"Readme" file for the estimation programs

(For "Contract Pricing in Consumer Credit Markets" by Einav, Jenkins, and Levin)

This is a "readme" file that explains what program files are included in this directory, and how they are organized. To actually run these files, interested researchers would need to contact the company through us and request access to the data, which are unfortunately proprietary. Please contact the authors at either leinav@stanford.edu (Liran Einav), jdlevin@stanford.edu (Jonathan Levin), or mjenk@wharton.upenn.edu (Mark Jenkins) for more details.

The included version of the code (in Matlab) is the one that produces our baseline results, which are reported in Tables 1-7 and Figures 1-8 of the paper. If you are interested in any of the other results (that are reported and discussed in the robustness section of the paper), please contact us at the e-mail addresses above. These additional programs are available upon request, but are not as nicely documented, so navigating through them may require some help from us.

Thanks for your interest!

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Overview

The computations in the paper proceed in the following four steps:

1. Compute summary statistics
    a. Tables: 1
    b. Figures: 1, 2, and 3
2. Calibrate structural model of borrowing and repayment behavior
    a. Figures: 4, A1, A2, A3
    b. Tables: A1, A2, A3
3. Estimate demand parameters using maximum likelihood
    a. Tables: 2 and 3
    b. Figures: 5
4. Estimate supply parameters and compute counterfactuals
    a. Tables: 4, 5, 6, and 7
    b. Figures: 6, 7, and 8

The files used in each step are listed below, along with a brief description. The programs were run in Stata and Matlab, as denoted by the file extensions .do and .m, respectively.

Part 1: Summary Statistics

- summary_stats.do – compute summary statistics for Table 1, rate of return histogram for Figure 1, and probability of repayment by credit quality and down payment amount for Figure 2. Figure 3 shows only raw data and does not require calculations.

Part 2: Structural Model Calibration

- main.m – solve borrower's optimal down and repayment problem for given set of parameters, compute moments, generate scatter plot, and output data for simulated regressions

- simulate_unobservables.m – simulate initial car value, initial liquidity, and repayment liquidity unobservables for each applicant given distribution parameters

- optimal_repayment.m – compute value function and policy function in all periods for a discretized grid of income and monthly payment amounts

- optimal_down – compute optimal down payments and simulate repayment decisions for all simulated applicants, given optimal repayment rules

    - CalcEVP1.m - input vector of liquidity and car value indices and output future values for each possible down payment choice

    - CalcEVPt.m – input vector of liquidity and car value indices and output future values for each possible loan repayment choice

- CalcUtility.m – compute borrower’s flow utility given income and payment size

- CalcDown.m – compute down payment given car price and monthly payment amount

- CalcMoments.m – compute borrowing and repayment moments based on simulated applicant draws and optimal decision rules

Part 3: Demand Model Estimation and Results

- initialize_parameters.do – compute initial parameter vector by estimating four demand equations separately (price, sale, down, default)

- estimate_ml.m – import initial parameter vector and maximize likelihood function described in Appendix B

- likelihood.m – given a parameter vector, compute the likelihood function described in Appendix B

- post_estimation.m – import final parameter vector, compute supply-side parameters, and generate tables and figures

- define_parameters.m – parse parameter vector into individual scalars and subvectors

- define_fittedvalues.m – compute fitted values from demand equations using estimated parameter vector

- simulate_for_model_fit.m – simulate unobservables from demand equations using estimated covariance matrix unconditionally

- create_table2.m – compute summary statistics using both actual data and simulated data from the estimated demand model for Table 2

- create_table3.m – compute marginal effects of changes in explanatory variables on the probability of sale for first column of Table 3

- create_figure5.m – compute down payment and default timing histograms using both actual data and simulated data from the estimated demand model for Figure 5

- create_figure8.m – compute default probabilities and expected down payments with and without credit-based minimum down payments for Figure 8

Part 4: Supply-Side Estimation and Results

- simulate_unobservables.m – simulate unobservables from demand equations using estimated covariance matrix conditional on observed outcomes

- create_table4.do – estimate probit and OLS recovery equations presented in Table 4

- create_table5.m – compute supply-side cost estimates by searching over grid of possible values; output presented in Table 5

- revenue_expectation.m – compute lending outcome variables for each applicant (e.g., sale indicator, down payment, default timing, revenue, profit, etc.).

    - revenue_coefficients.m – compute present value of loan revenue as a function of fraction of payments made, given loan terms and other observables

- create_table6.m – compute optimal minimum down payments and associated lending outcomes under different pricing regimes for Table 6

    - optimal_mindown.m – compute optimal minimum down payment requirements for the lender given estimated demand parameters.

- create_table7.m – compute equilibrium minimum down payments and associated profits under different market structures for Table 7

    - revenue_competition.m - compute outcome variables for each applicant (e.g., down payment, revenue, profit, etc.) with duopoly market structure

- create_figure6.m – compute data for Figure 6 by looping over minimum downs and computing probability of sale, probability of default, and expected profit at each

- create_figure7.m – compute data for Figure 7 by looping over price-cost margins and computing probability of sale, probability of default, and expected profit at each