

FINANCIAL ECONOMETRICS
SHANGHAI JIAO TONG UNIVERSITY
SUMMER SCHOOL 2026
EMPIRICAL EXERCISE 15.1

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

Data: `us_macro_monthly.csv` (1955:M1–2017:M12). The Index of Industrial Production IP is the column `INDPRO`; the oil-price shock $0t$ (the net oil price increase) is constructed from the crude-oil price series `WPU0561` (PPI: crude petroleum). Use the sample 1960:M1–2012:M12.

Empirical Exercise 15.1. In this exercise you will estimate the effect of oil prices on macroeconomic activity, using monthly data on the Index of Industrial Production (IP) and the monthly oil-price shock $0t$ described below.

This exercise uses `us_macro_monthly.csv`, covering 1955:M1–2017:M12. Take IP to be the column `INDPRO` (the Index of Industrial Production). The oil-price shock $0t$ is the *net oil price increase*: it equals the greater of zero or the percentage point difference between the oil price at date t and its maximum value over the past 12 months, where the oil price is the crude-petroleum producer price series `WPU0561`. Throughout, restrict attention to the sample period 1960:M1–2012:M12.

- (a) Compute the monthly growth rate in IP, expressed in percentage points, $ip_growth_t = 100 \times [\ln(IP_t) - \ln(IP_{t-1})]$. What are the mean and standard deviation of `ip_growth` over the 1960:M1–2012:M12 sample period? What are the units for `ip_growth` (percent, percent per annum, percent per month, or something else)?
- (b) Plot the value of $0t$. Why are so many values of $0t$ equal to zero? Why aren't some values of $0t$ negative?

- (c) Estimate a distributed lag model by regressing `ip_growth` onto the current value and 18 lagged values of `Oil`, including an intercept. What value of the HAC standard error truncation parameter m did you choose? Why?
- (d) Taken as a group, are the coefficients on `Oil` statistically significantly different from zero?
- (e) Construct graphs showing the estimated dynamic multipliers, cumulative multipliers, and 95% confidence intervals. Comment on the real-world size of the multipliers.
- (f) Suppose that high demand in the United States (evidenced by large values of `ip_growth`) leads to increases in oil prices. Is `Oil` exogenous? Are the estimated multipliers shown in the graphs in (e) reliable? Explain.

Calculations performed using Stata. See accompanying `E15_1_solution.do` file.