Ch. 6 Exercise: Unemployment

Model:
$L = 4000$; $E_0 = 1000$; $\phi = 0.25$; $\lambda = 0.05$
400 discouraged workers (not counted in the labor force)

(a) What is the natural rate of unemployment on the island?

$$(\frac{U}{L})_{steady-state} = \frac{\lambda}{\lambda + \phi} = \frac{0.05}{0.05 + 0.25} = \frac{1}{6} = 16.\bar{6}\%$$

(b) Let $E_0 = 1000$ (at $t = 0$). What is E_1? (Hint: Find the change in employment by considering the number of employed that lose their job in addition to the number of unemployed that find a job.)

$$E_1 = (1 - \lambda)E_0 + \phi U_0 = (1 - 0.05)(1000) + (0.25)(4000 - 1000) = 0.95(1000) + 0.25(3000) = 1700$$

(c) Using your result from the last part, write out $E_t = f(E_{t-1}, U_{t-1}, \phi, \lambda)$ and $U_t = g(E_{t-1}, U_{t-1}, \phi, \lambda)$ explicitly. Interpret.

$$E_t = (1 - \lambda)E_{t-1} + \phi U_{t-1}$$
$$U_t = (1 - \phi)U_{t-1} + \lambda E_{t-1}$$

(d) Compute L, E, U, and $\frac{U}{L}$ for $t = 0, 1, 2, \ldots, 25$ (use a table in Excel).

t	U	E	LF	UR	ER
0	1000	3000	4000	25.00%	75.00%
1	900	3100	4000	22.50%	77.50%
2	830	3170	4000	20.75%	79.25%
3	781	3219	4000	19.53%	80.48%
4	746.7	3253.3	4000	18.67%	81.33%
5	722.69	3277.31	4000	18.07%	81.93%
6	705.883	3294.12	4000	17.65%	82.35%
7	694.118	3305.88	4000	17.35%	82.65%
8	685.883	3314.12	4000	17.15%	82.85%
9	680.118	3319.88	4000	17.00%	83.00%
10	676.083	3323.92	4000	16.90%	83.10%
11	673.258	3326.74	4000	16.83%	83.17%
12	671.28	3328.72	4000	16.78%	83.22%
13	669.896	3330.1	4000	16.75%	83.25%
14	668.927	3331.07	4000	16.72%	83.28%
15	668.249	3331.75	4000	16.71%	83.29%
16	667.774	3332.23	4000	16.69%	83.31%
17	667.442	3332.56	4000	16.69%	83.31%
18	667.209	3332.79	4000	16.68%	83.32%
19	667.047	3332.95	4000	16.68%	83.32%
20	666.933	3333.07	4000	16.67%	83.33%
21	666.853	3333.15	4000	16.67%	83.33%
22	666.797	3333.2	4000	16.67%	83.33%
23	666.758	3333.24	4000	16.67%	83.33%
24	666.731	3333.27	4000	16.67%	83.33%
25	666.711	3333.29	4000	16.67%	83.33%

(e) What happens to the unemployment rate over time? How does this relate to the natural rate of unemployment?

The unemployment rate falls over time as it converges to the natural rate of unemployment from above.

(f) At $t = 26$, the discouraged workers decide to look for employment and are thus considered unemployed. How will this affect the unemployment rate, both initially and over time?

The unemployment rate initially rises above the steady-state unemployment rate when the discouraged workers join the labor force. After the initial change, the unemployment rate will return to the steady-state level from above because the rates of job finding and job separation are unaffected by the labor force entry of the discouraged workers.

(g) Compute L, E, U, and $\frac{U}{L}$ out to $t = 40$ given the change in the labor force at $t = 26$.

25	666.711	3333.29	4000	16.67%	83.33%
26	1066.7	3333.3	4400	24.24%	75.76%
27	966.689	3433.31	4400	21.97%	78.03%
28	896.682	3503.32	4400	20.38%	79.62%
29	847.677	3552.32	4400	19.27%	80.73%
30	813.374	3586.63	4400	18.49%	81.51%
31	789.362	3610.64	4400	17.94%	82.06%
32	772.553	3627.45	4400	17.56%	82.44%
33	760.787	3639.21	4400	17.29%	82.71%
34	752.551	3647.45	4400	17.10%	82.90%
35	746.786	3653.21	4400	16.97%	83.03%
36	742.75	3657.25	4400	16.88%	83.12%
37	739.925	3660.07	4400	16.82%	83.18%
38	737.948	3662.05	4400	16.77%	83.23%
39	736.563	3663.44	4400	16.74%	83.26%
40	735.594	3664.41	4400	16.72%	83.28%

(h) At $t = 41$, a new fleet of fishing boats arrives at the island and hires additional workers. As a result, $\phi_{t \geq 41} = 0.4$ and $\lambda_{t \geq 41} = 0.04$. Compute L, E, U, and $\frac{U}{L}$ out to $t = 60$ given this change.

40	735.594	3664.41	4400	16.72%	83.28%
41	587.933	3812.07	4400	13.36%	86.64%
42	505.242	3894.76	4400	11.48%	88.52%
43	458.936	3941.06	4400	10.43%	89.57%
44	433.004	3967	4400	9.84%	90.16%
45	418.482	3981.52	4400	9.51%	90.49%
46	410.35	3989.65	4400	9.33%	90.67%
47	405.796	3994.2	4400	9.22%	90.78%
48	403.246	3996.75	4400	9.16%	90.84%
49	401.818	3998.18	4400	9.13%	90.87%
50	401.018	3998.98	4400	9.11%	90.89%
51	400.57	3999.43	4400	9.10%	90.90%
52	400.319	3999.68	4400	9.10%	90.90%
53	400.179	3999.82	4400	9.09%	90.91%
54	400.1	3999.9	4400	9.09%	90.91%
55	400.056	3999.94	4400	9.09%	90.91%
56	400.031	3999.97	4400	9.09%	90.91%
57	400.018	3999.98	4400	9.09%	90.91%
58	400.01	3999.99	4400	9.09%	90.91%
59	400.006	3999.99	4400	9.09%	90.91%
60	400.003	4000	4400	9.09%	90.91%

(i) What is the new natural rate of unemployment after the events at $t = 26$ and $t = 41$?

$$(\frac{U}{L})_{steady-state} = \frac{\lambda}{\lambda + \phi} = \frac{0.04}{0.04 + 0.4} = \frac{1}{11} = 9.\overline{09}\%$$