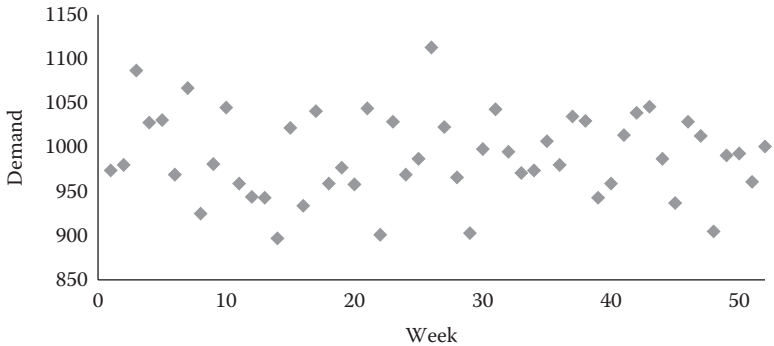

Figure 2.1
Plot of weekly demand for AAA batteries at BVE store.

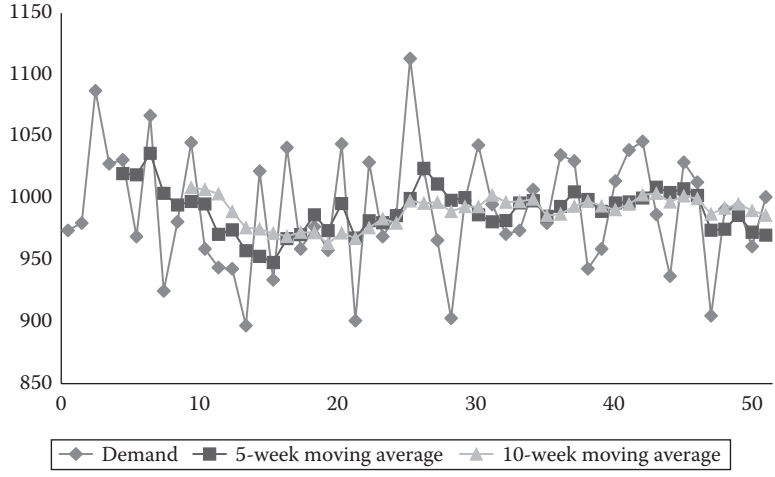

Figure 2.2
Comparison of 5- and 10-week moving averages.

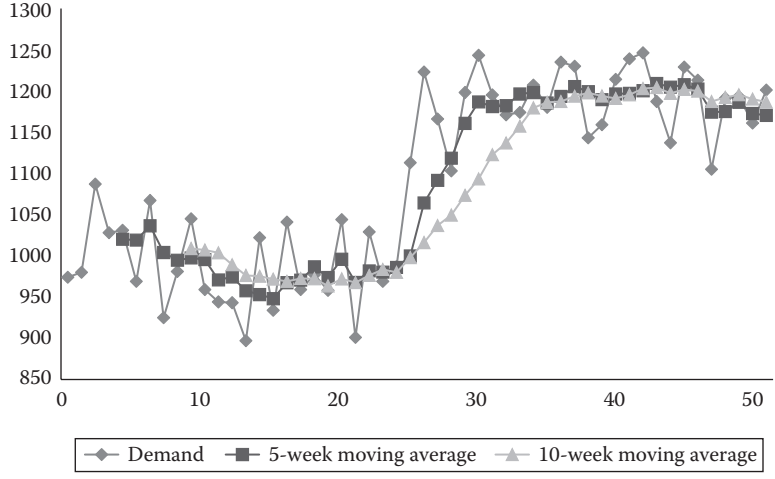

Figure 2.3
Comparison of response to process change with different moving average periods.

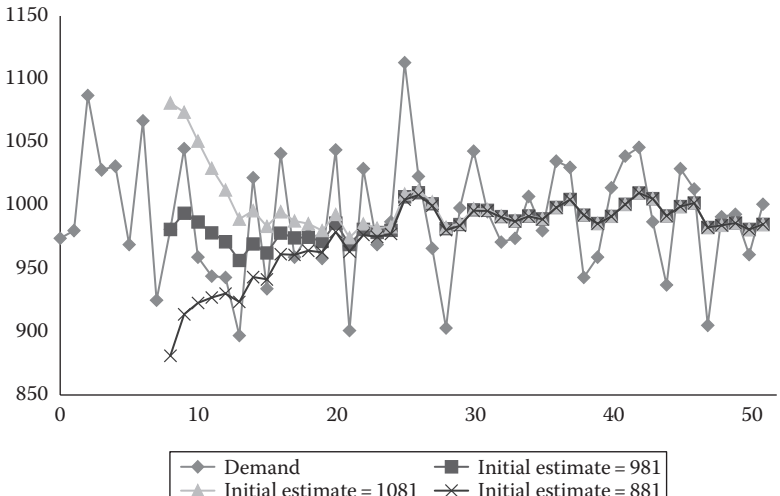

Figure 2.4
Comparison of exponential smoothing results using different initial estimates.

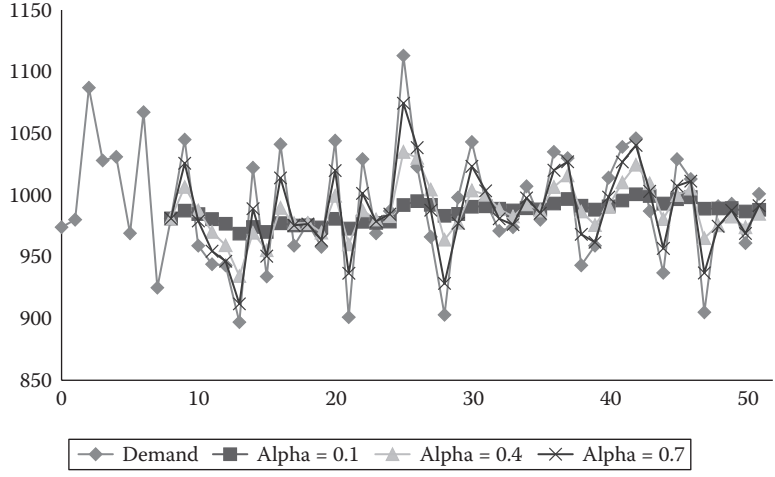

Figure 2.5
Comparison of exponential smoothing results using different weighting factors.

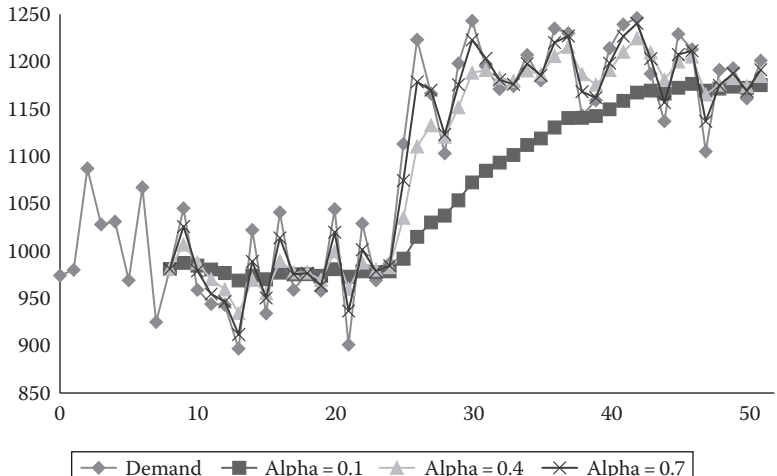

Figure 2.6
Comparison of response to process change with different weighting factors.

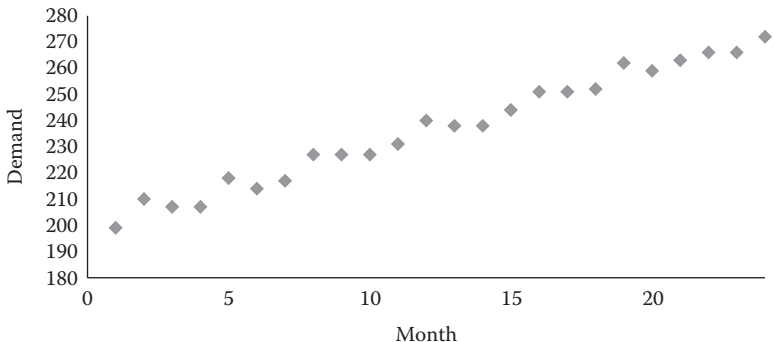

Figure 2.7
Plot of monthly demand for laptops at BVE store.

	A	B	C	D	E	F	G	H
1		t	d_t	td_t	t^2			
2		1	199	199	1			
3		2	210	420	4			
4		3	207	621	9			
5		4	207	828	16			
6		5	218	1090	25			
7		6	214	1284	36			
8		7	217	1519	49			
9		8	227	1816	64			
10		9	227	2043	81			
11		10	227	2270	100			
12		11	231	2541	121			
13		12	240	2880	144			
14		13	238	3094	169			
15		14	238	3332	196			
16		15	244	3660	225			
17		16	251	4016	256			
18		17	251	4267	289			
19		18	252	4536	324			
20		19	262	4978	361			
21		20	259	5180	400			
22		21	263	5523	441			
23		22	266	5852	484			
24		23	266	6118	529			
25		24	272	6528	576			
26							$\hat{a}$	$\hat{b}$
27	Total	300	5686	74595	4900		198.66	3.06

Cell	Formula	Note
D2	=B2*C2	Drag down to D25
E2	=B2^2	Drag down to E25
B27	=SUM(B2:B25)	Drag right to E27
H27	=(B25*D27-C27*B27)/(B25*E27-B27^2)	
G27	=(C27-H27*B27)/B25	

Figure 2.8
Spreadsheet calculation of slope and level in linear regression.

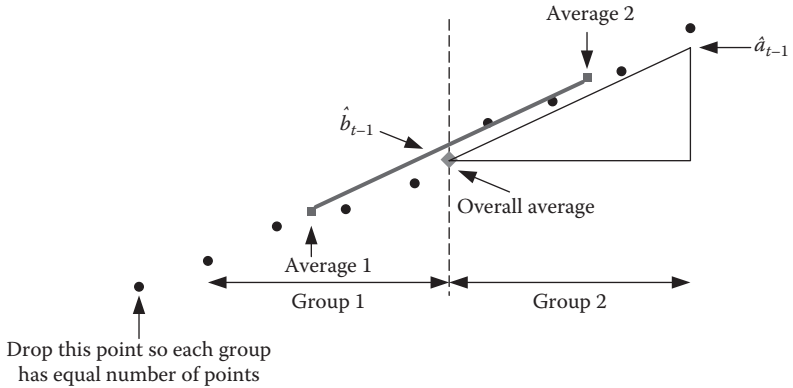

Figure 2.9
A simple method to estimate initial level and slope in double exponential smoothing.

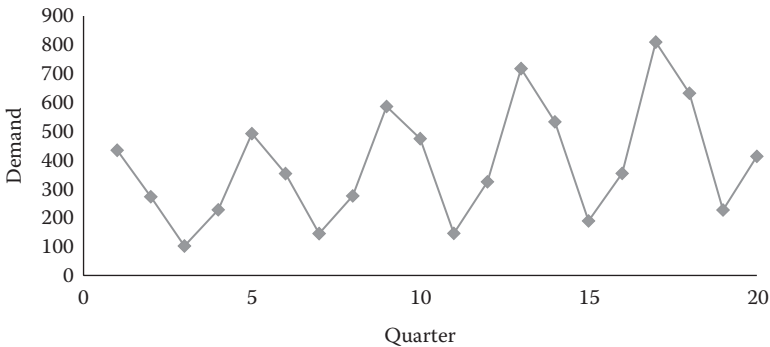

Figure 2.10
Plot of quarterly demand for HDTVs at BVE store.

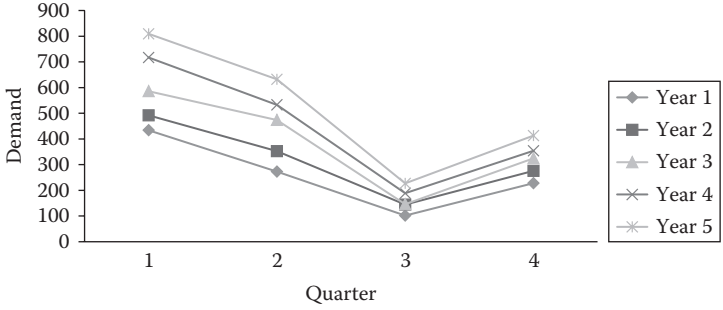

Figure 2.11
Plot of HDTV demand by quarter.

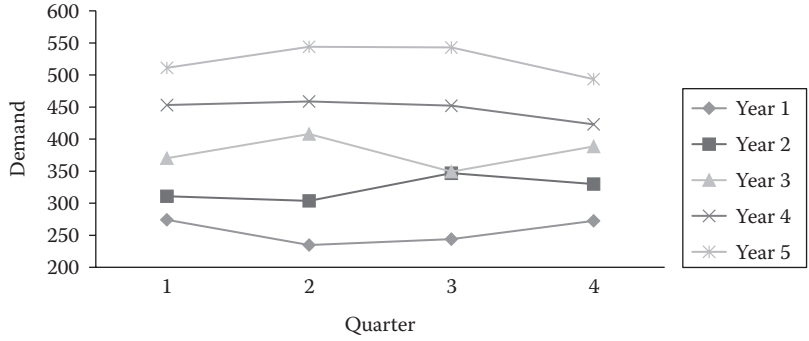

Figure 2.12
Plot of deseasonalized HDTV demand by quarter.

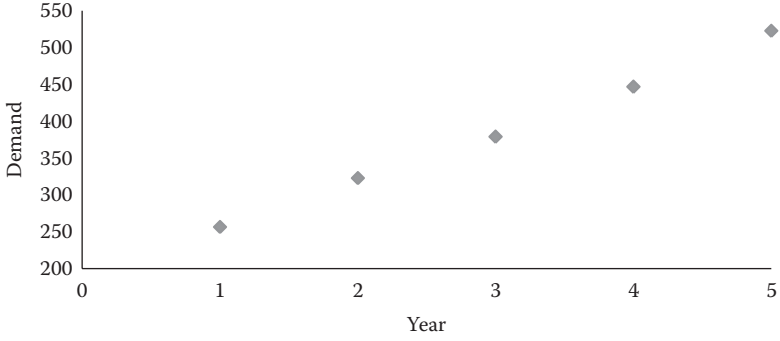

Figure 2.13
Plot of yearly average of deseasonalized HDTV demand.

	A	B	C	D	E	F	G
1	Quarter	d_t	$\hat{d}_t$	e_t	$\lvert e_t \rvert$	e_t^2	$\lvert e_t \rvert / d_t$
2	1	434					
3	2	273					
4	3	102					
5	4	228					
6	5	492	259	233	233	54289	0.47358
7	6	353	274	79	79	6241	0.2238
8	7	145	294	-149	149	22201	1.02759
9	8	276	305	-29	29	841	0.10507
10	9	586	317	269	269	72361	0.45904
11	10	474	340	134	134	17956	0.2827
12	11	146	370	-224	224	50176	1.53425
13	12	325	371	-46	46	2116	0.14154
14	13	717	383	334	334	111556	0.46583
15	14	533	416	117	117	13689	0.21951
16	15	189	430	-241	241	58081	1.27513
17	16	354	441	-87	87	7569	0.24576
18	17	809	448	361	361	130321	0.44623
19	18	632	471	161	161	25921	0.25475
20	19	227	496	-269	269	72361	1.18502
21	20	413	506	-93	93	8649	0.22518
22				Bias	MAD	MSE	MAPE
23				550	176.6	40895.5	53.5311

Cell	Formula	Note
C6	=ROUND(AVERAGE(B2:B5),0)	Drag down to C21
D6	=B6-C6	Drag down to D21
E6	=ABS(D6)	Drag down to E21
F6	=D6*D6	Drag down to F21
G6	=E6/B6	Drag down to G21
D23	=SUM(D6:D21)	
E23	=AVERAGE(E6:E21)	
F23	=AVERAGE(F6:F21)	
G23	=AVERAGE(G6:G21)*100	

Figure 2.14
Forecasting result and error analysis for the 4-quarter moving average model.

	A	B	C	D	E	F	G
1	Quarter	d_t	$\hat{d}_t$	e_t	$\lvert e_t \rvert$	e_t^2	$\lvert e_t \rvert / d_t$
2	1	434					
3	2	273					
4	3	102					
5	4	228					
6	5	492	323	169	169	28561	0.3435
7	6	353	334	19	19	361	0.05382
8	7	145	345	-200	200	40000	1.37931
9	8	276	357	-81	81	6561	0.29348
10	9	586	368	218	218	47524	0.37201
11	10	474	380	94	94	8836	0.19831
12	11	146	391	-245	245	60025	1.67808
13	12	325	402	-77	77	5929	0.23692
14	13	717	414	303	303	91809	0.42259
15	14	533	425	108	108	11664	0.20263
16	15	189	437	-248	248	61504	1.31217
17	16	354	448	-94	94	8836	0.26554
18	17	809	459	350	350	1E+05	0.43263
19	18	632	471	161	161	25921	0.25475
20	19	227	482	-255	255	65025	1.12335
21	20	413	493	-80	80	6400	0.1937
22				Bias	MAD	MSE	MAPE
23				142	168.9	36966	54.7675

Cell	Formula	Note
C6	=ROUND(11.38*A6+265.8,0)	Drag down to C21
D6	=B6-C6	Drag down to D21
E6	=ABS(D6)	Drag down to E21
F6	=D6*D6	Drag down to F21
G6	=E6/B6	Drag down to G21
D23	=SUM(D6:D21)	
E23	=AVERAGE(E6:E21)	
F23	=AVERAGE(F6:F21)	
G23	=AVERAGE(G6:G21)*100	

Figure 2.15
Forecasting result and error analysis for the trend model.

	A	B	C	D	E	F	G	H
1	Quarter	Seasonal Index	d_t	$\hat{d}_t$	e_t	$\lvert e_t \rvert$	e_t^2	$\lvert e_t \rvert / d_t$
2	1	1.583	434					
3	2	1.162	273					
4	3	0.418	102					
5	4	0.837	228					
6	5	1.583	492	506	-14	14	196	0.02846
7	6	1.162	353	372	-19	19	361	0.05382
8	7	0.418	145	134	11	11	121	0.07586
9	8	0.837	276	268	8	8	64	0.02899
10	9	1.583	586	610	-24	24	576	0.04096
11	10	1.162	474	448	26	26	676	0.05485
12	11	0.418	146	161	-15	15	225	0.10274
13	12	0.837	325	323	2	2	4	0.00615
14	13	1.583	717	714	3	3	9	0.00418
15	14	1.162	533	524	9	9	81	0.01689
16	15	0.418	189	189	0	0	0	0
17	16	0.837	354	378	-24	24	576	0.0678
18	17	1.583	809	818	-9	9	81	0.01112
19	18	1.162	632	601	31	31	961	0.04905
20	19	0.418	227	216	11	11	121	0.04846
21	20	0.837	413	433	-20	20	400	0.04843
22					Bias	MAD	MSE	MAPE
23					-24	14.13	278.3	3.98597

Cell	Formula	Note
D6	=ROUND((188.47+65.68*ROUND(A6/4+0.25,0))*B6,0)	Drag down to C21
E6	=C6-D6	Drag down to D21
F6	=ABS(E6)	Drag down to E21
G6	=E6*E6	Drag down to F21
H6	=F6/C6	Drag downto G21
E23	=SUM(E6:E21)	
F23	=AVERAGE(F6:F21)	
G23	=AVERAGE(G6:G21)	
H23	=AVERAGE(H6:H21)*100	

Figure 2.16
Forecasting result and error analysis for the seasonal model.

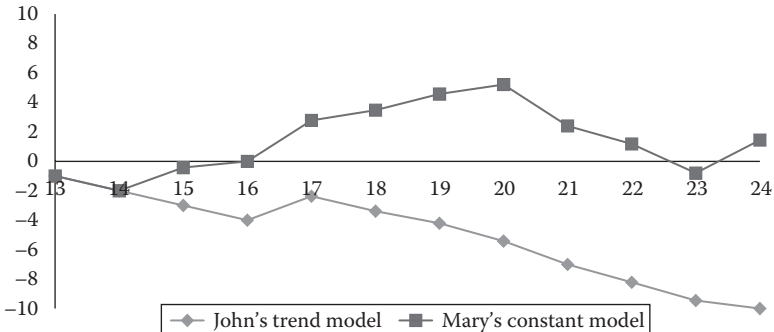

Figure 2.17
Plot of tracking signals for the two models.

	A	B	C	D	E	F	G	H	I	J	K	L
1					α					MAPE		
2	Month	Demand	0.1	0.2	0.3	0.4	0.5	α = 0.1	α = 0.2	α = 0.3	α = 0.4	α = 0.5
3	1	1059										
4	2	1136										
5	3	900										
6	4	942										
7	5	956										
8	6	1094										
9	7	1032	1015	1015	1015	1015	1015	0.016473	0.016473	0.016473	0.016473	0.016473
10	8	911	1017	1018	1020	1022	1024	0.116356	0.117453	0.119649	0.121844	0.12404
11	9	970	1006	997	987	978	968	0.037113	0.027835	0.017526	0.008247	0.002062
12	10	934	1002	992	982	975	969	0.072805	0.062099	0.051392	0.043897	0.037473
13	11	1040	995	980	968	959	952	0.043269	0.057692	0.069231	0.077885	0.084615
14	12	1026	1000	992	990	991	996	0.025341	0.033138	0.035088	0.034113	0.02924
15	13	969	1003	999	1001	1005	1011	0.035088	0.03096	0.033024	0.037152	0.043344
16	14	980	1000	993	991	991	990	0.020408	0.013265	0.011224	0.011224	0.010204
17	15	968	998	990	988	987	985	0.030992	0.022727	0.020661	0.019628	0.017562
18	16	959	995	986	982	979	977	0.037539	0.028154	0.023983	0.020855	0.01877
19	17	1041	991	981	975	971	968	0.048031	0.057637	0.063401	0.067243	0.070125
20	18	1023	996	993	995	999	1005	0.026393	0.029326	0.02737	0.02346	0.017595
21	19	999	999	999	1003	1009	1014	0	0	0.004004	0.01001	0.015015
22	20	980	999	999	1002	1005	1007	0.019388	0.019388	0.022449	0.02551	0.027551
23	21	1063	997	995	995	995	994	0.062088	0.06397	0.06397	0.06397	0.064911
24	22	1016	1004	1009	1015	1022	1029	0.011811	0.00689	0.000984	0.005906	0.012795
25	23	896	1005	1010	1015	1020	1023	0.121652	0.127232	0.132813	0.138393	0.141741
26	24	1049	994	987	979	970	960	0.052431	0.059104	0.06673	0.07531	0.084843
27												
28								3.881836	3.822104	3.92178	4.155509	4.37046

Cell	Formula	Note
C9	=ROUND(AVERAGE($B$3:$B$8),0)	Drag right to G9
C10	=ROUND($B9*C$2+C9*(1-C$2),0)	Drag right to G10; then drag down to G26 with C10 to G10 selected
H9	=ABS($B9-C9)/$B9	Drag right to L9; then drag down to L26 with H9 to L9 selected
H28	=AVERAGE(H15:H26)*100	Drag right to L28

Figure 2.18
Finding an appropriate weighting factor for an exponential smoothing model.

	A	B	C	D	E	F	G	H
1	Month	Demand	Forecast	*e*	|*e*|	Bias	MAD	TS
2	24	1049	987					
3	25	1040	999	41	41	41	41	1
4	26	1013	1007	6	6	47	23.5	2
5	27	992	1008	-16	16	31	21	1.47619
6	28	1132	1005	127	127	158	47.5	3.326316
7	29	1196	1030	166	166	324	71.2	4.550562
8	30	1039	1063	-24	24	300	63.33333	4.736842
9	31	1181	1058	123	123	423	71.85714	5.88668
10	32	1131	1083	48	48	471	68.875	6.838475
11	33	1186	1093	93	93	564	71.55556	7.881988
12	34	1247	1112	135	135	699	77.9	8.973042
13	35	1250	1139	111	111	810	80.90909	10.01124
14	36	1231	1161	70	70	880	80	11
15								

Cell	Formula	Note
C3	=ROUND(B2*0.2+0.8*C2,0)	Drag down to C14
D3	=B3-C3	Drag down to D14
E3	=ABS(D3)	Drag down to E14
F3	=SUM(D$3:D3)	Drag down to F14
G3	=AVERAGE(E$3:E3)	Drag down to G14
H3	=F3/G3	Drag down to H14

Figure 2.19
Analysis of the exponential smoothing model.

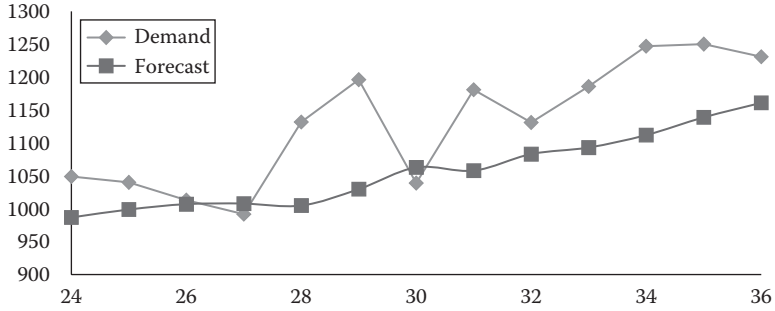

Figure 2.20
Plot of actual GPS demand versus forecast.

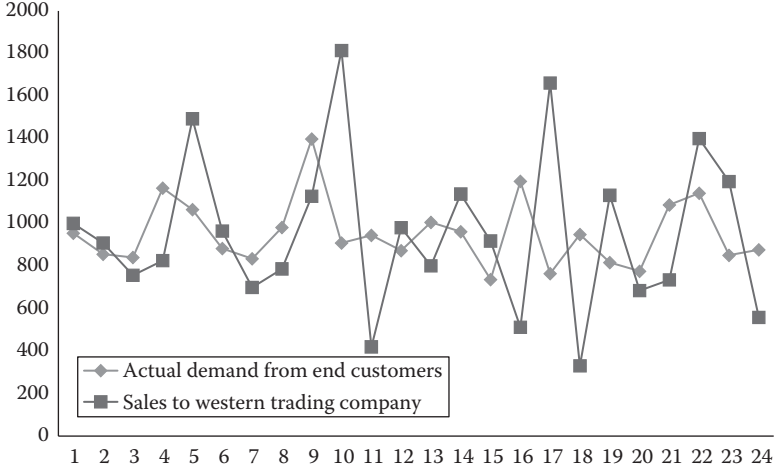

Figure 2.21
Comparison of sales observed at C & K and actual demand from end customers.

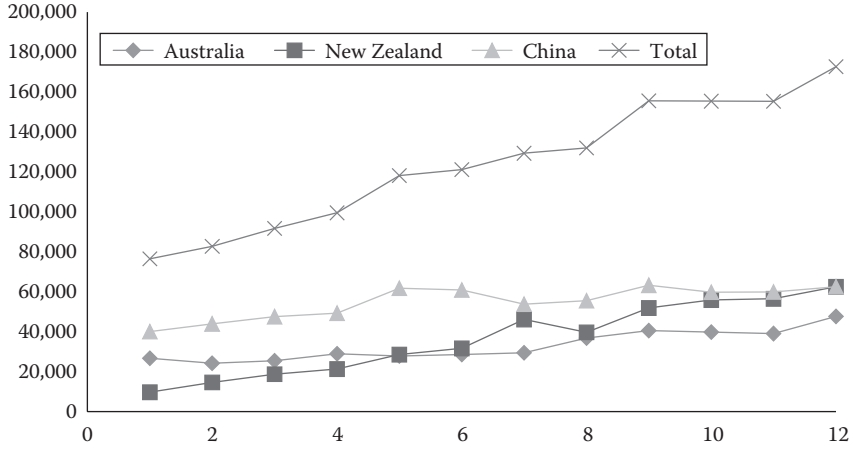

Figure 2.22
Plot of lamb shank demand at Tony's Lamb House.