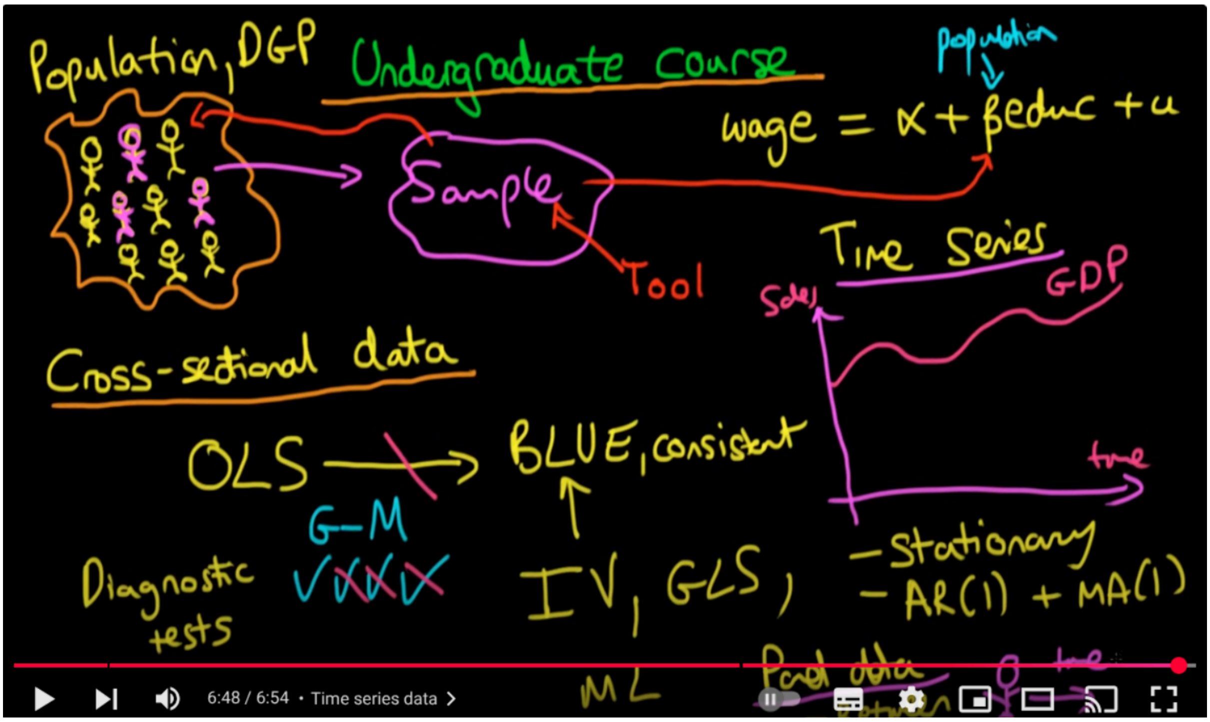
phd19_htwnote | Ben Lambert-Econometrics | 課本 | 👨‍🎓 |
2025/0524 做 ~/yt_enf/*.py 整理出 Ben Lambert Econometrics 課程表

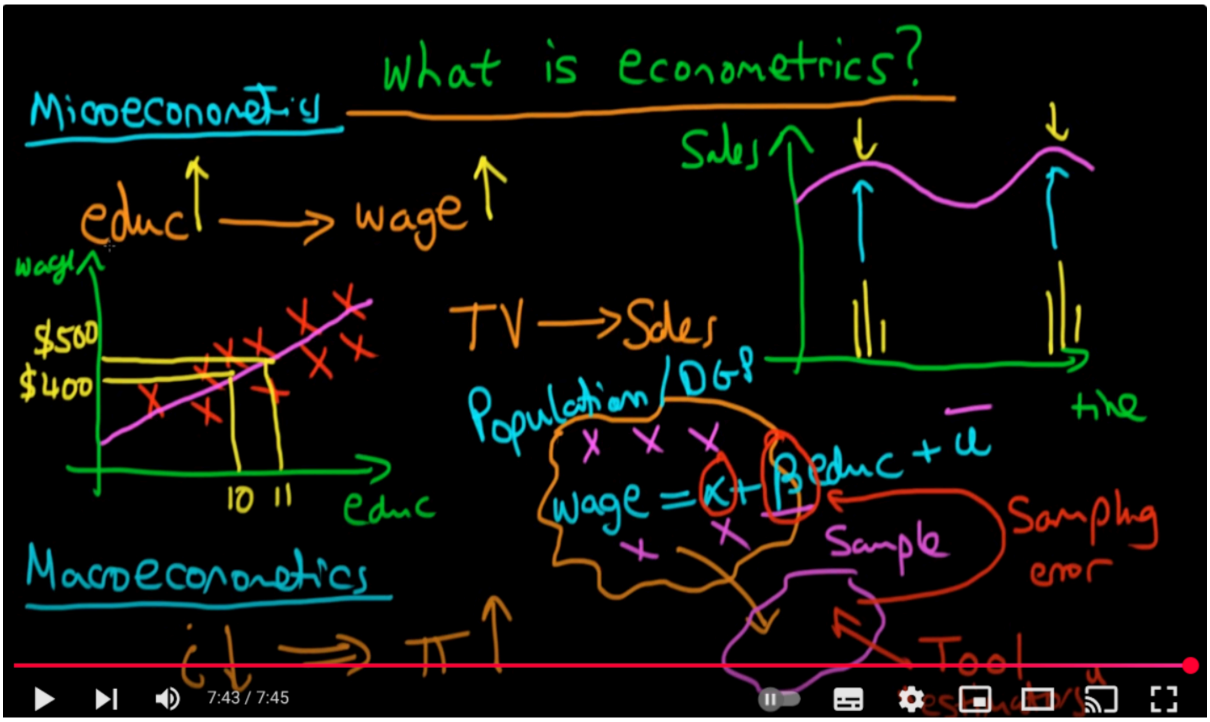
本來要和蘇朱家去上高地玩，但因秀月須去住長庚的行程取消，所以我整理這個課程，看能不能一週內看完。

筆記 2025/0524
1.[Undergraduate econometrics syllabus]
Cross-Section data: OLS-BLUE, G-M->Diagnostic tests-satisfy?(IV,consistency,GLS)
Time Series data: macro econometrics, Satationary -AR(1)+MA(1)
Panel Data: same individual data across time. modify-M-G. Random effect/Fixed effect.

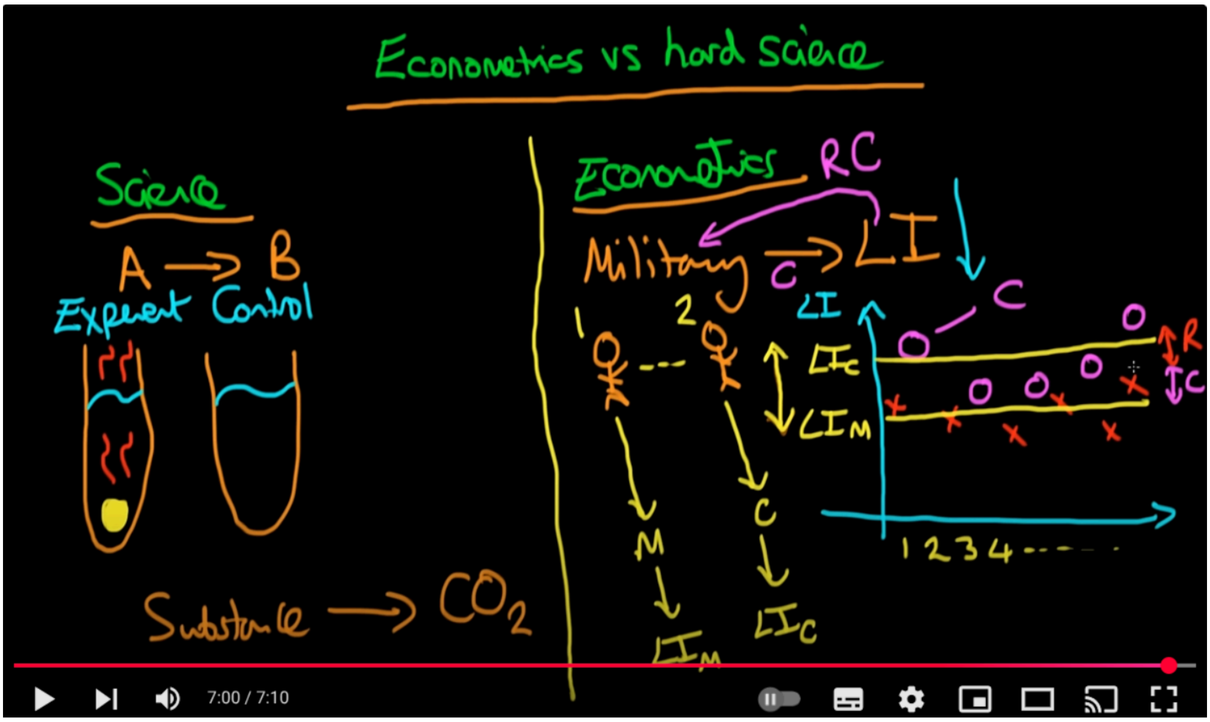


2.[What is econometrics?]
- microeconometrics: like wage/edu relationship; TVadv/Sales(try to understanding time series data);
- Macroeconometrics: macro relationship, like inflation rate/Interest rate;
- Within the Population we interested in the relationship between some variables.
- wage=a + b edu + u (all the variables are in u)

- some sort of Tool to estimate though sample (but sample might not be fully represent population, we call thins Sampling error)

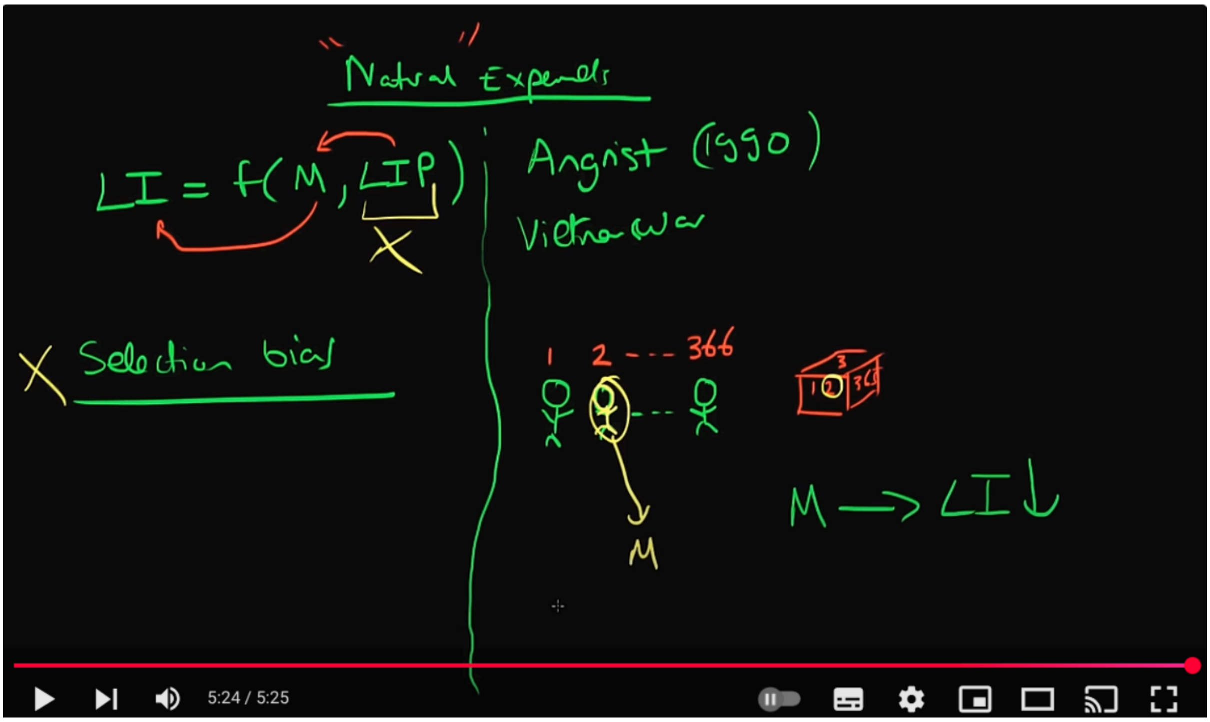


3. [Econometrics vs hard science]

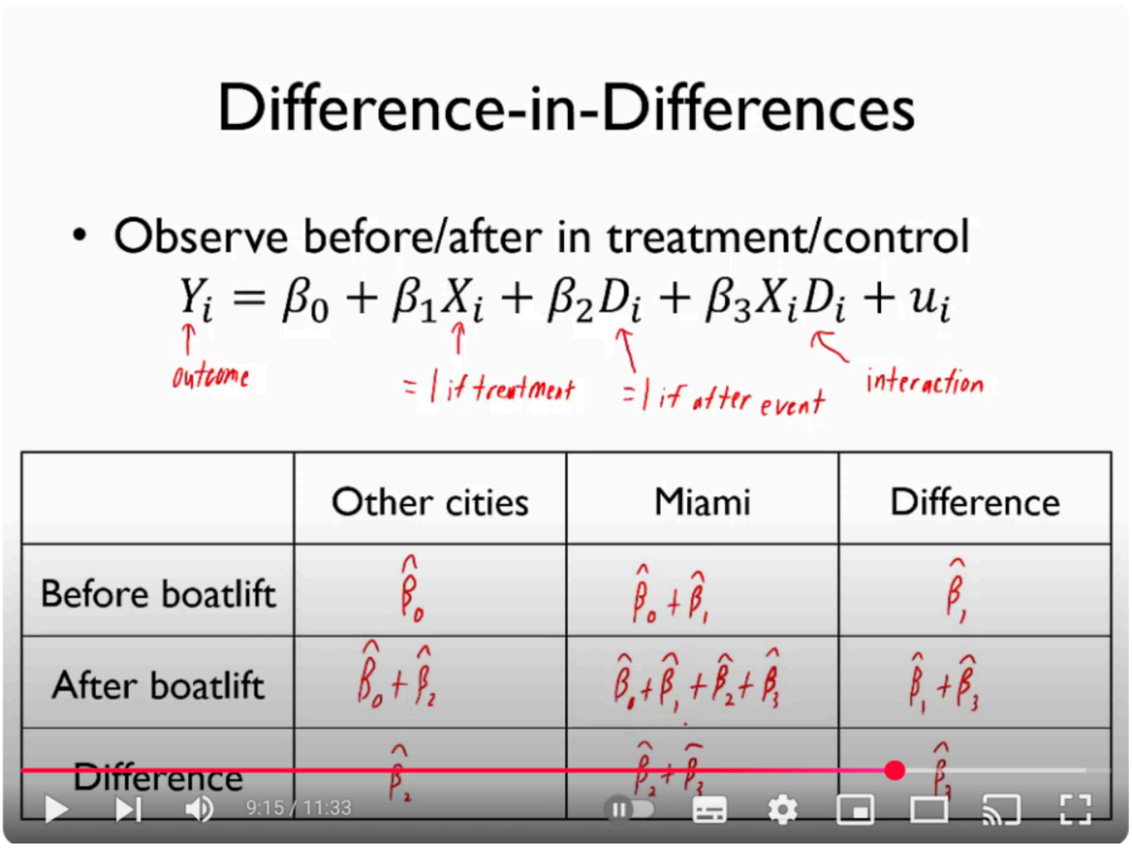


筆記 2025/0525
4. [Natural experiments in econometrics]
Joshua Angrist a professor at MIT(1990) did a bit of empirical research in 1990 which looked at the Vietnam war; conscription experiment; "what the effects of military participation had on

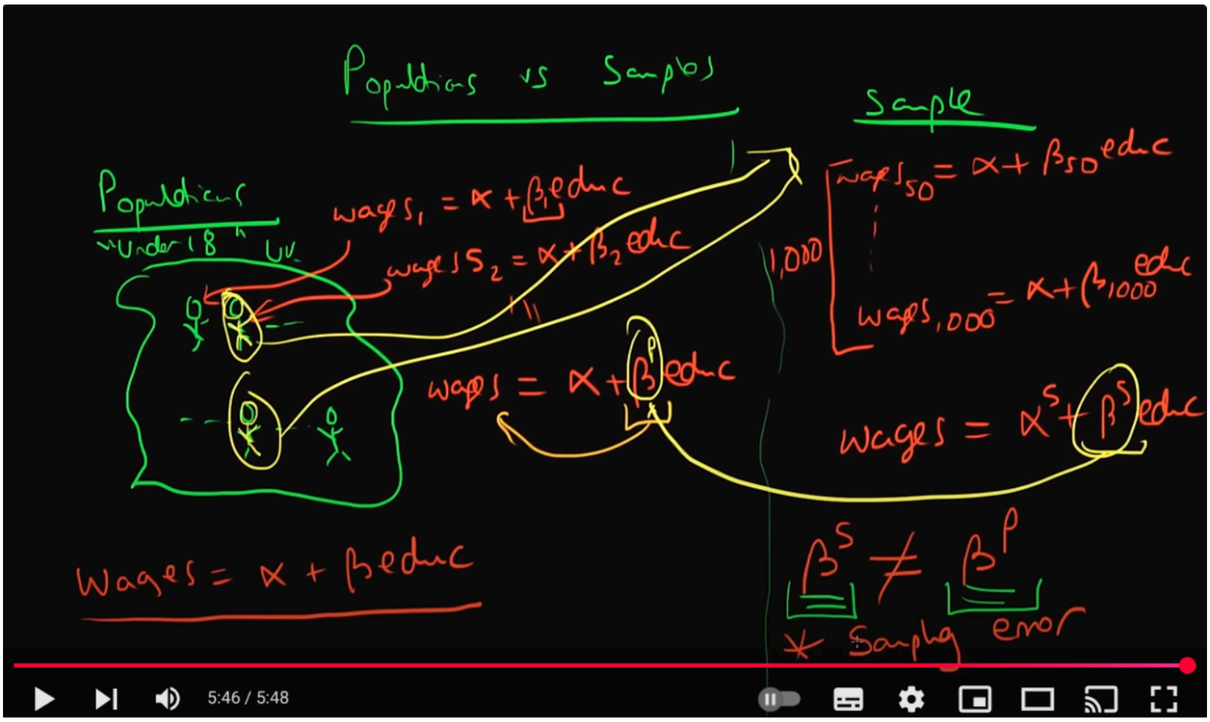
those individuals lifetime income potentials"; 1-366 days number random selected; M-LI(influence); it got rid of selection bias (But I will say that we're going to cover it later on when we talk about instrumental variables estimation); (quasi experiment 準實驗)



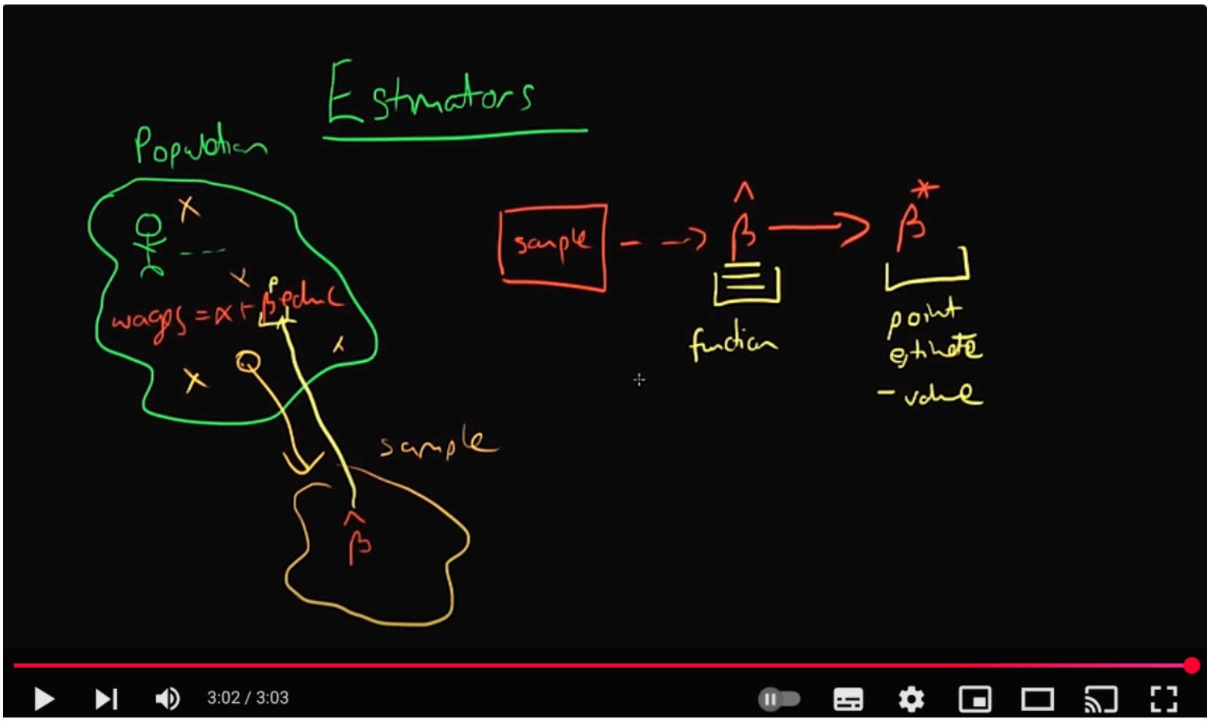
*可參考:Quasi-experiments: difference-in-differences



5. [Populations and samples in econometrics]
what the significance and importance of both is; (sample analog 樣本模擬/サンプルアナログ); 解釋sampling error; how do we come up with a good estimate of the effect of a whole;

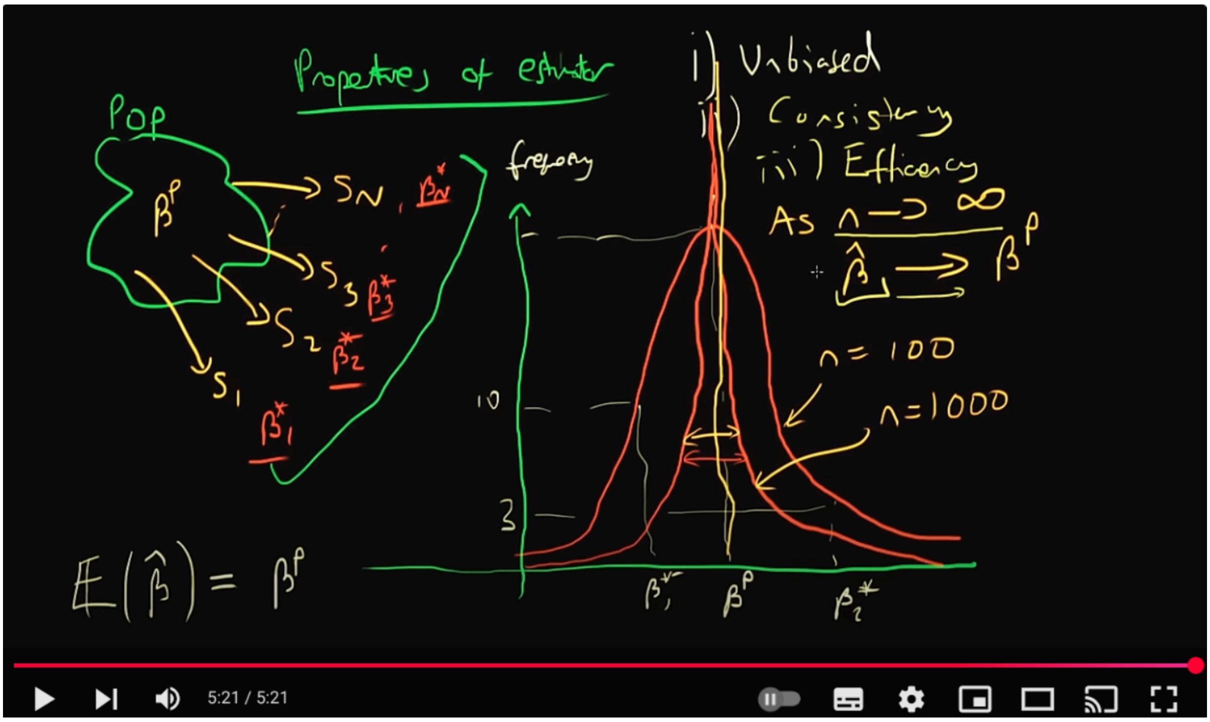


6. [Estimators - the basics]
estimator=β hat; will come out: β star=Point estimate of the population;

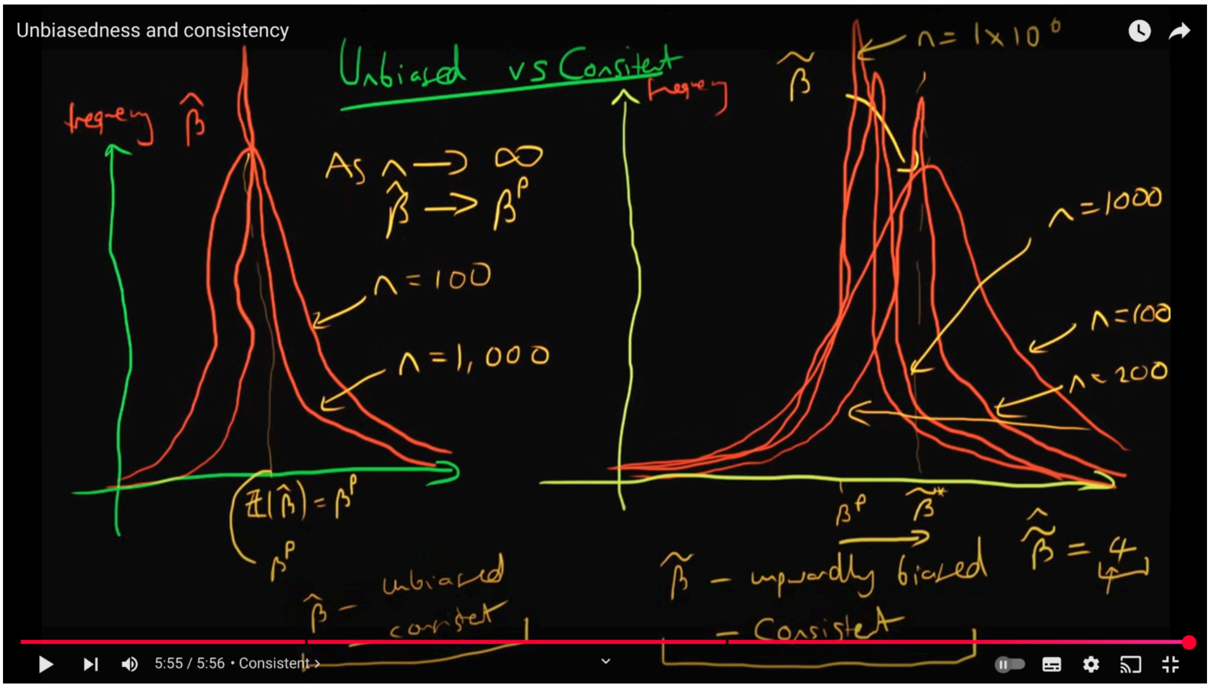


7. [Estimator properties]

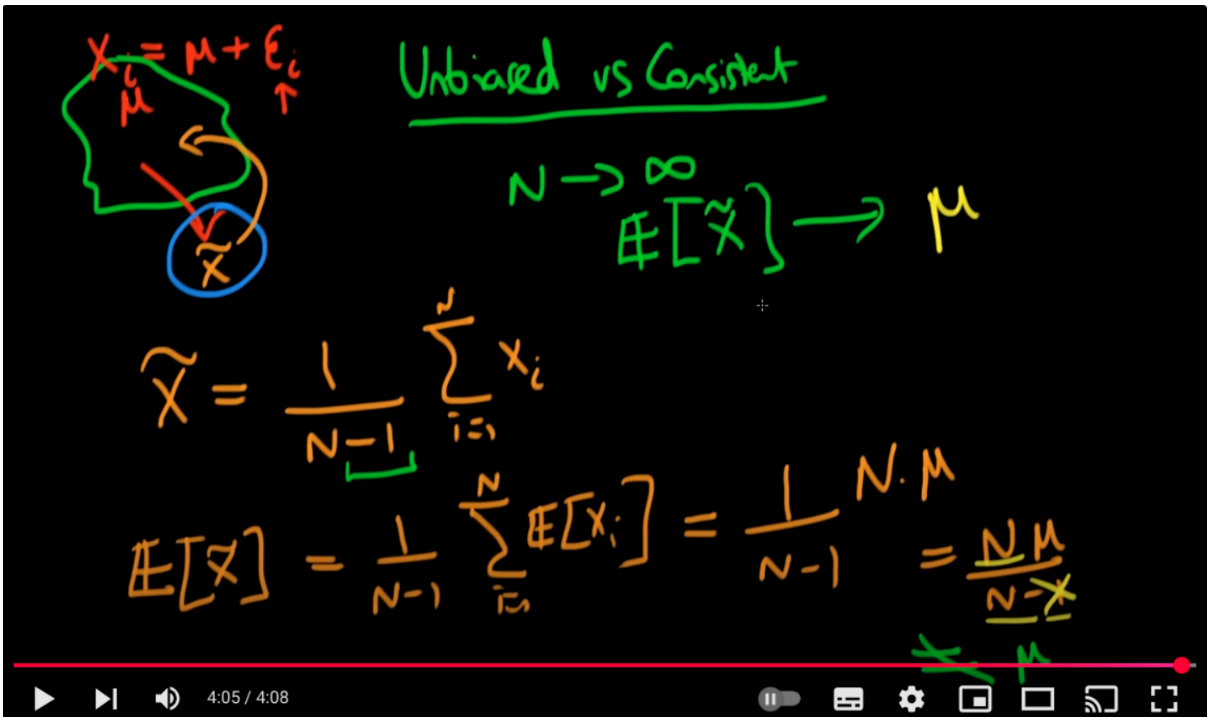
what does it mean to be a good estimator essentially; we hope the expectation out of our estimator so the expectation of our function is equal to the population parameter -> we call this property **(i)"unbiasedness"** or just our estimators are unbiased; **(ii)consistency**: When I've increased the sample size the values which I get for beta star are closer and closer to to the true population parameter. mathematically means that as our sample size tends to Infinity our estimator tends in value to the true population parameter. as ^->∞ then βhat->βP; will talk (iii)efficiency in the next video.



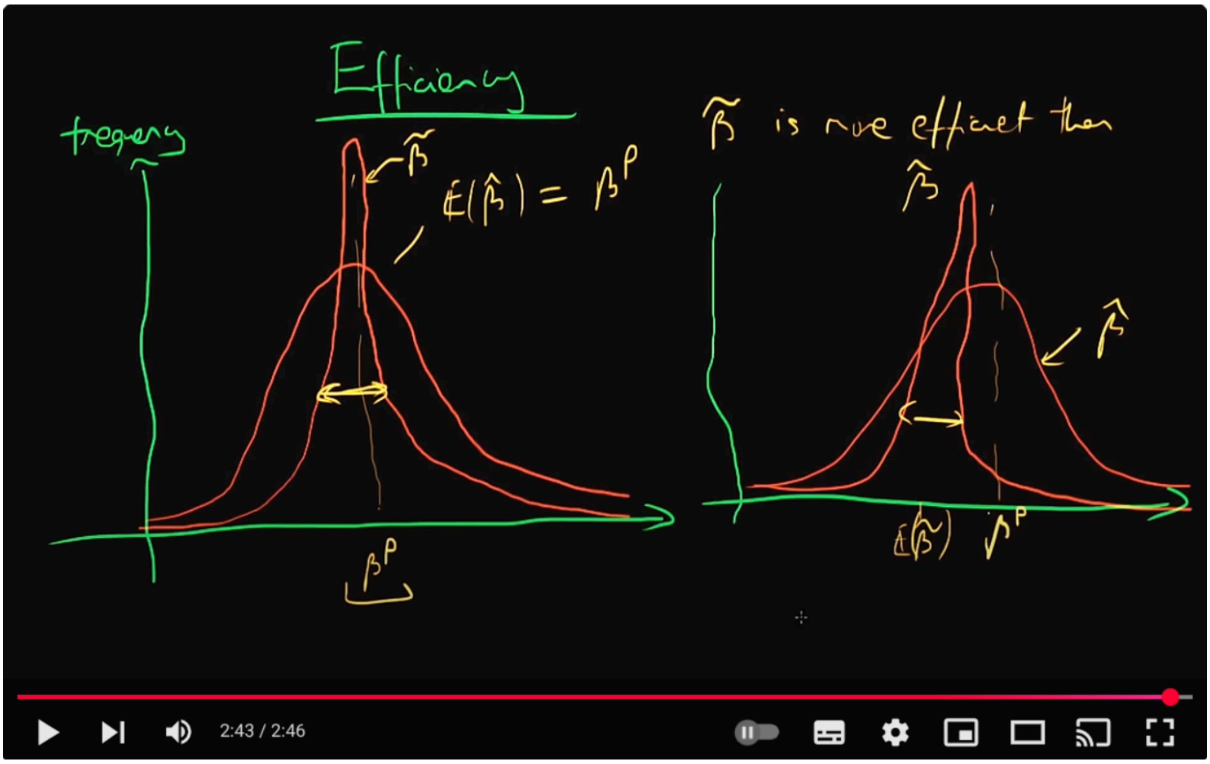
8. [Unbiasedness and consistency]
we expect βhat is unbiased and consistency, however it is also popular possible rather to get a estimator which is biased but consistent.



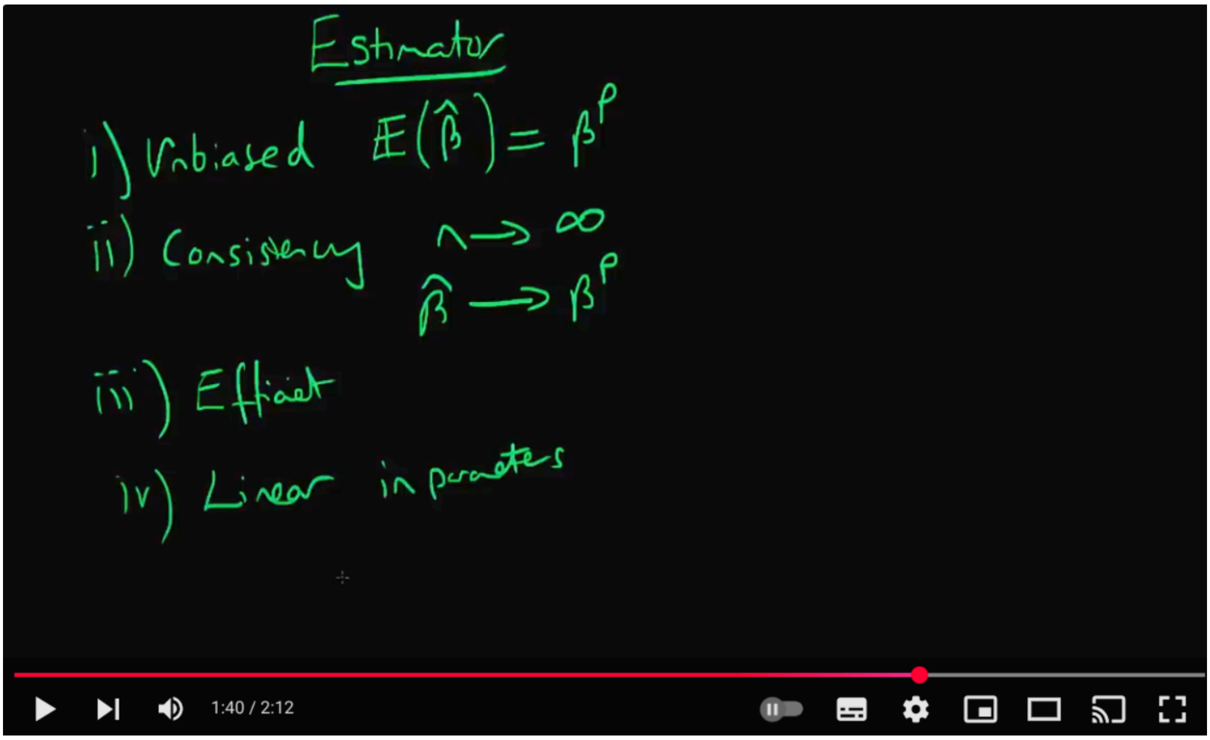
9. [Unbiasedness vs consistency of estimators - an example] the sort of sample size goes to Infinity is in fact the population mean mu, so even though I had a biased estimator of the population mean I actually have a consistent estimator for the population mean.



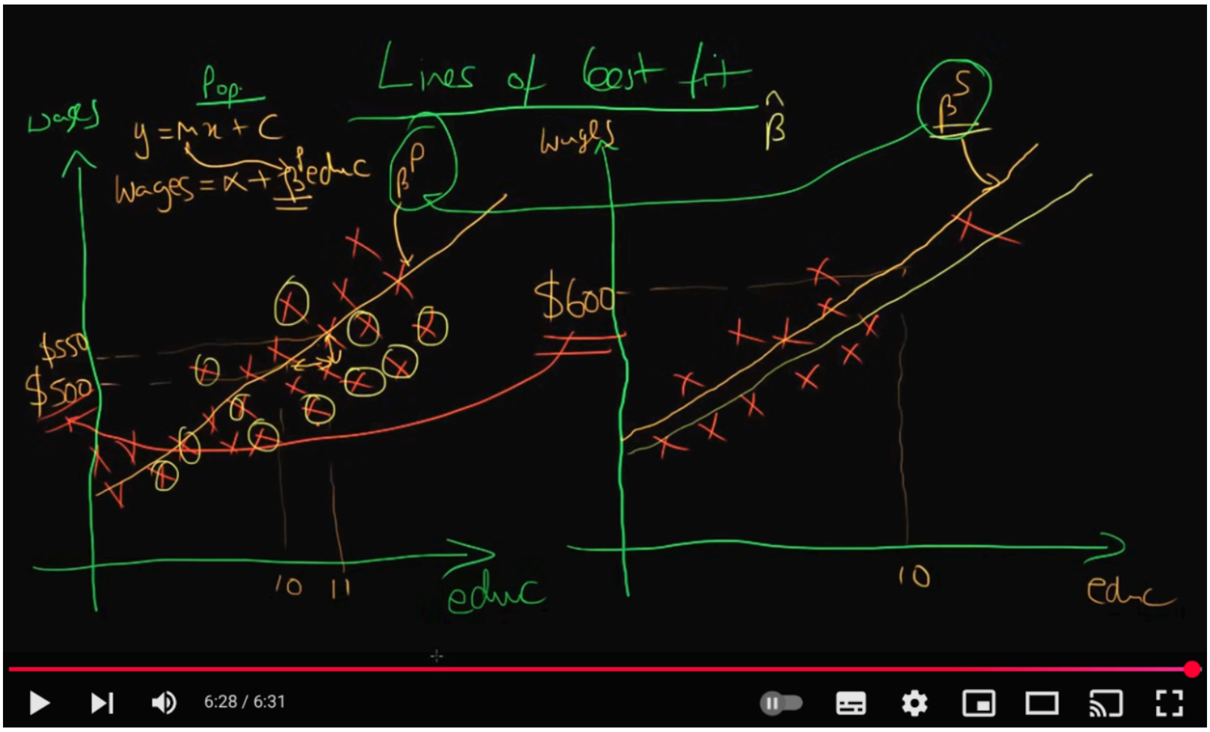
10. [Efficiency of estimators] **(iii)Efficiency:** more efficient also more unbiased;



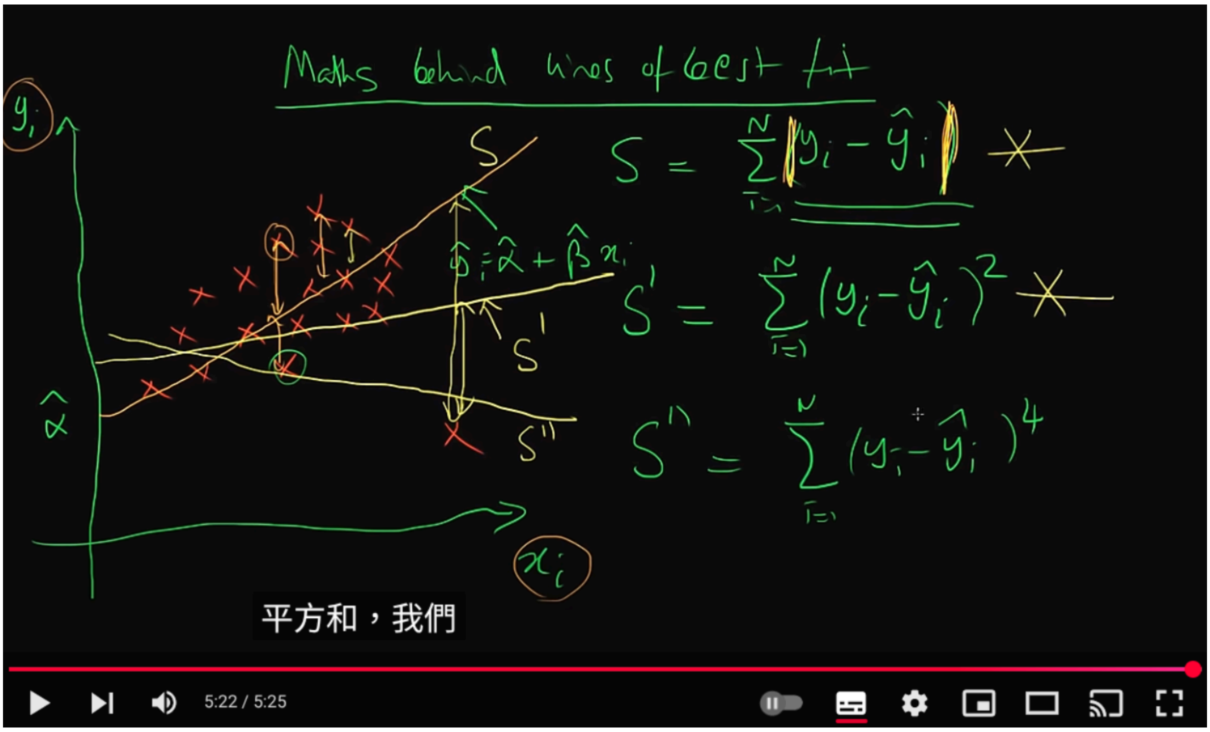
11. [Good estimator properties summary] (iv)linear relationship : we want our estimator beta hat to be a sort of linear function in parameters of the sample data.



12. [Lines of best fit in econometrics]
can I draw a line which goes or is as close to the points as possible, which we have from the sample, and this would be a line of best fit.



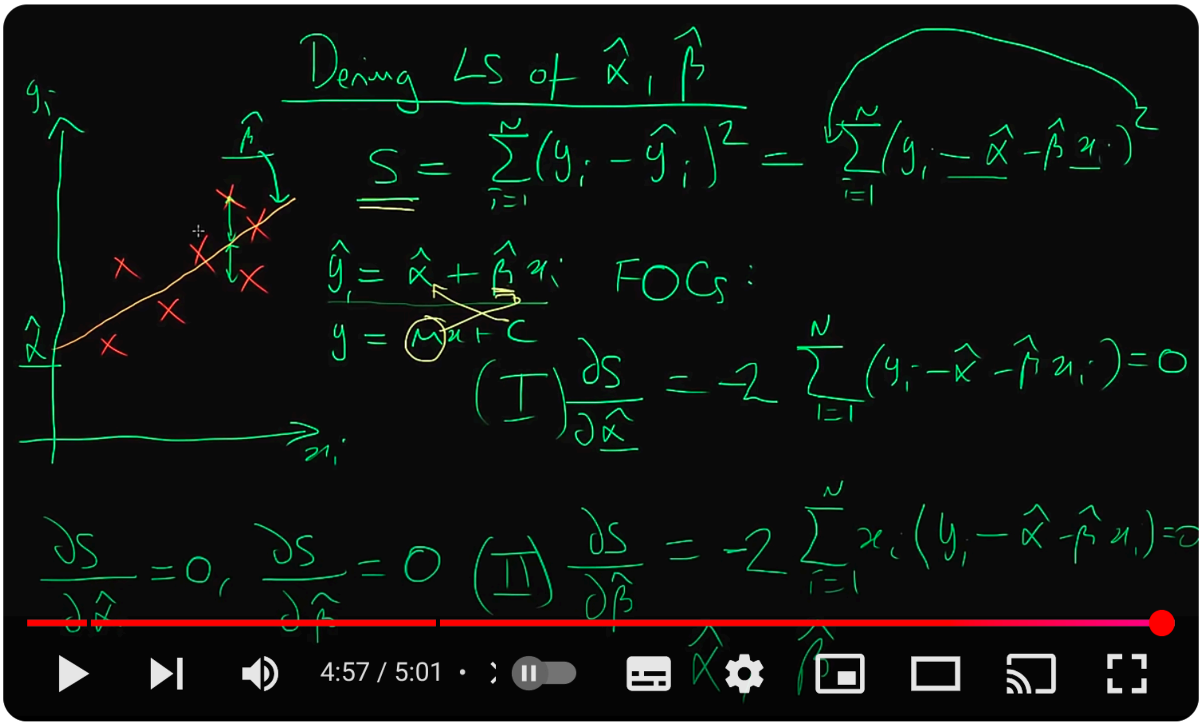
13. [The mathematics behind drawing a line of best fit]
objective way to fit a straight line to data; (absolute value or modulus的絕對值或模，記號為 |a| : modulus sign模數符號-取絕對值).



14. [Least Squares Estimators as BLUE]
There are no other linear estimators which we can apply to our samples which give us good or unbiased estimates of the population parameters. There are no more efficient estimators to do that so this is a really really important thing and under a set of conditions these assumptions least squared estimators which are a relatively simple set of tools to use can actually fulfill this.

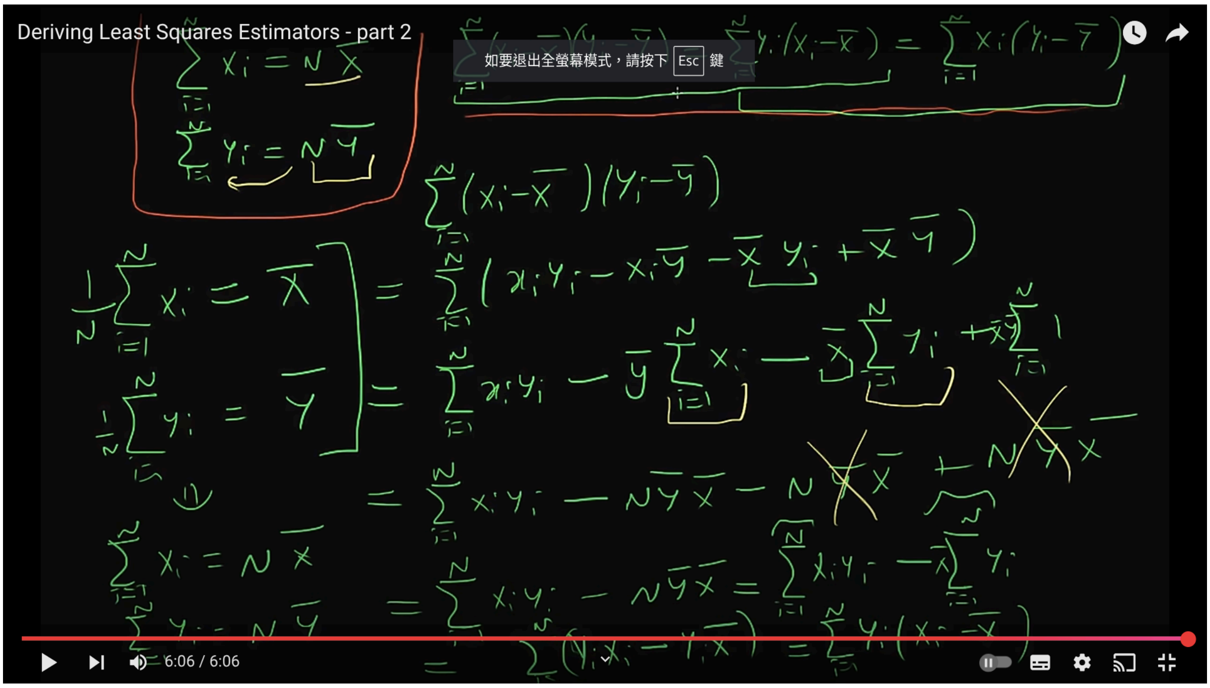
Least squared estimators under a set of conditions turn out to be a really really good tool to use to make inferences about the population.

筆記 2025/0526
15. [Deriving Least Squares Estimators - part 1]
Chain rule; 今天這裡(程式推導連鎖率時)卡關，跳出去李柏堅的微積分從53起開始複習(Chain Rule在59)。

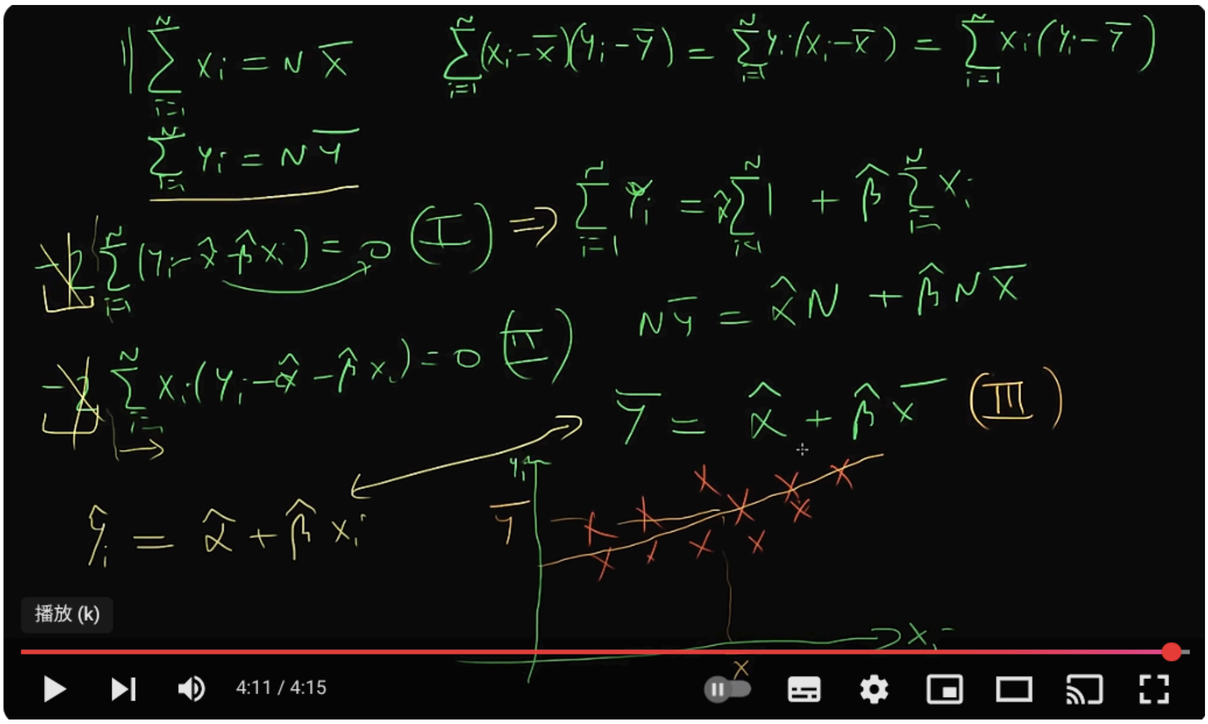


筆記 2025/0527
16. [Deriving Least Squares Estimators - part 2]

FOCs (First Order Condition):(i)
Second Order Conditio:(ii)



17. [Deriving Least Squares Estimators - part 3]
導出了Third Order Condition (iii)



18. [Deriving Least Squares Estimators - part 4]

19. [Deriving Least Squares Estimators - part 5]

20. [Least Squares Estimators - in summary]

21. [Taking expectations of a random variable]

22. [Moments of a random variable]

23. [Central moments of a random variable]

24. [Kurtosis]

25. [Skewness]

26. [Expectations and Variance properties]

27. [Covariance and correlation]

28. [Population vs sample quantities]

29. [The Population Regression Function]

30. [Problem set 1 - estimators introduction]

31. [Gauss-Markov assumptions part 1]

32. [Gauss-Markov assumptions part 2]

33. [Zero conditional mean of errors - Gauss-Markov assumption]

34. [Omitted variable bias - example 1]

35. [Omitted variable bias - example 2]

36. [Omitted variable bias - example 3]

37. [Omitted variable bias - proof part 1]

38. [Omitted variable bias - proof part 2]

39. [Reverse Causality - part 1]

40. [Reverse Causality - part 2]

41. [Measurement error in independent variable - part 1]

42. [Measurement error in independent variable - part 2]

43. [Functional misspecification 1]

44. [Functional misspecification 2]

45. [Linearity in parameters - Gauss-Markov]

46. [Random sample summary - Gauss-Markov]

47. [Gauss-Markov - explanation of random sampling and serial correlation]

48. [Serial Correlation summary]

49. [Serial Correlation - as a symptom of omitted variable bias]

50. [Serial Correlation - as a symptom of functional misspecification]

51. [Serial Correlation - caused by measurement error]

52. [Serial correlation biased standard errors (advanced topic) - part 1]

53. [Serial correlation biased standard errors (advanced topic) - part 2]

54. [Heteroskedasticity summary]

55. [Heteroskedastic errors - example 1]

56. [Heteroskedasticity - example 2]

57. [Heteroskedasticity caused by data aggregation (advanced topic)]

58. [Perfect collinearity - example 1]

59. [Perfect collinearity - example 2]

60. [Multicollinearity]

61. [Index - where we currently are in the overall plan of econometrics]

62. [Gauss-Markov proof part 1 (advanced)]

63. [Gauss-Markov proof part 2 (advanced)]

64. [Gauss-Markov proof part 3 (advanced)]

65. [Gauss-Markov proof part 4 (advanced)]

66. [Gauss-Markov proof part 5 (advanced)]

67. [Gauss-Markov proof part 6 (advanced)]

68. [Errors in populations vs estimated errors]

69. [Sum of squares]

70. [R squared part 1]

71. [R squared part 2]

72. [Degrees of freedom part 1]

73. [Degrees of freedom part 2 (advanced)]

74. [Overfitting in econometrics]

75. [Adjusted R squared]

76. [Unbiasedness of OLS - part one]

77. [Unbiasedness of OLS - part two]

78. [Variance of OLS estimators - part one]

79. [Variance of OLS estimators - part two]

80. [Estimator for the population error variance]

81. [Estimated variance of OLS estimators - intuition behind maths]

82. [Variance of OLS estimators in the presence of heteroscedasticity]

83. [Variance of OLS estimators in the presence of serial correlation]

84. [Gauss Markov conditions summary of problems of violation]

85. [Estimating the population variance from a sample - part one]

86. [Estimating the population variance from a sample - part two]

87. [Problem set 2 - OLS introduction - NBA players' wages]

88. [Hypothesis testing]

89. [Hypothesis testing - one and two tailed tests]

90. [Central Limit Theorem]

91. [Hypothesis testing in linear regression part 1]

92. [Hypothesis testing in linear regression part 2]

93. [Hypothesis testing in linear regression part 3]

94. [Hypothesis testing in linear regression part 4]

95. [Hypothesis testing in linear regression part 5]

96. [Normally distributed errors - finite sample inference]

97. [Tests for normally distributed errors]

98. [Interpreting Regression Coefficients in Linear Regression]

99. [Interpreting regression coefficients in log models part 1]

100. [Interpreting regression coefficients in log models part 2]

101. [The benefits of a log dependent variable]

102. [Dummy variables - an introduction]

103. [Dummy variables - interaction terms explanation]

104. [Continuous variables - interaction term interpretation]

105. [The F statistic - an introduction]

106. [F test - example 1]

107. [F test - example 2]

108. [F test - the similarity with the t test]

109. [The F test - R Squared form]

110. [Testing hypothesis about linear combinations of parameters - part 1]

111. [Testing hypothesis about linear combinations of parameters - part 2]

112. [Testing hypothesis about linear combinations of parameters - part 3]

113. [Testing hypothesis about linear combinations of parameters - part 4]

114. [Confidence intervals]

115. [The Goldfeld-Quandt test for heteroscedasticity]

116. [The Breusch Pagan test for heteroscedasticity]

117. [The White test for heteroscedasticity]

118. [Serial correlation testing - introduction]

119. [Serial correlation - The Durbin-Watson test]

120. [Serial correlation testing - the Breusch-Godfrey test]

121. [Ramsey RESET test for functional misspecification]

122. [Gauss-Markov violations: summary of issues]

123. [Heteroscedasticity: as a symptom of omitted variable bias - part 1]

124. [Heteroscedasticity: as symptom of omitted variable bias - part 2]

125. [Serial correlation: a symptom of omitted variable bias]

126. [Heteroscedasticity: dealing with the problems caused]

127. [Problem set 3 - Presidential election data - hypothesis testing and model selection]

128. [Weighted Least Squares: an introduction]

129. [Weighted Least Squares: mathematical introduction]

130. [Weighted Least Squares: an example]

131. [Weighted Least Squares in practice - feasible GLS - part 1]

132. [Weighted Least Squares in practice - feasible GLS - part 2]

133. [How to address the issue of serial correlation]

134. [GLS estimation to correct for serial correlation]

135. [fGLS for serially correlated errors]

136. [Instrumental Variables - an introduction]

137. [Endogeneity and Instrumental Variables]

138. [Instrumental Variables intuition - part 1]

139. [Instrumental Variables intuition - part 2]

140. [Instrumental Variables example - returns to schooling]

141. [Instrumental Variables example - classroom size]

142. [Instrumental Variables estimation - colonial origins of economic development]

143. [Instrumental Variables as Two Stage Least Squares]

144. [Proof that Instrumental Variables estimators are Two Stage Least Squares]

145. [Bad instruments - part 1]

146. [Bad instruments - part 2]

147. [Bias of Instrumental Variables - part 1]

148. [Bias of Instrumental Variables - part 2]

149. [Bias of Instrumental Variables - intuition]

150. [Consistency of Instrumental Variables - intuition]

151. [Consistency - comparing Ordinary Least Squares with Instrumental Variables]

152. [Inference using Instrumental Variables estimators]

153. [Multiple regressor Instrumental Variables estimation]

154. [Two Stage Least Squares - an introduction]

155. [Two Stage Least Squares - example]

156. [Two Stage Least Squares - multiple endogenous explanatory variables]

157. [Testing for endogeneity]

158. [Testing for endogenous instruments - test for overidentifying restriction]

159. [Problem set 4 - the return to education - WLS and IV estimators]

160. [Time series vs cross sectional data]

161. [Time series Gauss Markov conditions]

162. [Strict exogeneity]

163. [Strict exogeneity assumption - intuition]

164. [Lagged dependent variable model - strict exogeneity]

165. [Asymptotic assumptions for time series least squares]

166. [Conditions for stationary and weakly dependent series]

167. [Stationary in mean]

168. [Spurious regression]

169. [Spurious regression]

170. [Variance stationary processes]

171. [Covariance stationary processes]

172. [Stationary series summary]

173. [Weakly dependent time series]

174. [An introduction to Moving Average Order One processes]

175. [Moving Average processes - Stationary and Weakly Dependent]

176. [Autoregressive Order one process introduction and example]

177. [Autoregressive order 1 process - conditions for stationary in mean]

178. [Autoregressive order 1 process - conditions for stationary in variance]

179. [Autoregressive order 1 process - conditions for Stationary Covariance and Weak Dependence]

180. [Autoregressive vs Moving Average Order One processes - part 1]

181. [Autoregressive vs Moving Average Order One processes - part 2]

182. [Partial vs total autocorrelation]

183. [A Random Walk - introduction and properties]

184. [The qualitative difference between stationary and non-stationary AR(1)]

185. [Random walk not weakly dependent]

186. [Random walk with drift]

187. [Deterministic vs stochastic trends]

188. [Dickey Fuller test for unit root]

189. [Augmented Dickey Fuller tests]

190. [Dickey fuller test with time trend]

191. [Highly persistent time series]

192. [Integrated order of processes]

193. [Cointegration - an introduction]

194. [Cointegration tests]

195. [Levels vs differences regression - motivation for cointegrated regression]

196. [Leads and lags estimator for inference in cointegrated models (advanced)]

197. [Lagged independent variables]

198. [Problem set 5 - an introduction to time series]

199. [Mean and median lag]