

Quantitative Methods in Business Bogdan Werth

9.1

9.1 The numbers of motor policies taken out in each quarter of the three years 1998 to 2000 with the R. Devious Assurance Company are given below.

	Quarter ending			
	March	June	September	December
1998	295	329	325	255
1999	301	315	368	265
2000	350	386	405	262

(a) Calculate the trend using the method of moving averages
 (b) Estimate the seasonal factors assuming a multiplicative model
 (c) Deseasonalise the figures for 2000, September and December quarters only
 (d) Hence, by estimating the trend in the first two quarters of 2001 and applying the appropriate seasonal factors obtain a forecast for the actual numbers of policies for these two quarters.

Solutions by E. PARRY

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9.1

		No. of Motor Policies Y	Moving Average	Centred Mov Ave = Trend T	Y/T=S est.
1998	1	295			
	2	329			
	3	325	301	301.75	1.0771
	4	255	302.5	300.75	0.8479
1999	1	301	299	304.375	0.9889
	2	315	309.75	311	1.0129
	3	368	312.25	318.375	1.1559
	4	265	324.5	333.375	0.7949
2000	1	350	342.25	346.875	1.0090
	2	386	351.5	351.125	1.0993
	3	405	350.75		
	4	262			

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Year	1	2	3	4		No. of Motor Policies Y	Y/T=S est.
1998			1.0771	0.8479		1998 1	295
						2	329
1999	0.9889	1.0129	1.1559	0.7949		3	325
						4	255
2000	1.0090	1.0993			SUM	1999 1	301
Average	0.9990	1.0561	1.1165	0.8214	3.9929	2	315
						3	368
						4	265
						2000 1	350
						2	386
						3	405
						4	262

$$\frac{4,0000 - 3,9929}{4} = 0,0018$$

Thus our corrected S factors are:
 S1:1,001; S2:1,058; S3:1,118; S4:0,823

Quarter ending	Y	Deseasonalised (Y/T)
Sept 2000	405	405/1.118 = 362.3
Dec 2000	262	262/0.823 = 318.3

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9.1

MOTOR POLICIES 1998 - 2000

2001: Q1 $\Rightarrow F^{\text{cast}} = 375 \times 1.001 = 375$ policies
 2001: Q2 $\Rightarrow F^{\text{cast}} = 380 \times 1.058 = 402$ policies

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9.2

9.2 B A S Everton & Sons manufacture mainly PVC clothing. Figures for the quarterly sales ('000s) of the popular 'Number One' raincoat, are shown below.

	Quarter ending			
	March	June	September	December
1997	105.8	69.1	97.3	109.9
1998	110.4	72.4	91.7	113.3
1999	118.1	78.4	103.6	120.4
2000	115.6	81.8	106.7	

(a) Calculate the trend using the method of moving averages
 (b) Estimate the seasonal factors
 (c) Deseasonalise the 2000 figures only
 (d) Graph the data and obtain a forecast for the last quarter of 2000 and the first quarter of 2001

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9.2

		Sales ('000s) Y	Moving Average	Centred Mov Ave = Trend T	Y/T=S est.
1997	1	105.6			
	2	69.1			
	3	97.3	95.525	96.1	1.0125
	4	109.9	96.675	97.0875	1.1320
1998	1	110.4	97.5	96.8	1.1405
	2	72.4	96.1	95.525	0.7501
	3	91.7	96.95	97.9125	0.9366
	4	113.3	98.875	99.625	1.1373
1999	1	118.1	100.375	101.8525	1.1594
	2	78.4	103.35	104.2375	0.7521
	3	103.6	105.125	104.8125	0.9884
	4	120.4	104.5	104.925	1.1475
2000	1	115.6	105.35	105.7375	1.0933
	2	81.8	106.125		
	3	106.7			

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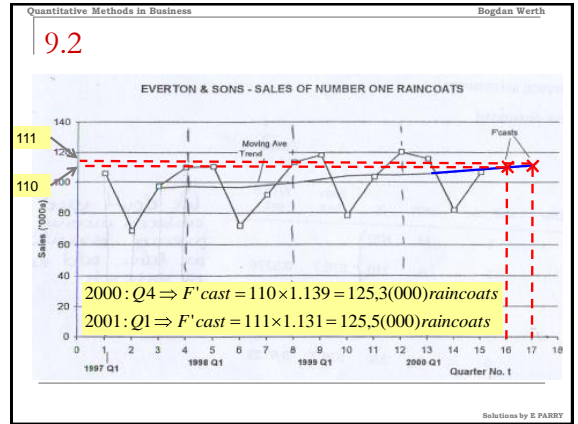
9.2

Year	1	2	3	4	
1997			1.0125	1.1320	
1998	1.1405	0.7501	0.9366	1.1373	
1999	1.1594	0.7521	0.9884	1.1475	
2000	1.0933				SUM
Average	1.1311	0.7511	0.9782	1.1389	4.0002

Quarter ending	Y	De-seasonalised (Y/T)
March 2000	115.6	115.6/1.131 = 102.2
Sept 2000	81.8	81.8/0.751 = 108.9
Dec 2000	106.7	106.7/0.979 = 109.0

Year	Quarter	Sales ('000s)	Y/T=S est.
1997	1	105.8	
	2	69.1	
	3	97.3	
	4	109.9	1.0125
1998	1	110.4	1.1405
	2	72.4	0.7501
	3	91.7	0.9366
	4	113.3	1.1373
1999	1	118.1	1.1594
	2	78.4	0.7521
	3	103.8	0.9884
	4	120.4	1.1475
2000	1	115.6	1.0933
	2	81.8	

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9.3

9.3 The figures in the table show units of service demanded of a service enterprise working a 24-hour day.

Day	Morning	Afternoon	Night
1	820	310	600
2	800	330	600
3	850	340	700
4	900	380	680

Use the method of moving averages to find the trend. Hence, assuming a multiplicative model, estimate the 'Seasonal' factors for the three shifts.

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9.3

S - Factors

Day	M	A	N	Sum
1		0.538	1.053	
2	1.387	0.572	1.006	
3	1.433	0.537	1.082	
4	1.364	0.582		
Ave	1.395	0.557	1.047	2.9987
Corr.	1.395	0.558	1.047	3.0000

Day	shift no.	shift	Y	Mov Ave	Y/T=S est.
1	1	M	820		
2	2	A	310	576.7	0.5376
3	3	N	600	570.0	1.0526
4	4	M	800	576.7	1.3873
5	5	A	330	576.7	0.5723
6	6	N	600	596.7	1.0056
7	7	M	860	600.0	1.4333
8	8	A	340	633.3	0.5368
9	9	N	700	646.7	1.0825
10	10	M	900	660.0	1.3636
11	11	A	380	653.3	0.5816
12	12	N	680		

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