

# Hidden Markov Models for Time Series An Introduction Using R

Errata as at 7 January 2016

- On p. 10, the fourth displayed equation should read as follows:

$$\delta_i = \frac{e^{\tau_i}}{1 + \sum_{j=2}^m e^{\tau_j}} \quad (i = 2, \dots, m),$$

- On p. 13, there are regrettably several typing errors in Table 1.3. The two models displayed should be as follows.

$i$	$\delta_i$	$\mu_i$	$\sigma_i^2$	$-\log L$
1	0.4454	4.656	0.8188	38.9134
2	0.5546	1.083	0.8114	
1	0.454	4.62	0.87	(38.924)
2	0.546	1.06	0.77	

- On p. 19, line  $-2$  of Section 1.3.3 should read:  
... Exercise 8 in Chapter 2 and Exercise 9 in Chapter 8 present
- On p. 44, the last four lines of Exercise 10 should read:

```
qpois.HMM(p, m, lambda, gamma, delta=NULL)
```

The function `dpois.HMM` computes the probability function at the arguments specified by the vector `x`, `ppois.HMM` the distribution function, and `qpois.HMM` the inverse distribution function.

- On p. 61, the line after (B.6) should read:  
To establish validity for  $t = T - 1, \dots$
- On p. 62, the second line of the proof of Proposition 4 should read:

$$\alpha_t(i)\beta_t(i) = \Pr(\mathbf{X}_1^t, C_t = i) \Pr(\mathbf{X}_{t+1}^T | C_t = i)$$

- On p. 76, line  $-2$  should begin:

$$\Pr(X_t = x | \mathbf{X}^{(-t)} = \mathbf{x}^{(-t)}) \propto$$

- On p. 79, the second line of Table 5.1 should read:

horizon: 1 2 3 10 20 30

- On p. 83, line  $-4$  should read:

$$\xi_{ti} = \max_{c_1, c_2, \dots, c_{t-1}} \Pr(\mathbf{C}^{(t-1)} = \mathbf{c}^{(t-1)}, C_t = i, \mathbf{X}^{(t)} = \mathbf{x}^{(t)}).$$

- On p. 83, line  $-2$  should read:  
the following recursion, for  $t=2, 3, \dots, T$  and  $j = 1, 2, \dots, m$ :
- On p. 100, the passage starting on line 15 should read:

$$-\phi/(1 + \phi^2);$$

see Exercise 3. This is opposite in sign to  $\phi$  and smaller in modulus. For instance, if  $\phi = 1/\sqrt{2}$ , the correlation of  $z_t$  and  $z_{t+1}$  is  $-2\phi/3$ .

- On p. 102, part (c) of Exercise 3 should read:  
(c)  $\text{Corr}(z_t, z_{t+1}) = -\phi/(1 + \phi^2)$ ;
- On p. 107, line 12 of Section 7.2.1 should begin:  
a sample  $\boldsymbol{\theta}_m^{(j)}$

- On p. 107, Equation (7.6) should read:

$$\hat{I} = \left( B^{-1} \sum_{j=1}^B \left( p(\mathbf{x}^{(T)} \mid m, \boldsymbol{\theta}_m^{(j)}) \right)^{-1} \right)^{-1};$$

- On p. 108, part of line –6 should read:

all have mean  $50/(m+1)$

- On p. 146, line –2 should read:

... the probability  $\nu_t(j, k; \mathbf{x}^{(t)})$ , with the

- On p. 195, line 1 should read:

Hence  $\Pr(C_t = j \mid C_{t-1} = i, x_{t-1} = x)$  is approximated by

- On p. 226, line 7 should read:

$$\xi_{ti} = \max_{c_1, c_2, \dots, c_{t-1}} \Pr(\mathbf{C}^{(t-1)} = \mathbf{c}^{(t-1)}, C_t = i, \mathbf{X}^{(t)} = \mathbf{x}^{(t)}).$$

- On p. 241, line 12 of the code in A.1.4 should read:

```
code=mod$code,mllk=mllk,AIC=AIC,BIC=BIC)
```

- On p. 243, a line of code is missing from A.2.3. Insert, after line 3 of A.2.3:

```
n <- length(x)
```

- On p. 245, a line of code is missing from A.2.6. Insert, after line 3 of A.2.6:

```
n <- length(x)
```

- On p. 251, line 4 of the code in A.4.1 should read:

```
gamma <- matrix(0,m,m)
```

- On p. 264, the details of the paper by Welch should read:

Welch, L.R. (2003). Hidden Markov models and the Baum–Welch algorithm. *IEEE Inform. Th. Soc. Newsl.* **53**, pp. 1, 10–13.

- On p. 267, the author index entry for Gutterp should read:

Gutterp, P., 80, 123, 181, 260, 264

- On p. 269, the author index entries for Robert and Titterington should read:

Robert, C.P., 70, 71, 103, 111, 112, 150, 258, 262, 263

Titterington, D.M., 25, 70, 71, 103, 111, 112, 150, 262–264