TABLE 9.2 Spreadsheet of Observations for AR(2) Model

t	Quarter	U_t	U_{t-1}	U_{t-2}
1	1948Q1	3.7	•	•
2	1948Q2	3.7	3.7	•
3	1948Q3	3.8	3.7	3.7
4	1948Q4	3.8	3.8	3.7
5	1949Q1	4.7	3.8	3.8
271	2015Q3	5.2	5.4	5.6
272	2015Q4	5.0	5.2	5.4
273	2016Q1	4.9	5.0	5.2

Question:

*Using AR(2), f*orecast the unemployment rate in the remaining quarter of 2016: That is: U_{2016Q2} , U_{2016Q3} *and* U_{2016Q4}

AR(2) model:

$$U_t = \delta + \theta_1 U_{t-1} + \theta_2 U_{t-2} + e_t$$

Estimated model:

$U_t = 0.2885 + 1.6128 U_{t-1} - 0.6621 U_{t-2}$, $\hat{\sigma} = 0.2947$

(se) (0.066) (0.0457) (0.0456)

The forecast value of the unemployment rate in 2016Q2:

$$\widehat{U}_{2016Q2} = \delta + \theta_1 U_{2016Q1} + \theta_2 U_{2015Q4}$$

Note that data on U is given up to $2016Q1$.

That is, we know: $U_{2016Q1} = 4.9$ & $U_{2015Q4} = 5$

Then, we will have:

$$\widehat{U}_{2016Q2} = \delta + (\theta_1 * 4.9) + (\theta_2 * 5) = 4.88$$

Similarly, the forecast value of the unemployment rate in 2016Q3:

$$\widehat{U}_{2016Q3} = \delta + \theta_1 U_{2016Q2} + \theta_2 U_{2016Q1}$$

We have: $U_{2016Q1} = 4.9$ *and* $\widehat{U}_{2016Q2}$*=4.88*

$$\widehat{U}_{2016Q3} = \delta + (\theta_1 * 4.88) + (\theta_2 * 4.9)$$*=4.9*

The standard errors of the forecast errors are:

$$\sigma_{f1} = \hat{\sigma} = 0.2947$$

$$\sigma_{f2} = \sigma\sqrt{1 + \theta_1^2} = 0.5593$$

$$\sigma_f = \sigma\sqrt{\left(\theta_1^2 + \theta_2\right)^2 + \theta_1^2 + 1} = 0.7996$$

The 95% forecast intervals are:

$$\widehat{U}_{2016Q2} \pm t_{(1-\frac{\alpha}{2},df)} * \sigma_{f1}$$

$$\widehat{U}_{2016Q3} \pm t_{(1-\frac{\alpha}{2},df)} * \sigma_{f2}$$

$$\widehat{U}_{2016Q4} \pm t_{(1-\frac{\alpha}{2},df)} * \sigma_{f3}$$