14.74

1. Default and Collateral

This question is based on Debraj Ray, p. 588, Exercise 9. Consider a monopolist lender who lends to borrowers on a repeated basis: the lender and the borrower expect to be matched together for an infinite number of periods (although in any given period, there may be no loan made). The loans are informal and are not backed up by written contracts. The lender has no way to recover a loan if the borrower chooses to default. The lender, however, threatens to cut off credit in the future to any defaulting borrower.

Borrowers discount the next period's earnings by a discount factor of 0.5 (lenders have the same discount factor). That is, the borrowers' present value utility function at date t is:

$$u(t) + 0.5u(t+1) + 0.5^2u(t+2) + ... + 0.5^Tu(t+T) + ...$$

where $u(t)$ is their instantaneous utility function.

a. Assume that the borrower expects to receive a constant instantaneous utility of V from now (period 0) till infinity. What is the present value of this stream of instantaneous utility at date 0?

Forget about (a) – except the key math insight – and consider the following scenario for the rest of the problem. Borrowers use the loan in cultivation. Cultivation can be done using one of two techniques. The first requires initial working capital of $100 and produces net output worth $300. The second requires $500 of working capital and yields net output of $1,000. Without a loan, the borrower cannot produce anything. Let R be the repayment amount that the borrower has to make next period.

b. Find the amount of loan the lender will advance to each borrower every period in order to maximize his own profits. How much is the scheduled repayment R and the implicit interest rate? In arriving at your answer, please answer the following:
   i. What are the two reasonable choices of loan that the lender can make?
   ii. If the lender chooses to lend the largest amount every period, what is the present value to the borrower of borrowing and repaying every period as a function of R? What is the present value to the borrower of defaulting in any single period, recognizing that if the borrower defaults at time t, he will never be able to borrow thereafter? How will R be chosen? What is the implicit interest rate? Under this R and implicit interest rate, what is the lender's profit? What is the borrower's profit?
   iii. Repeat the analysis in (ii) for the case where the lender chooses to lend the smallest amount every period.
   iv. Compare your results for (ii) and (iii). Which loan does the lender choose to make? Why? What is the repayment amount, implicit interest rate and profits under this chosen loan?

Introduce a new factor into this scenario. Suppose the lender can keep some of the borrower's assets (like jewelry) as collateral, which he will seize in the case of default. The present value of the asset to the borrower is $300.

c. Recalculate the optimal loan, repayment amount, implicit interest rate, and profits in this case.
d. Compare the two cases (of no collateral and collateral) and summarize the effect of collateralization on the other terms of the loan. Does it increase or decrease the welfare of the borrower and the lender?

2. **Oil Shock:** Read the paper by Owen Lamont posted on the course website. Do you think he has given sufficient evidence to prove the 2 hypotheses he stated in the abstract of the paper? Why or why not? Do you think he has shown that companies are credit constrained? Why or why not? (You do not need to read the entire paper in detail to answer these questions.) Please make your answers concise and limit the entire answer to no more than 250 words.

3. **Extra Credit**: **Micro-credit: Evaluation of the impact of micro-credit using household data from Bangladesh**
(Read "The Microfinance Promise" by Morduch (1999) to help you with intuition. It is a retrospective artice, which means that he really spells out everything.) The following problem is based on Morduch's 1998 study using a World Bank household survey from Bangladesh to assess whether micro-credit programs really help the poor (Tables 2, 6, and 7). The data set is cross-sectional, with all observations collected in 1993. The survey covered both villages with and villages without micro-credit institutions. Within each village, data is collected on households participating in a micro-credit program (Grameen, BRAC and BRDB) as well as on non-participating households.

A household is technically *eligible to participate* in a micro-credit program if it owns less than .5 acres of land. Of course the household can only participate if there exists a micro-credit program in the village.

Grameen, BRAC and BRDB all target the rural poor. Have these micro-credit programs improved the well-being of the target population?

a. Consider this as an estimate of the Grameen Bank's effect: β_a = E[y | household participated in Grameen] - E[y | household did not participate in Grameen], where y is the outcome of interest (e.g., per capita household consumption).
   i. Under what conditions would β_a provide an estimate of Grameen Bank's true effect? (Hint: Recall previous problem sets in which you have estimated the treatment effect using this simple difference.)
   ii. Suggest one reason why β_a might be upward biased (estimated effect is higher than the true effect).
   iii. Suggest one reason why β_a might be downward biased (estimated effect is lower than the true effect).
b. You have data on households from Grameen and non-Grameen villages, and know whether they are eligible or ineligible. Let **`program`** be a dummy variable equal to one if the household lives in a village with a Grameen Bank, and let **`eligible`** be a dummy variable equal to one if the household is eligible to participate. Consider y as the outcome of interest.
   i. Consider β_{bi} = E[y | program = 1] - E[y | program = 0]. Do you expect this to provide a good estimate of the Grameen Bank's effect? Why or why not?

ii. Consider β_{bii} = E[y | eligible = 1] - E[y | eligible = 0]. Do you expect this to provide a good estimate of the Grameen Bank's effect? Why or why not?
iii. Write down the difference-in-differences estimator in terms of conditional means. Call this estimator β_{did}.
iv. Consider the difference-in-difference estimate using land ownership to define eligibility. So, households with under .5 acres are considered eligible in this analysis. This part explores why it might not provide a good estimate.
    1. When we use the difference-in-differences estimator, what are we assuming about how the treated group's outcome would have been in the absence of treatment?
    2. Imagine you are a Grameen employee who cares about the poor. Due to resource constraints, you cannot provide services in every village. Where will you most likely locate? Is program placement likely to be random? That is, will program villages be similar in all respects to non-program villages except that the former have a Grameen Bank?
    3. The difference-in-differences estimator is fine so long as there are only *fixed* differences between program and non-program villages that impact eligible and ineligible households the same way. However, we can provide an example where on average, two villages look the same (so they appear to be good controls for each other), but in actuality have different dynamics. Suppose there are two villages, neither of which have a Grameen Bank yet: an equal village where the poor eat 1 per capita and the rich eat 2 per capita, and an unequal village where the poor eat .5 per capita and the rich eat 2.5 per capita. (For simplicity, just assume that in both villages, the proportion of poor is 50%.) Would you, the concerned Grameen employee, locate in the equal or unequal village? Why?
    4. Continuing with the previous example of the equal and unequal villages, what do you find if you do a difference-in-differences before the program? This is parallel to the "control experiments" we have explored in previous lectures and problem sets. Does the result of this control experiment make you more or less confident that β_{did} (using the after data) is a good estimator? (Note: the results you discussed in part (i) are differences-in-differences estimators using after data – recall that we only have a single cross-section).

c. Now, use the eligibility definition provided in the World Bank data set. According to this definition, a household is eligible if: [it is located in a non-village and owns less than .5 acres], or [it is located in a program village and (owns less than .5 acres *or* is already a program participant].
    i. Do you think this will result in different estimates than in part (b)?
    ii. The reason for the above finding is that there was mistargeting. Households that were technically not eligible for the program ended up participating in the program. Why might including households with more land in the treatment group cause our estimates of the program's effect to be upward biased?
    iii. Give two reasons (there are many) why mistargeting may have occurred, and explain. Is mistargeting necessarily bad?