Imperial College London

MSc Financial Technology

BUSI70606 Financial Econometrics

Tutorials

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Problem Set 1 - Regression Analysis

1. Explain with the use of equations, the difference between the sample regression function and the population regression function.

2. What five assumptions are usually made about the unobservable error terms in the classical linear regression model (CLRM)? Briefly explain the meaning of each. Why are these assumptions made?

3. Which of the following models can be estimated (following a suitable rearrangement if necessary) using ordinary least squares (OLS)?
   x, y, z are variables and α, β, γ are parameters to be estimated.

   (a) $y_t = \alpha + \beta x_t + u_t$
   (b) $y_t = e^{\beta t} x_t^{\beta} e^{u_t}$
   (c) $y_t = \alpha + \beta\gamma x_t + u_t$
   (d) $\ln(y_t) = \alpha + \beta \ln(x_t) + u_t$
   (e) $y_t = \alpha + \beta x_t z_t + u_t$

4. To estimate the CAPM beta of a stock one can run the regression:

$$[R_{it} - R_{rft}] = \alpha_i + \beta_i [R_{mt} - R_{rft}] + u_{it},$$

   where $[E(R_{it}) - R_{ft}]$ is the excess return on stock i and where $[E(R_{mt}) - R_{rft}]$ is the excess return on the market.

   (a) Assume that, using 62 observations, you have estimated a beta of 1.147 (with a standard error of 0.0548) for IBM. Test, at the 5% level, the null hypothesis that IBM is as risky (no more no less) than the market. Test this null against the single sided hypothesis that IBM is more risky than the market.

   (b) Now assume that, using 38 observations, you have estimated a beta of 0.214 (with a standard error of 0.186) for Acorn Mining. Test, at the 5% level, the null hypothesis that Acorn's returns do not have any systematic risk.
   (In other words the correlation between Acorn's returns and market returns is zero). Test this null against a two-sided alternative.

   (c) Form and interpret a 95% and 99% confidence interval for the beta you calculated in 4b.

5. Are hypothesis tested concerning the actual values of the coefficients (i.e. β) or their estimated values (i.e. $\hat{\beta}$)?