Tutorial 5

Augmented Dickey-Fuller (ADF) Test

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Purpose of the ADF Test

The Augmented Dickey-Fuller (ADF) test is a statistical test that is used to test for the presence of a unit root in a time series dataset. A unit root is a statistical term that refers to a stochastic trend in a dataset, which means that the data is non-stationary and has a time-varying mean and variance.

Equation for the ADF Test

The ADF test is based on the following equation:

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \sum_{i=1}^{p-1} \delta_i \Delta y_{t-i} + \varepsilon_t$$

where Δy_t is the first difference of the time series variable y_t, t is the time index, α is a constant, β is the coefficient on time, γ is the coefficient on the lagged dependent variable, δ_i are the coefficients on the lagged difference terms, and ε_t is the error term.

Process of the ADF Test

The ADF test involves the following steps:

1. Estimate the ADF regression equation using a time series dataset.
2. Calculate the test statistic, which measures the strength of evidence against the null hypothesis of a unit root.
3. Compare the test statistic to critical values from a distribution table to determine whether to reject or fail to reject the null hypothesis.

Interpreting the ADF Test Results

If the test statistic is less than the critical value at a given significance level (e.g., 1%, 5%, or 10%), then we fail to reject the null hypothesis of a unit root. This suggests that the time series variable is non-stationary and has a stochastic trend. If the test statistic is greater than the critical value, then we reject the null hypothesis of a unit root and conclude that the time series variable is stationary.