

FINANCIAL ECONOMETRICS  
SHANGHAI JIAO TONG UNIVERSITY  
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EMPIRICAL EXERCISE 15.2

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*Reference: Stock, J.H. and Watson, M.W., Introduction to Econometrics (4th Edition, Global Edition)*

*Data: `us_macro_quarterly.csv`. The PCE price index PCEP is the column PCEPTI and the CPI is CPIAUCSL. Use 1963:Q1–2012:Q4.*

**Empirical Exercise 15.2.** In the data file `us_macro_quarterly.csv`, you will find data on two aggregate price series for the United States: the price index for personal consumption expenditures (PCEP, the column PCEPTI) that you used in Empirical Exercise 14.1, and the Consumer Price Index (CPI, the column CPIAUCSL). These series are alternative measures of consumer prices in the United States. The CPI prices a basket of goods whose composition is updated every 5–10 years. PCEP uses chain-weighting to price a basket of goods whose composition changes from month to month. Economists have argued that the CPI will overstate inflation because it does not take into account the substitution that occurs when relative prices change. If this substitution bias is important, then average CPI inflation should be systematically higher than PCEP inflation. Let

$$Inf_t^{CPI} = 400 [\ln(CPI_t) - \ln(CPI_{t-1})], \quad Inf_t^{PCEP} = 400 [\ln(PCEP_t) - \ln(PCEP_{t-1})],$$

and  $Y_t = Inf_t^{CPI} - Inf_t^{PCEP}$ , so  $Inf_t^{CPI}$  is the quarterly rate of price inflation (measured in percentage points at an annual rate) based on the CPI,  $Inf_t^{PCEP}$  is the quarterly rate of price inflation from the PCEP, and  $Y_t$  is their difference. Using data from 1963:Q1 through 2012:Q4, carry out the following exercises.

- (a) Compute the sample means of  $Inf_t^{CPI}$  and  $Inf_t^{PCEP}$ . Are these point estimates

consistent with the presence of economically significant substitution bias in the CPI?

- (b) Compute the sample mean of  $Y_t$ . Explain why it is numerically equal to the difference in the means computed in (a).
- (c) Show that the population mean of  $Y$  is equal to the difference of the population means of the two inflation rates.
- (d) Consider the “constant-term-only” regression:  $Y_t = \beta_0 + u_t$ . Show that  $\beta_0 = E(Y)$ . Do you think that  $u_t$  is serially correlated? Explain.
- (e) Construct a 95% confidence interval for  $\beta_0$ . What value of the HAC standard error truncation parameter  $m$  did you choose? Why?
- (f) Is there statistically significant evidence that the mean inflation rate for the CPI is greater than the rate for the PCEP?
- (g) Is there evidence of instability in  $\beta_0$ ? Carry out a QLR test. (Hint: Make sure you use HAC standard errors for the regressions in the QLR procedure.)

*Calculations performed using Stata. See accompanying `E15.2.solution.do` file.*