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ACCURATE COMPUTATIONS OF MONTHLY AVERAGE DAILY EXTRATERRESTRIAL IRRADIATION AND THE MAXIMUM POSSIBLE SUNSHINE DURATION *

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ABSTRACT

The monthly average daily values of the extraterrestrial irradiation on a horizontal plane ($\bar{H}_o$) and the maximum possible sunshine duration ($\bar{S}_o$) are two important parameters that are frequently needed in various solar energy applications. These are generally calculated by solar scientists and engineers each time they are needed and often by using the approximate short-cut methods. Using the accurate analytical expressions developed by Spencer [5] for the declination and the eccentricity correction factor, computations for these parameters have been made for all the latitude values from 90°N to 90°S at intervals of 1° and are presented in a convenient tabular form. Monthly average daily values of the maximum possible sunshine duration as recorded on a Campbell Stoke's sunshine recorder $\bar{S}'_o$ are also computed and presented. These tables would avoid the need for repetitive and approximate calculations and serve as a useful ready reference for providing the accurate values of $\bar{H}_o$, $\bar{S}_o$ and $\bar{S}'_o$ to the solar energy scientists and engineers.

1. INTRODUCTION

The monthly average daily values of the extraterrestrial irradiation on a horizontal plane $\bar{H}_o$ and the maximum possible sunshine duration (MPSD) $\bar{S}_o$ are two important parameters that are frequently needed in solar energy applications. For instance, any attempts at estimating the global irradiation and the diffuse irradiation at a place invariably require the knowledge of one or both of these parameters at that place. The values of $\bar{H}_o$ have been tabulated by Duffie and Beckman [1] and Iqbal [2] for latitude intervals of 5^o. Duffie and Beckman [1] also present graphs for the values of $\bar{H}_o$ for recommended days of each month and nomogram for calculating the values of $\bar{S}_o$. However these are often not convenient enough and it is observed that most of the solar energy scientists do their own calculations for the values of $\bar{H}_o$ and $\bar{S}_o$ at their location. For reducing the amount of calculations, short-cut methods of using the middle day of each month or a single recommended day for each month [3] have often been employed. Realizing the need to provide these values once for all in a convenient form so as to avoid the repetitive and approximate calculations, recently Jain [4] compiled a table for these values. However, as explained in Sec. 3, these values are sometimes not sufficiently accurate mainly due to the inaccuracy involved in the expression for the declination δ. The aim of this note is to provide accurate values of $\bar{H}_o$, $\bar{S}_o$ and $\bar{S}'_o$ in a convenient tabular form.

2. COMPUTATIONS

All the computations were done on the ICTP computer Gould 32/87. The values of H_o for a given day were computed using the equation

$$H_o = \frac{24\times 3600}{\pi} \times I_{sc} \times E_o \times (\cos\phi \cos\delta \sin\omega_s + \frac{2\pi\omega_s}{360} \sin\phi \sin\delta). \quad (1)$$

The following accurate expressions for δ (in radians) and E_o, developed by Spencer [5], were used

$$\delta = 0.006918 - 0.399912 \cos\Gamma + 0.07257 \sin\Gamma - 0.006758 \cos 2\Gamma + 0.000907 \sin\Gamma - 0.002697 \cos 3\Gamma + 0.00148 \sin 3\Gamma, \quad (2)$$

$$E_o = 1.00011 + 0.034221 \cos\Gamma + 0.001280 \sin\Gamma + 0.000719 \cos 2\Gamma + 0.000077 \sin 2\Gamma, \quad (3)$$

where

$$\Gamma = 2\pi(N-1)/365 \quad . \quad (4)$$

eqn (2) estimates δ with a maximum error of 3' and eqn (3) estimates E_o with a maximum error of 0.0001. The monthly averages of H_o for each month were computed for all the ϕ-values from 90^oN to 90^oS at 1^o interval. The number of days in February were taken to be 28. The best value of the solar constant available at present is 1367 W/m^2 [6]. This value has been used in the computations.

The values of S_o for a given day and latitude value were computed using the relation

$$S_o = \frac{2}{15} \cos^{-1} (-\tan\phi \ \tan\delta) \quad (5)$$

and the monthly averages were taken for all the ϕ-values.

The values of S'_o were computed using the expression

$$S'_o = \frac{2}{15} \cos^{-1} \left\{ \frac{\cos 85^o - \sin\phi \sin\delta}{\cos\phi \cos\delta} \right\} \quad (6)$$

The North latitude values were taken as positive and the South latitude values as negative.

3. RESULTS AND DISCUSSION

The computed values of $\bar{H}_o$, $\bar{S}_o$ and $\bar{S}'_o$ are presented in Table 1 in the first, second and the third rows, respectively, against each ϕ-value. The essential difference between this table and the similar table in Ref. [4] is the use of different expressions for the calculation of δ and E_o in the two cases. The table in Ref. [4] was compiled by using the expression for δ as used by Cooper [7]

$$\delta = 23.45 \sin \left(360 \frac{284+N}{365}\right) \quad (7)$$

and for E_o as used by Duffie and Beckman [1]

$$E_o = 1 + 0.033 \cos \left(\frac{360N}{365}\right) \quad (8)$$

While the use of eqn(3) instead of eqn(8) does not create an appreciable difference, the use of eqn(2) instead of eqn(7) can indeed lead to substantial differences in the values of H_o - upto 10% or even more. This would not be obvious as eqn(8) is generally considered to be good enough for most of the practical purposes. But it has been shown [8] that even a small error in the value of δ can lead to relatively large errors in the value of H_o particularly for higher values of the latitude. In fact, it can be directly seen by a comparison of Table 1 in this paper and Table 1 of Ref. [4] that differences of upto 5-10% are not very uncommon and even larger differences are occasionally encountered. As the correlations and the models developed these days often claim to predict the solar radiation to an accuracy of about ± 5-10%, it is necessary to use the values of $\bar{H}_o$, $\bar{S}_o$ and $\bar{S}'_o$ to a higher accuracy of about 1-2%. Table 1 in this paper is meant to meet this need. It is highly recommended that in future work this table should be used for obtaining the values of $\bar{H}_o$, $\bar{S}_o$ and $\bar{S}'_o$ at any location. For intermediate ϕ-values, simply a linear interpolation between the two successive listed ϕ-values would provide the values of $\bar{H}_o$, $\bar{S}_o$ and $\bar{S}'_o$ without introducing any appreciable error at all.

The chart on the Campbell-Stoke's sunshine recorder does not burn when the solar elevation is less than 5^o [9]. Therefore the value of the MPSD recorded on a sunshine recorder is actually less than $\bar{S}_o$.

Some authors [10, 11] prefer to use the value of $\bar{S}'_o$ instead of $\bar{S}_o$ in their correlation. For this reason the values of $\bar{S}'_o$, as computed using eqn (6), are also provided in Table 1.

The computation of H_o values in this paper has been done using the recently suggested value of the solar constant [6], viz 1367 W/m^2. The values of the solar constant have undergone revisions several times in the past. An account of them is given by Iqbal [2]. It is not unlikely that no such revisions would take place in future. The values of $\bar{H}_o$ corresponding to any other value of the solar constant can be easily obtained from those presented here simply by multiplying the tabulated values herein by the ratio of the new value of the solar constant to 1367 W/m^2.

The use of eqn (2) instead of the simpler eqn (7) for the value of δ does provide more accurate values of H_o. However, there still remain uncertainties in the value of δ due to the leap-year cycle, the use of a single value of δ for a day, etc. These uncertainties are relatively small and one can expect the values of $\bar{H}_o$ provided in Table 1 to be accurate within about ±1%.

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NOMENCLATURE

$\bar{H}_o$	monthly average daily extraterrestrial irradiation on a horizontal surface.
$\bar{S}_o$	monthly average daily maximum possible sunshine duration.
$\bar{S}'_o$	monthly average daily maximum possible sunshine duration recorded by a Campbell-Stoke's sunshine recorder.
ϕ	latitude.
δ	declination.
ω_s	sunset hour angle.
N	day of the year with 1 on January 1.
E_o	eccentricity correction factor.
I_{sc}	solar constant.

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TABLE 1: MONTHLY AVERAGE DAILY VALUES OF EXTRATERRESTRIAL IRRADIATION ON HORIZONTAL PLANE AND MAXIMUM POSSIBLE SUNSHINE DURATION

FIRST ROW: EXTRATERRESTRIAL IRRADIATION (IN MEGAJOULES PER METER SQUARE)
SECOND ROW: ACTUAL MAXIMUM POSSIBLE SUNSHINE DURATION (IN HOURS)
THIRD ROW: MAXIMUM POSSIBLE SUNSHINE DURATION ON SUNSHINE RECORDER (IN HOURS)

ϕ	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
90.0	.00	.00	1.49	19.68	37.17	44.86	41.37	27.32	6.74	.00	.00	.00
	.00	.00	8.52	24.00	24.00	24.00	24.00	24.00	18.40	.00	.00	.00
	.00	.00	.00	22.40	24.00	24.00	24.00	24.00	8.00	.00	.00	.00
89.0	.00	.00	1.53	19.68	37.16	44.86	41.37	27.32	6.78	.00	.00	.00
	.00	.00	8.23	24.00	24.00	24.00	24.00	24.00	18.19	.00	.00	.00
	.00	.00	.00	22.23	24.00	24.00	24.00	24.00	7.79	.00	.00	.00
88.0	.00	.00	1.66	19.67	37.15	44.84	41.35	27.31	6.91	.00	.00	.00
	.00	.00	8.29	24.00	24.00	24.00	24.00	24.00	18.27	.00	.00	.00
	.00	.00	.57	21.72	24.00	24.00	24.00	24.00	7.86	.00	.00	.00
87.0	.00	.00	1.87	19.65	37.12	44.80	41.32	27.29	7.12	.00	.00	.00
	.00	.00	8.23	24.00	24.00	24.00	24.00	24.00	18.20	.00	.00	.00
	.00	.00	1.16	21.05	24.00	24.00	24.00	24.00	7.82	.00	.00	.00
86.0	.00	.00	2.17	19.63	37.08	44.76	41.27	27.26	7.41	.02	.00	.00
	.00	.00	8.26	24.00	24.00	24.00	24.00	24.00	17.82	.40	.00	.00
	.00	.00	1.76	20.37	24.00	24.00	24.00	23.92	7.83	.00	.00	.00
85.0	.00	.00	2.54	19.61	37.03	44.69	41.21	27.22	7.74	.07	.00	.00
	.00	.00	8.42	23.79	24.00	24.00	24.00	24.00	17.30	.90	.00	.00
	.00	.00	2.38	19.69	24.00	24.00	24.00	23.52	8.20	.00	.00	.00
84.0	.00	.00	2.98	19.61	36.97	44.62	41.15	27.17	8.12	.16	.00	.00
	.00	.00	8.85	23.36	24.00	24.00	24.00	24.00	16.71	1.44	.00	.00
	.00	.00	2.99	19.00	24.00	24.00	24.00	22.99	8.66	.00	.00	.00
83.0	.00	.00	3.46	19.64	36.89	44.53	41.06	27.12	8.55	.29	.00	.00
	.00	.00	9.31	22.86	24.00	24.00	24.00	24.00	16.12	2.03	.00	.00
	.00	.00	3.62	18.27	24.00	24.00	24.00	22.40	9.20	.00	.00	.00
82.0	.00	.00	3.99	19.71	36.81	44.43	40.97	27.06	9.01	.46	.00	.00
	.00	.00	9.86	22.28	24.00	24.00	24.00	24.00	15.47	2.63	.00	.00
	.00	.00	4.22	17.52	24.00	24.00	24.00	21.76	9.74	.00	.00	.00
81.0	.00	.01	4.56	19.81	36.71	44.31	40.86	26.99	9.53	.68	.00	.00
	.00	.25	10.20	21.68	24.00	24.00	24.00	23.95	14.86	3.25	.00	.00
	.00	.00	4.85	16.77	24.00	24.00	24.00	21.07	10.07	.26	.00	.00
80.0	.00	.05	5.15	19.96	36.60	44.18	40.74	26.92	10.07	.94	.00	.00
	.00	.63	10.43	21.06	24.00	24.00	24.00	23.66	14.48	3.89	.00	.00
	.00	.00	5.46	15.99	23.97	24.00	24.00	20.36	10.30	.63	.00	.00
79.0	.00	.12	5.75	20.14	36.49	44.04	40.61	26.88	10.63	1.25	.00	.00
	.00	1.13	10.60	20.42	24.00	24.00	24.00	23.26	14.21	4.54	.00	.00
	.00	.00	6.10	15.49	23.68	24.00	24.00	19.62	10.47	1.05	.00	.00

Table 1 (cont.)

ϕ	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
78.0	.00	.23	6.36	20.36	36.36	43.88	40.47	26.86	11.20	1.60	.00	.00
	.00	1.68	10.73	19.74	24.00	24.00	24.00	22.79	13.99	5.21	.00	.00
	.00	.00	6.71	15.11	23.23	24.00	24.00	18.82	10.60	1.53	.00	.00
77.0	.00	.40	6.98	20.63	36.22	43.71	40.31	26.87	11.77	2.00	.00	.00
	.00	2.28	10.85	19.05	24.00	24.00	24.00	22.25	13.81	5.88	.00	.00
	.00	.00	7.36	14.81	22.67	24.00	24.00	17.99	10.71	2.03	.00	.00
76.0	.00	.60	7.60	20.93	36.06	43.53	40.14	26.92	12.35	2.45	.00	.00
	.00	2.92	10.94	18.33	24.00	24.00	24.00	21.67	13.67	6.58	.00	.00
	.00	.20	7.82	14.57	22.01	24.00	23.84	17.28	10.80	2.57	.00	.00
75.0	.00	.86	8.22	21.29	35.90	43.34	39.96	27.00	12.93	2.94	.00	.00
	.00	3.60	11.02	17.60	23.98	24.00	24.00	21.05	13.54	7.15	.16	.00
	.00	.51	8.17	14.36	21.25	24.00	23.41	16.78	10.88	3.13	.00	.00
74.0	.00	1.18	8.84	21.68	35.74	43.13	39.77	27.13	13.51	3.46	.03	.00
	.00	4.31	11.09	17.08	23.73	24.00	24.00	20.40	13.44	7.56	.50	.00
	.00	.93	8.46	14.18	20.39	24.00	22.77	16.38	10.95	3.71	.00	.00
73.0	.00	1.54	9.46	22.09	35.59	42.90	39.56	27.29	14.09	4.00	.09	.00
	.00	5.07	11.15	16.68	23.35	24.00	24.00	19.69	13.34	7.89	.93	.00
	.00	1.41	8.70	14.02	19.39	24.00	21.96	16.04	11.00	4.31	.00	.00
72.0	.00	1.97	10.09	22.51	35.47	42.67	39.35	27.50	14.66	4.56	.19	.00
	.09	5.77	11.20	16.34	22.87	24.00	24.00	18.93	13.26	8.18	1.47	.00
	.00	1.93	8.90	13.88	18.65	23.46	20.87	15.75	11.05	4.93	.00	.00
71.0	.02	2.44	10.71	22.95	35.38	42.42	39.12	27.75	15.24	5.12	.34	.00
	.42	6.27	11.25	16.06	22.29	24.00	23.86	18.27	13.18	8.42	2.08	.00
	.00	2.49	9.08	13.76	18.10	21.57	19.79	15.50	11.10	5.57	.00	.00
70.0	.08	2.93	11.33	23.39	35.33	42.16	38.91	28.04	15.81	5.70	.54	.00
	.88	6.67	11.29	15.81	21.61	24.00	23.48	17.80	13.12	8.64	2.77	.00
	.00	3.10	9.24	13.65	17.65	20.48	19.10	15.28	11.13	6.11	.14	.00
69.0	.18	3.45	11.94	23.83	35.32	41.88	38.72	28.34	16.38	6.29	.80	.00
	1.47	7.01	11.33	15.58	20.84	24.00	22.92	17.40	13.06	8.83	3.56	.00
	.00	3.74	9.38	13.55	17.27	19.72	18.55	15.08	11.17	6.51	.44	.00
68.0	.33	3.99	12.56	24.28	35.37	41.60	38.57	28.65	16.95	6.88	1.13	.00
	2.21	7.31	11.36	15.39	19.94	24.00	22.20	17.07	13.00	9.01	4.42	.06
	.00	4.42	9.51	13.45	16.94	19.12	18.10	14.90	11.20	6.85	.82	.00
67.0	.56	4.54	13.17	24.72	35.46	41.31	38.47	28.98	17.51	7.47	1.51	.03
	3.19	7.58	11.39	15.21	19.27	23.52	21.22	16.77	12.95	9.16	5.01	.59
	.08	5.07	9.62	13.37	16.64	18.62	17.71	14.74	11.22	7.14	1.30	.00
66.0	.87	5.10	13.78	25.17	35.59	41.11	38.45	29.31	18.07	8.07	1.94	.15
	4.05	7.81	11.42	15.05	18.76	21.82	20.24	16.51	12.91	9.30	5.49	2.28
	.37	5.54	9.73	13.29	16.38	18.20	17.36	14.59	11.25	7.39	1.85	.00
65.0	1.24	5.67	14.39	25.62	35.74	41.00	38.47	29.64	18.63	8.67	2.39	.39
	4.64	8.03	11.45	14.90	18.33	20.83	19.61	16.27	12.87	9.43	5.89	3.24
	.78	5.93	9.82	13.22	16.14	17.82	17.05	14.45	11.27	7.62	2.48	.00
64.0	1.64	6.25	14.99	26.06	35.91	40.95	38.53	29.97	19.18	9.28	2.87	.70

Table 1 (cont.)

	5.12	8.22	11.47	14.76	17.96	20.14	19.10	16.06	12.83	9.55	6.24	3.92
	1.32	6.26	9.91	13.15	15.92	17.49	16.78	14.33	11.29	7.83	3.20	.00
63.0	2.08	6.84	15.59	26.50	36.09	40.93	38.60	30.31	19.72	9.88	3.36	1.06
	5.53	8.40	11.49	14.64	17.64	19.58	18.67	15.87	12.79	9.66	6.55	4.47
	2.00	6.55	9.99	13.09	15.72	17.19	16.52	14.21	11.31	8.02	3.98	.06
62.0	2.54	7.43	16.18	26.93	36.27	40.94	38.69	30.65	20.26	10.48	3.88	1.45
	5.89	8.56	11.52	14.52	17.35	19.11	18.29	15.69	12.76	9.76	6.82	4.93
	2.89	6.81	10.06	13.03	15.53	16.92	16.29	14.10	11.32	8.19	4.54	.53
61.0	3.03	8.03	16.77	27.37	36.46	40.96	38.79	30.98	20.79	11.09	4.41	1.88
	6.21	8.72	11.54	14.41	17.08	18.71	17.96	15.52	12.73	9.86	7.07	5.33
	3.69	7.05	10.13	12.97	15.36	16.67	16.08	14.00	11.34	8.34	4.98	2.08
60.0	3.53	8.63	17.36	27.79	36.65	41.00	38.90	31.31	21.32	11.69	4.95	2.33
	6.49	8.86	11.56	14.31	16.85	18.35	17.66	15.37	12.70	9.95	7.30	5.69
	4.24	7.27	10.20	12.92	15.20	16.44	15.89	13.90	11.35	8.49	5.36	2.96
59.0	4.05	9.24	17.94	28.21	36.85	41.04	39.01	31.64	21.84	12.30	5.51	2.81
	6.75	8.99	11.57	14.22	16.63	18.03	17.39	15.23	12.67	10.03	7.51	6.00
	4.69	7.46	10.25	12.87	15.05	16.23	15.70	13.81	11.37	8.62	5.70	3.60
58.0	4.59	9.84	18.52	28.63	37.04	41.10	39.13	31.96	22.36	12.90	6.07	3.30
	6.99	9.11	11.59	14.13	16.42	17.74	17.14	15.10	12.64	10.11	7.71	6.29
	5.08	7.65	10.31	12.82	14.92	16.03	15.53	13.72	11.38	8.75	5.99	4.11
57.0	5.14	10.45	19.09	29.04	37.24	41.15	39.25	32.28	22.87	13.50	6.64	3.81
	7.21	9.23	11.61	14.05	16.23	17.47	16.91	14.97	12.62	10.18	7.89	6.56
	5.42	7.82	10.36	12.78	14.78	15.85	15.37	13.64	11.39	8.87	6.26	4.55
56.0	5.69	11.06	19.65	29.44	37.43	41.21	39.37	32.60	23.37	14.10	7.22	4.34
	7.42	9.33	11.62	13.97	16.06	17.23	16.70	14.85	12.60	10.25	8.06	6.80
	5.72	7.97	10.41	12.73	14.66	15.68	15.22	13.57	11.40	8.98	6.51	4.93
55.0	6.26	11.67	20.21	29.83	37.61	41.28	39.48	32.91	23.87	14.69	7.80	4.88
	7.61	9.44	11.63	13.89	15.89	17.00	16.50	14.74	12.57	10.32	8.22	7.02
	6.00	8.12	10.46	12.69	14.54	15.51	15.08	13.49	11.40	9.08	6.73	5.27
54.0	6.84	12.28	20.77	30.22	37.80	41.34	39.60	33.21	24.36	15.29	8.39	5.43
	7.79	9.53	11.65	13.82	15.74	16.79	16.32	14.64	12.55	10.38	8.37	7.23
	6.25	8.26	10.50	12.65	14.43	15.36	14.95	13.42	11.41	9.18	6.94	5.57
53.0	7.42	12.89	21.31	30.60	37.98	41.40	39.71	33.50	24.84	15.87	8.99	5.99
	7.96	9.63	11.66	13.76	15.59	16.60	16.15	14.54	12.53	10.44	8.51	7.43
	6.49	8.39	10.54	12.61	14.32	15.21	14.82	13.36	11.42	9.27	7.14	5.85
52.0	8.01	13.50	21.85	30.98	38.15	41.46	39.82	33.79	25.32	16.46	9.58	6.56
	8.11	9.71	11.67	13.69	15.45	16.41	15.98	14.45	12.51	10.50	8.64	7.61
	6.71	8.51	10.58	12.58	14.22	15.08	14.70	13.29	11.43	9.35	7.32	6.11
51.0	8.61	14.11	22.39	31.34	38.32	41.51	39.93	34.07	25.79	17.04	10.19	7.14
	8.26	9.80	11.68	13.63	15.32	16.24	15.83	14.36	12.50	10.55	8.77	7.78
	6.91	8.63	10.61	12.54	14.13	14.94	14.58	13.23	11.43	9.43	7.49	6.34
50.0	9.21	14.72	22.92	31.70	38.48	41.56	40.03	34.35	26.25	17.62	10.79	7.73
	8.41	9.88	11.69	13.57	15.20	16.07	15.68	14.27	12.48	10.60	8.89	7.95
	7.10	8.74	10.65	12.51	14.03	14.82	14.47	13.17	11.44	9.51	7.65	6.56

Table 1 (cont.)

49.0	9.81	15.32	23.44	32.05	38.64	41.61	40.12	34.61	26.70	18.20	11.39	8.32
	8.54	9.95	11.71	13.52	15.08	15.92	15.55	14.19	12.46	10.65	9.01	8.10
	7.27	8.84	10.68	12.47	13.95	14.70	14.37	13.12	11.44	9.59	7.80	6.77
48.0	10.42	15.92	23.95	32.39	38.79	41.65	40.21	34.87	27.14	18.77	12.00	8.92
	8.67	10.02	11.72	13.46	14.97	15.77	15.41	14.11	12.45	10.70	9.11	8.25
	7.44	8.94	10.71	12.44	13.86	14.59	14.27	13.06	11.44	9.66	7.94	6.96
47.0	11.03	16.52	24.46	32.72	38.93	41.68	40.29	35.12	27.58	19.33	12.61	9.52
	8.79	10.09	11.73	13.41	14.86	15.63	15.29	14.04	12.43	10.74	9.22	8.39
	7.60	9.04	10.74	12.41	13.78	14.47	14.17	13.01	11.45	9.72	8.08	7.14
46.0	11.64	17.12	24.96	33.05	39.07	41.71	40.37	35.36	28.01	19.89	13.21	10.13
	8.91	10.16	11.74	13.36	14.76	15.49	15.17	13.97	12.42	10.79	9.32	8.52
	7.75	9.13	10.77	12.38	13.70	14.37	14.07	12.96	11.45	9.79	8.21	7.31
45.0	12.25	17.71	25.45	33.36	39.19	41.74	40.44	35.60	28.43	20.45	13.82	10.74
	9.02	10.23	11.74	13.32	14.66	15.37	15.05	13.90	12.40	10.83	9.41	8.65
	7.89	9.21	10.79	12.35	13.62	14.27	13.98	12.91	11.45	9.85	8.33	7.47
44.0	12.87	18.30	25.94	33.67	39.31	41.75	40.50	35.82	28.84	21.00	14.43	11.35
	9.13	10.29	11.75	13.27	14.56	15.24	14.94	13.83	12.39	10.87	9.51	8.77
	8.03	9.29	10.82	12.32	13.55	14.17	13.90	12.86	11.46	9.91	8.45	7.63
43.0	13.49	18.89	26.42	33.96	39.42	41.76	40.55	36.04	29.24	21.54	15.03	11.96
	9.23	10.35	11.76	13.23	14.47	15.12	14.84	13.77	12.37	10.91	9.60	8.89
	8.16	9.37	10.84	12.30	13.48	14.07	13.81	12.81	11.46	9.96	8.56	7.77
42.0	14.10	19.47	26.89	34.25	39.52	41.76	40.60	36.24	29.64	22.08	15.64	12.58
	9.33	10.41	11.77	13.18	14.38	15.01	14.73	13.70	12.36	10.95	9.68	9.00
	8.28	9.45	10.87	12.27	13.41	13.98	13.73	12.77	11.46	10.02	8.67	7.91
41.0	14.72	20.04	27.35	34.53	39.61	41.75	40.63	36.44	30.02	22.61	16.24	13.20
	9.43	10.46	11.78	13.14	14.30	14.90	14.64	13.64	12.35	10.98	9.76	9.11
	8.40	9.52	10.89	12.24	13.34	13.89	13.65	12.72	11.46	10.07	8.77	8.05
40.0	15.33	20.62	27.80	34.80	39.70	41.74	40.66	36.63	30.40	23.14	16.84	13.82
	9.52	10.52	11.79	13.10	14.22	14.80	14.54	13.59	12.34	11.02	9.84	9.22
	8.51	9.59	10.91	12.21	13.27	13.81	13.57	12.68	11.46	10.12	8.87	8.18
39.0	15.95	21.19	28.25	35.05	39.77	41.72	40.68	36.80	30.77	23.66	17.44	14.44
	9.61	10.57	11.79	13.06	14.14	14.69	14.45	13.53	12.32	11.05	9.92	9.32
	8.62	9.66	10.93	12.19	13.21	13.72	13.50	12.64	11.46	10.17	8.96	8.30
38.0	16.56	21.75	28.68	35.30	39.84	41.69	40.69	36.97	31.13	24.17	18.04	15.06
	9.70	10.62	11.80	13.03	14.06	14.59	14.36	13.47	12.31	11.09	10.00	9.42
	8.73	9.72	10.95	12.16	13.15	13.64	13.42	12.59	11.46	10.22	9.06	8.42
37.0	17.17	22.31	29.11	35.54	39.89	41.65	40.69	37.13	31.48	24.68	18.63	15.68
	9.78	10.67	11.81	12.99	13.99	14.50	14.27	13.42	12.30	11.12	10.07	9.51
	8.83	9.79	10.97	12.14	13.08	13.56	13.35	12.55	11.46	10.26	9.14	8.53
36.0	17.78	22.86	29.53	35.77	39.94	41.60	40.69	37.28	31.82	25.18	19.22	16.29
	9.86	10.72	11.81	12.95	13.91	14.41	14.19	13.37	12.29	11.15	10.14	9.60
	8.93	9.85	10.99	12.11	13.03	13.48	13.28	12.51	11.46	10.30	9.23	8.64
35.0	18.39	23.40	29.94	35.98	39.97	41.54	40.67	37.41	32.15	25.67	19.81	16.91

Table 1 (cont.)

	9.94 9.02	10.76 9.91	11.82 11.00	12.92 12.09	13.94 12.97	14.32 13.41	14.11 13.21	13.32 12.48	12.28 11.46	11.18 10.35	10.21 9.31	9.69 8.75
34.0	19.00 10.02 9.11	23.94 10.81 9.97	30.34 11.53 11.02	36.19 12.88 12.07	40.00 13.77 12.91	41.47 14.23 13.33	40.64 14.03 13.15	37.54 13.27 12.44	32.47 12.27 11.46	26.16 11.21 10.39	20.39 10.28 9.39	17.53 9.78 8.85
33.0	19.60 10.09 9.20	24.48 10.85 10.02	30.73 11.83 11.04	36.39 12.85 12.04	40.01 13.71 12.85	41.39 14.14 13.26	40.61 13.95 13.08	37.66 13.22 12.40	32.78 12.26 11.46	26.63 11.24 10.43	20.97 10.34 9.47	18.14 9.87 8.95
32.0	20.20 10.17 9.29	25.01 10.90 10.07	31.12 11.84 11.05	36.58 12.82 12.02	40.02 13.64 12.80	41.31 14.06 13.19	40.56 13.88 13.02	37.77 13.18 12.36	33.08 12.25 11.46	27.10 11.27 10.47	21.55 10.40 9.55	18.75 9.95 9.05
31.0	20.79 10.24 9.37	25.53 10.94 10.13	31.49 11.85 11.06	36.75 12.79 12.00	40.02 13.58 12.74	41.21 13.98 13.12	40.51 13.80 12.95	37.86 13.13 12.33	33.37 12.24 11.46	27.57 11.30 10.50	22.12 10.47 9.62	19.36 10.03 9.14
30.0	21.39 10.31 9.45	26.04 10.98 10.18	31.85 11.85 11.08	36.92 12.76 11.97	40.00 13.51 12.69	41.11 13.90 13.05	40.44 13.73 12.89	37.95 13.09 12.29	33.65 12.23 11.46	28.02 11.33 10.54	22.68 10.53 9.69	19.97 10.11 9.23
29.0	21.98 10.38 9.53	26.55 11.02 10.23	32.21 11.86 11.09	37.07 12.73 11.95	39.98 13.45 12.64	40.99 13.82 12.98	40.37 13.66 12.83	38.03 13.04 12.25	33.92 12.22 11.46	28.47 11.35 10.57	23.24 10.59 9.76	20.58 10.19 9.32
28.0	22.56 10.45 9.61	27.05 11.06 10.28	32.55 11.86 11.11	37.22 12.70 11.93	39.94 13.39 12.59	40.87 13.75 12.91	40.28 13.59 12.77	38.09 13.00 12.22	34.18 12.21 11.46	28.91 11.38 10.61	23.80 10.65 9.83	21.18 10.26 9.41
27.0	23.14 10.51 9.69	27.54 11.10 10.32	32.89 11.87 11.12	37.35 12.67 11.91	39.90 13.33 12.54	40.74 13.67 12.85	40.19 13.52 12.71	38.15 12.96 12.18	34.43 12.20 11.45	29.34 11.41 10.64	24.35 10.70 9.89	21.77 10.33 9.49
26.0	23.71 10.58 9.76	28.03 11.14 10.37	33.21 11.88 11.13	37.47 12.64 11.89	39.84 13.28 12.49	40.59 13.60 12.78	40.08 13.46 12.65	38.19 12.92 12.15	34.67 12.20 11.45	29.76 11.43 10.67	24.90 10.76 9.96	22.37 10.41 9.57
25.0	24.28 10.64 9.83	28.50 11.18 10.41	33.53 11.88 11.14	37.58 12.61 11.86	39.78 13.22 12.44	40.44 13.53 12.72	39.97 13.39 12.60	38.22 12.88 12.12	34.90 12.19 11.45	30.17 11.46 10.71	25.43 10.81 10.02	22.96 10.48 9.65
24.0	24.85 10.70 9.90	28.97 11.22 10.46	33.83 11.89 11.15	37.68 12.58 11.84	39.70 13.16 12.39	40.28 13.46 12.66	39.85 13.33 12.54	38.25 12.84 12.08	35.12 12.18 11.45	30.58 11.48 10.74	25.97 10.87 10.08	23.54 10.55 9.73
23.0	25.41 10.76 9.97	29.44 11.25 10.50	34.12 11.89 11.16	37.77 12.56 11.82	39.61 13.11 12.34	40.11 13.39 12.60	39.71 13.27 12.48	38.26 12.80 12.05	35.32 12.17 11.44	30.97 11.51 10.77	26.49 10.92 10.14	24.12 10.62 9.81
22.0	25.96 10.82 10.04	29.89 11.29 10.54	34.41 11.90 11.18	37.85 12.53 11.80	39.52 13.06 12.29	39.92 13.32 12.54	39.57 13.21 12.43	38.26 12.76 12.02	35.52 12.16 11.44	31.36 11.53 10.80	27.01 10.97 10.20	24.70 10.68 9.88
21.0	26.51 10.88 10.10	30.34 11.32 10.58	34.68 11.90 11.19	37.92 12.50 11.78	39.41 13.00 12.25	39.73 13.26 12.48	39.41 13.14 12.37	38.25 12.72 11.98	35.71 12.15 11.44	31.73 11.55 10.83	27.53 11.02 10.26	25.27 10.75 9.96

Table 1 (cont.)

20.0	27.05 10.94 10.17	30.77 11.36 10.63	34.95 11.91 11.20	37.97 12.48 11.76	39.29 12.95 12.20	39.53 13.19 12.42	39.25 13.08 12.32	38.23 12.68 11.95	35.88 12.15 11.43	32.10 11.58 10.85	28.03 11.08 10.32	25.84 10.81 10.03
19.0	27.58 11.00 10.23	31.20 11.39 10.66	35.20 11.91 11.20	38.02 12.45 11.73	39.16 12.90 12.15	39.32 13.13 12.36	39.07 13.03 12.27	38.20 12.65 11.92	36.05 12.14 11.43	32.46 11.60 10.88	28.53 11.13 10.37	26.40 10.88 10.10
18.0	28.11 11.05 10.29	31.62 11.43 10.70	35.44 11.92 11.21	38.05 12.43 11.71	39.02 12.85 12.11	39.10 13.06 12.30	38.89 12.97 12.21	38.15 12.61 11.89	36.20 12.13 11.43	32.81 11.62 10.91	29.02 11.18 10.43	26.95 10.94 10.17
17.0	28.63 11.11 10.35	32.03 11.46 10.74	35.67 11.92 11.22	38.07 12.40 11.69	38.87 12.80 12.06	38.86 13.00 12.24	38.69 12.91 12.16	38.10 12.57 11.86	36.34 12.12 11.42	33.15 11.64 10.93	29.51 11.22 10.48	27.50 11.01 10.24
16.0	29.15 11.17 10.41	32.43 11.50 10.78	35.89 11.93 11.23	38.08 12.38 11.67	38.72 12.75 12.01	38.62 12.94 12.18	38.49 12.85 12.11	38.04 12.54 11.82	36.48 12.11 11.42	33.48 11.67 10.96	29.99 11.27 10.53	28.04 11.07 10.30
15.0	29.66 11.22 10.47	32.83 11.53 10.82	36.10 11.93 11.24	38.09 12.35 11.65	38.55 12.70 11.97	38.37 12.87 12.12	38.27 12.80 12.06	37.96 12.50 11.79	36.60 12.11 11.42	33.80 11.69 10.99	30.46 11.32 10.59	28.58 11.13 10.37
14.0	30.16 11.28 10.53	33.21 11.56 10.85	36.30 11.94 11.25	38.07 12.33 11.63	38.36 12.65 11.92	38.11 12.81 12.07	38.05 12.74 12.00	37.88 12.47 11.76	36.71 12.10 11.41	34.11 11.71 11.01	30.92 11.37 10.64	29.11 11.19 10.43
13.0	30.65 11.33 10.59	33.58 11.59 10.89	36.49 11.94 11.25	38.05 12.30 11.61	38.17 12.60 11.88	37.84 12.75 12.01	37.81 12.69 11.95	37.78 12.43 11.73	36.81 12.09 11.41	34.41 11.73 11.04	31.37 11.41 10.69	29.63 11.25 10.50
12.0	31.14 11.38 10.65	33.95 11.63 10.92	36.66 11.95 11.26	38.02 12.28 11.59	37.97 12.55 11.83	37.56 12.69 11.95	37.57 12.63 11.90	37.67 12.40 11.70	36.89 12.09 11.40	34.70 11.75 11.06	31.82 11.46 10.74	30.15 11.31 10.56
11.0	31.62 11.44 10.70	34.30 11.66 10.96	36.83 11.95 11.27	37.97 12.25 11.56	37.76 12.51 11.79	37.27 12.63 11.90	37.32 12.58 11.85	37.56 12.36 11.66	36.97 12.08 11.40	34.97 11.77 11.08	32.25 11.51 10.79	30.66 11.37 10.63
10.0	32.09 11.49 10.76	34.65 11.69 10.99	36.98 11.95 11.28	37.92 12.23 11.54	37.54 12.46 11.74	36.98 12.57 11.84	37.05 12.52 11.80	37.43 12.33 11.63	37.04 12.07 11.39	35.24 11.79 11.11	32.68 11.55 10.84	31.16 11.43 10.69
9.0	32.55 11.54 10.81	34.98 11.72 11.03	37.13 11.96 11.28	37.85 12.21 11.52	37.31 12.41 11.70	36.67 12.52 11.78	36.78 12.47 11.75	37.29 12.30 11.60	37.09 12.06 11.39	35.50 11.82 11.13	33.10 11.60 10.88	31.65 11.49 10.75
8.0	33.00 11.59 10.87	35.31 11.75 11.06	37.26 11.96 11.29	37.77 12.18 11.50	37.07 12.37 11.65	36.35 12.46 11.73	36.49 12.42 11.70	37.14 12.26 11.57	37.13 12.06 11.38	35.75 11.84 11.15	33.51 11.64 10.93	32.14 11.54 10.81
7.0	33.45 11.64 10.92	35.62 11.78 11.09	37.38 11.97 11.30	37.68 12.16 11.48	36.81 12.32 11.61	36.03 12.40 11.67	36.20 12.36 11.64	36.98 12.23 11.54	37.16 12.05 11.38	35.99 11.86 11.18	33.92 11.69 10.98	32.62 11.60 10.87
6.0	33.88	35.93	37.49	37.58	36.55	35.69	35.90	36.81	37.18	36.21	34.31	33.09

Table 1 (cont.)

	11.69 10.96	11.62 11.13	11.57 11.30	12.14 11.46	12.27 11.57	12.34 11.61	12.31 11.59	12.20 11.51	12.04 11.37	11.88 11.20	11.73 11.03	11.66 10.93
5.0	34.31 11.75 11.03	36.22 11.65 11.16	37.59 11.98 11.31	37.47 12.11 11.43	36.28 12.23 11.52	35.35 12.29 11.56	35.59 12.26 11.54	36.63 12.16 11.47	37.19 12.04 11.36	36.43 11.90 11.22	34.69 11.78 11.07	33.55 11.72 10.99
4.0	34.73 11.80 11.08	36.50 11.86 11.19	37.67 11.98 11.31	37.35 12.09 11.41	36.00 12.18 11.48	34.99 12.23 11.50	35.27 12.21 11.49	36.43 12.13 11.44	37.19 12.03 11.36	36.63 11.92 11.24	35.07 11.82 11.12	34.01 11.77 11.05
3.0	35.14 11.85 11.13	36.78 11.91 11.22	37.75 11.99 11.32	37.22 12.07 11.39	35.71 12.14 11.43	34.63 12.17 11.45	34.94 12.16 11.44	36.23 12.10 11.41	37.18 12.02 11.35	36.83 11.94 11.26	35.43 11.87 11.16	34.45 11.83 11.10
2.0	35.54 11.90 11.18	37.04 11.94 11.25	37.81 11.99 11.32	37.07 12.05 11.37	35.41 12.09 11.39	34.26 12.11 11.39	34.60 12.10 11.39	36.02 12.07 11.38	37.15 12.01 11.34	37.01 11.96 11.28	35.79 11.91 11.21	34.89 11.89 11.16
1.0	35.94 11.95 11.24	37.29 11.97 11.28	37.86 12.00 11.33	36.92 12.02 11.35	35.10 12.05 11.34	33.88 12.06 11.33	34.25 12.05 11.34	35.80 12.03 11.35	37.12 12.01 11.34	37.18 11.98 11.30	36.13 11.96 11.25	35.32 11.94 11.22
.0	36.32 12.00 11.29	37.53 12.00 11.32	37.90 12.00 11.33	36.75 12.00 11.32	34.78 12.00 11.30	33.50 12.00 11.28	33.90 12.00 11.28	35.56 12.00 11.31	37.07 12.00 11.33	37.35 12.00 11.32	36.47 12.00 11.30	35.74 12.00 11.28
-1.0	36.69 12.05 11.34	37.77 12.03 11.35	37.93 12.00 11.34	36.57 11.98 11.30	34.45 11.95 11.25	33.10 11.94 11.22	33.53 11.95 11.23	35.32 11.97 11.28	37.01 11.99 11.32	37.50 12.02 11.34	36.80 12.04 11.34	36.15 12.06 11.33
-2.0	37.06 12.10 11.39	37.99 12.06 11.38	37.95 12.01 11.34	36.38 11.95 11.28	34.11 11.91 11.20	32.70 11.89 11.16	33.16 11.90 11.18	35.07 11.93 11.25	36.94 11.99 11.32	37.64 12.04 11.36	37.11 12.09 11.39	36.56 12.11 11.39
-3.0	37.41 12.15 11.44	38.19 12.09 11.41	37.96 12.01 11.34	36.19 11.93 11.25	33.76 11.86 11.16	32.29 11.83 11.10	32.77 11.84 11.13	34.80 11.90 11.21	36.86 11.98 11.31	37.76 12.06 11.38	37.42 12.13 11.43	36.95 12.17 11.45
-4.0	37.75 12.20 11.49	38.39 12.12 11.44	37.95 12.02 11.35	35.98 11.91 11.23	33.41 11.82 11.11	31.87 11.77 11.04	32.38 11.79 11.07	34.53 11.87 11.18	36.77 11.97 11.30	37.88 12.08 11.40	37.72 12.15 11.47	37.33 12.23 11.50
-5.0	38.09 12.25 11.54	38.58 12.15 11.47	37.93 12.02 11.35	35.76 11.89 11.21	33.04 11.77 11.06	31.44 11.71 10.99	31.98 11.74 11.02	34.24 11.84 11.15	36.67 11.96 11.29	37.99 12.10 11.42	38.00 12.22 11.52	37.71 12.28 11.56
-6.0	38.41 12.31 11.59	38.75 12.18 11.50	37.91 12.03 11.35	35.53 11.86 11.18	32.67 11.73 11.02	31.00 11.66 10.93	31.58 11.69 10.97	33.95 11.80 11.11	36.55 11.96 11.29	38.08 12.12 11.44	38.28 12.27 11.56	38.07 12.34 11.61
-7.0	38.73 12.36 11.64	38.92 12.22 11.53	37.87 12.03 11.36	35.29 11.84 11.16	32.28 11.68 10.97	30.56 11.60 10.87	31.16 11.64 10.91	33.65 11.77 11.08	36.43 11.95 11.28	38.16 12.14 11.46	38.54 12.31 11.60	38.43 12.40 11.67
-8.0	39.03 12.41 11.69	39.07 12.25 11.56	37.82 12.04 11.36	35.03 11.82 11.13	31.89 11.63 10.92	30.11 11.54 10.81	30.74 11.58 10.86	33.34 11.74 11.04	36.29 11.94 11.27	38.23 12.16 11.48	38.80 12.36 11.65	38.77 12.46 11.73

Table 1 (cont.)

-9.0	39.32 12.46 11.74	39.21 12.28 11.59	37.75 12.04 11.36	34.77 11.79 11.11	31.49 11.59 10.87	29.65 11.48 10.75	30.31 11.53 10.80	33.01 11.70 11.01	36.14 11.94 11.26	38.29 12.18 11.50	39.04 12.40 11.69	39.11 12.51 11.78
-10.0	39.61 12.51 11.79	39.35 12.31 11.61	37.68 12.05 11.37	34.50 11.77 11.08	31.09 11.54 10.82	29.19 11.43 10.68	29.87 11.48 10.74	32.68 11.67 10.97	35.99 11.93 11.25	38.34 12.21 11.52	39.27 12.45 11.73	39.44 12.57 11.84
-11.0	39.88 12.56 11.84	39.47 12.34 11.64	37.59 12.05 11.37	34.22 11.75 11.05	30.67 11.49 10.77	28.71 11.37 10.62	29.42 11.42 10.69	32.34 11.64 10.93	35.82 11.92 11.24	38.38 12.23 11.54	39.50 12.49 11.78	39.75 12.63 11.89
-12.0	40.14 12.62 11.89	39.57 12.37 11.67	37.50 12.05 11.37	33.93 11.72 11.03	30.24 11.45 10.72	28.24 11.31 10.56	28.97 11.37 10.63	31.99 11.60 10.90	35.64 11.91 11.23	38.41 12.25 11.56	39.71 12.54 11.82	40.06 12.69 11.95
-13.0	40.40 12.67 11.94	39.67 12.41 11.70	37.39 12.06 11.37	33.63 11.70 11.00	29.81 11.40 10.67	27.75 11.25 10.50	28.51 11.31 10.57	31.64 11.57 10.86	35.45 11.91 11.22	38.42 12.27 11.58	39.91 12.59 11.86	40.35 12.75 12.01
-14.0	40.64 12.72 11.99	39.76 12.44 11.73	37.27 12.06 11.37	33.31 11.67 10.97	29.37 11.35 10.62	27.26 11.19 10.43	28.04 11.26 10.51	31.27 11.53 10.82	35.24 11.90 11.21	38.43 12.29 11.59	40.10 12.63 11.91	40.64 12.81 12.06
-15.0	40.87 12.78 12.04	39.83 12.47 11.76	37.14 12.07 11.38	32.99 11.65 10.95	28.93 11.30 10.57	26.76 11.13 10.37	27.57 11.20 10.45	30.89 11.50 10.78	35.03 11.89 11.20	38.42 12.31 11.61	40.28 12.68 11.95	40.92 12.87 12.12
-16.0	41.09 12.83 12.09	39.89 12.50 11.79	36.99 12.07 11.38	32.66 11.62 10.92	28.47 11.25 10.51	26.26 11.06 10.30	27.08 11.15 10.39	30.51 11.46 10.74	34.81 11.89 11.19	38.40 12.33 11.63	40.45 12.73 12.00	41.18 12.93 12.18
-17.0	41.30 12.89 12.14	39.94 12.54 11.82	36.84 12.08 11.38	32.32 11.60 10.89	28.01 11.20 10.46	25.75 11.00 10.23	26.60 11.09 10.33	30.11 11.43 10.70	34.58 11.88 11.18	38.37 12.36 11.65	40.61 12.78 12.04	41.44 12.99 12.24
-18.0	41.50 12.95 12.19	39.98 12.57 11.85	36.68 12.08 11.38	31.97 11.57 10.86	27.54 11.15 10.40	25.23 10.94 10.16	26.10 11.03 10.27	29.71 11.39 10.66	34.33 11.87 11.17	38.33 12.38 11.67	40.75 12.82 12.09	41.68 13.06 12.29
-19.0	41.69 13.00 12.25	40.01 12.61 11.88	36.50 12.09 11.38	31.61 11.55 10.83	27.06 11.10 10.35	24.71 10.87 10.09	25.60 10.97 10.20	29.30 11.35 10.62	34.08 11.86 11.15	38.27 12.40 11.69	40.89 12.87 12.13	41.92 13.12 12.35
-20.0	41.87 13.06 12.30	40.03 12.64 11.91	36.31 12.09 11.38	31.24 11.52 10.80	26.58 11.05 10.29	24.18 10.81 10.02	25.10 10.92 10.14	28.88 11.32 10.58	33.81 11.85 11.14	38.21 12.42 11.71	41.02 12.92 12.18	42.14 13.19 12.41
-21.0	42.03 13.12 12.35	40.03 12.68 11.94	36.12 12.10 11.38	30.86 11.50 10.77	26.09 11.00 10.23	23.65 10.74 9.95	24.59 10.86 10.07	28.46 11.28 10.54	33.54 11.85 11.13	38.13 12.45 11.72	41.13 12.98 12.22	42.35 13.25 12.47
-22.0	42.19 13.18 12.40	40.03 12.71 11.97	35.91 12.10 11.38	30.48 11.47 10.74	25.59 10.94 10.17	23.12 10.68 9.88	24.07 10.79 10.01	28.02 11.24 10.49	33.25 11.84 11.12	38.05 12.47 11.74	41.23 13.03 12.27	42.56 13.32 12.53
-23.0	42.33	40.01	35.69	30.08	25.09	22.58	23.55	27.58	32.96	37.95	41.32	42.75

Table 1 (cont.)

	13.24	12.75	12.11	11.44	10.89	10.61	10.73	11.20	11.83	12.49	13.08	13.38
	12.46	12.00	11.38	10.70	10.11	9.80	9.94	10.45	11.10	11.76	12.31	12.59
-24.0	42.47	39.98	35.46	29.68	24.58	22.03	23.02	27.13	32.66	37.84	41.41	42.93
	13.30	12.78	12.11	11.42	10.84	10.54	10.67	11.16	11.82	12.52	13.13	13.45
	12.51	12.03	11.38	10.67	10.05	9.72	9.87	10.40	11.09	11.78	12.36	12.65
-25.0	42.59	39.94	35.22	29.26	24.07	21.48	22.49	26.68	32.34	37.72	41.48	43.10
	13.36	12.82	12.12	11.39	10.78	10.47	10.61	11.12	11.81	12.54	13.19	13.52
	12.57	12.06	11.38	10.64	9.99	9.65	9.80	10.36	11.07	11.80	12.41	12.72
-26.0	42.70	39.89	34.96	28.84	23.55	20.93	21.95	26.21	32.02	37.59	41.54	43.26
	13.42	12.86	12.12	11.36	10.72	10.40	10.54	11.08	11.80	12.57	13.24	13.59
	12.62	12.10	11.38	10.60	9.92	9.56	9.72	10.31	11.06	11.82	12.46	12.78
-27.0	42.81	39.83	34.70	28.41	23.02	20.37	21.41	25.74	31.68	37.44	41.58	43.41
	13.49	12.90	12.13	11.33	10.67	10.33	10.48	11.04	11.80	12.59	13.30	13.67
	12.68	12.13	11.38	10.57	9.85	9.48	9.65	10.26	11.04	11.84	12.50	12.84
-28.0	42.90	39.75	34.43	27.98	22.49	19.81	20.86	25.26	31.34	37.29	41.62	43.55
	13.55	12.94	12.14	11.30	10.61	10.25	10.41	11.00	11.79	12.62	13.35	13.74
	12.74	12.16	11.38	10.53	9.79	9.40	9.57	10.21	11.03	11.85	12.55	12.91
-29.0	42.98	39.67	34.15	27.53	21.96	19.24	20.31	24.78	30.99	37.13	41.65	43.68
	13.62	12.98	12.14	11.27	10.55	10.18	10.34	10.96	11.78	12.65	13.41	13.81
	12.80	12.19	11.38	10.49	9.72	9.31	9.49	10.16	11.01	11.87	12.60	12.97
-30.0	43.05	39.57	33.85	27.08	21.42	18.68	19.76	24.29	30.62	36.95	41.66	43.80
	13.69	13.02	12.15	11.24	10.49	10.10	10.27	10.91	11.77	12.67	13.47	13.89
	12.86	12.22	11.38	10.45	9.65	9.22	9.41	10.10	10.99	11.89	12.65	13.04
-31.0	43.11	39.46	33.55	26.62	20.87	18.11	19.20	23.79	30.25	36.76	41.67	43.91
	13.76	13.06	12.15	11.21	10.42	10.02	10.20	10.87	11.76	12.70	13.53	13.97
	12.92	12.26	11.37	10.41	9.57	9.13	9.33	10.05	10.98	11.91	12.70	13.11
-32.0	43.16	39.34	33.24	26.15	20.32	17.53	18.64	23.29	29.87	36.57	41.66	44.01
	13.83	13.10	12.16	11.18	10.36	9.94	10.12	10.82	11.75	12.73	13.60	14.05
	12.98	12.29	11.37	10.37	9.50	9.04	9.24	10.00	10.96	11.93	12.76	13.18
-33.0	43.19	39.22	32.91	25.67	19.77	16.96	18.08	22.78	29.48	36.36	41.65	44.10
	13.91	13.15	12.17	11.15	10.29	9.86	10.05	10.78	11.74	12.76	13.66	14.13
	13.04	12.33	11.37	10.33	9.42	8.94	9.15	9.94	10.94	11.95	12.81	13.25
-34.0	43.22	39.07	32.58	25.19	19.21	16.38	17.51	22.26	29.08	36.14	41.62	44.18
	13.98	13.19	12.17	11.12	10.23	9.77	9.97	10.73	11.73	12.79	13.72	14.22
	13.10	12.36	11.37	10.29	9.34	8.84	9.06	9.88	10.92	11.97	12.86	13.32
-35.0	43.24	38.92	32.23	24.70	18.65	15.80	16.94	21.74	28.68	35.91	41.58	44.25
	14.06	13.24	12.18	11.08	10.16	9.68	9.89	10.68	11.72	12.82	13.79	14.31
	13.17	12.39	11.36	10.24	9.26	8.74	8.97	9.82	10.90	11.99	12.92	13.40
-36.0	43.25	38.76	31.88	24.20	18.09	15.23	16.37	21.22	28.26	35.67	41.53	44.31
	14.14	13.28	12.19	11.05	10.09	9.59	9.81	10.63	11.71	12.85	13.86	14.40
	13.23	12.43	11.36	10.20	9.17	8.63	8.87	9.76	10.88	12.01	12.98	13.47
-37.0	43.25	38.59	31.52	23.70	17.52	14.64	15.80	20.69	27.84	35.42	41.48	44.36
	14.22	13.33	12.19	11.01	10.01	9.50	9.73	10.58	11.70	12.88	13.93	14.49
	13.30	12.47	11.36	10.15	9.08	8.52	8.77	9.69	10.86	12.03	13.03	13.55

Table 1 (cont.)

-38.0	43.23	38.41	31.15	23.19	16.95	14.06	15.22	20.15	27.40	35.17	41.41	44.40
	14.30	13.38	12.20	10.97	9.94	9.41	9.64	10.53	11.69	12.91	14.00	14.58
	13.37	12.50	11.35	10.10	8.99	8.41	8.67	9.62	10.83	12.05	13.09	13.63
-39.0	43.21	38.21	30.76	22.67	16.38	13.48	14.65	19.61	26.96	34.90	41.33	44.43
	14.39	13.43	12.21	10.94	9.86	9.31	9.55	10.47	11.68	12.95	14.08	14.68
	13.44	12.54	11.35	10.05	8.90	8.29	8.56	9.55	10.81	12.07	13.15	13.71
-40.0	43.18	38.01	30.37	22.15	15.81	12.90	14.07	19.06	26.51	34.62	41.24	44.46
	14.48	13.48	12.21	10.90	9.78	9.20	9.46	10.41	11.66	12.98	14.16	14.78
	13.52	12.58	11.34	9.99	8.80	8.16	8.45	9.48	10.79	12.10	13.22	13.79
-41.0	43.14	37.80	29.97	21.62	15.23	12.32	13.49	18.51	26.06	34.33	41.15	44.47
	14.57	13.54	12.22	10.86	9.70	9.10	9.36	10.36	11.65	13.02	14.24	14.89
	13.59	12.62	11.34	9.94	8.70	8.03	8.33	9.41	10.76	12.12	13.28	13.88
-42.0	43.09	37.57	29.56	21.08	14.65	11.74	12.91	17.96	25.59	34.03	41.04	44.47
	14.67	13.59	12.23	10.82	9.62	8.99	9.27	10.30	11.64	13.05	14.32	15.00
	13.67	12.66	11.33	9.88	8.59	7.90	8.21	9.33	10.73	12.14	13.34	13.97
-43.0	43.03	37.34	29.14	20.54	14.07	11.16	12.34	17.40	25.12	33.72	40.92	44.47
	14.77	13.65	12.24	10.77	9.53	8.88	9.16	10.23	11.63	13.09	14.40	15.11
	13.75	12.70	11.32	9.82	8.48	7.76	8.08	9.25	10.71	12.16	13.41	14.06
-44.0	42.96	37.10	28.72	20.00	13.49	10.59	11.76	16.84	24.64	33.40	40.80	44.46
	14.87	13.71	12.25	10.73	9.44	8.76	9.06	10.17	11.61	13.13	14.49	15.23
	13.83	12.75	11.32	9.76	8.37	7.61	7.95	9.17	10.68	12.19	13.48	14.15
-45.0	42.89	36.84	28.28	19.45	12.91	10.01	11.18	16.28	24.15	33.07	40.66	44.44
	14.98	13.77	12.26	10.68	9.34	8.63	8.95	10.10	11.60	13.17	14.59	15.35
	13.92	12.79	11.31	9.70	8.25	7.46	7.81	9.08	10.65	12.21	13.55	14.25
-46.0	42.80	36.58	27.84	18.89	12.33	9.44	10.61	15.71	23.66	32.74	40.52	44.41
	15.09	13.84	12.26	10.64	9.24	8.51	8.83	10.03	11.58	13.21	14.68	15.48
	14.00	12.84	11.30	9.63	8.12	7.29	7.66	8.99	10.61	12.23	13.63	14.35
-47.0	42.71	36.31	27.39	18.33	11.75	8.87	10.04	15.14	23.16	32.39	40.37	44.38
	15.21	13.91	12.27	10.59	9.14	8.37	8.71	9.96	11.57	13.26	14.78	15.61
	14.10	12.88	11.29	9.56	7.99	7.12	7.51	8.89	10.58	12.26	13.70	14.46
-48.0	42.61	36.03	26.93	17.77	11.17	8.31	9.47	14.57	22.65	32.04	40.21	44.34
	15.33	13.98	12.28	10.54	9.03	8.23	8.59	9.89	11.55	13.30	14.89	15.75
	14.19	12.93	11.28	9.49	7.85	6.94	7.35	8.79	10.55	12.29	13.78	14.57
-49.0	42.50	35.74	26.46	17.20	10.59	7.75	8.90	13.99	22.14	31.67	40.04	44.29
	15.46	14.05	12.29	10.48	8.92	8.08	8.45	9.81	11.54	13.35	14.99	15.90
	14.29	12.98	11.27	9.41	7.70	6.74	7.18	8.69	10.51	12.31	13.87	14.68
-50.0	42.39	35.44	25.98	16.63	10.01	7.19	8.34	13.42	21.61	31.30	39.87	44.24
	15.59	14.12	12.31	10.43	8.80	7.93	8.32	9.73	11.52	13.40	15.11	16.05
	14.39	13.03	11.26	9.33	7.55	6.54	6.99	8.58	10.47	12.34	13.95	14.80
-51.0	42.27	35.14	25.50	16.05	9.44	6.64	7.78	12.84	21.09	30.92	39.68	44.18
	15.74	14.20	12.32	10.37	8.68	7.76	8.17	9.64	11.50	13.45	15.23	16.22
	14.50	13.09	11.25	9.24	7.38	6.32	6.80	8.46	10.43	12.37	14.04	14.93
-52.0	42.15	34.82	25.01	15.47	8.86	6.10	7.22	12.26	20.55	30.53	39.50	44.12

Table 1 (cont.)

	15.89	14.29	12.33	10.31	8.55	7.59	8.02	9.55	11.49	13.50	15.36	16.39
	14.61	13.14	11.24	9.15	7.21	6.08	6.59	8.34	10.39	12.40	14.13	15.06
-53.0	42.02	34.50	24.51	14.89	8.29	5.57	6.67	11.68	20.01	30.14	39.30	44.06
	16.04	14.37	12.34	10.24	9.41	7.40	7.85	9.46	11.47	13.56	15.49	16.57
	14.73	13.20	11.23	9.06	7.02	5.82	6.37	8.21	10.34	12.43	14.23	15.19
-54.0	41.88	34.17	24.00	14.30	7.73	5.04	6.13	11.10	19.47	29.73	39.10	43.99
	16.21	14.47	12.35	10.18	8.26	7.21	7.68	9.36	11.45	13.62	15.63	16.77
	14.85	13.26	11.21	8.96	6.82	5.54	6.12	8.07	10.29	12.46	14.33	15.34
-55.0	41.75	33.84	23.49	13.71	7.17	4.53	5.59	10.52	18.92	29.32	38.90	43.92
	16.39	14.56	12.37	10.11	8.11	7.00	7.50	9.26	11.43	13.68	15.78	16.98
	14.98	13.33	11.20	8.85	6.60	5.23	5.86	7.92	10.24	12.49	14.44	15.49
-56.0	41.61	33.49	22.97	13.12	6.61	4.02	5.07	9.95	18.36	28.90	38.69	43.86
	16.58	14.67	12.38	10.03	7.94	6.77	7.30	9.15	11.40	13.75	15.94	17.20
	15.12	13.39	11.18	8.74	6.37	4.89	5.57	7.76	10.19	12.52	14.55	15.65
-57.0	41.47	33.15	22.44	12.53	6.06	3.53	4.55	9.37	17.80	28.47	38.48	43.79
	16.79	14.77	12.39	9.95	7.77	6.53	7.09	9.03	11.38	13.82	16.11	17.44
	15.26	13.46	11.16	8.62	6.11	4.51	5.26	7.59	10.13	12.56	14.67	15.82
-58.0	41.33	32.79	21.91	11.94	5.52	3.05	4.04	8.79	17.23	28.04	38.26	43.72
	17.01	14.89	12.41	9.87	7.58	6.26	6.86	8.90	11.36	13.89	16.29	17.71
	15.42	13.53	11.14	8.49	5.83	4.07	4.90	7.41	10.07	12.59	14.80	16.01
-59.0	41.19	32.43	21.37	11.34	4.99	2.59	3.55	8.22	16.66	27.60	38.04	43.66
	17.25	15.01	12.43	9.78	7.37	5.97	6.61	8.77	11.33	13.97	16.49	18.00
	15.58	13.61	11.12	8.35	5.52	3.55	4.49	7.21	10.00	12.63	14.93	16.20
-60.0	41.05	32.07	20.82	10.75	4.46	2.14	3.07	7.65	16.09	27.16	37.83	43.61
	17.51	15.14	12.44	9.69	7.15	5.65	6.34	8.63	11.30	14.05	16.70	18.31
	15.76	13.69	11.10	8.20	5.17	2.90	4.01	7.00	9.93	12.67	15.08	16.41
-61.0	40.92	31.70	20.27	10.15	3.95	1.72	2.61	7.08	15.51	26.71	37.61	43.57
	17.79	15.28	12.46	9.59	6.92	5.29	6.04	8.48	11.27	14.14	16.93	18.67
	15.95	13.78	11.08	8.04	4.76	1.59	3.42	6.77	9.86	12.71	15.23	16.64
-62.0	40.79	31.32	19.72	9.56	3.45	1.33	2.16	6.52	14.92	26.25	37.40	43.54
	18.11	15.44	12.48	9.48	6.65	4.89	5.71	8.31	11.24	14.24	17.18	19.07
	16.15	13.87	11.05	7.87	4.29	.43	2.52	6.51	9.78	12.76	15.39	16.89
-63.0	40.68	30.95	19.15	8.96	2.97	.96	1.74	5.97	14.33	25.79	37.19	43.53
	18.47	15.60	12.51	9.36	6.36	4.42	5.33	8.13	11.21	14.34	17.45	19.53
	16.37	13.97	11.02	7.68	3.66	.00	1.63	6.22	9.69	12.81	15.57	17.16
-64.0	40.58	30.57	18.59	8.37	2.50	.63	1.34	5.42	13.74	25.32	36.98	43.54
	18.89	15.78	12.53	9.24	6.04	3.86	4.90	7.94	11.17	14.45	17.76	20.08
	16.62	14.08	10.99	7.47	2.84	.00	.97	5.89	9.60	12.86	15.76	17.45
-65.0	40.50	30.19	18.01	7.78	2.06	.34	.98	4.88	13.15	24.86	36.79	43.59
	19.36	15.97	12.55	9.10	5.67	3.17	4.39	7.73	11.13	14.57	18.11	20.76
	16.88	14.19	10.96	7.24	2.13	.00	.46	5.52	9.50	12.91	15.97	17.78
-66.0	40.45	29.82	17.44	7.19	1.64	.12	.65	4.34	12.55	24.38	36.61	43.69
	19.95	16.19	12.58	8.95	5.24	2.18	3.76	7.49	11.09	14.70	18.51	21.72
	17.18	14.31	10.92	6.99	1.52	.00	.13	5.07	9.38	12.97	16.20	18.15

Table 1 (cont.)

-67.0	40.44	29.44	16.85	6.61	1.25	.02	.39	3.82	11.95	23.91	36.45	43.90
	20.81	16.42	12.61	8.79	4.73	.48	2.78	7.23	11.05	14.84	18.99	23.41
	17.50	14.45	10.88	6.70	1.00	.00	.00	4.46	9.26	13.03	16.45	18.57
-68.0	40.50	29.07	16.27	6.03	.90	.00	.21	3.32	11.34	23.43	36.32	44.20
	21.79	16.69	12.64	8.61	4.06	.00	1.80	6.93	11.00	14.99	19.58	23.94
	17.88	14.59	10.83	6.36	.57	.00	.00	3.77	9.12	13.10	16.73	19.07
-69.0	40.62	28.71	15.68	5.46	.62	.00	.09	2.83	10.74	22.96	36.24	44.50
	22.55	16.99	12.67	8.42	3.16	.00	1.08	6.60	10.94	15.17	20.44	24.00
	18.31	14.75	10.78	5.97	.23	.00	.00	3.12	8.97	13.17	17.04	19.66
-70.0	40.79	28.36	15.09	4.89	.40	.00	.03	2.36	10.13	22.48	36.21	44.79
	23.12	17.33	12.71	8.19	2.39	.00	.52	6.20	10.88	15.36	21.23	24.00
	18.82	14.93	10.72	5.48	.02	.00	.00	2.54	8.81	13.25	17.40	20.40
-71.0	40.98	28.02	14.49	4.34	.23	.00	.00	1.92	9.52	22.01	36.23	45.07
	23.58	17.73	12.75	7.94	1.71	.00	.14	5.73	10.82	15.58	21.92	24.00
	19.46	15.12	10.66	4.81	.00	.00	.00	1.99	8.62	13.34	17.82	21.45
-72.0	41.20	27.71	13.89	3.80	.12	.00	.00	1.51	8.91	21.54	36.29	45.33
	23.91	18.23	12.80	7.66	1.13	.00	.00	5.07	10.74	15.82	22.53	24.00
	20.40	15.34	10.59	4.16	.00	.00	.00	1.48	8.40	13.43	18.33	23.33
-73.0	41.43	27.42	13.29	3.27	.05	.00	.00	1.16	8.30	21.08	36.39	45.58
	24.00	18.93	12.85	7.32	.65	.00	.00	4.31	10.66	16.11	23.07	24.00
	21.49	15.59	10.51	3.53	.00	.00	.00	1.02	8.15	13.54	18.97	23.93
-74.0	41.64	27.19	12.69	2.76	.01	.00	.00	.86	7.69	20.62	36.52	45.82
	24.00	19.69	12.91	6.92	.27	.00	.00	3.60	10.56	16.44	23.50	24.00
	22.32	15.88	10.42	2.93	.00	.00	.00	.61	7.86	13.66	19.92	24.00
-75.0	41.84	27.00	12.08	2.28	.00	.00	.00	.61	7.09	20.19	36.67	46.04
	24.00	20.40	12.98	6.40	.02	.00	.00	2.95	10.46	16.85	23.84	24.00
	22.99	16.22	10.31	2.37	.00	.00	.00	.28	7.51	13.80	20.80	24.00
-76.0	42.03	26.86	11.48	1.84	.00	.00	.00	.41	6.48	19.77	36.83	46.25
	24.00	21.08	13.06	5.67	.00	.00	.00	2.33	10.33	17.42	24.00	24.00
	23.51	16.63	10.19	1.84	.00	.00	.00	.04	7.07	13.96	21.58	24.00
-77.0	42.21	26.76	10.88	1.45	.00	.00	.00	.25	5.88	19.40	36.99	46.44
	24.00	21.72	13.15	4.95	.00	.00	.00	1.75	10.19	18.12	24.00	24.00
	23.89	17.14	10.04	1.33	.00	.00	.00	.00	6.43	14.15	22.27	24.00
-78.0	42.37	26.70	10.28	1.11	.00	.00	.00	.13	5.28	19.07	37.13	46.62
	24.00	22.32	13.27	4.26	.00	.00	.00	1.21	10.01	18.79	24.00	24.00
	24.00	17.91	9.86	.86	.00	.00	.00	.00	5.75	14.37	22.89	24.00
-79.0	42.52	26.68	9.68	.82	.00	.00	.00	.06	4.69	18.78	37.26	46.79
	24.00	22.87	13.40	3.58	.00	.00	.00	.74	9.79	19.46	24.00	24.00
	24.00	18.75	9.63	.47	.00	.00	.00	.00	5.11	14.65	23.40	24.00
-80.0	42.66	26.69	9.09	.57	.00	.00	.00	.02	4.12	18.53	37.38	46.94
	24.00	23.37	13.57	2.94	.00	.00	.00	.34	9.52	20.11	24.00	24.00
	24.00	19.54	9.34	.15	.00	.00	.00	.00	4.45	15.01	23.80	24.00
-81.0	42.79	26.73	8.51	.38	.00	.00	.00	.00	3.56	18.32	37.49	47.08

Table 1 (cont.)

	24.00	23.75	13.80	2.32	.00	.00	.00	.05	9.14	20.75	24.00	24.00
	24.00	20.32	8.88	.00	.00	.00	.00	.00	3.80	15.55	24.00	24.00
-82.0	42.90	26.80	7.95	.22	.00	.00	.00	.00	3.03	18.14	37.59	47.20
	24.00	24.00	14.14	1.72	.00	.00	.00	.00	8.53	21.37	24.00	24.00
	24.00	21.06	8.30	.00	.00	.00	.00	.00	3.18	16.25	24.00	24.00
-83.0	43.00	26.86	7.43	.11	.00	.00	.00	.00	2.54	18.01	37.68	47.31
	24.00	24.00	14.69	1.14	.00	.00	.00	.00	7.88	21.97	24.00	24.00
	24.00	21.77	7.71	.00	.00	.00	.00	.00	2.53	16.93	24.00	24.00
-84.0	43.08	26.91	6.95	.04	.00	.00	.00	.00	2.11	17.91	37.75	47.40
	24.00	24.00	15.15	.64	.00	.00	.00	.00	7.29	22.56	24.00	24.00
	24.00	22.46	7.18	.00	.00	.00	.00	.00	1.94	17.58	24.00	24.00
-85.0	43.16	26.96	6.53	.01	.00	.00	.00	.00	1.72	17.85	37.81	47.48
	24.00	24.00	15.58	.21	.00	.00	.00	.00	6.70	23.10	24.00	24.00
	24.00	23.10	6.65	.00	.00	.00	.00	.00	1.33	18.21	24.00	24.00
-86.0	43.22	26.99	6.16	.00	.00	.00	.00	.00	1.37	17.83	37.87	47.55
	24.00	24.00	15.74	.00	.00	.00	.00	.00	6.18	23.60	24.00	24.00
	24.00	23.62	6.21	.00	.00	.00	.00	.00	.77	18.81	24.00	24.00
-87.0	43.26	27.02	5.87	.00	.00	.00	.00	.00	1.08	17.83	37.91	47.60
	24.00	24.00	15.77	.00	.00	.00	.00	.00	5.80	24.00	24.00	24.00
	24.00	24.00	5.89	.00	.00	.00	.00	.00	.26	19.32	24.00	24.00
-88.0	43.29	27.04	5.66	.00	.00	.00	.00	.00	.86	17.85	37.94	47.64
	24.00	24.00	15.71	.00	.00	.00	.00	.00	5.73	24.00	24.00	24.00
	24.00	24.00	5.96	.00	.00	.00	.00	.00	.00	19.55	24.00	24.00
-89.0	43.31	27.05	5.53	.00	.00	.00	.00	.00	.73	17.85	37.95	47.66
	24.00	24.00	15.77	.00	.00	.00	.00	.00	5.81	24.00	24.00	24.00
	24.00	24.00	5.91	.00	.00	.00	.00	.00	.00	19.64	24.00	24.00
-90.0	43.32	27.06	5.49	.00	.00	.00	.00	.00	.69	17.86	37.96	47.67
	24.00	24.00	15.48	.00	.00	.00	.00	.00	5.60	24.00	24.00	24.00
	24.00	24.00	6.19	.00	.00	.00	.00	.00	.00	19.35	24.00	24.00