Time Series Regression: Concept Review

- **Time Series Data:** Observations collected sequentially over time, where the order of data points matters (e.g., annual copper prices, housing starts).
- **Autocorrelation and Chronology:** Residuals in time series data may be correlated across time, violating the assumption of independence, due to chronological nature of the data.
- **Testing for Autocorrelation:**

$$\epsilon_t = \rho_1 \epsilon_{t-1} + \rho_2 \epsilon_{t-2} + \cdots + \rho_q \epsilon_{t-q} + \gamma_t$$

  where ϵ_t is the residual at time t, ρ is the autocorrelation coefficient, and γ_t is zero-mean, homoskedastic and serially uncorrelated error.

  - **Durbin-Watson (DW) Test:** Detects first-order autocorrelation. ($H_0 : \rho = 0$)
  - **Breusch-Godfrey (LM) Test:** Detects higher-order autocorrelation. ($H_0 : \rho_1 = \rho_2 = \cdots = \rho_q = 0$)
- **Newey-West Correction:** Provides robust standard errors that account for both heteroskedasticity and autocorrelation, ensuring valid inference.