Regressions

Noé Debrois

June 16, 2024

Multivariate Regressions

y = 4+ βx+ + 4+ , + ε [1, +].

- Generalizing the Simple Model: Extend the simple one-dimensional regression model to accommodate multiple independent variables. For example, the number of cars sold may depend on factors like car prices, public transport prices, petrol prices, and public concern about global warming.
- Matrix Notation: Represent the multiple regression model using vectorial notation: $y = X\beta + u$, where y is the dependent variable, X is the matrix of independent variables, β is the vector of coefficients, and u is the error term.

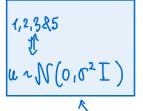
The constant Term is $y_t = \beta_1 + \beta_2 x_{2t} + \beta_3 x_{3t} + \cdots + \beta_{r+1} x_{r+3t} + x_{t+3t} + x_{t+3t}$. Multiple Regression and the Constant Term

• Inclusion of the Constant Term: The regression equation includes a constant term represented as a column of ones in the X matrix. The general form of the equation is $y_t = \beta_1 + \beta_2 x_{2t} + \beta_3 x_{3t} + \dots + \beta_{r+1} x_{r+1,t} + u_t$.

Ordinary Least Squares (OLS) Estimator

- Parameter Estimation: The OLS method is used to estimate the parameters β by minimizing the sum of squared residuals. The OLS estimator is BLUE (Best Linear Unbiased Estimator, if certain assumptions hold.
- Linear Unbiased Estimator) if certain assumptions hold.

 Assumptions of the CLRM (Classical Linear Regression Model): $\vec{u} = \gamma - \chi \beta \text{ in matrix form.}$ 0.15: min. the RSS: $S(\beta) = \sum_{t=1}^{T} \left[y_t - \beta_1 \cdot \beta_2 x_{2t} - \dots \cdot \beta_{r+2} x_{r+1} \right]^2$ $= \sum_{t=1}^{T} \vec{u}_t^2 = \vec{u}_t \vec{u}_t .$



SEE THE PROPERTIES

OF THE ESTIMATORS.

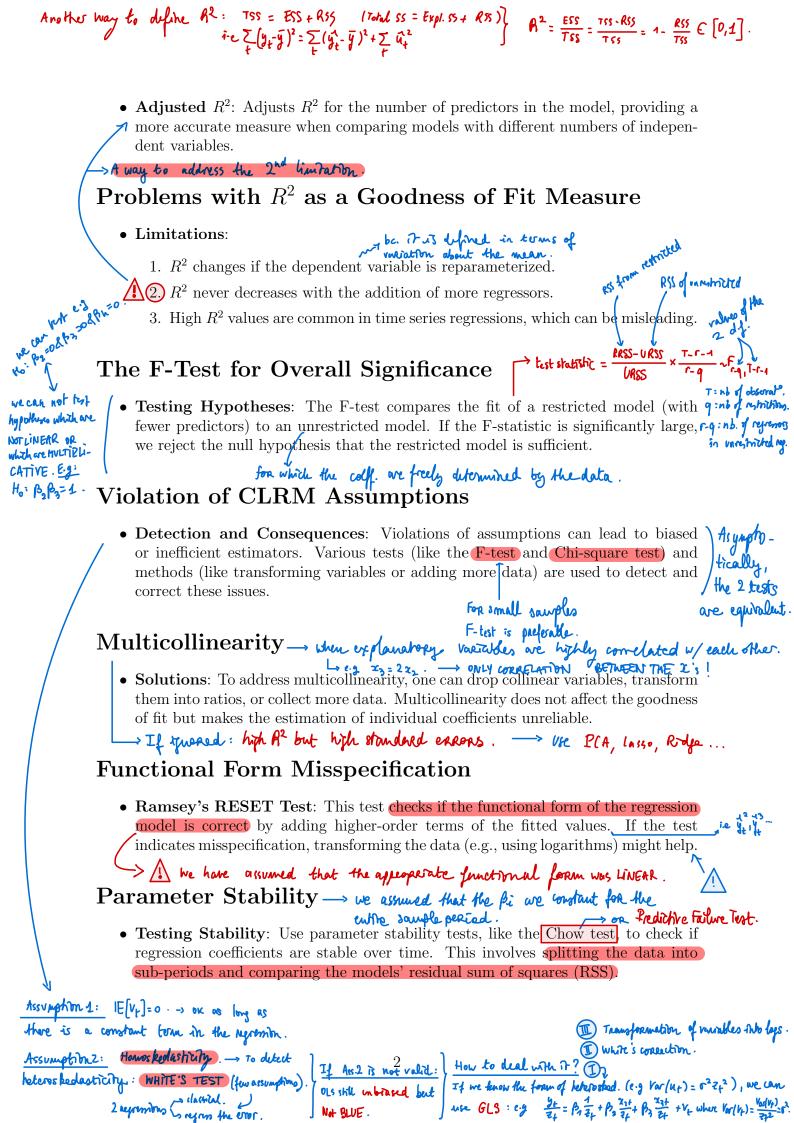
- 1. The error term has zero mean $E(u_t) = 0$.
- 2. Homoscedasticity $Var(u_t) = \sigma^2$. 3. No autocorrelation $Cov(u_i, u_j) = 0$.
- 4. The independent variables are non-stochastic.
- 5. The error terms are normally distributed.

$$\rightarrow m_{\perp} \sim \mathcal{N}(0.0^2)$$
.

Goodness of Fit: R^2 and Adjusted R^2

 R^2 : Measures the proportion of the variance in the dependent variable that is predictable from the independent variables. R^2 values range from 0 to 1.

a newwe of how well one regression medil outhally fits thedata.



Assumption 3: cov(ui, uj)= 0 for if), i.e. "there is no pattern in the errors". > To detect autocorrelation: Durbin- Nation (DW) test: it assumes: uf = Put-1 + vt W/vt N(0, 0,2) t.e 11toader autocorr. It test Ho: p=0. The test stashistic:
Dunt of THUMA -> DW. $DW = \frac{\sum_{i=2}^{L} \left(\hat{u}_{i} - \hat{u}_{i+1}^{L}\right)^{2}}{\sum_{i=2}^{L} \hat{u}_{i}^{2}} 22(1-\hat{\rho}) \in [0, L] . \quad \text{estimated correlation.}$ Intervalible region where we can neither reject now not reject to .RULE OF THUMB AD DW. L> Other test: Breusch-Godfrey Test: 1th order autocom! · IP ass.3, is not valid: OLS otill unbinded but Not OLUE. · How to deal with it? GLS on About on dynamical models (Anna, VAR). tesuption 5: normality. -> Coatapane normality test: a normal distribution is Not skewed & has a kurtosis: 3. What should we do if not normal? Not sorrows... use nethods w/o this ars. ; or use dummy variable (e.g for oct. 1987). • See the nethed for building a CLAM model, stides 75-77. · ARTÎCLE "Determinants of Soverigh Credit Rottyss", Coulor & Packer (1996). - 6 fectors play a big role in determining sorverigh credit ratings: incomes, GDP growth, inflation, external debt, industrialized or not, of default history. aneusrons. The ratings provide more exformation on yields than all of the macro factors put together.

- We cannot determine well what factors influence how the markets will react to ratings announcements. - Only 79 observations for rating announcements.

- Little attempt @ diagnostic checking.

1- Where did the factors (explanatory metables) come from?

ON THE BARBR.