SARIMA

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The SARIMA model is an extension of the ARIMA model, often used when we suspect a model may have a seasonal effect.

By definition, the seasonal auto-regressive integrated moving average - SARIMA(p,d,q)(P,D,Q)s - process is a multiplicative of two ARMA processes of the differenced time series.

Where:

- \(x t\) is the original non-stationary output at time t.
- \(y t\) is the differenced (stationary) output at time t.
- \(d\) is the non-seasonal integration order of the time series.
- \(p\) is the order of the non-seasonal AR component.
- \(P\) is the order of the seasonal AR component.
- \(q\) is the order of the non-seasonal MA component.
- \(Q\) is the order of the seasonal MA component.
- \(s\) is the seasonal length.
- \(D\) is the seasonal integration order of the time series.
- \(a t\) is the innovation, shock or the error term at time t.
- \(\{a_t\}\) time series observations are independent and identically distributed (i.e. i.i.d) and follow a Gaussian distribution (i.e. \(\Phi(0,\sigma^2)\))

Assuming y_t follows a stationary process with a long-run mean of \mu, then taking the expectation from both sides, we can express \phi_o as follows:

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[\phi 0 = (1-\phi 1-\phi 2-\phi 2-\phi 1)]
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Thus, the SARIMA(p,d,q)(P,D,Q)s process can now be expressed as:

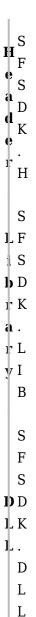
In sum, (z t) is the differenced signal after we subtract its long-run average.

Notes: The order of the seasonal or non-seasonal AR (or MA) component is solely determined by the order of the last lagged variable with a non-zero coefficient. In principle, you can have fewer parameters than the order of the component.

Remarks

- 1. The variance of the shocks is constant or time-invariant.
- 2. The order of the seasonal or non-seasonal AR (or MA) component is solely determined by the order of the last lagged variable with a non-zero coefficient. In principle, you can have fewer parameters than the order of the component.
- 3. **Example:** Consider the following SARIMA(0,1,1)(0,1,1)12 process: $(1-L)(1-L^{12})x_t-mu = (1+\theta L)(1+\theta L^{12})a_t$ **Note:** This is the AIRLINE model, a special case of the SARIMA model.

Requirements



See Also

[template("related")]