

TS Module 16: ARIMA Forecasting HW

(The attached PDF file has better formatting.)

Homework assignment: ARIMA(0,1,1) process

The estimated (forecast) and actual values for Periods 48, 49, and 50 of an ARIMA(0,1,1) process are shown below.

Forecasts are *one period ahead* forecasts: $\hat{y}_{48}(1)$ for Period 49 and $\hat{y}_{49}(1)$ for Period 50.

<i>Period</i>	<i>Forecast</i>	<i>Actual</i>
48	70.5	71.5
49	72.0	74.0
50	73.0	74.8

- The estimated and actual values are for the ARIMA(0,1,1) time series.
- The values of μ and θ_1 are for the ARMA model of first differences. (Cryer and Chan use θ for an ARMA process, not θ_1 .)

To solve the homework assignment, use the following steps:

- Determine the residual for each period for the ARIMA(0,1,1) model.
- These are also the residuals for the ARMA process of first differences.
- Determine the forecasts and actual values for the MA(1) process of first differences for the last two periods.
- Write equations for these forecasts in terms of the mean, the residual in the previous period, and θ_1 . Remember that θ_1 is the *negative* of the moving average parameter.
- You have a pair of linear equations with two unknowns, μ and θ_1 .
- Solve for μ and θ_1 and verify that these values give the forecasts in the table.
- Use the residual for Period 50 and the values of μ and θ_1 to forecast Period 51.
- Derive the forecast for the original ARIMA time series for Period 51.

- A. What is the mean μ of the ARMA model of first differences?
- B. What is θ_1 of the ARMA model of first differences?
- C. What is the forecasted value of the ARIMA(0,1,1) process for Period 51?

Show the derivations of the parameters and the forecast.