

# Financial Econometrics

## Binary dependent variable

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In this lab session, we investigate following research question: **Do overvalued firms pay more often in stock when acquiring other firms?**

The rational for this hypothesis is fairly simple. Let's say the stock price of firm A is overvalued. It currently trades at 6\$. However, management knows that the real value is 5\$ and that the stock price eventually reverts. Firm A currently completes the acquisition of firm B which is valued at 600\$. They have two options to pay for firm B, either offer them 600\$ in cash or 100 shares in firm A at the current market price.

1. Cash acquisition: firm A has to pay 600\$ which is worth 600\$.
2. Share acquisition: firm A offers 100 shares at 6\$ per share to the shareholders of firm B. However, management knows that the share price is overvalued, and will revert back to 5\$. Hence, this option costs them 500\$.

Please use the *Method\_of\_payment.csv* data. The data on M&A is gathered from Thomson SDC database, with a set of selection criteria as standard in the literature. Please see below the description of variables provided,

- *yyyy*: year of the deal announcement
- *all\_stock*: a dummy variable equal to 1 if the transaction is fully paid in stock
- *relnsize*: ratio of deal value to acquirer market value
- *lbidder\_size*: log of the bidder's market value at the end of the fiscal year before the acquisition announcement in millions US dollars
- *bidder\_lev*: the bidder's long term debt divided by the market value of assets
- *bidder\_mtb*: the bidder's market value of assets (defined as the book value of total assets minus common equity plus the market value of equity) divided by the bidder's book value of assets
- *med\_mtb\_sect*: median MTB of the sector of the bidder during the announcement year
- *bidder\_tang*: bidder's asset tangibility
- *bidder\_rd*: bidder's R&D expenses
- *bidder\_cash*: bidder's cash holdings
- *domestic*: a dummy equal to 1 if the transaction is domestic
- *horz*: a dummy variable equal to 1 if the transaction is horizontal
- *public*: a dummy equal to 1 if the target is public
- *rate*: interest rate

Additional variable definition: generate an overvaluation measure. We define *overvalued* as *bidder\_mtb* minus *med\_mtb\_sect*.

Your analysis proceeds as follows:

1. Load the data and winsorize at the 99% level, except dummy variables.
2. Estimate the following regression models. In the first specification, explain whether or not the merger is fully paid in stock by the constructed overvaluation measure. In the second specification add all relevant control variables. Estimate both specification with LPM, Probit, and Logit. Report all six results in a stargazer table.
  - Does overvaluation matter? Evaluate statistical and economic significance.

3. For the logit models, estimate average treatment effects and treatment affect at means with and without additional controls.
  - Do estimates compare to the LPM model in the previous task?
4. Compute Pseudo  $R^2$  for the logit models.
  - How important are the additional controls?
5. Test whether the multiple regression model (with controls) is better than the simple model with only a single regressor. For LPM use *linearHypothesis()* and *lrtest* for logit and probit.