

Solution for the worksheet

temporal time series analysis part II

Joaquin Rapela

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1. Listing 1 shows the completed function *forecat* and Figure 1 shows the forecasting results for an AR(7) model.

```
1 def forecast(x, acov, mu, m, max_h):
2     Gamma_m = buildGamma(acov=acov, m=m)
3     forecasts_means = np.empty(max_h, dtype=np.double)
4     forecasts_vars = np.empty(max_h, dtype=np.double)
5     xMinusMu_mR = (x-mu)[::-1][:m]
6     for h in range(1, max_h+1):
7         gamma_mh = acov[h:(h+m)]
8         a_m = np.linalg.solve(Gamma_m, gamma_mh)
9         forecasts_means[h-1] = mu + np.inner(a_m, xMinusMu_mR)
10        forecasts_vars[h-1] = acov[0] - np.inner(a_m, gamma_mh)
11    return forecasts_means, forecasts_vars
```

Listing 1: completed *forecat* function

2. Listing 2 shows the completed function *estimateCoefsAndNoisVarARpYW* and Figure 2 shows the estimated coefficients of an AR(3) model.

```
1 def estimateCoefsAndNoiseVarARpYW(acov, p, N):
2     Gammap = buildGamma(acov=acov, m=p)
3     gammaph = acov[1:]
4     phiHat = np.linalg.solve(Gammap, gammaph)
5     sigma2Hat = acov[0] - np.inner(phiHat, acov[1:])
6     phiCovHat = sigma2Hat/N * np.linalg.inv(Gammap)
7     return phiHat, phiCovHat, sigma2Hat
```

Listing 2: completed *estimateCoefsAndNoisVarARpYW* function

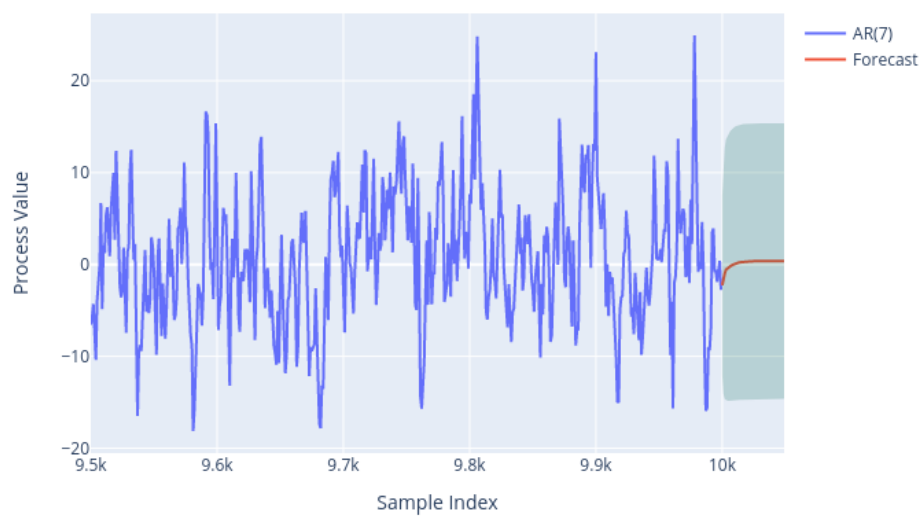


Figure 1: Forecasting result for an AR(7) model

$$\sigma^2 = 1.00, \hat{\sigma}^2 = 1.02$$

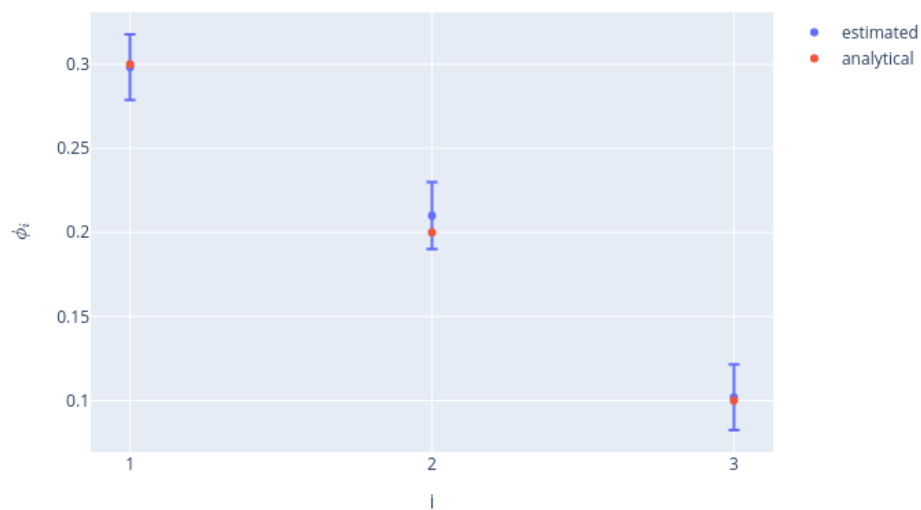


Figure 2: True and estimated coefficients for an AR(3) model.