Forecasting Using Econometric and Atheoretical Time Series Models

Consider estimating and then forecasting out-of-sample the annual consumption of chicken in the United States. The data (1951-1997) are:

\[ Y = \text{per capita chicken consumption (in pounds)} \]
\[ PC = \text{the price of chicken (in cents per pound)} \]
\[ PB = \text{the price of beef (in cents per pound)} \]
\[ YD = \text{U. S. per capita disposable income (in hundreds of dollars)} \]

You can find the data (chick6.wf1) at:

http://occawlonline.pearsoned.com/bookbind/pubbooks/studenmund_awl/chapter1/deluxe.html

We wish to compare out-of-sample forecasts of the demand for chicken using econometric models and using methods that do not use any economic structure, only statistical treatments.

1. **OLS**

   a. unconditional forecasts: \( \hat{Y}_{t+1} = X_t \hat{\beta} \)
   
   b. conditional forecasts: \( \hat{Y}_{t+1} = \hat{X}_t \hat{\beta} \)

2. **GLS**

   With an AR(1) error \( (\varepsilon_t = \rho \varepsilon_{t-1} + \mu_t) \) and using a simple regression model \( (Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t) \) the gls forecast is:

   \( \hat{Y}_{t+1} = \rho \hat{Y}_t + \hat{\beta}_0 (1-\rho) + \hat{\beta}_1 (\hat{X}_{t+1} - \hat{\rho} X_t) \)
3. **Forecasting confidence intervals**

A 95% confidence interval is approximately

$$[\hat{Y}_{t+n} \pm 2s_e]$$

4. **Forecasting with simultaneous systems**

Typically uses simulation methods.

5. **Forecasting with ARIMA(p,d,q) models**

$$Y_t = \beta_0 + \theta_1 Y_{t-1} + ... + \theta_p Y_{t-p} + \epsilon_t + \phi_1 \epsilon_{t-1} + ... + \phi_q \epsilon_{t-q}$$

The first part is the AR process, the second the MA process and the original series is differenced d times to achieve stationarity (detrend).