Appendix H4-1
A comparison of forecasting techniques applied to ATM withdrawals
Season = 6 days (using all available data points)

Forecasting method	Smoothing constants	Seasonality	Measures of forecast error		
			RSME	MAPE	MAD
Simple exponential smoothing	α = 0.3183	Simple seasonal relatives	70 346	49.18%	54 162
Simple exponential smoothing	α = 0.3290	Moving seasonal relatives	73 356	48.59%	54 460
FIT smoothing (trend = default)	α = 0.2969 δ = 0.0576	Simple seasonal relatives	70 506	44.77%	53 180
FIT smoothing (trend = regressed)	α = 0.2500 δ = 0.0655	Simple seasonal relatives	70 400	43.82%	52 895
FIT smoothing (trend = default)	α = 0.3047 δ = 0.0586	Moving seasonal relatives	73 002	44.24%	53 579
FIT smoothing (trend = regressed)	α = 0.2974 δ = 0.0585	Moving seasonal relatives	72 653	43.81%	53 282
Trend regressed exponential smoothing	α = 0.3085	Simple seasonal relatives	70 192	47.51%	53 791
Trend regressed exponential smoothing	α = 0.3192	Moving seasonal relatives	73 058	47.08%	54 127
Simple average	-	Simple seasonal relatives	79 433	62.22%	65 256
Simple average	-	Moving seasonal relatives	79 809	61.78%	65 350
Moving average	Step = 5	Simple seasonal relatives	64 835	44.81%	47 724
Moving average	Step = 5	Moving seasonal relatives	65 544	44.06%	47 204
Winter's method (trend = default)	α = 0.3 δ = 0 γ = 0	Simple seasonal relatives	69 725	49.17%	53 957
Winter's method (trend = regressed)	α = 0.2 δ = 0 γ = 0	Simple seasonal relatives	67 523	46.41%	50 945
Winter's method (trend = default)	α = 0.3 δ = 0.1 γ = 0	Moving seasonal relatives	71 169	44.51%	53 142
Winter's method (trend = regressed)	α = 0.2 δ = 0 γ = 0	Moving seasonal relatives	68 537	46.10%	51 604

Appendix H4-2

A comparison of forecasting techniques applied to ATM withdrawals

Season = 24 days (using all available data points)

Forecasting method	Smoothing constants	Seasonality	Measures of forecast error		
			RSME	MAPE	MAD
Simple exponential smoothing	$\alpha = 0.2512$	Simple seasonal relatives	65 903	44.37%	48 435
Simple exponential smoothing	$\alpha = 0.3326$	Moving seasonal relatives	100 060	45.29%	61 042
FIT smoothing (trend = default)	$\alpha = 0.2500$ $\delta = 3.052 \times 10^{-5}$	Simple seasonal relatives	65 903	44.38%	48 439
FIT smoothing (trend = regressed)	$\alpha = 0.2354$ $\delta = 3.052 \times 10^{-5}$	Simple seasonal relatives	65 391	42.89%	48 037
FIT smoothing (trend = default)	$\alpha = 0.2969$ $\delta = 0.0605$	Moving seasonal relatives	98 485	41.75%	59 560
FIT smoothing (trend = regressed)	$\alpha = 0.2969$ $\delta = 0.0584$	Moving seasonal relatives	97 819	41.54%	59 343
Trend regressed exponential smoothing	$\alpha = 0.2361$	Simple seasonal relatives	65 492	42.90%	48 051
Trend regressed exponential smoothing	$\alpha = 0.3223$	Moving seasonal relatives	99 195	43.91%	60 435
Simple average	-	Simple seasonal relatives	71 736	54.53%	58 942
Simple average	-	Moving seasonal relatives	78 624	54.21%	61 423
Moving average	Step = 5	Simple seasonal relatives	58 723	41.68%	44 564
Moving average	Step = 5	Moving seasonal relatives	66 208	39.34%	48 372
Winter's method (trend = default)	$\alpha = 0.3$ $\delta = 0$ $\gamma = 0$	Simple seasonal relatives	73 614	45.23%	51 834
Winter's method (trend = regressed)	$\alpha = 0.2$ $\delta = 0$ $\gamma = 0$	Simple seasonal relatives	61 687	42.36%	46 798
Winter's method (trend = default)	$\alpha = 0.2$ $\delta = 0.3$ $\gamma = 0$	Moving seasonal relatives	78 680	41.21%	56 553
Winter's method (trend = regressed)	$\alpha = 0$ $\delta = 0$ $\gamma = 0$	Moving seasonal relatives	67 158	46.04%	50 964

Appendix H4-3

A comparison of forecasting techniques applied to ATM withdrawals

Season = 26 days (using all available data points)

Forecasting method	Smoothing constants	Seasonality	Measures of forecast error		
			RSME	MAPE	MAD
Simple exponential smoothing	α = 0.3001	Simple seasonal relatives	56 143	37.45%	43 633
Simple exponential smoothing	α = 0.4102	Moving seasonal relatives	77 698	39.75%	55 609
FIT smoothing (trend = default)	α = 0.2450 δ = 0.0625	Simple seasonal relatives	57 417	34.70%	43 517
FIT smoothing (trend = regressed)	α = 0.2450 δ = 0.0391	Simple seasonal relatives	56 779	34.35%	42 937
FIT smoothing (trend = default)	α = 0.3672 δ = 0.0625	Moving seasonal relatives	76 099	37.54%	55 412
FIT smoothing (trend = regressed)	α = 0.3593 δ = 0.0625	Moving seasonal relatives	75 535	37.28%	55 105
Trend regressed exponential smoothing	α = 0.2871	Simple seasonal relatives	55 758	35.91%	42 862
Trend regressed exponential smoothing	α = 0.3984	Moving seasonal relatives	76 326	38.59%	54 825
Simple average	-	Simple seasonal relatives	71 570	51.02%	59 516
Simple average	-	Moving seasonal relatives	80 814	52.12%	62 373
Moving average	Step = 4	Simple seasonal relatives	54 825	35.42%	40 642
Moving average	Step = 4	Moving seasonal relatives	67 611	35.76%	47 516
Winter's method (trend = default)	α = 0.3 δ = 0 γ = 0	Simple seasonal relatives	58 168	38.08%	45 566
Winter's method (trend = regressed)	α = 0.3 δ = 0 γ = 0	Simple seasonal relatives	55 550	35.94%	43 083
Winter's method (trend = default)	α = 0.1 δ = 0.55 γ = 0	Moving seasonal relatives	67 692	34.58%	49 647
Winter's method (trend = regressed)	α = 0 δ = 0 γ = 0	Moving seasonal relatives	65 096	41.16%	49 352

Appendix H4-4

A comparison of forecasting techniques applied to ATM withdrawals Season = 30 days (using all available data points)

Forecasting method	Smoothing constants	Seasonality	Measures of forecast error		
			RSME	MAPE	MAD
Simple exponential smoothing	$\alpha = 0.2453$	Simple seasonal relatives	66 157	44.44%	49 356
Simple exponential smoothing	$\alpha = 0.1408$	Moving seasonal relatives	206 757	70.89%	106 798
FIT smoothing (trend = default)	$\alpha = 0.2452$ $\delta = 3.052 \times 10^{-5}$	Simple seasonal relatives	66 156	44.43%	49 355
FIT smoothing (trend = regressed)	$\alpha = 0.2344$ $\delta = 3.052 \times 10^{-5}$	Simple seasonal relatives	65 462	42.80%	48 739
FIT smoothing (trend = default)	$\alpha = 0.1250$ $\delta = 0.0938$	Moving seasonal relatives	207 673	77.59%	118 555
FIT smoothing (trend = regressed)	$\alpha = 0.1172$ $\delta = 0.0938$	Moving seasonal relatives	201 647	77.41%	117 460
Trend regressed exponential smoothing	$\alpha = 0.2344$	Simple seasonal relatives	65 483	42.80%	48 719
Trend regressed exponential smoothing	$\alpha = 0.1248$	Moving seasonal relatives	195 661	64.27%	100 444
Simple average	-	Simple seasonal relatives	74 942	56.95%	60 131
Simple average	-	Moving seasonal relatives	113 312	72.61%	92 319
Moving average	Step = 5	Simple seasonal relatives	65 698	40.85%	47 530
Moving average	Step = 5	Moving seasonal relatives	224 216	61.50%	87 263
Winter's method (trend = default)	$\alpha = 0.3$ $\delta = 0$ $\gamma = 0$	Simple seasonal relatives	72 177	45.64%	54 870
Winter's method (trend = regressed)	$\alpha = 0.1$ $\delta = 0$ $\gamma = 0$	Simple seasonal relatives	65 794	45.54%	51 812
Winter's method (trend = default)	$\alpha = 0.1$ $\delta = 0$ $\gamma = 0.05$	Moving seasonal relatives	170 590	68.78%	98 229
Winter's method (trend = regressed)	$\alpha = 0$ $\delta = 0.05$ $\gamma = 0.15$	Moving seasonal relatives	80 911	46.45%	62 237

Appendix H4-5

A comparison of forecasting techniques applied to ATM withdrawals Season = 6 days (using most recent 56 data points)

Forecasting method	Smoothing constants	Seasonality	Measures of forecast error		
			RSME	MAPE	MAD
Simple exponential smoothing	α = 0.2187	Simple seasonal relatives	67 235	50.27%	50 012
Simple exponential smoothing	α = 0.2164	Moving seasonal relatives	67 815	50.00%	50 564
FIT smoothing (trend = default)	α = 0.2500 δ = 0.2812	Simple seasonal relatives	69 180	47.32%	50 062
FIT smoothing (trend = regressed)	α = 0.2500 δ = 0.2812	Simple seasonal relatives	69 208	47.34%	50 083
FIT smoothing (trend = default)	α = 0.2500 δ = 0.2812	Moving seasonal relatives	70 576	47.65%	51 129
FIT smoothing (trend = regressed)	α = 0.2500 δ = 0.2812	Moving seasonal relatives	70 611	47.68%	51 155
Trend regressed exponential smoothing	α = 0.2170	Simple seasonal relatives	67 177	50.65%	50 099
Trend regressed exponential smoothing	α = 0.2140	Moving seasonal relatives	67 750	50.45%	50 715
Simple average	-	Simple seasonal relatives	64 567	52.98%	49 249
Simple average	-	Moving seasonal relatives	64 839	51.89%	49 430
Moving average	Step = 5	Simple seasonal relatives	54 159	40.20%	39 428
Moving average	Step = 5	Moving seasonal relatives	54 526	39.99%	39 911
Winter's method (trend = default)	α = 0.2 δ = 0 γ = 0	Simple seasonal relatives	67 935	52.42%	51 631
Winter's method (trend = regressed)	α = 0 δ = 0 γ = 0	Simple seasonal relatives	64 617	51.59%	49 392
Winter's method (trend = default)	α = 0.2 δ = 0 γ = 0	Moving seasonal relatives	68 787	52.50%	52 515
Winter's method (trend = regressed)	α = 0 δ = 0 γ = 0	Moving seasonal relatives	65 073	51.33%	49 851

Appendix H4-6

A comparison of forecasting techniques applied to ATM withdrawals

Season = 24 days (using most recent 56 data points)

Forecasting method	Smoothing constants	Seasonality	Measures of forecast error		
			RSME	MAPE	MAD
Simple exponential smoothing	α = 0.0774	Simple seasonal relatives	58 075	35.98%	41 391
Simple exponential smoothing	α = 0.0777	Moving seasonal relatives	61 720	38.25%	39 378
FIT smoothing (trend = default)	α = 0.0391 δ = 0.0468	Simple seasonal relatives	58 641	36.91%	42 194
FIT smoothing (trend = regressed)	α = 0.0085 δ = 0.0312	Simple seasonal relatives	57 825	36.84%	41 522
FIT smoothing (trend = default)	α = 0.0352 δ = 0.0468	Moving seasonal relatives	61 752	38.18%	38 988
FIT smoothing (trend = regressed)	α = 0.0312 δ = 0.0351	Moving seasonal relatives	61 592	38.12%	38 787
Trend regressed exponential smoothing	α = 0.0118	Simple seasonal relatives	57 718	36.50%	41 362
Trend regressed exponential smoothing	α = 0.0585	Moving seasonal relatives	61 368	37.97%	38 883
Simple average	-	Simple seasonal relatives	55 652	37.79%	39 823
Simple average	-	Moving seasonal relatives	60 495	40.00%	37 423
Moving average	Step = 5	Simple seasonal relatives	53 923	32.22%	35 638
Moving average	Step = 5	Moving seasonal relatives	49 108	31.67%	30 153
Winter's method (trend = default)	α = 0.2 δ = 0 γ = 0	Simple seasonal relatives	60 705	39.73%	42 524
Winter's method (trend = regressed)	α = 0 δ = 0 γ = 0	Simple seasonal relatives	58 583	39.58%	42 066
Winter's method (trend = default)	α = 0.1 δ = 0 γ = 0	Moving seasonal relatives	70 616	46.93%	43 085
Winter's method (trend = regressed)	α = 0 δ = 0 γ = 0	Moving seasonal relatives	63 326	40.67%	39 162

Appendix H4-7

A comparison of forecasting techniques applied to ATM withdrawals

Season = 26 days (using most recent 56 data points)

Forecasting method	Smoothing constants	Seasonality	Measures of forecast error		
			RSME	MAPE	MAD
Simple exponential smoothing	$\alpha = 0.0771$	Simple seasonal relatives	49 938	33.49%	35 660
Simple exponential smoothing	$\alpha = 0.1960$	Moving seasonal relatives	74 431	42.47%	41 782
FIT smoothing (trend = default)	$\alpha = 0.0761$ $\delta = 3.052 \times 10^{-5}$	Simple seasonal relatives	49 920	33.49%	35 638
FIT smoothing (trend = regressed)	$\alpha = 0.0899$ $\delta = 0.0056$	Simple seasonal relatives	50 448	33.90%	36 203
FIT smoothing (trend = default)	$\alpha = 0.1960$ $\delta = 3.052 \times 10^{-5}$	Moving seasonal relatives	74 428	42.47%	41 781
FIT smoothing (trend = regressed)	$\alpha = 0.2011$ $\delta = 3.052 \times 10^{-5}$	Moving seasonal relatives	75 314	43.31%	42 480
Trend regressed exponential smoothing	$\alpha = 0.0937$	Simple seasonal relatives	50 687	34.21%	36 488
Trend regressed exponential smoothing	$\alpha = 0.2009$	Moving seasonal relatives	75 248	43.29%	42 452
Simple average	-	Simple seasonal relatives	46 900	30.43%	33 194
Simple average	-	Moving seasonal relatives	62 187	36.47%	35 384
Moving average	Step = 4	Simple seasonal relatives	52 291	31.22%	35 787
Moving average	Step = 5	Moving seasonal relatives	59 056	32.74%	31 036
Winter's method (trend = default)	$\alpha = 0.1$ $\delta = 0$ $\gamma = 0$	Simple seasonal relatives	52 636	35.45%	37 681
Winter's method (trend = regressed)	$\alpha = 0$ $\delta = 0$ $\gamma = 0$	Simple seasonal relatives	47 525	31.73%	33 975
Winter's method (trend = default)	$\alpha = 0.1$ $\delta = 0.05$ $\gamma = 0$	Moving seasonal relatives	66 098	40.27%	40 791
Winter's method (trend = regressed)	$\alpha = 0$ $\delta = 0$ $\gamma = 0$	Moving seasonal relatives	61 022	34.61%	33 647

Appendix H4-8

A comparison of forecasting techniques applied to ATM withdrawals Season = 30 days (using most recent 56 data points)

Forecasting method	Smoothing constants	Seasonality	Measures of forecast error		
			RSME	MAPE	MAD
Simple exponential smoothing	$\alpha = 0.0690$	Simple seasonal relatives	73 596	34.38%	35 025
FIT smoothing (trend = default)	$\alpha = 0.0625$ $\delta = 0.1250$	Simple seasonal relatives	76 148	35.75%	36 368
FIT smoothing (trend = regressed)	$\alpha = 0.0234$ $\delta = 0.0157$	Simple seasonal relatives	91 961	50.97%	55 725
Trend regressed exponential smoothing	$\alpha = 0.0304$	Simple seasonal relatives	92 138	50.56%	54 842
Simple average	-	Simple seasonal relatives	77 954	43.65%	49 631
Moving average	Step = 5	Simple seasonal relatives	95 795	44.80%	42 461
Winter's method (trend = default)	$\alpha = 0.1$ $\delta = 0.05$ $\gamma = 0$	Simple seasonal relatives	78 931	40.97%	44 069
Winter's method (trend = regressed)	$\alpha = 0$ $\delta = 0$ $\gamma = 0$	Simple seasonal relatives	66 367	31.79%	35 682