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Received - 2022-11-08 02:14:28 PM
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SOAH DOCKET NO. 473-22-04394
PUC DOCKET NO. 53719

APPLICATION OF ENTERGY TEXAS, INC. FOR AUTHORITY TO CHANGE RATES	**§ § §**	**BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS**

CITIES' RESPONSE TO ETI'S FIRST RFI

The Cities of Anahuac, Beaumont, Bridge City, Cleveland, Dayton, Groves, Houston, Huntsville, Liberty, Montgomery, Navasota, Nederland, Oak Ridge North, Orange, Pine Forest, Pinehurst, Port Arthur, Port Neches, Roman Forest, Rose City, Shenandoah, Silsbee, Sour Lake, Splendora, Vidor, West Orange, and Willis ("Cities") hereby file their response to Entergy Texas, Inc.'s ("ETI") First Request for Information ("RFI") to Cities. Cities' responses to the RFIs are attached hereto and numbered as they were numbered in ETI's Request. Cities' response is timely filed pursuant to Tex. Admin. Code § 22.144(c) and SOAH Order No. 2. All parties to the above captioned proceeding may treat these responses as if they were filed under oath.

Respectfully submitted,
LAWTON LAW FIRM, P.C.

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ATTORNEY FOR CITIES

CERTIFICATE OF SERVICE

I hereby certify that a copy of this document was served on all parties of record in this proceeding on this the 8th day of November, 2022, in accordance with the Order Suspending Rules issued in Project No. 50664.

Molly Mayhall Vandervoort

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Responding Party: Cities
Requesting Party: ETI

Docket No.: 53719
Question No.: ETI-CITIES 1-1

Prepared by: Counsel, Mark Garrett, David Garrett, Karl Nalepa, Kevin O'Donnell, and Norman Gordon
Sponsoring Witness: Mark Garrett, David Garrett, Karl Nalepa, Kevin O'Donnell, and Norman Gordon

REQUEST:

ETI-CITIES 1-1 Please provide, in native format, all workpapers and documents supporting the testimony of each witness filing testimony on your behalf in this proceeding. Please ensure all formula and cells are intact.

RESPONSE:

Mark Garrett:

Please see the Direct Testimony of Mark E. Garrett and the Workpapers of Mark E. Garrett. The native format workpapers for Exhibit MG-2 were filed with the Commission and were provided to all parties on October 27, 2022.

David Garrett:

Please see Attachment 1. See also the Direct Testimony of David J. Garrett and the Workpapers of David J. Garrett. The native format workpapers for Exhibit DJG-2 were filed with the Commission and were provided to all parties on October 27, 2022.

Karl Nalepa:

Please see the Direct Testimony of Karl J. Nalepa and the Workpapers of Karl J. Nalepa. The native format workpapers for Attachment D to Mr. Nalepa's testimony were filed with the Commission and were provided to all parties on October 27, 2022.

Kevin O'Donnell:

Please see the Direct Testimony of Kevin W. O'Donnell. The native format workpapers for Mr. O'Donnell's exhibits are being provided electronically ("53719 Resp to ETI-Cities 1-1 ODonnell WP").

Norman Gordon:

Please see the Direct Testimony of Norman J. Gordon and the Workpapers of Norman J. Gordon. The native format workpapers for Exhibit NJG-1 and NJG-3 are being provided electronically ("53719 Resp to ETI-Cities 1-1 Schedule_NJG-1 WP" and "53719 Resp to ETI-Cities 1-1 Sch_NJG-3 WP"). Please note that Exhibit NJG-3 has no calculations and therefore there are no formulas in the corresponding workpaper.

Attachment to ETI-Cities 1-1:

1. Depreciation of Group Properties (Bulletin 155), Winfrey (cited pages)

2. Depreciation Systems, Wolf (cited pages)

3. EIA Annual Energy Outlook 2022

4. Engineering, Valuation and Depreciation, Marston (cited pages)

5. Public Utility Depreciation Practices, NARUC (cited pages)

6. Stat Analyses of Industrial Prop Retirements (Bulletin 125), Winfrey (cited pages)

DEPRECIATION OF GROUP PROPERTIES

By Robley Winfrey

ENGINEERING RESEARCH INSTITUTE
BULLETIN 155
1942

REPRINTED 1969

IOWA STATE UNIVERSITY
ENGINEERING RESEARCH INSTITUTE
AMES, IOWA 50010

APPENDIX

The 18 Type Curves

The following section contains supplementary information on the 18 type curves. The final equations of the type frequency curves give the numerical values of the coefficients and constants in the general equations below. In Table 42 (page 124) is tabulated the percent surviving and probable lives corresponding to the 18 type curves which are illustrated in Figs. 28, 29, and 30.

General Equations of the 18 Type Frequency Curves

Left Mode Nos. 0 and 1

$$y_x = y_0 \left(1 - \frac{(x \pm d_m)^2}{a^2}\right)^m \quad \text{for } x \text{ values to left of mode.}$$

$$y_x = y_0 \left(1 - \frac{(x \pm D_m)^2}{A^2}\right)^M \quad \text{for } x \text{ values to right of mode.}$$

Left Mode Nos. 2, 3, and 5 and
Right Mode Nos. 1, 2, 3, 4, and 5

$$y_x = Y_e \left(1 + \frac{x \pm D_m}{A_1}\right)^{M_1} \left(1 - \frac{x \pm D_m}{A_2}\right)^{M_2} + y_e \left(1 + \frac{x \pm d_m}{a_1}\right)^{m_1} \left(1 - \frac{x \pm d_m}{a_2}\right)^{m_2}$$

Left Mode No. 4

$$y_x = Y_e \left(1 - \left[\frac{x+D}{A_1}\right]^2\right)^{M_1} + y_e \left(1 - \left[\frac{x+d}{a_1}\right]^2\right)^{m_1}, \quad -10 \leqq x \leqq -D$$

$$y_x = Y_e \left(1 - \left[\frac{x+D}{A_2}\right]^2\right)^{M_2} + y_e \left(1 - \left[\frac{x+d}{a_1}\right]^2\right)^{m_1}, \quad -D \leqq x \leqq -d$$

$$y_x = Y_e \left(1 - \left[\frac{x+D}{A_2}\right]^2\right)^{M_2} + y_e \left(1 - \left[\frac{x+d}{a_2}\right]^2\right)^{m_2}, \quad -d \leqq x \leqq (A_2 - D)$$

Symmetrical Nos. 0, 1, 2, 3, 4, 5, and 6

$$y_x = y_0 \left(1 - \frac{x^2}{a^2}\right)^m$$

in which

y_x = ordinate to the frequency curve at age x (origin at the mean age).
y_0 = ordinate to the frequency curve at its mode.
Y_e = ordinate to the major constituent curve at its mean.
y_e = ordinate to the minor constituent curve at its mean.

x = age (in units equal to 10 percent of average life), measured from the average-life ordinate.

$D_m, d_m = x$ distance from the mean of the type curve to the mean of the constituent curve.

$A, A_1, A_2, a, a_1, a_2, M, M_1, M_2, m, m_1, m_2$ are parameters.

Final Equations of the 18 Type Frequency Curves

In the following 18 equations, x is measured from the mean, or average life, negative values of x being to the left of 100 percent of average life and positive values to the right. An age interval of 10 percent of average life is equal to x. Therefore, if $x=-2.5$ the equivalent age is 75 percent of average life. When $x=+4.2$ the equivalent is 142 percent of average life.

Left Mode No. 0

$$y_x = 6.24256418\left(1-\frac{(x+5.06)^2}{24.60758105}\right)^{0.4411811}$$ for x values to left of 49.4 percent of average life, and

$$y_x = 6.24256418\left(1-\frac{(x+5.06)^2}{1569.183739}\right)^{7.73906308}$$ for x values to right of 49.4 percent of average life.

Left Mode No. 1

$$y_x = 7.45095687\left(1-\frac{(x+4)^2}{85.49500000}\right)^{4.77742941}$$ for x values to left of 60 percent of average life, and

$$y_x = 7.45095687\left(1-\frac{(x+4)^2}{697.8983268}\right)^{4.74147112}$$ for x values to right of 60 percent of average life.

Left Mode No. 2

$$y_x = 6.2\left(1+\frac{x-0.56632298}{10.56632238}\right)^{2.00491507}\left(1-\frac{x-0.56632298}{18.11962398}\right)^{4.15639835}$$
$$+4.03141046\left(1+\frac{x+1.98831766}{4.90258200}\right)^{2.73360630}\left(1-\frac{x+1.98831766}{12.07825433}\right)^{6.15831022}$$

Left Mode No. 3

$$y_x = 6.12\left(1+\frac{x-0.69997304}{9.94997304}\right)^{2.51767682}\left(1-\frac{x-0.69997304}{13.35543784}\right)^{3.72183230}$$
$$+8.19722280\left(1+\frac{x+1.22119072}{6.98766177}\right)^{10.13754029}\left(1-\frac{x+1.22119072}{16.85048078}\right)^{23.90598437}$$

Left Mode No. 4

$$y_x = 10.811999434\left(1-\frac{(x+0.600)^2}{51.8400}\right)^{25.300} + 9.901828065\left(1-\frac{(x+0.300)^2}{56.2500}\right)^{3.650} \quad \text{Limits:} \quad -10 \leqq x \leqq -0.6$$

$$y_x = 10.811999434\left(1-\frac{(x+0.600)^2}{184.9600}\right)^{62.000} + 9.901828065\left(1-\frac{(x+0.300)^2}{56.2500}\right)^{3.650} \quad \text{Limits:} \quad -0.6 \leqq x \leqq -0.3$$

$$y_x = 10.811999434\left(1-\frac{(x+0.600)^2}{184.9600}\right)^{62.000} + 9.901828065\left(1-\frac{(x+0.300)^2}{176.8900}\right)^{8.350} \quad \text{Limits:} \quad -0.3 \leqq x \leqq (13.6-0.6)$$

Left Mode No. 5

$$y = 12.76925713\left(1+\frac{x-0.088051975}{5.9500}\right)^{4.7715}\left(1-\frac{x-0.088051975}{10.7500}\right)^{9.4275} + 16.28938438\left(1+\frac{x+0.161460055}{4.0000}\right)^{11.0000}\left(1-\frac{x+0.161460055}{5.7000}\right)^{17.3400}$$

Symmetrical No. 0

$$y_x = 6.95219904\left(1-\frac{x^2}{100}\right)^{0.74857140}$$

Symmetrical No. 1

$$y_x = 9.08025966\left(1-\frac{x^2}{100}\right)^{1.82829970}$$

Symmetrical No. 2

$$y_x = 11.91103882\left(1-\frac{x^2}{100}\right)^{3.70000374}$$

Symmetrical No. 3

$$y_x = 15.61048797\left(1-\frac{x^2}{100}\right)^{6.9015918}$$

Symmetrical No. 4

$$y_x = 22.32936082\left(1-\frac{x^2}{81}\right)^{11.83337940}$$

Symmetrical No. 5

$$y_x = 33.22051575\left(1-\frac{x^2}{64}\right)^{21.43782170}$$

Symmetrical No. 6

$$y_x = 52.47259169\left(1-\frac{x^2}{49}\right)^{41.63414220}$$

Right Mode No. 1

$$y_x = 4.87234751\left(1+\frac{x+2.1173}{19.08200310}\right)^{2.16036988}\left(1-\frac{x+2.1173}{12.2}\right)^{1.03056945}$$
$$+2.95921394\left(1+\frac{x-2.03848}{9.25013197}\right)^{2.69374074}\left(1-\frac{x-2.03848}{6.76380495}\right)^{1.89831583}$$

Right Mode No. 2

$$y_x = 6.89465710\left(1+\frac{x+0.470}{30.05448169}\right)^{9.16816044}\left(1-\frac{x+0.470}{9.05171312}\right)^{2.06241419}$$
$$+3.34428110\left(1+\frac{x-0.470}{91.60465100}\right)^{100.000}\left(1-\frac{x-0.470}{7.80000000}\right)^{7.800}$$

Right Mode No. 3

$$y_x = 9.4035297069\left(1+\frac{x+0.235}{17.61801370}\right)^{7.950}\left(1-\frac{x+0.235}{7.18500000}\right)^{2.850}$$
$$+5.5945716839\left(1+\frac{x-0.698}{17.31323077}\right)^{27.900}\left(1-\frac{x-0.698}{6.25200000}\right)^{9.400}$$

Right Mode No. 4

$$y_x = 15.20129316\left(1+\frac{x+0.11}{17.92683200}\right)^{14.05850000}\left(1-\frac{x+0.11}{5.41801100}\right)^{2.58112010}$$
$$+5.85667821\left(1+\frac{x-0.70}{2.56783700}\right)^{3.66879450}\left(1-\frac{x-0.70}{3.45398750}\right)^{1.27997731}$$

Right Mode No. 5

$$y_x = 14.99330391\left(1+\frac{x+0.12869}{7.0000000}\right)^{5.79473520}\left(1-\frac{x+0.12869}{3.8764409}\right)^{2.76276090}$$
$$+15.44614441\left(1+\frac{x-0.2086}{4.2350000}\right)^{6.01833400}\left(1-\frac{x-0.2086}{2.4150000}\right)^{3.02300010}$$

TABLE 42. PERCENT SURVIVING AND PROBABLE LIVES OF THE 18 TYPE CURVES

Age, percent of average life	Type curve L_0		Type curve L_1		Type curve L_2		Type curve L_3	
	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life
0	100.00000	99.99089	100.00000	100.00591	100.00000	100.00021	100.00000	99.99845
5	98.88950	101.08161	99.63717	100.36022	99.98516	100.01451	100.00000	99.99845
10	97.09985	102.80445	99.05431	100.90562	99.88940	100.10272	99.99965	99.99876
15	94.91674	104.88011	98.19015	101.68240	99.64732	100.31485	99.98571	100.01084
20	92.45291	107.20770	96.98956	102.72297	99.20930	100.67961	99.92003	100.06478
25	89.77813	109.73060	95.40973	104.04967	98.53977	101.20981	99.75597	100.19186
30	86.94316	112.41127	93.42541	105.67380	97.61555	101.90662	99.44760	100.41659
35	83.98860	115.22191	91.03275	107.59530	96.41791	102.76752	98.95304	100.75520
40	80.94912	118.13988	88.25133	109.80281	94.85656	103.83997	98.23067	101.21934
45	77.85578	121.14498	85.12428	112.27369	92.77820	105.21155	97.22244	101.82694
50	74.73764	124.21747	81.71638	114.97383	90.07738	106.93905	95.82788	102.61565
55	71.61815	127.34132	78.11040	117.85716	86.72860	109.03813	93.88854	103.64810
60	68.50728	130.51283	74.40204	120.86522	82.78113	111.49302	91.20570	105.00185
65	65.41269	133.73056	70.67865	123.93996	78.33876	114.26913	87.59534	106.74906
70	62.34191	136.99306	66.96789	127.06747	73.53626	117.32197	82.95922	108.93749
75	59.30233	140.29892	63.28229	130.24572	68.51802	120.60387	77.33872	111.58081
80	56.30114	143.64678	59.63417	133.47273	63.42158	124.06752	70.92603	114.65849
85	53.34528	147.03529	56.03557	136.74659	58.36648	127.66832	64.02853	118.12085
90	50.44141	150.46313	52.49810	140.06547	53.44823	131.[illegible]6588	57.00209	121.89571
95	47.59585	153.92902	49.03293	143.42757	48.73660	135.[illegible]2517	50.17916	125.89546
100	44.81457	157.43172	45.65060	146.83119	44.27685	139.12062	43.81420	130.02557
105	42.10313	160.97001	42.36105	150.27465	40.09316	142.72029	38.05845	134.19523
110	39.46666	164.54272	39.17345	153.73638	36.19309	146.51867	32.96348	138.32936
115	36.90985	168.14870	36.09618	157.27483	32.57226	150.30366	28.50446	142.37842
120	34.43690	171.78684	33.13678	160.82853	29.21877	154.07214	24.61134	146.32230
125	32.05150	175.45606	30.30187	164.41606	26.11696	157.82557	21.19779	150.16671
130	29.75687	179.15533	27.59711	168.03608	23.25024	161.56858	18.18205	153.93424
135	27.55566	182.88363	25.02721	171.68727	20.60301	165.30763	15.49809	157.65409
140	25.45004	186.63999	22.59584	175.36838	18.16176	169.04987	13.09864	161.35412
145	23.44162	190.42346	20.30567	179.07823	15.91540	172.80201	10.95300	165.05640
150	21.53151	194.23313	18.15836	182.81566	13.85508	176.56980	9.04239	168.77609
155	19.72030	198.06812	16.15455	186.57958	11.97372	180.35762	7.35497	172.52213
160	18.00807	201.92758	14.29388	190.36894	10.26528	184.16841	5.88180	176.29886
165	16.39443	205.81068	12.57504	194.18272	8.72414	188.00373	4.61406	180.10757
170	14.87851	209.71662	10.99380	198.01998	7.34447	191.86401	3.54138	183.94776
175	13.43001	213.64466	9.55304	201.87979	6.11983	195.74884	2.65120	187.81802
180	12.13419	217.59403	8.24285	205.76127	5.04292	199.65727	1.92866	191.71659
185	10.90195	221.56404	7.06053	209.66358	4.10549	203.58804	1.35694	195.64161
190	9.75982	225.55399	6.00073	213.58591	3.29841	207.53975	0.91776	199.59130
195	8.70500	229.56322	5.05748	217.52750	2.61180	211.51131	0.59197	203.56400
200	7.73441	233.59110	4.22433	221.48760	2.03522	215.50128	0.36025	207.55823
205	6.84472	237.63700	3.49436	225.46551	1.55792	219.50860	0.20376	211.57267
210	6.03238	241.70032	2.86034	229.46057	1.16899	223.53224	0.10480	215.60622
215	5.29368	245.78052	2.31483	233.47212	0.85763	227.57124	4.7392*	219.65804
220	4.62473	249.87702	1.85022	237.49955	0.61326	231.62472	1.7822*	223.72779
225	4.02158	253.98930	1.45887	241.54228	0.42576	235.69196	5.0302*	227.81621
230	3.48020	258.11684	1.13320	245.59973	0.28560	239.77193	8.5317*	231.92737
235	2.99653	262.25915	0.86577	249.67137	0.18296	243.86424	4.5269*	236.08217
240	2.56649	266.41576	0.64937	253.75670	0.11287	247.96820	1.2840*	240.50000
245	2.18608	270.58622	0.47711	257.85521	6.5248*	252.08326	Absolute zero at age 256.29	
250	1.85133	274.76467	0.34247	261.96644	3.5011*	256.20897		
255	1.55837	278.96689	0.23940	266.08993	1.7066*	260.34301		
260	1.30345	283.17628	0.16234	270.22531	7.3138*	264.49126		
265	1.08297	287.39783	0.10626	274.37212	2.6141*	268.64793		
270	0.89347	291.63117	6.6733*	278.53000	7.0921*	272.81610		

L_0, L_1 and L_2 concluded on page 128.

*Condensed from the usual form 6.6733x10[illegible].

TABLE 42. PERCENT SURVIVING AND PROBABLE LIVES OF THE 18 TYPE CURVES, CONT.

Age, percent of average life	Type curve L_4		Type curve L_5		Type curve S_0		Type curve S_1	
	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life
0	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000
5	100.00000	100.00000	100.00000	100.00000	99.64988	100.34029	99.97697	100.02220
10	100.00000	100.00000	100.00000	100.00000	98.83704	101.10222	99.84198	100.14667
15	100.00000	100.00000	100.00000	100.00000	97.66579	102.16343	99.51978	100.42955
20	100.00000	100.00000	100.00000	100.00000	96.18813	103.46285	98.95479	100.90197
25	99.99994	100.00004	100.00000	100.00000	94.44074	104.95979	98.10590	101.57914
30	99.99491	100.00364	100.00000	100.00000	92.45276	106.62440	96.94397	102.46569
35	99.95590	100.02975	100.00000	100.00000	90.24878	108.43369	95.45014	103.55926
40	99.81999	100.11433	100.00000	100.00000	87.85047	110.36934	93.61458	104.85306
45	99.49620	100.30086	99.99994	100.00003	85.27737	112.41641	91.43547	106.33757
50	98.87810	100.62951	99.99221	100.00400	82.54749	114.56250	88.91814	108.00180
55	97.85817	101.12929	99.91441	100.04046	79.67768	116.79719	86.07422	109.83412
60	96.33923	101.81492	99.59667	100.17473	76.68385	119.11161	82.92102	111.82276
65	94.23074	102.69191	98.77418	100.48580	73.58124	121.49814	79.48078	113.95626
70	91.40395	103.77670	97.15592	101.03139	70.38447	123.95016	75.78013	116.22361
75	87.59685	105.13067	94.48180	101.83388	67.10774	126.46193	71.84942	118.61443
80	82.36077	106.87908	90.38589	102.92896	63.76487	129.02839	67.72221	121.11903
85	75.23825	109.17620	84.04805	104.45606	60.36941	131.64506	63.43466	123.72839
90	66.20766	112.12265	74.41381	106.63177	56.93468	134.30800	59.02506	126.43422
95	56.03106	115.68281	61.43633	109.59890	53.47385	137.01367	54.53322	129.22889
100	45.92922	119.68734	46.93011	113.33734	50.00000	139.75891	50.00000	132.10541
105	36.82670	123.94999	33.60849	117.66137	46.52615	142.54088	45.46678	135.05737
110	29.20175	128.26669	23.25529	122.24209	43.06532	145.35702	40.97494	138.07892
115	23.07537	132.47687	15.99530	126.73263	39.63059	148.20503	36.56533	141.16474
120	18.18649	136.52655	11.00040	130.99004	36.23513	151.08280	32.27779	144.30994
125	14.22200	140.45874	7.44648	135.10346	32.89226	153.98841	28.15058	147.51008
130	10.95212	144.35016	4.86568	139.20493	29.61532	156.92014	24.21987	150.76110
135	8.24831	148.26014	3.02930	143.35703	26.41876	159.87638	20.51922	154.05930
140	6.04296	152.21838	1.78262	147.56930	23.31614	162.85568	17.07898	157.40128
145	4.28876	156.23332	0.98432	151.83527	20.32232	165.85670	13.92578	160.78396
150	2.93706	160.30381	0.50537	156.14726	17.45251	168.87822	11.08186	164.20450
155	1.93260	164.42557	0.23884	160.49880	14.72263	171.91911	8.56453	167.66033
160	1.21574	168.59388	0.10227	164.88452	12.14953	174.97833	6.38542	171.14910
165	0.72670	172.80433	3.8912*-2	169.29999	9.75122	178.05493	4.54986	174.66867
170	0.40962	177.05300	1.2804*-2	173.74155	7.54724	181.14740	3.05603	178.21712
175	0.21565	181.33633	3.3047*-3	178.20627	5.55926	184.25699	1.89410	181.79275
180	0.10473	185.65127	7.5300*-4	182.69165	3.81187	187.38111	1.04521	185.39421
185	4.6162*-2	189.99496	1.1578*-4	187.19677	2.33421	190.52013	0.48022	189.02070
190	1.8062*-2	194.36507	1.0862*-5	191.71987	1.16296	193.67471	0.15802	192.67315
195	6.0815*-3	198.75944	4.5333*-7	196.26370	0.35012	196.85095	2.3033*-2	196.36205
200	1.6836*-3	203.17626	3.8160*-9	200.83860	0.00000	200.00000	0.00000	200.00000
205	3.5703*-4	207.61398	2.4958*-12	205.51817	Absolute zero at age 200.0		Absolute zero at age 200.0	
210	5.1468*-5	212.07250	Absolute zero at age 208.38					
215	4.0358*-6	216.55238						
220	1.0376*-7	221.05924						
225	1.6690*-10	225.62577						
230	0.00000	230.00000						
	Absolute zero at age 230.0							

*Condensed from the usual form 4.6162×10^{-2}.

TABLE 42. PERCENT SURVIVING AND PROBABLE LIVES OF THE 18 TYPE CURVES, CONT.

Age, percent of average life	Type curve S_2		Type curve S_3		Type curve S_4		Type curve S_5	
	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life
0	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000
5	99.99977	100.00022	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000
10	99.99438	100.00516	99.99998	100.00002	100.00000	100.00000	100.00000	100.00000
15	99.96508	100.03065	99.99955	100.00039	100.00000	100.00000	100.00000	100.00000
20	99.87562	100.10424	99.99626	100.00308	100.00000	100.00000	100.00000	100.00000
25	99.67336	100.26114	99.98158	100.01439	100.00000	100.00000	100.00000	100.00000
30	99.29313	100.53891	99.93451	100.04835	99.99994	100.00004	100.00000	100.00000
35	98.66236	100.97274	99.81435	100.12926	99.99925	100.00050	100.00000	100.00000
40	97.70666	101.59210	99.55468	100.29188	99.99445	100.00347	100.00000	100.00000
45	96.35547	102.41897	99.06070	100.57890	99.97162	100.01648	100.00000	100.00000
50	94.54722	103.46727	98.21171	101.03602	99.89006	100.05898	99.99986	100.00007
55	92.23368	104.74343	96.86915	101.70637	99.65644	100.16958	99.99803	100.00092
60	89.38348	106.24745	94.88992	102.62546	99.09588	100.40916	99.98250	100.00741
65	85.98454	107.97422	92.14318	103.81800	97.93460	100.85553	99.89372	100.04020
70	82.04539	109.91488	88.52850	105.29680	95.81171	101.58974	99.52630	100.15847
75	77.50546	112.05802	83.99263	107.06350	92.33195	102.67936	98.36721	100.47958
80	72.68428	114.39069	78.54224	109.11051	87.15666	104.16613	95.47669	101.16553
85	67.37969	116.89776	72.25073	111.42339	80.11173	106.06203	89.62837	102.36758
90	61.76531	119.56988	65.25765	113.98329	71.27816	108.35315	79.84902	104.16759
95	55.93719	122.38914	57.76056	116.76904	61.03029	111.00766	66.16179	106.56047
100	50.00000	125.34413	50.00000	119.75873	50.00000	113.98428	50.00000	109.47834
105	44.06281	128.42274	42.23944	122.93091	38.96971	117.23905	33.83821	112.82728
110	38.23469	131.61370	34.74235	126.26526	28.72184	120.72977	20.15098	116.51424
115	32.62031	134.90665	27.74927	129.74306	19.88827	124.41839	10.37163	120.45988
120	27.31572	138.29213	21.45776	133.34737	12.84334	128.27194	4.52331	124.60162
125	22.40454	141.76152	16.00737	137.06307	7.66805	132.26258	1.63279	128.89201
130	17.95461	145.30705	11.47150	140.87676	4.18829	136.36718	0.47370	133.29585
135	14.01546	148.92167	7.85682	144.77670	2.06540	140.56669	0.10628	137.78717
140	10.61652	152.59905	5.11008	148.75260	0.90412	144.84554	1.7505*[illegible]	142.34693
145	7.76632	156.33349	3.13085	152.79550	0.34356	149.19105	1.9664*[illegible]	146.96095
150	5.45278	160.11988	1.78829	156.89763	0.10994	153.59287	1.3506*[illegible]	151.61900
155	3.64453	163.95363	0.93930	161.05224	2.8348*[illegible]	158.04267	4.7901*[illegible]	156.31432
160	2.29334	167.83069	0.44532	165.25372	5.5528*[illegible]	162.53372	6.5855*[illegible]	161.04285
165	1.33764	171.74735	0.18565	169.49639	7.4641*[illegible]	167.06104	2.0400*[illegible]	165.80504
170	0.70687	175.70044	6.5494*[illegible]	173.77668	5.8485*[illegible]	171.62133	4.1151*[illegible]	170.61149
175	0.32664	179.68720	1.8423*[illegible]	178.09091	1.9628*[illegible]	176.21146	8.2575*[illegible]	175.50523
180	0.12438	183.70544	3.7393*[illegible]	182.43656	1.3859*[illegible]	180.84334	0.00000	180.00000
185	3.4916*[illegible]	187.75240	4.5414*[illegible]	186.81280	2.0195*[illegible]	185.55252	Absolute zero at age 180.0	
190	5.6228*[illegible]	191.83362	2.1671*[illegible]	191.22341	0.00000	190.00000		
195	2.3407*[illegible]	195.96419	1.0622*[illegible]	195.69685	Absolute zero at age 190.0			
200	0.00000	200.00000	0.00000	200.00000				
205								
	Absolute zero at age 200.0		Absolute zero at age 200.0					

*Condensed from the usual form 3.4916x10[illegible].

TABLE 42. PERCENT SURVIVING AND PROBABLE LIVES OF THE 18 TYPE CURVES, CONT.

Age, percent of average life	Type curve S_4		Type curve R_1		Type curve R_2		Type curve R_3	
	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life
0	100.00000	100.00000	100.00000	100.00180	100.00000	100.00000	100.00000	100.00000
5	100.00000	100.00000	98.67319	101.31249	99.49224	100.49725	99.90802	100.08961
10	100.00000	100.00000	97.25548	102.67964	98.89359	101.05981	99.77155	100.21605
15	100.00000	100.00000	95.74739	104.09966	98.19184	101.69229	99.57488	100.38902
20	100.00000	100.00000	94.14988	105.56867	97.37369	102.39917	99.29891	100.61902
25	100.00000	100.00000	92.46439	107.08232	96.42474	103.18491	98.92096	100.91703
30	100.00000	100.00000	90.69276	108.63674	95.32938	104.05390	98.41475	101.29408
35	100.00000	100.00000	88.83506	110.22850	94.07074	105.01055	97.75059	101.76079
40	100.00000	100.00000	86.88515	111.86026	92.63063	106.05929	96.89555	102.32699
45	100.00000	100.00000	84.83266	113.53789	90.98955	107.20471	95.81369	103.00148
50	100.00000	100.00000	82.66538	115.26865	89.12668	108.45158	94.46607	103.79204
55	100.00000	100.00000	80.37080	117.06003	87.02008	109.80490	92.81029	104.70569
60	100.00000	100.00000	77.93721	118.91905	84.64706	111.26991	90.79948	105.74941
65	99.99996	100.00001	75.35462	120.85185	81.98479	112.85214	88.38061	106.93117
70	99.99835	100.00052	72.61549	122.86346	79.01133	114.55726	85.49283	108.26067
75	99.96681	100.00889	69.71522	124.95773	75.70717	116.39102	82.06093	109.75071
80	99.64167	100.07979	66.65272	127.13731	72.05731	118.35898	78.02814	111.41669
85	97.71260	100.41499	63.43064	129.40376	68.05401	120.46632	73.30461	113.27609
90	90.70910	101.37934	60.05371	131.75762	63.70000	122.71746	67.84370	115.34643
95	74.50386	103.25562	56.53884	134.19860	59.01217	125.11571	61.63582	117.64274
100	50.00000	106.03512	52.89519	136.72566	54.02510	127.66288	54.74208	120.17476
105	25.49614	109.51346	49.14416	139.33722	48.79396	130.35885	47.31746	122.94457
110	9.29090	113.46679	45.30930	142.03122	43.39604	133.20108	39.61801	125.94491
115	2.28740	117.72763	41.41805	144.80529	37.92987	136.18423	31.98179	129.15823
120	0.35833	122.18704	37.50154	147.65686	32.31131	139.29962	24.78027	132.55624
125	3.3192*-[illegible]	126.77740	33.59414	150.58322	27.26603	142.53491	18.34962	136.10033
130	1.6488*-[illegible]	131.45697	29.73303	153.58167	22.31913	145.87373	12.92397	139.74426
135	3.8261*-[illegible]	136.19977	25.95763	156.76125	17.78236	149.29606	8.59763	143.44083
140	3.3790*-[illegible]	140.98968	22.30885	159.78422	13.74239	152.77927	5.33296	147.15341
145	8.2277*-[illegible]	145.81720	18.82834	162.98331	10.25227	156.30063	3.00720	150.86725
150	3.1928*-[illegible]	150.67814	15.55747	166.24450	7.32937	159.84111	1.46794	154.59151
155	6.9354*-[illegible]	155.57400	12.53623	169.56552	4.96076	163.38985	0.56322	158.34810
160	7.5148*-[illegible]	160.51341	9.80182	172.94384	3.11416	166.94690	0.13638	162.15692
165	1.0945*-[illegible]	165.50004	7.38707	176.37592	1.74922	170.52220	9.9847*-[illegible]	166.03924
170	0.00000	170.00000	5.31832	179.85535	0.82235	174.13012	Absolute zero at age 169.50	
175	Absolute zero at age 170.0		3.61284	183.36828	0.28040	177.78323		
180			2.27508	186.88301	4.5610*-[illegible]	181.49239		
185			1.29047	190.33183	6.5960*-[illegible]	185.50000		
190			0.61061	193.65695	Absolute zero at age 185.82			
195			0.17949	196.99140				
200			4.5573*-[illegible]	200.50000				
205			0.00000	205.00000				
210			Absolute zero at age 200.83					

*Condensed from the usual form 3.3192x10-[illegible].

TABLE 42. PERCENT SURVIVING AND PROBABLE LIVES OF THE 18 TYPE CURVES, CONT.

Age, percent of average life	Type curve R_4		Type curve R_5	
	Percent surviving	Probable life, percent of average life	Percent surviving	Probable life, percent of average life
0	100.00000	100.00049	100.00000	99.99926
5	99.99432	100.00601	100.00000	99.99926
10	99.98287	100.01658	100.00000	99.99926
15	99.96090	100.03575	100.00000	99.99926
20	99.92061	100.06894	100.00000	99.99926
25	99.84968	100.12389	100.00000	99.99926
30	99.72952	100.21114	100.00000	99.99926
35	99.53311	100.34439	99.99998	99.99929
40	99.22264	100.54048	99.99916	99.99978
45	98.74727	100.81910	99.99100	100.00441
50	98.04124	101.20197	99.95114	100.02514
55	97.02304	101.71159	99.82089	100.08662
60	95.59608	102.36961	99.49249	100.22610
65	93.65182	103.19487	98.80274	100.48760
70	91.07592	104.20140	97.53312	100.91344
75	87.75801	105.39634	95.39673	101.54592
80	83.60532	106.77778	91.94655	102.44128
85	78.55460	108.33401	86.55794	103.67210
90	72.42015	110.09162	78.54068	105.30800
95	64.75218	112.16416	67.46899	107.39151
100	55.38004	114.63438	53.61839	109.92926
105	44.79042	117.49630	38.27696	112.90149
110	33.97478	120.68251	23.63847	116.27958
115	24.00508	124.10272	12.08071	120.03018
120	15.65853	127.67001	4.95374	124.03417
125	9.26945	131.31951	1.61653	127.91040
130	4.80402	135.02206	0.29276	131.69264
135	2.02527	138.78538	5.3622*-2	135.63094
140	0.39682	142.63490	0.00000	140.00000
145	8.5247*-2	146.58440	Absolute zero at age 137.48	
150	1.2803*-2	150.66575		
155	0.00000	155.00000		
	Absolute zero at age 153.08			

Age, percent of average life	Type curve L_0, concluded: Percent surviving	Probable life, percent of average life
275	0.73167	295.87593
280	0.59449	300.13177
285	0.47904	304.39833
290	0.38262	308.67529
295	0.30276	312.96234
300	0.23719	317.25916
305	0.18385	321.56548
310	0.14089	325.88100
315	0.10666	330.20545
320	7.9690*-2	334.53858
325	5.8700*-2	338.88014
330	4.2579*-2	343.22988
335	3.0373*-2	347.58758
340	2.1275*-2	351.95302
345	1.4608*-2	356.32609
350	9.8117*-3	360.70651
355	6.4322*-3	365.09417
360	4.1041*-3	369.48663
365	2.5406*-3	373.88746
370	1.5200*-3	378.29492
375	8.7481*-4	382.70842
380	4.8165*-4	387.12827
385	2.5188*-4	391.55417
390	1.2402*-4	395.98600
395	5.6842*-5	400.42364
400	2.3804*-5	404.86698
405	9.0286*-6	409.31583
410	2.9812*-6	413.77071
415	8.2579*-7	418.23126
420	1.8014*-7	422.69784
425	2.7860*-8	427.17126
430	2.5148*-9	431.65335
435	8.6258*-11	436.14968
440	2.9897*-12	440.68596
445	1.1790*-14	445.50000
	Absolute zero at age 445.53	

Continuation of Left Mode Types

Age	Type curve L_1		Type curve L_2	
275	3.9886*-[illegible]	282.69860	1.2032*-[illegible]	276.99972
280	2.2451*-[illegible]	286.87760	7.6317*-[illegible]	281.21830
285	1.1731*-[illegible]	291.06671	2.6860*-[illegible]	285.92239
290	5.5762*-[illegible]	295.26570	Absolute zero at age 286.86	
295	2.3399*-[illegible]	299.47442		
300	8.2700*-[illegible]	303.69289		
305	2.2723*-[illegible]	307.92147		
310	4.1607*-[illegible]	312.16147		
315	3.5342*-[illegible]	316.41771		
320	3.8022*-[illegible]	320.71968		
	Absolute zero at age 324.18			

*Condensed from the usual form 8.5247×10^{-2}.

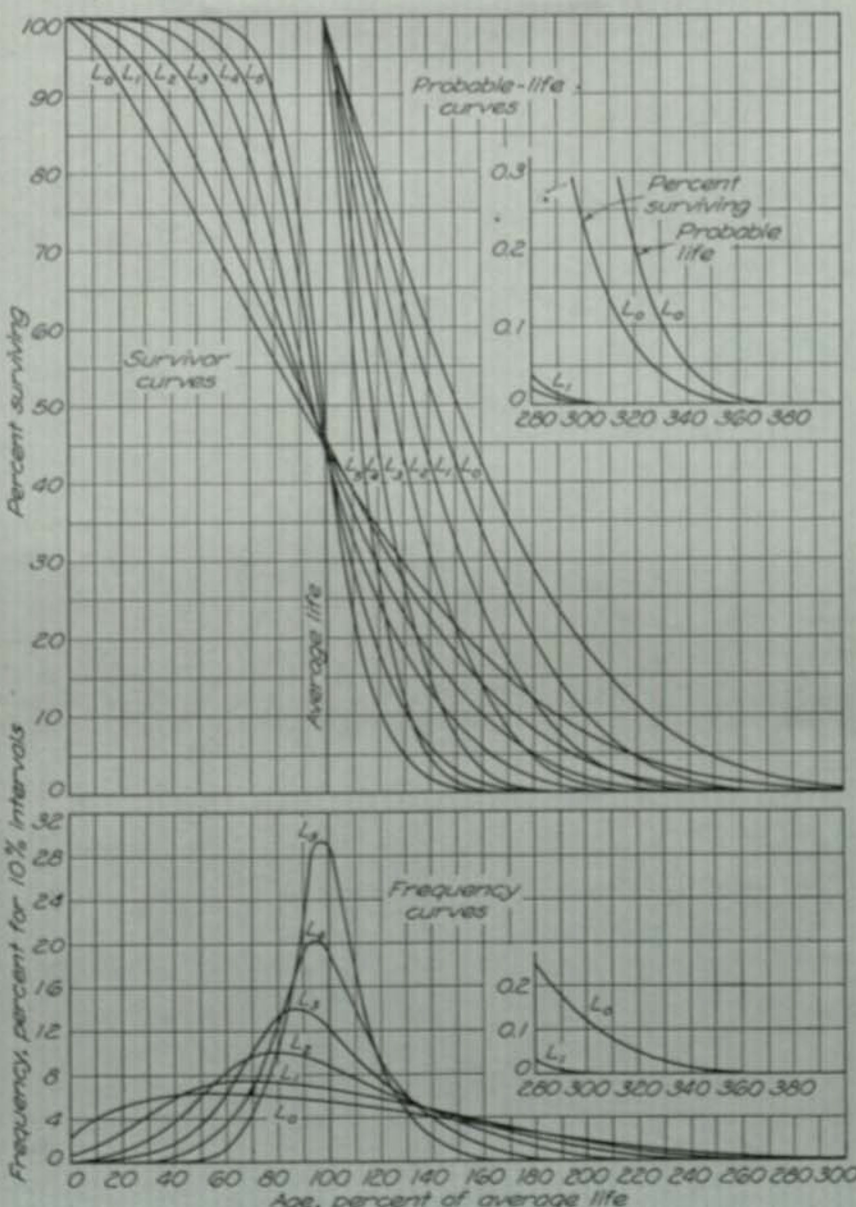

Fig. 28. Left mode type survivor, probable life, and frequency curves.

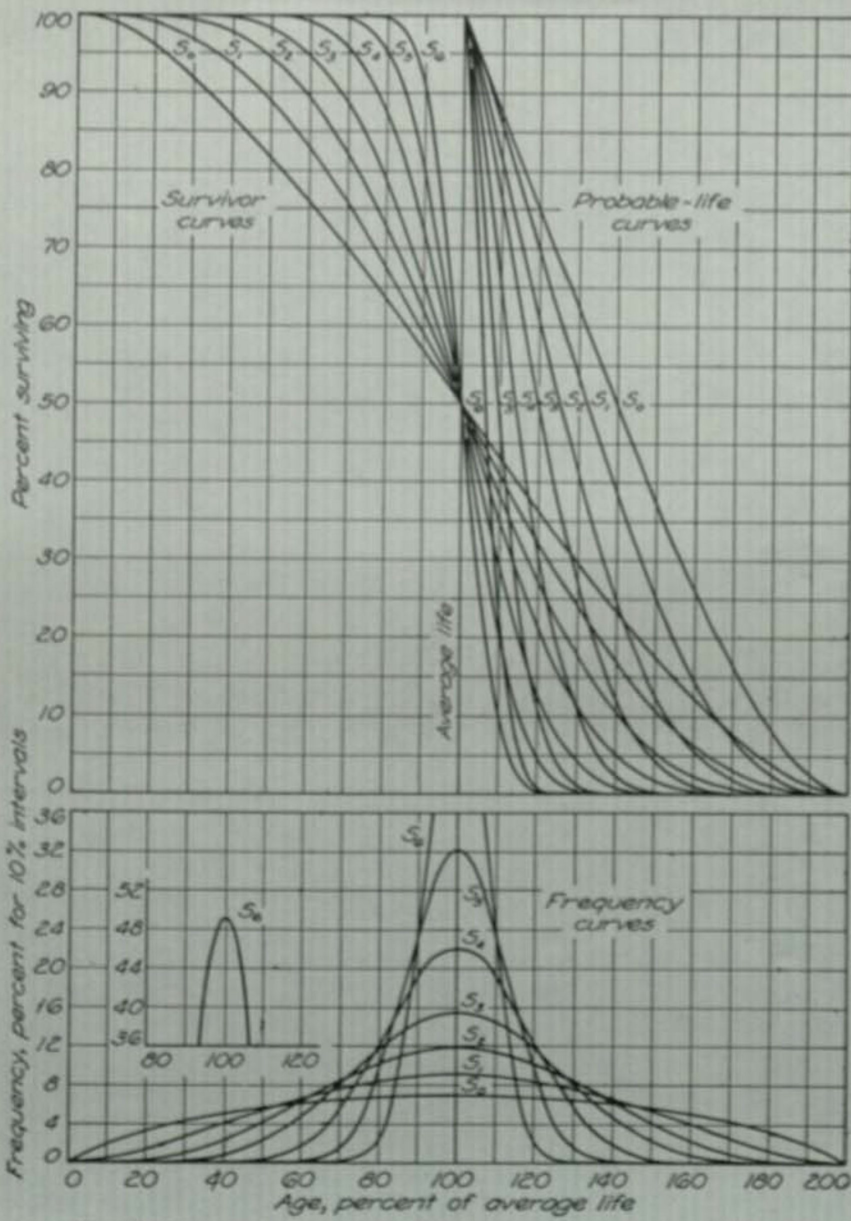

Fig. 23. Symmetrical type survivor, probable life, and frequency curves.

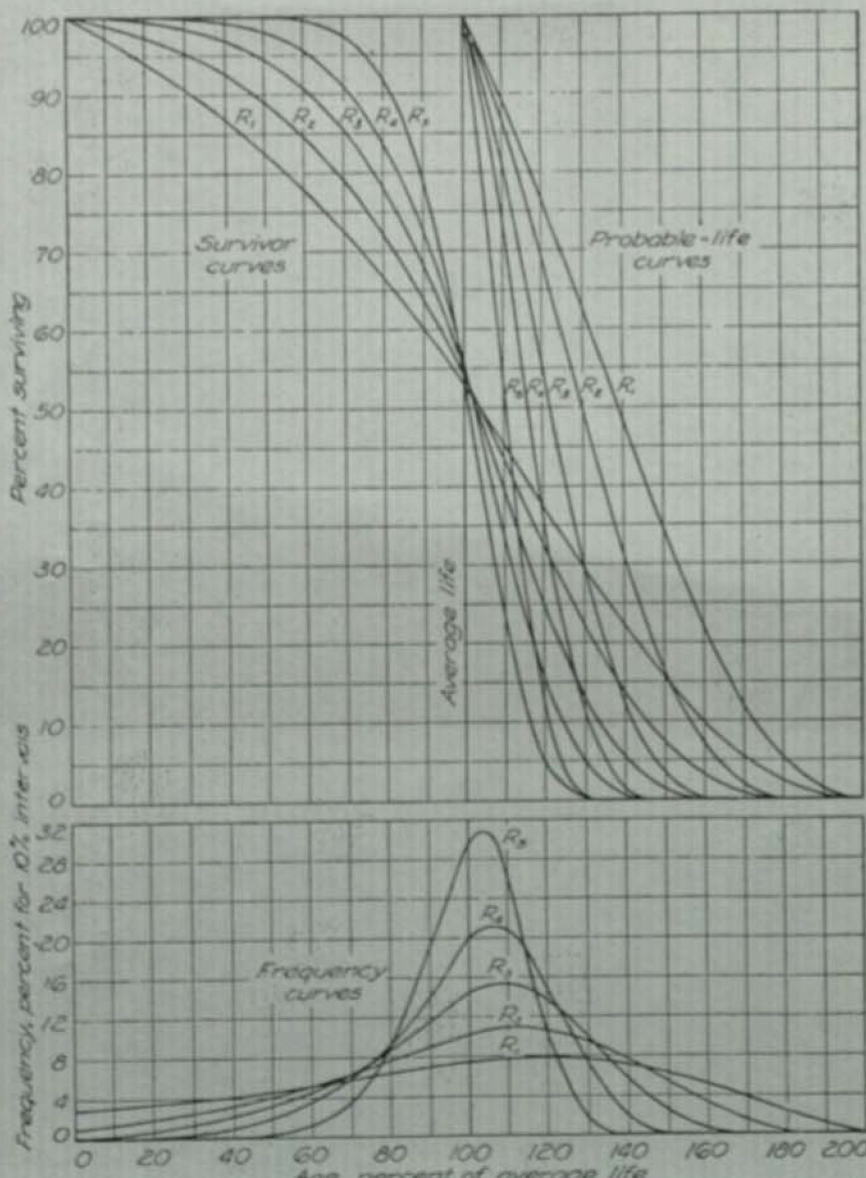

Fig. 30. Right mode type survivor, probable life, and frequency curves.

Depreciation Systems

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sary to define the average life, probable life, equal life groups, expectancy, and other values required by various systems of depreciation.

CHARACTERISTICS OF SERVICE LIFE

To develop a simple example showing the life characteristics of industrial property, imagine a group of 100 identical units of property that are placed in service during the same year. This is a *homogeneous group of property* because all units in the group are identical.

Age Intervals

The life has been defined as the time from installation to retirement from service, but conventions must be adopted to obtain consistent statistics. A common convention is to assume that any unit installed during the year is installed on July 1, that is, at the middle of the calendar year. This is equivalent to assuming the units are installed uniformly during the year, because this would result in an average installation date at midyear. Units retired before the end of the first year will be said to have been retired at age 0.25 years, while units remaining in service at the end of the year will have reached an age of 0.5 years. These assumptions are called the *half-year convention.* Adoption of the half-year convention leads to definition of age intervals 0–0.5 years, 0.5–1.5 years, 1.5–2.5 years, through the interval containing the maximum life, with midpoints of 0.25 years, 1 year, 2 years, and extending to the maximum life. These age intervals are stated in general terms and are shown below. It is convenient to use the index i to refer to an age interval and to denote the midpoint of age interval i by the value x(i). Any unit retired during the age interval i will be assumed to have a life equal to x(i). The symbol ML represents the midpoint of the final age interval and is called the *maximum life.*[1] Use of the half-year convention results in, with the exception of the first age interval, midpoints equal to integer values with the index for an age interval equal to the midpoint.

Index	Age	Midpoint
i	Interval i	x(i)
0	0 ≤ Service Life < 0.5	0.25
1	0.5 ≤ Service Life < 1.5	1
2	1.5 ≤ Service Life < 2.5	2
•		•
•		•
ML	(ML − 0.5) ≤ Service Life < (ML + 0.5)	ML

This convention will be used throughout this text unless otherwise noted.

Frequency Curves

The *retirement frequency curve* is a graph of the frequency of retirements as a function of age. The retirement frequency is the ratio of retirements during an age interval to the original number of units installed and can be expressed as either a fraction or as a percentage. Of the 100 units in our example, suppose that the longest-lived unit was retired during the age interval 2.5–3.5 years so that the following four age intervals are necessary to describe the life characteristics.

Index	Age	Midpoint
i	Interval i	x(i)
0	0 ≤ Service Life < 0.5	0.25
1	0.5 ≤ Service Life < 1.5	1
2	1.5 ≤ Service Life < 2.5	2
3	2.5 ≤ Service Life < 3.5	3

Of the 100 units, 20 were retired during the age interval 0, 40 during age interval 1, 30 during age interval 2, and the final 10 during age interval 3. The calculations for the retirement frequency curve, Figure 3.1, are

$$
\begin{aligned}
f(0) &= (20/100)100\% = 20\% \\
f(1) &= (40/100)100\% = 40\% \\
f(2) &= (30/100)100\% = 30\% \\
f(3) &= (10/100)100\% = \underline{10\%} \\
& \qquad\qquad\qquad\quad 100\%
\end{aligned}
$$

where f(i) = the retirement frequency during age interval i. Each frequency must be positive and the sum of the frequencies must total 100%, because all property must be accounted for.

Survivor Curves

The *survivor curve* is a graph of the percent of units remaining in service expressed as a function of age. The survivor curve could be obtained by recording the number of units remaining in service at the start of each age interval. Or, if the frequency curve is known, the percent surviving at the end of an age interval can be obtained by subtracting the percent retired during the interval from the percent surviving at the start of the interval. Conversely, the frequency curve can be obtained by subtracting successive reported in units, as in our example, their importance is often measured in dollars. Then the percent surviving is determined by the ratio of dollars retired divided by the total dollars installed. It can be argued that because it is dollars, not units, that are the object of capital recovery, dollars are a better measure than units for use in depreciation calculations.

Average Service Life

The average life of the property can be calculated from the frequency curve by using the equation

$$AL = E(\text{life}) = \Sigma x(i)f(i)/100\% \qquad \text{for } i = 1,2,3, \ldots, ML$$

Notice that the frequency is divided by 100% to convert it to a fraction. For our example the average life is AL = (.25)(.20) + (1)(.40) + (2)(.30) + (3)(.10) = 1.35 years.

The symbol E(life) is read *expected life* and is also called the *average life*. There is a direct relationship between the survivor curve and the average life; the area beneath the survivor curve equals the average life. Because the survivor curve is measured in percent, the area under the curve must be divided by 100% to convert it from percent-years to years. The area under the survivor curve and between ages of 0–0.5 years is calculated by multiplying the average height of the curve times the width of the interval or [(1.0 + 0.8)/2](0.5) = 0.45 years. The areas under the next three intervals, each of which has a width of 1 year, are (0.8 + 0.4)/2 = 0.6, (0.4 + 0.1)/2 = 0.25, and (0.1 + 0)/2 = 0.05 respectively. Their sum is 0.45 + 0.6 + 0.25 + 0.05 = 1.35 years, which is consistent with the previous calculation. These calculations are shown graphically in Figure 3.4.

Another average that is used frequently in depreciation calculations is the expectancy, which is a function of the age. The expectancy of a unit of property is simply its remaining years of service. The expectancy of a group of units is the average number of remaining years of service of the surviving property and is calculated as follows

$$RL(i) = E(\text{remaining life at beginning of age interval } i)$$
$$RL(i) = \Sigma\,[(x(k) - i)f(x)/100\%]/S(i) \qquad \text{for } k = i, i + 1, \ldots, ML$$

At age 1.5 years, the expectancy of our example property is [(2 − 1.5)(0.3) + (3 − 1.5)(0.1)]/0.4 = 0.75 years. This is also equal to the area under the survivor curve and to the right of the age 1.5 years divided by the percent surviving at age 1.5 years. Thus, this remaining service (i.e., the area under the curve) is allocated among the units remaining in service (i.e., the per-

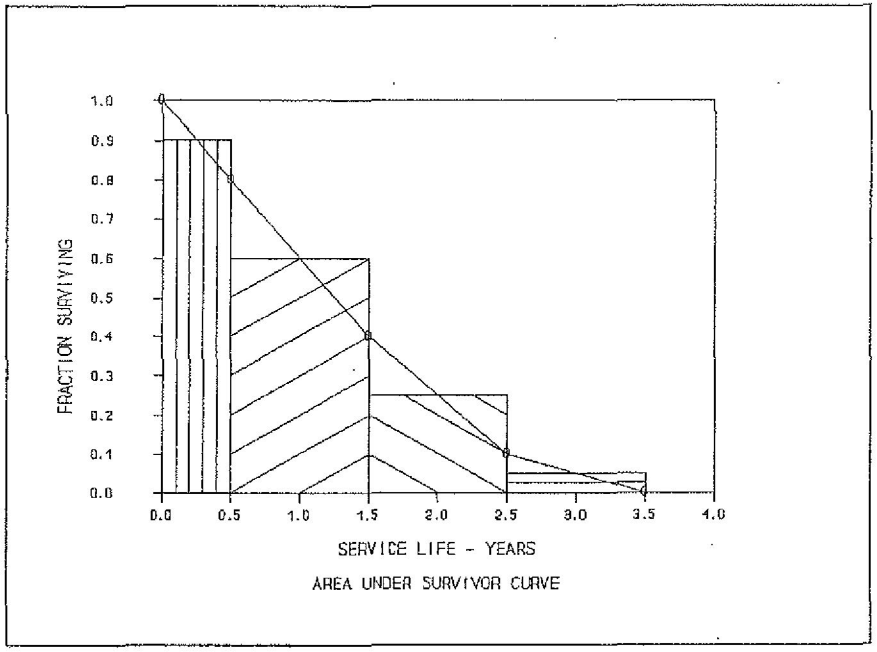

Figure 3.4. The area under the survivor curve.

cent surviving). This calculation is [(0.4 + 0.1)/2 + (0.1 + 0)/2]/0.4 = 0.3/0.4 = 0.75 years.

The terms *expectancy* and *average remaining life* are both commonly used to describe the E(remaining life at beginning of age interval i). The term average remaining life, which is often shortened to *remaining life*, is more descriptive and will be used in this text. The term *probable life* is used to describe the total life expectancy of the property surviving at any age and is equal to the remaining life plus the current age. The remaining life and probable life of the example property are shown below.

Age	% Surviving	Area under Curve, Right of Age, % − Years	Remaining Life, Years	Probable Life, Years
0.0	100%	135	1.35	1.35
0.5	80%	90	1.125	1.625
1.5	40%	30	0.75	2.25
2.5	10%	5	0.50	3.00
3.5	0%	0	...	...

widely used in science and engineering. This involves the gathering of data that contain information about the subject under investigation. These data are analyzed and generalizations made. Models, based on observed data, are then developed. The system of Iowa curves is the result of this approach.

In either case, the resulting model must be verified by its application and proven usefulness. Both the Iowa curve and Gompertz-Makeham models have been used successfully over long periods of time.

The Iowa Curves

Development of the curves began at the Iowa Engineering Experiment Station at what was then Iowa State College, in Ames, Iowa. Much of the early work was done under the supervision of Anson Marston, director of the Experiment Station and dean of the College of Engineering. In 1916, Edwin Kurtz, then a student at the University of Wisconsin, began to assemble data relating to the life characteristics of industrial property. He started work for the Experiment Station in 1921 and a year later was joined in his research by Robley Winfrey, a young civil engineer also employed by the Experiment Station. In 1924 the Experiment Station published in *Bulletin 70* observed life data from 52 groups of utility property. Next Kurtz (1930) described methods of compiling mortality tables and frequency curve models.

Bulletin 103 by Winfrey and Kurtz (1931) contained the forerunners to the Iowa type curves. The purpose of *Bulletin 103* is described as follows:

> The following pages present a method of calculating the mortality curve, the probable life curve, and the rate of renewals of particular examples and types of physical equipment. The method has been applied to 65 sets of original life data for property found in the following industries. . . .
>
> The 13 type curves can be used as valuable aids in forecasting the probable future service lives of individual items and of groups of items of different kinds of physical equipment. (P. 5)

The use of these curves, although recommended, was qualified:

> In view of these natural changes in character of equipment and conditions of service, mortality curves based upon the records of equipment may not give accurate pictures of what may be expected in the way of service of new equipment—equipment used to replace old items as they are retired. However, these records should indicate the general trends and when *intelligently interpreted,* offer an exceedingly valuable aid in the estimation of the service which may be expected from physical equipment. (P. 6, emphasis added.)

A total of 65 property groups were examined, and frequency and survivor curves were calculated for each group. Because the average and maximum life of the curves vary over a wide range of years, the average life was set to 100% and the curves were redrawn using an abscissa of age as a percent of average life, rather than years. The curves were then compared and the following observations were made.

> The comparison brought out three distinguishing characteristics: location of the mode (the point of maximum ordinate) relative to the average life, magnitude of the mode, and the maximum age in percent of the average life. The curves were then classified into three groups according to whether the mode was to the left, approximately coincident, or to the right of the average life, and these three groups subclassified according to the magnitude of the mode. The classification, which was almost wholly by inspection, resulted in 13 groups or types, four groups having the mode to the left of the average life, five groups having the mode to the right of the average life. (P. 27)

Next the data were smoothed by fitting them to one of the 12 types of curves developed by the statistician Karl Pearson. Professor A. W. Snedecor, who became well known for his statistical work, provided assistance with the fitting.

Winfrey continued to gather and analyze data. In 1935 he wrote *Statistical Analysis of Industrial Property Retirements, Bulletin 125,* and it became the basic reference on life analysis. Additional data, the bulk of which was from public utilities, had been gathered and the number of property groups examined now totaled 176. Types of property included waterworks boilers, telegraph and electrical poles, railroad cars, various types of crossties, farm equipment, trucks, watt hour meters, gas meters, power transformers, pavement, and culverts. Analysis of this additional data resulted in the addition of 6 more curves to bring the total to 6 left modal curves, 7 symmetrical curves, and 5 right modal curves. These became known as the Iowa curves. The *Bulletin* contains the source of the original data, the equations of the curves, tables of the curves, and a discussion of the procedures used to analyze this data. Winfrey also discussed five methods of constructing survivor curves from aged data. In the following years, Winfrey applied the Iowa curves to a wide variety of property in many parts of the world.

Harold A. Cowles (1967) revised *Bulletin 125* to correct some errors in the tables and to add 4 origin modal models, or O type curves, developed by a graduate student, Frank Couch. The original data suggested the presence of these types of curves, but they were not included in earlier publications because of the low frequency with which they occurred. Couch fit these curves and they form Appendix D of the revised *Bulletin 125.*

Winfrey (1942) also wrote *Depreciation of Group Properties, Bulletin 155.* In it he discussed various methods of group depreciation and introduced the unit summation method of depreciation, which later became known as the equal life group (ELG) method.

The appendix of *Bulletin 155* contains tables of the percent surviving and probable life of the 18 Iowa type curves. These tables contain revisions to the tables in *Bulletin 125.* Although these changes are small and mostly in the R2 and R3 type curves, only the appendix of *Bulletin 155* contains the correct values of the 18 original Iowa type curves; these tables are tabulated at 5% intervals. The appendix of this book contains tables in which the equations are evaluated at 1% intervals. These tables are reproduced from original notes of Winfrey and are consistent with the values from *Bulletin 155.* Tables of the four O type curves in the same appendix are reproduced from the revised edition of *Bulletin 125.*

Attempts to reproduce the tables using an electronic computer and the equations for the curves have been made, but the results do not exactly match the 5 decimal place figures of Winfrey's revised calculations, with the major differences occurring as the percent surviving approaches zero. The original tables were the result of tedious calculations using mechanical calculators and tables of 10-place logarithms. Winfrey needed this high degree of accuracy to achieve consistency in the renewal calculations discussed in *Bulletin 125.* There are usually differences between the original tables and the computer-generated tables. These can result from procedures used to round calculations. Also, a function evaluated from tables of logarithms and the same function evaluated from an algorithm used by the computer may have different values. Current computer programs requiring values from the Iowa curves often store the table values of the 22 curves and use a table lookup procedure to obtain points on the survivor curve and the probable life curve.

The estimates made by the life forecaster do not require the five-decimal accuracy found in these tables. Yet, two identical sets of calculations, both using the same input data but done on different computers, should generate identical results. Failure to obtain this consistency may create undeserved reservations about the results of the computer programs. This, in turn, could cast doubts on the soundness of a report that uses the output in question.

The Iowa curves have become widely used models of the life characteristics of industrial property and they have been used for a variety of applications other than depreciation. Their repeated use has served as a test of their validity as a model. One criticism of the Iowa curves was that because their roots were in property installed near the turn of the century, new technology might bring with it new types of curves. The counterargument was that the Iowa type curves represent a wide range of patterns and

though the technology may change, the underlying patterns of retirements remain relatively constant and can be adequately described by the 22 Iowa type curves.

In the late 1970s, John Russo, a graduate student working under the supervision of Cowles, conducted research that reproduced the original development of the Iowa curves. Data from more than 2000 property accounts reflecting observations during the period 1965 to 1975 were collected. From these, 490 accounts from a wide range of industries were selected for analysis. They were grouped into 33 clusters that were designated as the Russo curves. Then 56 accounts, selected from the approximately 1500 remaining, were fit to both the Russo curves and to the Iowa curves. Russo (1980, 15) drew three major conclusions:

> 1. No evidence was produced to conclude that the Iowa curve set, as it stands, is not a valid set of standard curves.
>
> 2. No evidence was found to conclude that new curve shapes could be produced at this time that would add to the validity of the Iowa curve set. A very small percentage of industrial account data could not be well fit by Iowa curves. The vast majority were well fit within the current Iowa array. The occasional data not easily fit appeared to reflect random management or economic situations that did not fall within the norms of any particular industry. No pattern, however, was evident that would lead to an expansion of the array that would be useful over a large amount of data experience. By far the most prevalent types of accounts that could not be easily fit were multi-modal accounts. Because of the diversity of locations and magnitudes of the modes between multi-modal accounts, no discernable patterns were found that might lead to an expansion of the Iowa set or the formulation of a set of standard multi-modal curves. Additional study and research in this area is definitely in order.
>
> 3. No evidence was found to suggest that the number of curves within the Iowa set should be reduced, although some Iowa curves, especially in the symmetrical modal group, were not utilized to produce fits during the fitting of the 56 curves. A general review of the overall account data used in the study suggested that these curves would be utilized to some degree with larger sample sizes. Because some reasonably substantial usage of these curves can be expected in industrial practice and because the elimination of selected curves would interrupt a well-spaced existing array, it appeared unreasonable to reduce the number of curves within the Iowa set based on the evidence produced in this study.

The System of Iowa Curves

The equations for the frequency curves of the 22 Iowa curves and tables of the percent surviving and probable average service lives can be found in *Bulletin 125.* The curves are classified by three variables: the average life, the location of the mode, and the variation of the life. Because

$$Y = a_0 + a_1X + a_2X^2 + a_3X^3 + \ldots + a_nX^n$$

Standard regression techniques and computer programs can be used to find the regression coefficients a_i. Although this technique works well for smoothing, the polynomial function should only be used with great care to extrapolate data. In *Statistical Theory with Engineering Applications* Abraham Hald (1952:559) states, "From a purely statistical point of view the regression curve provides a description of the interrelation between the two variables within the limited range of the observations, and extrapolations, i.e., computations or values outside this range are in principle not justifiable as perhaps it is not possible to represent the interrelation outside the observed range by the function utilized. It is therefore absolutely necessary that extrapolation be firmly based on professional knowledge concerning the data." A polynomial curve may not be a good function to use for the difficult task of extrapolation.

If the Iowa curves are adopted as a model, an underlying assumption is that the process describing the retirement pattern is one of the 22 processes described by the Iowa curves. The problem is then to decide which specific type of Iowa curve "best" fits the observed data. *Best* can take on different meanings, each with subtle differences; here it will refer to the curve that most accurately represents the observed data.

One method is to fit the data visually. Until recently, this required a set of curves printed on translucent paper. Printed on each sheet is a family of a specific type Iowa curve. Each member of the family represents a different average life, typically running from 10 to 50 years in steps of 2 years. Traditionally these curves were scaled to 4 years/inch and 10% surviving/inch, but sets of curves scaled to one-half or double this size were also common. These scales can be multiplied or divided by a constant to accommodate observed data with very long or very short lives. If, for example, the observed curve had an average life of about 80 years, the scale could be doubled so that the curves would run from 20 to 100 years. The observed curve was plotted on graph paper using the same scale, and a translucent sheet of paper with the printed curves was then placed over the observed curve, allowing the analyst to compare visually the empirical and observed curves.

After plotting the observed curve, the analyst should first visually examine the plotted data to make an initial judgment about the type curves that may be good fits. The analyst also must decide which points or sections of the curve should be given the most weight. Points at the end of the curve are often based on fewer exposures and may be given less weight than points based on larger samples. The weight placed on those points will depend on the size of the exposures. Often the middle section of the curve (that section ranging from approximately 80% to 20% surviving) is given

more weight than the first and last sections. This middle section is relatively straight and is the portion of the curve that often best characterizes the survivor curve.

Begin fitting with the left modal curves and identify the two or three curves that appear to best fit the data. Note the curve type and the corresponding average life, which is typically estimated to the nearest year. Continue with the symmetrical, right modal, and origin modal curves. Some groups may not give a suitable fit.

Continue by reexamining the contenders selected during the first pass. Often the choice between two or three tentative selections is difficult to make. The conservative choice is toward the lower life and right modal curve.

An alternative to visual fitting is mathematical fitting. Usually the least squares method is used. This method is time consuming if done by hand, and is not practical unless a computer is used. Typical logic for a computer program is as follows. First a type curve is arbitrarily selected. If the observed curve goes to zero percent surviving, calculate the area under the curve and designate this the average life.

If the observed curve is a stub curve (i.e., if it does not go to zero), calculate the area under the curve and up to the age at final data point. Call this area the *realized life.* Then systematically vary the average life of the theoretical survivor curve and calculate its realized life at the age corresponding to the study date. This trial and error procedure ends when you find an average life such that the realized life of the theoretical curve equals the realized life of the observed curve. Call this the *average life.*

Once the average life is found, calculate the difference between each percent surviving point on the observed survivor curve and the corresponding point on the Iowa curve. Square each difference and sum them. The sum of squares is used as a measure of goodness of fit for that particular Iowa type curve. This procedure is repeated for the remaining 21 Iowa type curves. The "best fit" is declared to be the type of curve that minimizes the sum of differences squared.

On the surface, the removal of judgment from the fitting process may appear to be an advantage, but blind acceptance of mechanical fitting processes will occasionally but consistently result in poor results. A better procedure is to use the least squares method to select candidates for the best fit. Comparison of the sum of squares will reveal situations where the difference between the best choices is small. The analyst should then visually examine the observed data and compare them to the theoretical curves. This can be done quickly on a computer with graphic capabilities so that the analyst need not use time to plot the observed curve by hand. The analyst can consider single points that may contribute significantly to the sum of squares but that may deserve less weight than other points. Fits at various sections on the curve can be evaluated and weighted using the judgment of an experienced analyst.

The results of mathematical curve fitting serve as a guide for the analyst and speed the visual fitting process. But the results of the mathematical fitting should be checked visually and the final determination of the best fit be made by the analyst. Computer systems that will mathematically fit the data and provide graphical curve fitting are widely available. Wisely used, these systems are a powerful tool for the depreciation professional.

Fitting Stub Survivor Curves

Stub curves, which are survivor curves for which the data end before the curve reaches 0% surviving, are frequently encountered. The realized life of the property is the area under the curve and to the left of the final point on the survivor curve as shown in Figure 3.6. Unless the remaining property is retired immediately, the average life of the property will exceed the realized life.

The process of fitting stub survivor curves to an Iowa or other type curve is essentially the same as fitting a complete survivor curve. The obvious and critical difference is that the fit is valid only to the final observed point on the survivor curve.

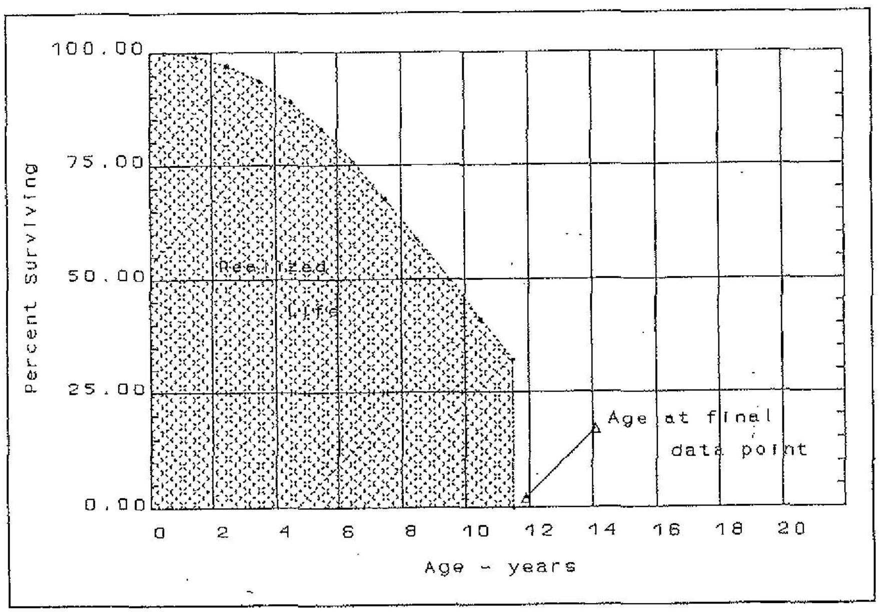

Figure 3.6. A stub survivor curve and the realized life.

Stub curves contain the essence of the shape of the curve and can be accurately fit even though the curve is not complete. To clarify this, think about conducting the following experiment. Gather several complete survivor curves and fit them to Iowa curves. Then truncate the observed survivor curves and fit the truncated curves to Iowa curves. Compare the fits of the complete and stub curves to see if consistent results are obtained. The experiment could be repeated by successively truncating more of the curve until only a short stub remained. Analysis of the results of the experiment will reveal how short the stub curve can be before the results of fitting the stub curves differ from the fit to the entire curve. This experiment was performed by Cowles (1957), who concluded that reasonably good fits were obtained for stub curves that ended at a point as high as 70% surviving. Longer stub curves (i.e., those with 40% or less surviving) were fit with a high degree of accuracy. This shows that the upper portions of the various types of Iowa curves are distinctive enough to identify the curve.

When reporting the results of fitting a stub curve, the analyst must be careful to say the fit applies to the observed data and not beyond. This can be done by appending the length of the stub to the results of the fit. This notation is suggested:

Type – life [S(b) – S(e)]

where S(b) = largest observed percent surviving (usually 100%) and S(e) = the smallest, or ending, percent surviving.

An example of the use of this notation is R2 – 30 [100% – 46%], which would show that the analyst believed the best fit of the observed data was an Iowa R2 type curve with a 30-year average life, and that the observed curve started at 100% surviving but was a stub curve whose final point was at 46% surviving. The average life of the property will be 30 years only if the future forces of retirement continue to follow those of a R2–30 Iowa curve.

A method of estimating the parameters g, s, and c of the Gompertz-Makeham equation to observed data has been described and can be applied to either a stub or complete curve. Once the parameters are estimated, the complete, smoothed curve can be plotted, and the area under the curve (i.e., the average life) can be calculated. Again, the reports of the results of the analysis must include the length of the stub curve. Only the realized life (i.e., the area under the stub curve) is known, and the estimate of life obtained from extrapolation of the survivor curves assumes that future forces of retirement will remain unchanged. The forces can be thought of as measured by the constants in the hazard function

$$h(x) = A + Bc^x$$

Table 4.10. Conversion of salvage in Table 4.9 to 1982 dollars.

	Experience year						
	82	83	84	85	86	87	88
Gross salvage	94	337	418	645	834	890	720
Cost of retiring	27	106	163	276	437	539	553
Annual retirements	157	627	941	1568	2508	3135	3292
Gross salvage ratio	.60	.54	.44	.41	.33	.28	.22
Cost of retiring ratio	.17	.17	.17	.18	.17	.17	.17
Net salvage ratio	.43	.37	.27	.23	.16	.11	.05

5 Depreciation Systems

THE recovery of capital through depreciation accruals may be thought of as a dynamic system. A system is an arrangement of things that are connected to form a complete organization of integrated parts. The state of the system at any time is defined by current values of the characteristics that define the system. A dynamic system is one where the state of the system depends on the history of the input variables. To define and study a system is to better understand the system so that more efficient methods of control can be designed to accomplish the desired ends.

There are two methods of controlling a system. One is to select an input and wait for the result or final output. If a different output is desired, the input is changed and the new output is obtained. The other method of control is to select an initial input, monitor the process, and when necessary, alter the input to achieve the desired goal. The first method is called an open control loop and the second a closed control loop. A necessary feature of the closed control loop is the feedback resulting from the monitoring of the system. A home heating system is a common and simple example of a dynamic system with a closed feedback loop. The parts of the system are a furnace and a thermostat. The thermostat monitors the room temperature and creates feedback, in the form of electrical signals, when the room temperature rises above or falls below the desired temperature. The electrical signals turn the furnace off or on to achieve the desired goal, a constant, predetermined room temperature.

Think of a depreciation accounting system as a dynamic system controlled with a closed feedback loop. Estimates of life and salvage and the amount of plant in service are inputs to the system, and the accumulated provision for depreciation is a measure of the state of the system at any time. The process of calculating the accumulated provision for depreciation is determined by the factors needed to define the system. The initial input to the system is estimates of the life and salvage, which are combined in an accrual rate. Dynamic forces affect the life and salvage, and revision of the original life and salvage estimates are the result of the monitoring process. These revisions to the initial input initiate feedback in the form of adjustments to the accumulated provision for depreciation. The goal of the system is recovery of capital in a timely manner.

One consideration that complicates this discussion is that many options can be combined to form many different depreciation systems. Whether the depreciation is for book, tax, valuation, or other purposes, each of these factors must be considered when discussing and defining a depreciation system.

DEFINING A DEPRECIATION SYSTEM

Below is a list of the factors needed to define a depreciation system. Each factor contains two or three options, and the complete definition of a system requires the selection of one option from each factor. The order of the list is arbitrary, but the last four factors are those whose options are varied when discussing depreciation systems commonly used to calculate book depreciation.

1. The depreciation concept, including (a) physical condition, (b) decrease in value, or (c) cost of operation
2. Depreciation over (a) time or (b) units of production
3. Depreciation of (a) a unit of property or (b) a group of property
4. Methods of allocation, including (a) the straight line method, (b) an accelerated method, or (c) a decelerated method
5. Procedures for applying the method of allocation including (a) the average life procedure, (b) the equal life group procedure, or (c) the probable life procedure
6. Adjustment using (a) the amortization method or (b) the remaining life method
7. Use of (a) the broad group model or (b) the vintage group model

The mathematically astute reader who multiplies the number of options in each factor will find that there are 432 combinations of options, each of which is a potential depreciation system. However, not all of these combinations are feasible, and some are unimportant. Only a few of these

combinations are of major interest when considering systems of book depreciation currently being used.

Concepts of Depreciation

Three options are available when defining the concept of depreciation. These include (a) physical condition, (b) decrease in value, or (c) cost of operation. Though all have been used by utilities to determine book value, the cost of operation is, with few exceptions, the concept in current use.

Physical condition is, perhaps, the first option a lay person would think of if asked to define depreciation. An early reference to the relationship between depreciation and physical condition is from the 1588 textbook by John Mellis who referred to a debit to the profit and loss account because "implements of householde I doe find at this day to be consumed and worn." A later reference is in the 1833 annual report of the Baltimore and Ohio Railroad, which reported that an annuity was established "to provide for the replacement of oak sills and sleepers and yellow pine string-pieces."

Two problems arise when using the concept of physical condition as a measure of depreciation. First, wear and tear do not account for all retirements; in fact, they are often a minor reason for the retirement of property. Second, physical condition can be difficult to measure. Though it is possible to measure directly the wear of railroad track and the corrosion of cast iron pipe, easily measurable wear is not characteristic of most industrial property.

The concept of loss of value is also a common depreciation concept, and the lay person often uses it to explain the difference between the purchase price and the current market value of an automobile or major household appliance. The definition from the Supreme Court case *Lindheimer v. Illinois Bell Telephone* (1934) is often quoted: "Broadly speaking, depreciation is the loss, not restored by current maintenance, which is due to all the factors causing the ultimate retirement of the property. These factors embrace wear and tear, decay, inadequacy, and obsolescence."

In contrast to the concept of physical depreciation, the Lindheimer definition recognizes that factors other than wear and tear cause or contribute to the retirement of property. The definition refers to the "loss" but does not clearly state what is "lost" or how the "loss" should be measured. A 1935 definition by the Federal Communications Commission was similar to the Lindheimer definition but referred to "loss in service value," where service value is equated to the original cost less salvage.

Use of the concept of loss of value to determine annual depreciation charges might imply the need for an annual valuation of the property owned by the organization, particularly if the rate of loss in value was not uniform or readily defined. The process of determining a value is complex, depending on the purpose of the valuation and type of property. Thus, an annual valuation of a utility could be such an expensive and time-consuming process that it would not be a practical approach to use in determining annual depreciation.

Many types of property provide a constant level of service until they are retired. The intrinsic physical value of this type of property is only that it functions. A gas meter is a common example of a type of property that may provide a constant level of service throughout its life. If value is measured by the level of service provided, the meter would retain full value until retirement because its value to the utility would depend on its function rather than its age. This concept ignores the consumption of future service and would result in an annual depreciation charge that would be zero until the final year of service. Then the charge would equal the full value and would result in deferring all depreciation charges until the final year of service. A concept that better matches depreciation to service rendered and weighs it in relation to the total service potential might be preferable for purposes of both book and valuation depreciation. That is, a quantitative measure of value, such as service-years, is generally preferable to a functional measure.

The third concept is that depreciation represents an allocated cost of capital to operation. This concept recognizes that depreciation is a cost of providing service and that an organization should recover the capital invested in equipment and other property needed to provide the required service. In fact, the term *capital recovery* is often used in connection with depreciation. An early reference to depreciation is by the Roman Marcus Vitrurius Pollio, who in 27 B.C. wrote of "walls which are built of soft and smooth-looking stone, that will not last long." He calculated that the walls would not last more than eighty years and suggested that, for purposes of valuation, one-eightieth part of their original cost be deducted each year. Pollio not only raised several issues concerning depreciation but seemed to be equating depreciation to a cost of operation.

The definition of *depreciation accounting* by the American Institute of Certified Public Accountants (1961, par. 56) reflects the concept of depreciation as a cost: "Depreciation accounting is a system of accounting that aims to distribute cost or other basic value of tangible capital assets, less salvage (if any), over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not of valuation." This definition does not use the term *loss of service value* because it is defining depreciation accounting rather than depreciation itself. The definition emphasizes that the purpose of depreciation accounting is a means of distributing cost in a rational manner during the service life, in turn providing for the systematic recovery of capital. By use of the term *useful life,* the definition encompasses all causes of retirement. By referring to the distribution of cost less salvage, this definition recognizes that salvage should be considered when developing depreciation charges.

Historically, all three concepts of depreciation have been used by utilities to determine the book value of industrial property. Of these, the concept of depreciation as the allocation of cost has proven to be the most useful and most widely used concept.

Time versus Unit of Production

Useful life can be measured in units of time or units of production (also called units of service). Measurement of life in years is a common and familiar concept. Measurement of life in units of production can be applied to some types of property such as a truck, whose life can be measured in miles (e.g., a useful life of 100,000 miles). A feeder pipeline connecting an oil field to a transmission line will be in service until the field is no longer productive. If the only function of the feeder line is to transport oil from the field to the transmission line, the life of the feeder line is determined by the reserves of the oil field that must eventually pass through the pipeline. Annual depreciation could be measured in units of production, such as barrels of oil. A railroad might depreciate rail as a function of the accumulated weight that the rail has carried.

Suppose a truck is to be depreciated over its life as measured in miles. First, the life must be estimated, say 100,000 miles. Second, the number of miles the truck will be driven during the next year, say 27,000 miles, must be forecast to have sufficient information to budget the annual depreciation charge. Third, at the end of the year when the budgeted annual depreciation becomes an accounting entry, the amount would be calculated to reflect the actual miles driven.

The most common measure of life is in units of time rather than units of production. Most types of property (e.g., poles, buildings, wire) do not have a measure of production associated with them. If the life can be measured in some unit of production and the rate of production is constant from year to year, measurement of life in either units of time or production will result in the same annual accruals. The unit of production has strong appeal in situations where use varies significantly over time and the life can be measured in units of production. But these two conditions are not often met, and usually life is measured over time.

Depreciation of an Individual Unit versus a Group

Accounting records of transactions relating to depreciable property can be kept on either a unit or a group basis. An individual unit of property has a single life, while the units in a group of property display a range, or dispersion, of lives. Grouping many units of property into a single account simplifies the accounting system but also creates a complexity not encountered in the depreciation of an individual unit. The resulting complications provide a major challenge to the depreciation analyst.

A vintage group refers to a group of property placed in service during the same year. The plant in service decreases until all units are retired from service. The individual unit and the vintage group are similar because each has well-defined life characteristics. The life of an individual unit is described by a single number and the life of a vintage group is described by a survivor curve, which is a statistical description of the lives of the units of property in the group.

Methods of Allocation

To fully recover capital invested in plant and equipment, the total depreciation charge must equal the depreciation base. When using the allocation of cost concept, the depreciation base is the initial, or original, cost less net salvage. The annual depreciation accrual rate for a unit of property can be (a) constant over life (straight line), (b) high during early years and low in later years (accelerated), or (c) low in early years and high in later years (decelerated). Most methods of allocation fall into one of these three classifications, although it would be possible to develop a method that is a combination of them. The straight line method of allocation is the method of allocation most often used when calculating book depreciation. Accelerated methods of allocation are commonly used for tax purposes. Decelerated methods of allocation are not in common use for book or tax purposes, but they are of historical interest and are used in valuation problems.

Average Life, Equal Life Group, or Probable Life Procedures

The average life and equal life group procedures are two ways of applying a method of allocation to determine the annual accrual. The probable life procedure is similar to the average life procedure, but is not appropriate for depreciation accounting.

A group of property displays a wide range of lives, and the life characteristics of the group must be described statistically. This is in contrast to a unit of property, whose life can be described as a single number. When depreciating a group of property, rather than a unit of property, a major decision must be made whether to base the depreciation accrual rate on the average life of the group (the average life procedure) or whether to divide the group into subgroups of equal life (the equal life group procedure).

In the average life procedure, a constant annual accrual rate based on the average life of all property in the group is applied to the surviving

property. Most retirements occur either before or after, rather than at, the average life, but both short- and long-lived property are depreciated at the same rate. Property having a shorter life than the average will not be fully depreciated by the time of its retirement. Because the accrual rate is based on the average life of the group, the difference between accruals for early retirements and the full cost of the early retirements will be balanced during the life of the property having lives longer than the average. The result is that the group will be fully depreciated by the time of the final retirement.

In the equal life group procedure the property is divided into subgroups that each have a common life. Each subgroup is then depreciated as a unit using an accrual rate based on the common life of the group. Each unit is fully depreciated by the time it is retired. Application of the equal life group procedure is generally considered to better match the consumption of capital with service provided than does application of the average life procedure.

Any of the three methods of allocation (i.e., straight line, accelerated, or decelerated) can be applied to an individual unit or to group property. When the average life procedure is applied, the straight line method of allocation is easily used; application of either an accelerated or a decelerated method becomes more complicated. When the equal life group procedure is used, any of the three methods of allocation can be easily used.

The probable life procedure is a variation of the average life procedure. It is not valid for depreciation accounting or capital recovery because it does not fully depreciate the group. The depreciation charges are allocated over the average life of the property remaining in service (i.e., over the probable life), so that the continually decreasing rate is inadequate to fully recover the depreciable base. Use of this procedure should be restricted to those special situations where it is applicable; for example, it may used in the valuation process.

Methods of Adjustment

Depreciation accrual rates are calculated using estimates of the service life and salvage. Over time, new events that provide additional information occur, and the existing estimates are revised. A revision of the estimates of life and salvage results in the recognition that the accumulated provision for depreciation may now be either higher or lower than necessary, depending upon the magnitude and direction of the revised estimates. This recognition may justify an adjustment to the accumulated provision for depreciation, an adjustment to the annual depreciation rate, or both.

Adjustments to the accumulated provision for depreciation[1] can be made using either a fixed amortization period or the remaining life basis. The term *amortization method of adjustment* is used to describe a general equal to the area under the survivor curve and may be written (area under the survivor curve)/AL = original cost, or by rearranging this equation, AL = (the area under the survivor curve)/(original cost). The average life has been shown to equal the area under the survivor curve divided by the original cost (true whether the survivor curve is measured in dollars or units), so the original equality is true. We can conclude that this system will fully recover the initial investment regardless of the shape of the survivor curve.

This equation also shows that if the AL used in the accrual rate is not equal to the actual average life, the sum of the accruals will not equal the original cost. Suppose that the actual life was 8 years, but a life of 6 years was forecast and used in the depreciation rate. The total accruals would equal 8/6 or 133% of the original cost, and the accumulated provision for depreciation would show an overaccrual equal to 133% − 100% or 33% of the original cost at the time of the final retirement. Similarly, a forecast of a life of 10 years would result in total accruals of 8/10 or 80% of the original cost. At the time of the final retirement the accumulated provision for depreciation would show an underaccrual equal to 100% − 80% or 20% of the original cost.

Consider a property group having the survivor curve shown in Figure 5.1. This curve could result from the grouping of two units, one with a cost of $4000 and a 4-year life and the second with a cost of $6000 and an 8-year life. The average life (AL) is the area under the survivor curve divided by the original cost or the AL = [(4000 × 4) + (6000 × 8)]/10000 or 6.4 years. The straight line, average life annual accrual rate is 1/6.4 or 15.625%.

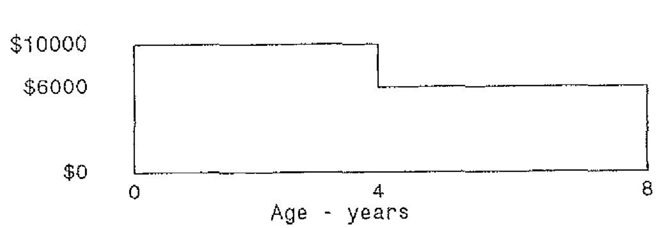

Figure 5.1. A survivor curve with an average life of 6.4 years.

NOTE: To simplify calculations in this section, age intervals will be 0–1, 1–2, 2–3, etc., installations will be assumed to occur at the start of the age interval, and retirements will be assumed to occur at the end of the age interval. The average plant in service during the age interval will then equal the balance at the start of the interval, so that applying the annual accrual rate to the plant in service at the start of the interval is equivalent to applying it to the average balance. In all tables in this section, the balance, accumulated provision for depreciation, and calculated accumulated depreciation are calculated at the beginning of the year. Note that the accumulated provision for depreciation is zero at the beginning of the initial year. Examples using the half-year convention will be shown later.

Table 5.5 (see end of chapter) shows the annual accruals and accumulated provision for depreciation that result from the SL-AL system. Column (b) shows beginning of year balances of $10,000 for the four years 1974 to 1977, and balances of $6000 for the next four years, 1978 to 1981. This follows the survivor curve shown in Figure 5.1. Column (c) shows a $4000 retirement at the end of 1977 and a $6000 retirement at the end of 1981. The annual accrual, column (e), is the product of the rate, column (d), and the plant balance at the start of the year, column (b). As described in the preceding note, retirements are assumed to take place at the end of the year, so that the plant balance at the start of the year is also the average balance during the year. The accumulated provision for depreciation, column (f), is zero at the start of the first year and is then increased by the annual accruals and reduced by the annual retirements. At the time of the final retirement, the accumulated provision for depreciation is zero, showing that the sum of the annual accruals and the annual retirements equals zero and that the property is fully depreciated.

Suppose that at the time of the initial installation of the property, the estimate of the average life was 7.4 years. If the rate 1/7.4 is used throughout the life of the property but the actual life is 6.4 years, then only (6.4/7.4)($10000) or $8649 will be depreciated and $10000 − $8649 or $1351 of invested capital will not be recovered. This is verified by the calculations shown in Table 5.6 (see end of chapter).

An Adjustment Problem—AL Procedure

Now suppose that in January 1977, because of events and activities occurring since 1974, the original forecast of 7.4 years average life is revised to 6.4 years. Table 5.7 (see end of chapter) shows the accumulated provision for depreciation at the start of 1977 is $4054. Unless some corrective action is taken, the annual accruals will not equal the $10,000 original cost, and at the time of the final retirement a total of $1351 will remain unrecovered. The SL-AL system of calculating the annual accruals must be augmented to include a method of adjustment to define a depreciation system that will adapt to the almost certain circumstance that forecasts are revised from time to time.

When there is a revision of the original forecast of service life, it

NOTES

1. Gas (FERC), electric (FERC), and water companies (NARUC) use the title Accumulated Provision for Depreciation, while telecommunications (FCC) and railroads (ICC) use the title Accumulated Depreciation. Telecommunications used the title Depreciation Reserve until 1986. We will use the term *Accumulated Provision for Depreciation*. It refers to the net balance of either of these accounts.

2. The CADR is also called reserve ratio or the accrued ratio.

3. The balance, usually shown in column (b) of the tables at the end of this chapter, can be defined as the balance at the start of the year or the average balance during the year. The convention used in this chapter results in the start-of-year balance equaling the average balance. When other conventions are used, a small difference between the two annual accruals may result because the remaining life calculation typically applies the rate to the beginning-year balance while the amortization calculation typically applies the rate to the average balance during the year.

4. All of these variables except AL are a function of the age of the property, and a complete notation would include an index for the age. For example, rather than RL, use RL(i) = the remaining life at age i. The following calculations all refer to the same year so the index i is dropped.

5. Remember that both the realized and future salvage ratios are averages. Both the survivor curve and the salvage ratio at each age from zero to the maximum life are required to calculate these average ratios. For convenience, we will use the terms realized or future salvage ratio rather than *average* realized or *average* future salvage ratio.

6 Continuous Property Groups

CHAPTER 5 used elementary survivor curves, a single vintage group, and a simplified format to illustrate the calculation of the annual accrual for depreciation for several systems of depreciation. This chapter will use Iowa survivor curves and formats characteristic of those found in industrial practice to illustrate the application of these systems of depreciation to continuous property groups. The illustrations will include the use of both average salvage and salvage that varies with age.

A continuous property group[1] is created when vintage groups are combined to form a common group. Each year property is removed from service for many reasons and, at the same time, property may be added either to replace property that was retired or to increase service capacity. Over time the operating and physical characteristics of the property change, but the continuous property group continues as long as the service it provides is needed. If new vintages are no longer added, the continuous property group becomes closed, or bounded, and over time becomes smaller and finally vanishes. The continuous property group, which is usually recorded as a plant account or subaccount, is of interest because it represents the most common method of grouping assets for depreciation.

The method of allocation, the procedure for applying the method of allocation, and the method of adjustment (e.g., SL-AL-AM) specify the factors that define a depreciation system for a vintage group. The terms broad group and vintage group describe two ways of viewing the life and salvage characteristics of the vintage groups that have been combined to form a continuous property group for purposes of depreciation. One approach is to view the continuous property group as a collection of vintage groups each of which have the same life and salvage characteristics. This is called the *broad group model.* The other approach is to view the continuous property group as a collection of vintage groups each of which can have different life and salvage characteristics. This is called the *vintage group model.* The model being used will be identified by either stating that the broad or vintage group model is being used or by adding the initials BG or VG to those defining the depreciation system (e.g., SL-AL-AM-BG).

THE BROAD GROUP MODEL

The broad group model requires that a single survivor curve and a single salvage schedule be chosen to represent all the vintages in the continuous property group. Though it is likely that individual vintages will have different life and salvage characteristics, the broad group model makes the simplifying assumption that all vintages in the continuous property group have identical life and salvage characteristics. Thus, if the broad group model is used, it must be reasonable to represent the life and salvage characteristics of each vintage with a single survivor curve and salvage schedule.

The Average Life Procedure

The average life (AL) procedure is discussed in this section. First the amortization (i.e., the SL-AL-AM-BG system) and then the remaining life method of adjustment (i.e., the SL-AL-RL-BG system) will be illustrated.[2] Both the life and salvage characteristics must be chosen in a manner consistent with the assumptions of the broad group model to provide reasonable estimates of depreciation. When using the average life procedure, the reasoning used to choose the life and salvage characteristics of the broad group is the same for both the AM and RL methods of adjustment.

Figure 6.1 represents the realized (historical) and future (forecast) life characteristics of a continuous property group. Each row represents a vintage group. The first row represents the oldest surviving vintage and the final row the most recent vintage. Each column represents a calendar year. The first column is the year during which the oldest surviving vintage was installed. The space dividing the realized life and the future life marks the end of the most recent year, and the last column is the year the last unit from the last surviving vintage is retired. Let each cell represent the vintage surviving plant at the end of the calendar year, so that the cells in any row form a survivor curve reflecting the life characteristics of that vintage.

Tables 8.1 and 8.2 in Chapter 8 contain the schedule of additions, retirements, and plant balances for the continuous property group called Account 897—Utility Devices. This property group is used to illustrate the

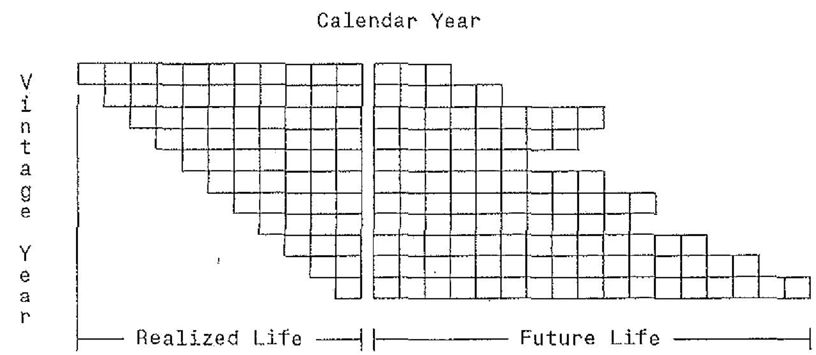

Figure 6.1. A representation of the realized and future life of a continuous property group.

calculation of the annual accrual for depreciation. Tables 8.1 and 8.2 contain the data necessary to construct the triangular-shaped, realized life portion of Figure 6.1. Place yourself in time at the end of the final year for which there is data (i.e., for Account 897 this is December 31, 1990). Look back in time and see the historical record of additions and retirements. Now imagine moving forward in time. As the years pass, visualize the declining vintage balances, with some vintages becoming completely retired while others remain in service. Finally, the last unit of the last vintage is retired. The record of the future balances, contained in the righthand side of the figure, defines the future life. Each row (i.e., each vintage survivor curve) can be divided into either realized life or future life. Older vintages are mostly realized life and newer vintages are mostly future life. The realized life is documented in the aged data while the future life is a forecast. The product of the age at retirement times the amount of the retirement, summed over all retirements and divided by the total retirements is the average life. The job of the depreciation professional is, first, to determine the realized life and, second, to forecast the future life. Then when using the AL procedure and the broad group model, he or she must select the survivor curve that best describes the life characteristics (i.e., a single curve that describes both the realized life and the future life) of the single group of property formed by combining the vintage groups shown in Figure 6.1. The Iowa S1–10 survivor curve will be used to describe the life characteristics of Account 897 for use with the average life procedure and the broad group model.

Figure 6.1 also can be used to help explain the method of estimating the average salvage ratio and the future salvage ratios. For this purpose, let the study date forward), because, under the ELG procedure, property should be fully depreciated at retirement and the accrual rate depends only on the shape of the survivor curve from the age at the study date to maximum life. It is not unusual to estimate a single average net salvage ratio and apply it to each ELG, rather than to use aged salvage with a different salvage ratio for each ELG. The use of an average salvage ratio is often the result of the lack of aged salvage data and the lack of models to estimate future salvage ratios by age.

Remaining life depreciation usually refers to the SL-AL-RL system of depreciation; use of the AL procedure is implied as is use of the same survivor curve for all vintages. Emphasis is placed on forecasting the remaining life or future curve. When calculating the future accruals, the same future salvage ratio is often used for all vintages.

Users of remaining life depreciation often do not explicitly calculate the CAD. As previously discussed, calculation of the CAD is implicit in the use of the remaining life method of adjustment, because the variation between the CAD and the accumulated provision for depreciation is automatically amortized over the remaining life. Explicit calculation of the CAD will allow the depreciation professional to find the portion of the annual accrual associated with amortization of the variation (either positive or negative).

When the ELG procedure is used with the remaining life method of adjustment, a term such as *ELG – remaining life depreciation* may be used to describe the SL-ELG-RL system. A single future survivor curve and future salvage ratio usually are applied to all vintages, although the future curve could be varied. Several pages in Chapter 6 were devoted to a discussion of the allocation of the accumulated provision for depreciation to each vintage when using this depreciation system. It was shown that allocation in proportion to the calculated future accruals resulted in a composite remaining life that is independent of the variation between the CAD and the accumulated provision for depreciation. Then the composite ELG accrual rate is calculated based on that composite remaining life.

Specify each of the four factors of a depreciation system to ensure communication. It is not safe to assume that life and salvage are treated in the same manner. Take care to indicate differences in the manner in which they are treated.

NOTE

1. *Whole life* is also used in a second context in which it is used in contrast to *location life*. When property is reused, the location life is the length of time from installation at a particular location to retirement from that location. The whole life can then be divided into a series of location lives.

8 Actuarial Methods of Developing Life Tables

FOUR basic methods of developing a life table can be used when aged data are available. These include the placement band method,[1] the experience band method, the multiple original group method, and the individual unit method. Each provides special insight to the life characteristics of the property and each has its limitations.

DATA REQUIREMENTS

The term *aged data* is used to describe the information reflecting the initial age distributions, annual additions, and the changes to that property for each year in the history of the account. Original data include the annual additions, retirements, transfers, sales, acquisitions, and other transactions. These data must be checked to ensure they are consistent, accurate, and coded so that they can be used to find the exposures and retirements for each age interval.

The aged data base used in this chapter is an account labeled Account 897–Utility Devices and is shown in Tables 8.1 and 8.2 (see end of chapter). These data contain the initial age distribution and have been simplified by assuming that the only two transactions can occur—the addition of new property and the retirement of installed property. Table 8.1 displays the of 6.00/123.00 or 0.0488. Any property that was exposed but not retired during the age interval must have survived or still have been in service at the end of the age interval. Therefore, the survivor ratio, shown in column (e), is 1 minus the retirement ratio. For age interval 8.5–9.5 years the survivor ratio is 1 − 0.0488 or 0.9512.

Column (f) contains the percent surviving at the beginning of the interval. At age 0, 100% of the property is in service and the retirement ratio for the age interval 0.0–0.5 years shows that survivor ratio for the interval is 1 − 0 or 1, leaving 1 × 100.00% or 100.00% surviving at age 0.5 years. During age interval 0.5–1.5 years, the survivor ratio is 1 − 0.0137 or 0.9863, so that the percent surviving at age 1.5 years is 0.9863 × 100.00% or 98.63%. In general, the percent surviving at the beginning of an interval is the percent surviving at the beginning of the previous interval multiplied by the survivor ratio during the interval.

In this example, all the original $146.00 has been retired from service. Often plant is still in service at the start of the oldest age interval resulting in an incomplete or stub survivor curve. The survivor curve is plotted by graphing the percent surviving shown in column (f) as a function of the age, shown in column (a).

The retirement ratios show a tendency to increase with age, although there is randomness as the ratios fluctuate from year to year. The retirement ratio during the age interval 13.5–14.5 years appears significantly larger than its neighbors. Look to the forces of retirement during 1982 for a possible explanation of this large ratio. During the year 1988, all the remaining plant in service is retired and the resulting retirement ratio of 1 brings the percent surviving to zero. Figure 8.2 (see end of chapter) is a graph of this survivor curve.

Placement Band Method

Perhaps the most intuitive method of constructing a life table is by the placement band method. First, consider a placement band consisting of a single year, 1968. Experience for this placement band starts in 1968 and ends in 1990, as shown in Figure 8.3 (see end of chapter).

Table 8.3 is the life table developed using the 1968 placement band. Note that in the table heading the placement band is defined 1968–1968, while the experience band runs from 1968, the first year in which property was installed, to 1990, the most recent experience.

When using the placement band method, the resulting survivor curve describes the life characteristics of the group of property installed during that placement year. Suppose there had been no transfers, sales, acquisitions, and other entries, but only the initial installations followed by the regular retirements each year. The survivor curve obtained from the single

placement year would be identical with that obtained by plotting the dollars surviving at the end of each year. Examination of the placement band method when only additions and retirements are considered emphasizes that this method traces the history of the particular group of property installed during a specific placement year or band of years.

Usually placement bands include more than one year, defining a group of property installed during a specific period or era, rather than a single year. Construction of a band of more than one year raises two computational questions. To identify and help answer these questions, consider the placement band formed by combining the 1968, 1969, and 1970 placement years. This band is shown graphically in Figure 8.4 and the resulting life table is shown in Table 8.4 (see end of chapter for figures and tables).

For the typical age interval, retirements and exposures from each of the three placement bands must be combined to obtain a single retirement ratio, and this raises the first computational problem. Two possible methods of combining these numbers come to mind, but first the retirement ratio for each of the three placement bands must be calculated. For the age interval 6.5–7.5 years in the 1968–1970 placement band, retirements come from (a) the 1968 placement band and the 1975 experience year—5 units, (b) the 1969 placement band and the 1976 experience band—2 units, and (c) the 1970 placement band and the 1977 experience band—8 units. These retirements all occur during the same age interval, 6.5–7.5 years. Exposures of 133, 69, and 102 for each of the three years are obtained in a similar manner and retirement ratios of 5/133 or 0.0376, 2/69 or 0.0290, and 8/102 or 0.0784 can then be calculated. The first method to combine these ratios, and the method used in all remaining examples, is to weight each ratio by its exposures/total exposures and calculate a weighted average of (133 × 0.0376 + 69 × 0.0290 + 102 × 0.0784)/(133 + 69 + 102) or 0.0493. This is equivalent to dividing the sum of the retirements by the sum of the exposures, or (5 + 2 + 8)/(133 + 69 + 102) or 0.0493.

The second method is to calculate an unweighted average of the three rates to obtain (0.0375 + 0.0289 + 0.0784)/3 or 0.0483. This weights each placement year equally regardless of the number of units involved, and this method should be considered when it is desirable to give each vintage equal weight. As a practical matter, the two methods will typically yield approximately the same results. The first method is most commonly used because it gives equal weight to each unit.

The second computational problem occurs near the end of the survivor curve. Through the first 19 age intervals, each of the three years contributes exposures and retirements to be included in the calculation of the retirement ratio. However, during the age interval 17.5–18.5 years, the exposures and retirements from the 1970 placement band are from the final experience year, 1990, and this placement cannot contribute information for the

4. Identification of special activities or events that may, in the future, affect retirement of property. This will include only those activities that the analyst encountered during the life analysis process and would not be a comprehensive list.

Life analysis necessarily precedes life forecasting. Analysis of historical data and events gives the forecaster the raw material on which the forecast will be based.

RETIREMENT: A MANAGEMENT DECISION

Early work in the analysis of service life of industrial property was based on models, developed by actuarial scientists, that described age characteristics of human populations. *Forces of mortality* is a descriptive term used by these scientists, and, although "mortality" properly refers to humans, the term has been applied to industrial property. Forces of retirement is perhaps a better phrase to use to describe the various conditions that lead to the retirement of industrial property. Many useful categories of forces of retirement have been made, and the following list is from *Engineering Valuation and Depreciation* (Marston, Winfrey, and Hempstead, 1953).

A. Physical condition
   1. Accident
   2. Catastrophe
   3. Deterioration from time
   4. Wear and tear from use
B. Functional situations
   5. Inadequacy
   6. Obsolescence
      a. Economic
      b. Style and mode
C. Situations unrelated to the property
   7. Termination of the need
   8. Abandonment of the enterprise
   9. Requirement of the public authority

Retirement of industrial property is the result of a management decision. Some of these are easy decisions. When a car, for example, runs into and destroys a telephone pole, management has little choice but to retire and replace the pole. The decision to retire an electric generating system in more difficult and its timing is critical to the financial health of the company.

Decisions to replace industrial property are, to some extent, a function of the laws of nature that determine the physical characteristics and properties of materials and processes used to provide services. Many models used in engineering reflect natural phenomena and are based on the work of mathematicians, physicists, chemists, and other scientists. For example, failure of railroad track caused by wear may be a highly predictable function of the cumulative tons of traffic carried by the track. Models that develop this functional relationship can be very useful in developing maintenance policy, planning operations, and, to some extent, predicting service life.

However, most retirements are more subtle functions of factors such as the economy, changing technology, or government regulations, all of which significantly influence management decisions. Other factors such as maintenance policy or organizational goals are a direct result of management decisions. It is accurate to think of retirement as a management decision and realize that when forecasting service life, the various factors that mold management thought and action must be identified.

FORECASTING: A SYSTEMATIC APPROACH

The process used for developing a forecast of service life characteristics is heavily dependent on the circumstances surrounding the specific group of property under consideration. The appropriate forecasting approach can range from a traditional, well-defined, highly mechanical process to a nontraditional, loosely defined process involving newly developed forecasting techniques. In addition, because forecasting involves significant portions of judgment, experts may disagree upon which process is appropriate.

Most of the forecasting problems encountered in public utilities can be classified into several general categories. One method of developing a systematic approach to forecasting is to define the general categories and then prescribe a forecasting approach to each. When necessary, additional categories can be defined and appropriate forecasting approaches developed. Sometimes new techniques may be needed. The set of categories and prescriptions then defines a systematic approach to forecasting.

Seven Major Categories

This section defines seven general categories of forecasting problems. The characteristics of each category are defined by the results or output from the life analysis process. Each category is broad enough to maintain its own distinct characteristics. Although these seven categories are not

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APPENDIX I Iowa Curve Tables

Source: The table values for the L, S, and R type curves are based on calculations using 10 place logarithms and made under the supervision of Robley Winfrey. The values at 5% intervals were first published in *Depreciation of Group Properties,* Iowa Engineering Experiment Station Bulletin 155, published in 1942 and republished 1969 by the Iowa State University Engineering Research Institute. Winfrey's complete tables, with values at 1% intervals, were first published in *The Estimation of Depreciation* by Fitch, Bissinger, and Wolf in 1975. The values for the O type curves are from Winfrey's *Statistical Analysis of Industrial Property Retirements,* Bulletin 125 as revised in April 1967 by Harold A. Cowles.

Table A

Iowa Type curve L0

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	99.87056	99.1198	0.0088	100.12
2	99.68038	98.3080	0.0169	100.31
3	99.44834	97.5362	0.0246	100.54
4	99.18298	96.7958	0.0320	100.80
5	98.88950	96.0816	0.0392	101.08
6	98.57147	95.3900	0.0461	101.39
7	98.23157	94.7183	0.0528	101.72
8	97.87191	94.0646	0.0594	102.06
9	97.49419	93.4271	0.0657	102.43
10	97.09986	92.8045	0.0720	102.80
11	96.69011	92.1956	0.0780	103.20
12	96.26604	91.5996	0.0840	103.60
13	95.82657	91.0173	0.0898	104.02
14	95.37855	90.4425	0.0956	104.44
15	94.91874	89.8782	0.1012	104.88
16	94.44381	89.3277	0.1067	105.33
17	93.96040	88.7847	0.1122	105.78
18	93.46710	88.2506	0.1175	106.25
19	92.96443	87.7251	0.1227	106.73
20	92.45291	87.2077	0.1279	107.21
21	91.93301	86.6981	0.1330	107.70
22	91.40618	86.1949	0.1381	108.19
23	90.86982	85.7007	0.1430	108.70
24	90.32735	85.2124	0.1479	109.21
25	89.77813	84.7306	0.1527	109.73
26	89.22254	84.2551	0.1574	110.26
27	88.66092	83.7857	0.1621	110.79
28	88.09361	83.3220	0.1668	111.32
29	87.52092	82.8639	0.1714	111.86
30	86.94316	82.4113	0.1759	112.41
31	86.36064	81.9638	0.1804	112.96
32	85.77364	81.5213	0.1848	113.52
33	85.18246	81.0836	0.1892	114.08
34	84.58736	80.6505	0.1935	114.65
35	83.98860	80.2219	0.1978	115.22
36	83.38647	79.7976	0.2020	115.80
37	82.78120	79.3774	0.2062	116.38
38	82.17306	78.9611	0.2104	116.96
39	81.56228	78.5487	0.2145	117.55
40	80.94912	78.1399	0.2186	118.14
41	80.33381	77.7346	0.2227	118.73
42	79.71659	77.3326	0.2267	119.33
43	79.09769	76.9337	0.2307	119.93
44	78.47734	76.5379	0.2346	120.54
45	77.85578	76.1450	0.2386	121.14
46	77.23323	75.7547	0.2425	121.75
47	76.60992	75.3670	0.2463	122.37
48	75.98606	74.9817	0.2502	122.98
49	75.36190	74.5986	0.2540	123.60
50	74.73764	74.2175	0.2578	124.22
51	74.11342	73.8384	0.2616	124.84
52	73.48930	73.4612	0.2654	125.46
53	72.86534	73.0860	0.2691	126.09
54	72.24160	72.7127	0.2729	126.71
55	71.61815	72.3413	0.2766	127.34
56	70.99504	71.9719	0.2803	127.97
57	70.37234	71.6043	0.2840	128.60
58	69.75010	71.2386	0.2876	129.24
59	69.12840	70.8748	0.2913	129.87
60	68.50728	70.5128	0.2949	130.51
61	67.88682	70.1527	0.2985	131.15
62	67.26707	69.7945	0.3021	131.79
63	66.64809	69.4380	0.3056	132.44
64	66.02994	69.0834	0.3092	133.08
65	65.41269	68.7306	0.3127	133.73
66	64.79639	68.3795	0.3162	134.38
67	64.18110	68.0303	0.3197	135.03
68	63.56689	67.6828	0.3232	135.68
69	62.95380	67.3371	0.3266	136.34
70	62.34191	66.9931	0.3301	136.99
71	61.73127	66.6508	0.3335	137.65
72	61.12193	66.3103	0.3369	138.31
73	60.51396	65.9715	0.3403	138.97
74	59.90741	65.6343	0.3437	139.63
75	59.30233	65.2989	0.3470	140.30
76	58.69880	64.9652	0.3503	140.97
77	58.09686	64.6331	0.3537	141.63
78	57.49656	64.3027	0.3570	142.30
79	56.89797	63.9739	0.3603	142.97
80	56.30114	63.6468	0.3635	143.65
81	55.70613	63.3213	0.3668	144.32
82	55.11298	62.9974	0.3700	145.00
83	54.52176	62.6751	0.3732	145.68
84	53.93250	62.3544	0.3765	146.35
85	53.34528	62.0353	0.3796	147.04
86	52.76014	61.7178	0.3828	147.72
87	52.17713	61.4018	0.3860	148.40
88	51.59631	61.0874	0.3891	149.09
89	51.01772	60.7745	0.3923	149.77
90	50.44141	60.4631	0.3954	150.46
91	49.86744	60.1533	0.3985	151.15
92	49.29585	59.8450	0.4016	151.84
93	48.72669	59.5382	0.4046	152.54
94	48.16001	59.2329	0.4077	153.23
95	47.59585	58.9290	0.4107	153.93

Iowa Type curve L0

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	44.81457	57.4317	0.4257	157.43
101	44.26652	57.1366	0.4286	158.14
102	43.72131	56.8428	0.4316	158.84
103	43.17898	56.5505	0.4345	159.55
104	42.63958	56.2596	0.4374	160.26
105	42.10313	55.9700	0.4403	160.97
106	41.56968	55.6818	0.4432	161.68
107	41.03927	55.3950	0.4460	162.40
108	40.51194	55.1096	0.4489	163.11
109	39.98773	54.8255	0.4517	163.83
110	39.46665	54.5427	0.4546	164.54
111	38.94879	54.2613	0.4574	165.26
112	38.43413	53.9812	0.4602	165.98
113	37.92274	53.7024	0.4630	166.70
114	37.41463	53.4249	0.4658	167.42
115	36.90985	53.1487	0.4685	168.15
116	36.40843	52.8738	0.4713	168.87
117	35.91039	52.6002	0.4740	169.60
118	35.41577	52.3278	0.4767	170.33
119	34.92459	52.0567	0.4794	171.06
120	34.43690	51.7868	0.4821	171.79
121	33.95270	51.5182	0.4848	172.52
122	33.47204	51.2509	0.4875	173.25
123	32.99494	50.9847	0.4902	173.98
124	32.52142	50.7198	0.4928	174.72
125	32.05150	50.4561	0.4954	175.46
126	31.58522	50.1935	0.4981	176.19
127	31.12260	49.9322	0.5007	176.93
128	30.66365	49.6721	0.5033	177.67
129	30.20840	49.4131	0.5059	178.41
130	29.75687	49.1553	0.5084	179.16
131	29.30908	48.8987	0.5110	179.90
132	28.86504	48.6432	0.5136	180.64
133	28.42478	48.3889	0.5161	181.39
134	27.98832	48.1357	0.5186	182.14
135	27.55566	47.8836	0.5212	182.88
136	27.12683	47.6327	0.5237	183.63
137	26.70184	47.3829	0.5262	184.38
138	26.28070	47.1341	0.5287	185.13
139	25.86343	46.8865	0.5311	185.89
140	25.45004	46.6400	0.5336	186.64
141	25.04053	46.3946	0.5361	187.39
142	24.63493	46.1502	0.5385	188.15
143	24.23324	45.9069	0.5409	188.91
144	23.83547	45.6646	0.5434	189.66
145	23.44162	45.4235	0.5458	190.42
146	23.05171	45.1833	0.5482	191.18
147	22.66573	44.9442	0.5506	191.94
148	22.28371	44.7062	0.5529	192.71
149	21.90563	44.4691	0.5553	193.47
150	21.53151	44.2331	0.5577	194.23
151	21.16135	43.9981	0.5600	195.00
152	20.79514	43.7641	0.5624	195.76
153	20.43290	43.5311	0.5647	196.53
154	20.07462	43.2991	0.5670	197.30
155	19.72030	43.0681	0.5693	198.07
156	19.36994	42.8381	0.5716	198.84
157	19.02354	42.6090	0.5739	199.61
158	18.68110	42.3809	0.5762	200.38
159	18.34261	42.1538	0.5785	201.15
160	18.00807	41.9276	0.5807	201.93
161	17.67748	41.7023	0.5830	202.70
162	17.35082	41.4780	0.5852	203.48
163	17.02810	41.2547	0.5875	204.25
164	16.70931	41.0322	0.5897	205.03
165	16.39443	40.8107	0.5919	205.81
166	16.08347	40.5901	0.5941	206.59
167	15.77640	40.3704	0.5963	207.37
168	15.47323	40.1515	0.5985	208.15
169	15.17394	39.9336	0.6007	208.93
170	14.87851	39.7166	0.6028	209.72
171	14.58695	39.5005	0.6050	210.50
172	14.29923	39.2852	0.6071	211.29
173	14.01534	39.0708	0.6093	212.07
174	13.73527	38.8573	0.6114	212.86
175	13.45901	38.6447	0.6136	213.64
176	13.18653	38.4329	0.6157	214.43
177	12.91783	38.2219	0.6178	215.22
178	12.65288	38.0118	0.6199	216.01
179	12.39168	37.8025	0.6220	216.80
180	12.13419	37.5940	0.6241	217.59
181	11.88041	37.3864	0.6261	218.39
182	11.63032	37.1796	0.6282	219.18
183	11.38389	36.9736	0.6303	219.97
184	11.14111	36.7684	0.6323	220.77
185	10.90196	36.5640	0.6344	221.56
186	10.66640	36.3605	0.6364	222.36
187	10.43444	36.1577	0.6384	223.16
188	10.20603	35.9557	0.6404	223.96
189	9.98117	35.7544	0.6425	224.75
190	9.75982	35.5540	0.6445	225.55
191	9.54197	35.3543	0.6465	226.35
192	9.32758	35.1554	0.6484	227.16
193	9.11664	34.9573	0.6504	227.96
194	8.90912	34.7599	0.6524	228.76
195	8.70500	34.5632	0.6544	229.56

Table A continued

Iowa Type curve L0

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
200	7.73441	33.5911	0.6641	233.59
201	7.55011	33.3989	0.6660	234.40
202	7.36902	33.2073	0.6679	235.21
203	7.19111	33.0165	0.6698	236.02
204	7.01636	32.8264	0.6717	236.83
205	6.84472	32.6370	0.6736	237.64
206	6.67618	32.4483	0.6755	238.45
207	6.51071	32.2603	0.6774	239.26
208	6.34827	32.0729	0.6793	240.07
209	6.18884	31.8863	0.6811	240.89
210	6.03239	31.7003	0.6830	241.70
211	5.87888	31.5150	0.6848	242.52
212	5.72828	31.3304	0.6867	243.33
213	5.58057	31.1464	0.6885	244.15
214	5.43571	30.9632	0.6904	244.96
215	5.29368	30.7805	0.6922	245.78
216	5.15443	30.5985	0.6940	246.60
217	5.01795	30.4172	0.6958	247.42
218	4.88419	30.2365	0.6976	248.24
219	4.75313	30.0564	0.6994	249.06
220	4.62473	29.8770	0.7012	249.88
221	4.49897	29.6982	0.7030	250.70
222	4.37580	29.5201	0.7048	251.52
223	4.25521	29.3425	0.7066	252.34
224	4.13714	29.1656	0.7083	253.17
225	4.02159	28.9893	0.7101	253.99
226	3.90850	28.8136	0.7119	254.81
227	3.79785	28.6385	0.7136	255.64
228	3.68961	28.4640	0.7154	256.46
229	3.58374	28.2901	0.7171	257.29
230	3.48021	28.1168	0.7188	258.12
231	3.37898	27.9441	0.7206	258.94
232	3.28004	27.7720	0.7223	259.77
233	3.18333	27.6005	0.7240	260.60
234	3.08884	27.4295	0.7257	261.43
235	2.99653	27.2591	0.7274	262.26
236	2.90636	27.0893	0.7291	263.09
237	2.81830	26.9201	0.7308	263.92
238	2.73233	26.7514	0.7325	264.75
239	2.64840	26.5833	0.7342	265.58
240	2.56649	26.4158	0.7358	266.42
241	2.48657	26.2487	0.7375	267.25
242	2.40860	26.0823	0.7392	268.08
243	2.33255	25.9163	0.7408	268.92
244	2.25838	25.7511	0.7425	269.75
245	2.18608	25.5862	0.7441	270.59
246	2.11560	25.4219	0.7458	271.42
247	2.04692	25.2581	0.7474	272.26
248	1.98000	25.0949	0.7491	273.09
249	1.91481	24.9322	0.7507	273.93
250	1.85133	24.7700	0.7523	274.77
251	1.78951	24.6084	0.7539	275.61
252	1.72934	24.4472	0.7555	276.45
253	1.67078	24.2866	0.7571	277.29
254	1.61380	24.1264	0.7587	278.13
255	1.55837	23.9668	0.7603	278.97
256	1.50446	23.8077	0.7619	279.81
257	1.45204	23.6491	0.7635	280.65
258	1.40109	23.4909	0.7651	281.49
259	1.35157	23.3333	0.7667	282.33
260	1.30345	23.1763	0.7682	283.18
261	1.25671	23.0196	0.7698	284.02
262	1.21132	22.8635	0.7714	284.86
263	1.16726	22.7076	0.7729	285.71
264	1.12448	22.5525	0.7745	286.55
265	1.08297	22.3978	0.7760	287.40
266	1.04270	22.2435	0.7776	288.24
267	1.00364	22.0897	0.7791	289.09
268	0.96577	21.9363	0.7806	289.94
269	0.92905	21.7835	0.7822	290.78
270	0.89347	21.6311	0.7837	291.63
271	0.85900	21.4790	0.7852	292.48
272	0.82560	21.3277	0.7867	293.33
273	0.79327	21.1766	0.7882	294.18
274	0.76197	21.0259	0.7897	295.03
275	0.73167	20.8760	0.7912	295.88
276	0.70236	20.7263	0.7927	296.73
277	0.67402	20.5767	0.7942	297.58
278	0.64660	20.4281	0.7957	298.43
279	0.62010	20.2797	0.7972	299.28
280	0.59449	20.1318	0.7987	300.13
281	0.56975	19.9843	0.8002	300.98
282	0.54586	19.8370	0.8016	301.84
283	0.52279	19.6903	0.8031	302.69
284	0.50052	19.5442	0.8046	303.54
285	0.47904	19.3981	0.8060	304.40
286	0.45831	19.2529	0.8075	305.25
287	0.43833	19.1077	0.8089	306.11
288	0.41906	18.9633	0.8104	306.96
289	0.40050	18.8190	0.8118	307.82
290	0.38252	18.6750	0.8132	308.68
291	0.36540	18.5316	0.8147	309.53
292	0.34882	18.3886	0.8161	310.39
293	0.33286	18.2464	0.8175	311.25
294	0.31752	18.1037	0.8190	312.10
295	0.30276	17.9619	0.8204	312.96

Iowa Type curve L0

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
300	0.23719	17.2586	0.8274	317.26
301	0.22560	17.1196	0.8288	318.12
302	0.21449	16.9804	0.8302	318.98
303	0.20384	16.8415	0.8316	319.84
304	0.19363	16.7032	0.8330	320.70
305	0.18385	16.5651	0.8343	321.57
306	0.17448	16.4278	0.8357	322.43
307	0.16552	16.2901	0.8371	323.29
308	0.15694	16.1533	0.8385	324.15
309	0.14874	16.0163	0.8398	325.02
310	0.14089	15.8808	0.8412	325.88
311	0.13340	15.7444	0.8426	326.74
312	0.12624	15.6090	0.8439	327.61
313	0.11940	15.4745	0.8453	328.47
314	0.11288	15.3395	0.8466	329.34
315	0.10666	15.2049	0.8480	330.20
316	0.10073	15.0705	0.8493	331.07
317	0.09508	14.9364	0.8506	331.94
318	0.08969	14.8039	0.8520	332.80
319	0.08457	14.6699	0.8533	333.67
320	0.07969	14.5376	0.8546	334.54
321	0.07505	14.4055	0.8559	335.41
322	0.07064	14.2736	0.8573	336.27
323	0.06645	14.1421	0.8586	337.14
324	0.06247	14.0113	0.8599	338.01
325	0.05870	13.8791	0.8612	338.88
326	0.05512	13.7480	0.8625	339.75
327	0.05172	13.6189	0.8638	340.62
328	0.04851	13.4870	0.8651	341.49
329	0.04546	13.3583	0.8664	342.36
330	0.04258	13.2280	0.8677	343.23
331	0.03985	13.1000	0.8690	344.10
332	0.03727	12.9722	0.8703	344.97
333	0.03484	12.8421	0.8716	345.84
334	0.03254	12.7145	0.8729	346.71
335	0.03037	12.5873	0.8741	347.59
336	0.02833	12.4577	0.8754	348.46
337	0.02640	12.3318	0.8767	349.33
338	0.02459	12.2027	0.8780	350.20
339	0.02288	12.0774	0.8792	351.08
340	0.02128	11.9479	0.8805	351.95
341	0.01977	11.8222	0.8818	352.82
342	0.01835	11.6984	0.8830	353.70
343	0.01702	11.5735	0.8843	354.57
344	0.01578	11.4436	0.8856	355.44
345	0.01461	11.3200	0.8868	356.32
346	0.01351	11.2010	0.8880	357.20
347	0.01249	11.0749	0.8893	358.07
348	0.01154	10.9454	0.8905	358.95
349	0.01064	10.8290	0.8917	359.83
350	0.00981	10.7029	0.8930	360.70
351	0.00904	10.5720	0.8943	361.57
352	0.00831	10.4567	0.8954	362.46
353	0.00764	10.3299	0.8967	363.33
354	0.00701	10.2133	0.8979	364.21
355	0.00643	10.0895	0.8991	365.09
356	0.00589	9.9687	0.9003	365.97
357	0.00539	9.8470	0.9015	366.85
358	0.00493	9.7192	0.9028	367.72
359	0.00450	9.6001	0.9040	368.60
360	0.00410	9.4879	0.9051	369.49
361	0.00374	9.3531	0.9065	370.35
362	0.00340	9.2384	0.9076	371.24
363	0.00309	9.1151	0.9088	372.12
364	0.00280	9.0073	0.9099	373.01
365	0.00254	8.8782	0.9112	373.88
366	0.00230	8.7524	0.9125	374.75
367	0.00208	8.6253	0.9137	375.63
368	0.00187	8.5377	0.9146	376.54
369	0.00169	8.3938	0.9161	377.39
370	0.00152	8.2767	0.9172	378.28
371	0.00137	8.1282	0.9187	379.13
372	0.00122	8.0661	0.9193	380.07
373	0.00110	7.8915	0.9211	380.89
374	0.00098	7.7965	0.9220	381.80
375	0.00087	7.7191	0.9228	382.72
376	0.00078	7.5521	0.9245	383.55
377	0.00069	7.4719	0.9253	384.47
378	0.00062	7.2591	0.9274	385.26
379	0.00054	7.2604	0.9274	386.26
380	0.00048	7.1055	0.9289	387.11
381	0.00042	7.0492	0.9296	388.05
382	0.00037	6.9342	0.9307	388.93
383	0.00033	6.7141	0.9329	389.71
384	0.00029	6.5713	0.9343	390.57
385	0.00025	6.5427	0.9346	391.54
386	0.00022	6.3668	0.9363	392.37
387	0.00019	6.2931	0.9371	393.29
388	0.00017	5.9747	0.9403	393.97
389	0.00014	6.1479	0.9385	395.15
390	0.00012	6.0893	0.9391	396.09
391	0.00011	5.5975	0.9440	396.60
392	0.00009	5.7304	0.9427	397.73
393	0.00008	5.3842	0.9462	398.38
394	0.00007	5.0820	0.9492	399.08
395	0.00006	4.8458	0.9515	399.85

Iowa Type curve L0				
Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
400	0.00002	5.0390	0.9496	405.04
401	0.00002	4.0396	0.9596	405.04
402	0.00002	3.0402	0.9696	405.04
403	0.00001	4.1190	0.9588	407.12
404	0.00001	3.4820	0.9652	407.48
405	0.00001	2.4831	0.9752	407.48
406	0.00001	1.4843	0.9852	407.48
407	0.00001	0.4855	0.9951	407.49
408	0.00000	0.0000	1.0000	408.00

Iowa Type curve L1				
Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	99.94205	99.0636	0.0094	100.06
2	99.87728	98.1275	0.0187	100.13
3	99.80521	97.1980	0.0280	100.20
4	99.72534	96.2755	0.0372	100.28
5	99.63717	95.3602	0.0464	100.36
6	99.54020	94.4526	0.0555	100.45
7	99.43392	93.5531	0.0645	100.55
8	99.31755	92.6621	0.0734	100.66
9	99.19147	91.7792	0.0822	100.78
10	99.05431	90.9056	0.0909	100.91
11	98.90588	90.0413	0.0996	101.04
12	98.74570	89.1865	0.1081	101.19
13	98.57331	88.3416	0.1166	101.34
14	98.38828	87.5068	0.1249	101.51
15	98.19015	86.6824	0.1332	101.68
16	97.97853	85.8685	0.1413	101.87
17	97.75302	85.0655	0.1493	102.07
18	97.51325	84.2734	0.1573	102.27
19	97.25887	83.4925	0.1651	102.49
20	96.98956	82.7230	0.1728	102.72
21	96.70503	81.9649	0.1804	102.96
22	96.40500	81.2184	0.1878	103.22
23	96.08924	80.4837	0.1952	103.48
24	95.75754	79.7607	0.2024	103.76
25	95.40973	79.0497	0.2095	104.05
26	95.04568	78.3505	0.2165	104.35
27	94.66527	77.6634	0.2234	104.66
28	94.26844	76.9882	0.2301	104.99
29	93.85515	76.3250	0.2367	105.33
30	93.42541	75.6738	0.2433	105.67
31	92.97926	75.0345	0.2497	106.03
32	92.51679	74.4071	0.2559	106.41
33	92.03810	73.7915	0.2621	106.79
34	91.54335	73.1876	0.2681	107.19
35	91.03275	72.5953	0.2740	107.60
36	90.50652	72.0145	0.2799	108.01
37	89.96493	71.4450	0.2856	108.44
38	89.40830	70.8867	0.2911	108.89
39	88.83697	70.3394	0.2966	109.34
40	88.25133	69.8028	0.3020	109.80
41	87.65179	69.2768	0.3072	110.28
42	87.03887	68.7612	0.3124	110.76
43	86.41288	68.2557	0.3174	111.26
44	85.77452	67.7599	0.3224	111.76
45	85.12428	67.2737	0.3273	112.27
46	84.46275	66.7967	0.3320	112.80
47	83.79054	66.3285	0.3367	113.33
48	83.10829	65.8689	0.3413	113.87
49	82.41667	65.4175	0.3458	114.42
50	81.71633	64.9739	0.3503	114.97
51	81.00811	64.5375	0.3546	115.54
52	80.29262	64.1082	0.3589	116.11
53	79.57066	63.6853	0.3631	116.69
54	78.84299	63.2685	0.3673	117.27
55	78.11041	62.8572	0.3714	117.86
56	77.37370	62.4509	0.3755	118.45
57	76.63369	62.0491	0.3795	119.05
58	75.89120	61.6513	0.3835	119.65
59	75.14704	61.2569	0.3874	120.26
60	74.40205	60.8652	0.3913	120.87
61	73.65696	60.4758	0.3952	121.48
62	72.91198	60.0887	0.3991	122.09
63	72.16720	59.7036	0.4030	122.70
64	71.42273	59.3207	0.4068	123.32
65	70.67855	58.9400	0.4106	123.94
66	69.93509	58.5613	0.4144	124.56
67	69.19213	58.1848	0.4182	125.18
68	68.44988	57.8103	0.4219	125.81
69	67.70843	57.4379	0.4256	126.44
70	66.96789	57.0675	0.4293	127.07
71	66.22836	56.6991	0.4330	127.70
72	65.48994	56.3328	0.4367	128.33
73	64.75272	55.9685	0.4403	128.97
74	64.01680	55.6061	0.4439	129.61
75	63.28229	55.2457	0.4475	130.25
76	62.54928	54.8873	0.4511	130.89
77	61.81787	54.5308	0.4547	131.53
78	61.08815	54.1762	0.4582	132.18
79	60.36022	53.8235	0.4618	132.82
80	59.63417	53.4727	0.4653	133.47
81	58.91011	53.1238	0.4688	134.12
82	58.18813	52.7768	0.4722	134.78
83	57.46832	52.4315	0.4757	135.43
84	56.75076	52.0882	0.4791	136.09
85	56.03557	51.7466	0.4825	136.75
86	55.32282	51.4068	0.4859	137.41
87	54.61261	51.0688	0.4893	138.07
88	53.90503	50.7326	0.4927	138.73
89	53.20016	50.3982	0.4960	139.40
90	52.49811	50.0655	0.4993	140.07
91	51.79894	49.7345	0.5027	140.73
92	51.10275	49.4052	0.5059	141.41
93	50.40963	49.0777	0.5092	142.08
94	49.71966	48.7518	0.5125	142.75
95	49.03293	48.4276	0.5157	143.43

Iowa Type curve L1				
Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	45.65061	46.8312	0.5317	146.83
101	44.98497	46.5167	0.5348	147.52
102	44.32312	46.2039	0.5380	148.20
103	43.66514	45.8926	0.5411	148.89
104	43.01109	45.5828	0.5442	149.58
105	42.36105	45.2747	0.5473	150.27
106	41.71509	44.9680	0.5503	150.97
107	41.07329	44.6628	0.5534	151.66
108	40.43570	44.3592	0.5564	152.36
109	39.80240	44.0570	0.5594	153.06
110	39.17345	43.7564	0.5624	153.76
111	38.54891	43.4572	0.5654	154.46
112	37.92886	43.1594	0.5684	155.16
113	37.31334	42.8631	0.5714	155.86
114	36.70243	42.5683	0.5743	156.57
115	36.09618	42.2748	0.5773	157.27
116	35.49464	41.9828	0.5802	157.98
117	34.89788	41.6922	0.5831	158.69
118	34.30595	41.4029	0.5860	159.40
119	33.71890	41.1150	0.5888	160.12
120	33.13678	40.8285	0.5917	160.83
121	32.55964	40.5434	0.5946	161.54
122	31.98754	40.2596	0.5974	162.26
123	31.42051	39.9771	0.6002	162.98
124	30.85860	39.6959	0.6030	163.70
125	30.30187	39.4161	0.6058	164.42
126	29.75034	39.1375	0.6086	165.14
127	29.20406	38.8603	0.6114	165.86
128	28.66307	38.5843	0.6142	166.58
129	28.12741	38.3095	0.6169	167.31
130	27.59711	38.0361	0.6196	168.04
131	27.07221	37.7639	0.6224	168.76
132	26.55274	37.4929	0.6251	169.49
133	26.03873	37.2231	0.6278	170.22
134	25.53021	36.9546	0.6305	170.95
135	25.02721	36.6873	0.6331	171.69
136	24.52975	36.4211	0.6358	172.42
137	24.03787	36.1562	0.6384	173.16
138	23.55157	35.8924	0.6411	173.89
139	23.07089	35.6298	0.6437	174.63
140	22.59584	35.3684	0.6463	175.37
141	22.12644	35.1081	0.6489	176.11
142	21.66271	34.8489	0.6515	176.85
143	21.20467	34.5909	0.6541	177.59
144	20.75232	34.3340	0.6567	178.33
145	20.30567	34.0782	0.6592	179.08
146	19.86475	33.8235	0.6618	179.82
147	19.42955	33.5700	0.6643	180.57
148	19.00008	33.3175	0.6668	181.32
149	18.57635	33.0660	0.6693	182.07
150	18.15836	32.8157	0.6718	182.82
151	17.74612	32.5664	0.6743	183.57
152	17.33962	32.3181	0.6768	184.32
153	16.93886	32.0709	0.6793	185.07
154	16.54383	31.8247	0.6818	185.82
155	16.15455	31.5796	0.6842	186.58
156	15.77099	31.3355	0.6866	187.34
157	15.39315	31.0923	0.6891	188.09
158	15.02103	30.8502	0.6915	188.85
159	14.65461	30.6091	0.6939	189.61
160	14.29388	30.3689	0.6963	190.37
161	13.93882	30.1298	0.6987	191.13
162	13.58943	29.8916	0.7011	191.89
163	13.24568	29.6543	0.7035	192.65
164	12.90755	29.4181	0.7058	193.42
165	12.57504	29.1827	0.7082	194.18
166	12.24811	28.9483	0.7105	194.95
167	11.92675	28.7149	0.7129	195.71
168	11.61092	28.4823	0.7152	196.48
169	11.30062	28.2507	0.7175	197.25
170	10.99580	28.0200	0.7198	198.02
171	10.69644	27.7902	0.7221	198.79
172	10.40252	27.5613	0.7244	199.56
173	10.11400	27.3332	0.7267	200.33
174	9.83085	27.1061	0.7289	201.11
175	9.55304	26.8798	0.7312	201.88
176	9.28054	26.6544	0.7335	202.65
177	9.01330	26.4298	0.7357	203.43
178	8.75130	26.2061	0.7379	204.21
179	8.49450	25.9833	0.7402	204.98
180	8.24285	25.7613	0.7424	205.76
181	7.99632	25.5401	0.7446	206.54
182	7.75486	25.3197	0.7468	207.32
183	7.51844	25.1002	0.7490	208.10
184	7.28701	24.8815	0.7512	208.88
185	7.06053	24.6636	0.7534	209.66
186	6.83895	24.4465	0.7555	210.45
187	6.62223	24.2301	0.7577	211.23
188	6.41032	24.0146	0.7599	212.01
189	6.20316	23.7999	0.7620	212.80
190	6.00073	23.5859	0.7641	213.59
191	5.80295	23.3727	0.7663	214.37
192	5.60980	23.1603	0.7684	215.16
193	5.42120	22.9486	0.7705	215.95
194	5.23711	22.7377	0.7726	216.74
195	5.05748	22.5275	0.7747	217.53
196	4.88226	22.3181	0.7768	218.32

Iowa Type curve L1				
Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
200	4.22433	21.4876	0.7851	221.49
201	4.07030	21.2818	0.7872	222.28
202	3.92035	21.0767	0.7892	223.08
203	3.77442	20.8722	0.7913	223.87
204	3.63244	20.6685	0.7933	224.67
205	3.49436	20.4655	0.7953	225.47
206	3.36011	20.2632	0.7974	226.26
207	3.22965	20.0615	0.7994	227.06
208	3.10291	19.8605	0.8014	227.86
209	2.97983	19.6602	0.8034	228.66
210	2.86035	19.4605	0.8054	229.46
211	2.74440	19.2616	0.8074	230.26
212	2.63194	19.0633	0.8094	231.06
213	2.52290	18.8656	0.8113	231.87
214	2.41722	18.6685	0.8133	232.67
215	2.31483	18.4722	0.8153	233.47
216	2.21568	18.2764	0.8172	234.28
217	2.11971	18.0812	0.8192	235.08
218	2.02685	17.8867	0.8211	235.89
219	1.93704	17.6928	0.8231	236.69
220	1.85022	17.4996	0.8250	237.50
221	1.76634	17.3069	0.8269	238.31
222	1.68532	17.1148	0.8289	239.11
223	1.60711	16.9234	0.8308	239.92
224	1.53165	16.7325	0.8327	240.73
225	1.45888	16.5422	0.8346	241.54
226	1.38873	16.3526	0.8365	242.35
227	1.32115	16.1635	0.8384	243.16
228	1.25607	15.9750	0.8402	243.98
229	1.19344	15.7871	0.8421	244.79
230	1.13320	15.5998	0.8440	245.60
231	1.07529	15.4130	0.8459	246.41
232	1.01965	15.2268	0.8477	247.23
233	0.96622	15.0411	0.8496	248.04
234	0.91495	14.8560	0.8514	248.86
235	0.86577	14.6714	0.8533	249.67
236	0.81864	14.4873	0.8551	250.49
237	0.77348	14.3040	0.8570	251.30
238	0.73026	14.1209	0.8588	252.12
239	0.68891	13.9385	0.8606	252.94
240	0.64937	13.7568	0.8624	253.76
241	0.61160	13.5755	0.8642	254.58
242	0.57554	13.3947	0.8661	255.39
243	0.54114	13.2144	0.8679	256.21
244	0.50835	13.0345	0.8697	257.03
245	0.47711	12.8552	0.8714	257.86
246	0.44737	12.6766	0.8732	258.68
247	0.41909	12.4983	0.8750	259.50
248	0.39221	12.3206	0.8768	260.32
249	0.36669	12.1432	0.8786	261.14
250	0.34247	11.9666	0.8803	261.97
251	0.31952	11.7902	0.8821	262.79
252	0.29778	11.6145	0.8839	263.61
253	0.27721	11.4393	0.8856	264.44
254	0.25777	11.2642	0.8874	265.26
255	0.23940	11.0902	0.8891	266.09
256	0.22208	10.9162	0.8908	266.92
257	0.20575	10.7429	0.8926	267.74
258	0.19038	10.5698	0.8943	268.57
259	0.17592	10.3975	0.8960	269.40
260	0.16234	10.2255	0.8977	270.23
261	0.14960	10.0537	0.8995	271.05
262	0.13765	9.8831	0.9012	271.88
263	0.12647	9.7126	0.9029	272.71
264	0.11602	9.5423	0.9046	273.54
265	0.10627	9.3719	0.9063	274.37
266	0.09717	9.2028	0.9080	275.20
267	0.08870	9.0338	0.9097	276.03
268	0.08082	8.8669	0.9113	276.87
269	0.07351	8.6978	0.9130	277.70
270	0.06673	8.5307	0.9147	278.53
271	0.06046	8.3635	0.9164	279.36
272	0.05467	8.1964	0.9180	280.20
273	0.04932	8.0312	0.9197	281.03
274	0.04441	7.8639	0.9214	281.86
275	0.03989	7.6983	0.9230	282.70
276	0.03574	7.5341	0.9247	283.53
277	0.03195	7.3685	0.9263	284.37
278	0.02848	7.2054	0.9279	285.21
279	0.02532	7.0423	0.9296	286.04
280	0.02245	6.8786	0.9312	286.88
281	0.01985	6.7141	0.9329	287.71
282	0.01749	6.5526	0.9345	288.55
283	0.01536	6.3919	0.9361	289.39
284	0.01345	6.2286	0.9377	290.23
285	0.01173	6.0686	0.9393	291.07
286	0.01019	5.9102	0.9409	291.91
287	0.00882	5.7505	0.9425	292.75
288	0.00761	5.5854	0.9441	293.59
289	0.00653	5.4265	0.9457	294.43
290	0.00558	5.2652	0.9473	295.27
291	0.00474	5.1097	0.9489	296.11
292	0.00401	4.9488	0.9505	296.95
293	0.00337	4.7937	0.9521	297.79
294	0.00282	4.6312	0.9537	298.63
295	0.00234	4.4786	0.9552	299.48
296	0.00193	4.3238	0.9568	300.32

Table A continued

Iowa Type curve L1

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
300	0.00083	3.6806	0.9632	303.68
301	0.00065	3.5614	0.9644	304.56
302	0.00051	3.4018	0.9660	305.40
303	0.00040	3.1998	0.9680	306.20
304	0.00030	3.0998	0.9690	307.10
305	0.00023	2.8910	0.9711	307.89
306	0.00017	2.7350	0.9726	308.74
307	0.00012	2.6663	0.9733	309.67
308	0.00009	2.3885	0.9761	310.39
309	0.00006	2.3328	0.9767	311.33
310	0.00004	2.2494	0.9775	312.25
311	0.00003	1.8328	0.9817	312.83
312	0.00002	1.4994	0.9850	313.50
313	0.00001	1.4994	0.9850	314.50
314	0.00001	0.5006	0.9950	314.50
315	0.00000	0.0000	1.0000	315.00

Iowa Type curve L2

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	99.99981	99.0003	0.0100	100.00
2	99.99889	98.0013	0.0200	100.00
3	99.99658	97.0036	0.0300	100.00
4	99.99221	96.0077	0.0399	100.01
5	99.98516	95.0145	0.0499	100.01
6	99.97481	94.0242	0.0598	100.02
7	99.96060	93.0375	0.0696	100.04
8	99.94197	92.0548	0.0795	100.05
9	99.91840	91.0764	0.0892	100.08
10	99.88940	90.1027	0.0990	100.10
11	99.85449	89.1340	0.1087	100.13
12	99.81324	88.1706	0.1183	100.17
13	99.76522	87.2128	0.1279	100.21
14	99.71004	86.2608	0.1374	100.26
15	99.64733	85.3148	0.1469	100.31
16	99.57673	84.3749	0.1563	100.37
17	99.49792	83.4414	0.1656	100.44
18	99.41060	82.5142	0.1749	100.51
19	99.31448	81.5936	0.1841	100.59
20	99.20931	80.6796	0.1932	100.68
21	99.09483	79.7722	0.2023	100.77
22	98.97083	78.8715	0.2113	100.87
23	98.83711	77.9775	0.2202	100.98
24	98.69348	77.0903	0.2291	101.09
25	98.53978	76.2098	0.2379	101.21
26	98.37585	75.3359	0.2466	101.34
27	98.20157	74.4687	0.2553	101.47
28	98.01682	73.6081	0.2639	101.61
29	97.82151	72.7541	0.2725	101.75
30	97.61555	71.9066	0.2809	101.91
31	97.39888	71.0654	0.2893	102.07
32	97.17137	70.2306	0.2977	102.23
33	96.93262	69.4024	0.3060	102.40
34	96.68183	68.5811	0.3142	102.58
35	96.41791	67.7675	0.3223	102.77
36	96.13962	66.9622	0.3304	102.96
37	95.84571	66.1660	0.3383	103.17
38	95.53422	65.3801	0.3462	103.38
39	95.20560	64.6040	0.3540	103.60
40	94.85656	63.8399	0.3616	103.84
41	94.48666	63.0879	0.3691	104.09
42	94.09481	62.3485	0.3765	104.35
43	93.68001	61.6224	0.3838	104.62
44	93.24139	60.9099	0.3909	104.91
45	92.77820	60.2115	0.3979	105.21
46	92.28984	59.5275	0.4047	105.53
47	91.77585	58.8581	0.4114	105.86
48	91.23588	58.2034	0.4180	106.20
49	90.66975	57.5637	0.4244	106.56
50	90.07738	56.9390	0.4306	106.94
51	89.45886	56.3292	0.4367	107.33
52	88.81436	55.7344	0.4427	107.73
53	88.14419	55.1543	0.4485	108.15
54	87.44876	54.5889	0.4541	108.59
55	86.72360	54.0412	0.4596	109.04
56	85.98432	53.5016	0.4650	109.50
57	85.21661	52.9790	0.4702	109.98
58	84.42626	52.4703	0.4753	110.47
59	83.61413	51.9751	0.4802	110.98
60	82.78113	51.4931	0.4851	111.49
61	81.92824	51.0239	0.4898	112.02
62	81.05647	50.5673	0.4943	112.57
63	80.16690	50.1229	0.4988	113.12
64	79.26062	49.6903	0.5031	113.69
65	78.33876	49.2691	0.5073	114.27
66	77.40247	48.8591	0.5114	114.86
67	76.45290	48.4597	0.5154	115.46
68	75.49123	48.0707	0.5193	116.07
69	74.51863	47.6915	0.5231	116.69
70	73.53626	47.3220	0.5268	117.32
71	72.54528	46.9616	0.5304	117.96
72	71.54685	46.6099	0.5339	118.61
73	70.54209	46.2667	0.5373	119.27
74	69.53212	45.9315	0.5407	119.93
75	68.51802	45.6039	0.5440	120.60
76	67.50085	45.2835	0.5472	121.28
77	66.48165	44.9701	0.5503	121.97
78	65.46140	44.6632	0.5534	122.66
79	64.44107	44.3624	0.5564	123.36
80	63.42158	44.0675	0.5593	124.07
81	62.40383	43.7781	0.5622	124.78
82	61.38866	43.4938	0.5651	125.49
83	60.37687	43.2142	0.5679	126.21
84	59.36924	42.9392	0.5706	126.94
85	58.36648	42.6683	0.5733	127.67
86	57.36928	42.4013	0.5760	128.40
87	56.37827	42.1378	0.5786	129.14
88	55.39407	41.8776	0.5812	129.88
89	54.41722	41.6204	0.5838	130.62
90	53.44823	41.3659	0.5863	131.37
91	52.48759	41.1138	0.5889	132.11
92	51.53574	40.8639	0.5914	132.86
93	50.59305	40.6160	0.5938	133.62
94	49.65990	40.3699	0.5963	134.37
95	48.73660	40.1252	0.5987	135.13

Table A continued

Iowa Type curve L2

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	44.27685	38.9174	0.6108	138.92
101	43.41757	38.6777	0.6132	139.68
102	42.56950	38.4383	0.6156	140.44
103	41.73271	38.1990	0.6180	141.20
104	40.90725	37.9597	0.6204	141.96
105	40.09316	37.7203	0.6228	142.72
106	39.29046	37.4807	0.6252	143.48
107	38.49913	37.2408	0.6276	144.24
108	37.71916	37.0006	0.6300	145.00
109	36.95049	36.7599	0.6324	145.76
110	36.19309	36.5187	0.6348	146.52
111	35.44688	36.2769	0.6372	147.28
112	34.71179	36.0346	0.6397	148.03
113	33.98772	35.7916	0.6421	148.79
114	33.27458	35.5480	0.6445	149.55
115	32.57226	35.3037	0.6470	150.30
116	31.88064	35.0587	0.6494	151.06
117	31.19961	34.8130	0.6519	151.81
118	30.52904	34.5667	0.6543	152.57
119	29.86880	34.3198	0.6568	153.32
120	29.21877	34.0721	0.6593	154.07
121	28.57881	33.8239	0.6618	154.82
122	27.94878	33.5751	0.6642	155.58
123	27.32855	33.3258	0.6667	156.33
124	26.71799	33.0759	0.6692	157.08
125	26.11696	32.8256	0.6717	157.83
126	25.52533	32.5748	0.6743	158.57
127	24.94297	32.3237	0.6768	159.32
128	24.36975	32.0722	0.6793	160.07
129	23.80555	31.8205	0.6818	160.82
130	23.25024	31.5686	0.6843	161.57
131	22.70370	31.3165	0.6868	162.32
132	22.16582	31.0643	0.6894	163.06
133	21.63648	30.8120	0.6919	163.81
134	21.11558	30.5598	0.6944	164.56
135	20.60301	30.3077	0.6969	165.31
136	20.09867	30.0566	0.6994	166.06
137	19.60247	29.8038	0.7020	166.80
138	19.11431	29.5522	0.7045	167.55
139	18.63410	29.3008	0.7070	168.30
140	18.16176	29.0499	0.7095	169.05
141	17.69721	28.7993	0.7120	169.80
142	17.24037	28.5492	0.7145	170.55
143	16.79117	28.2996	0.7170	171.30
144	16.34953	28.0505	0.7195	172.05
145	15.91540	27.8020	0.7220	172.80
146	15.48870	27.5542	0.7245	173.55
147	15.06937	27.3070	0.7269	174.31
148	14.65737	27.0605	0.7294	175.06
149	14.25262	26.8148	0.7319	175.81
150	13.85508	26.5698	0.7343	176.57
151	13.46470	26.3256	0.7367	177.33
152	13.08142	26.0823	0.7392	178.08
153	12.70519	25.8399	0.7416	178.84
154	12.33597	25.5983	0.7440	179.60
155	11.97372	25.3576	0.7464	180.36
156	11.61838	25.1179	0.7488	181.12
157	11.26991	24.8791	0.7512	181.88
158	10.92827	24.6412	0.7536	182.64
159	10.59341	24.4043	0.7560	183.40
160	10.25528	24.1684	0.7583	184.17
161	9.94385	23.9335	0.7607	184.93
162	9.62907	23.6995	0.7630	185.70
163	9.32089	23.4666	0.7653	186.47
164	9.01926	23.2347	0.7677	187.23
165	8.72414	23.0037	0.7700	188.00
166	8.43549	22.7738	0.7723	188.77
167	8.15324	22.5449	0.7746	189.54
168	7.87736	22.3169	0.7768	190.32
169	7.60779	22.0900	0.7791	191.09
170	7.34447	21.8640	0.7814	191.86
171	7.08736	21.6391	0.7836	192.64
172	6.83640	21.4151	0.7858	193.42
173	6.59153	21.1920	0.7881	194.19
174	6.35270	20.9699	0.7903	194.97
175	6.11983	20.7489	0.7925	195.75
176	5.89288	20.5287	0.7947	196.53
177	5.67178	20.3095	0.7969	197.31
178	5.46647	20.0911	0.7991	198.09
179	5.24687	19.8738	0.8013	198.87
180	5.04292	19.6573	0.8034	199.66
181	4.84456	19.4417	0.8056	200.44
182	4.65171	19.2270	0.8077	201.23
183	4.46429	19.0132	0.8099	202.01
184	4.28225	18.8002	0.8120	202.80
185	4.10549	18.5881	0.8141	203.59
186	3.93396	18.3768	0.8162	204.38
187	3.76756	18.1663	0.8183	205.17
188	3.60622	17.9567	0.8204	205.96
189	3.44987	17.7478	0.8225	206.75
190	3.29841	17.5398	0.8246	207.54
191	3.15178	17.3326	0.8267	208.33
192	3.00988	17.1261	0.8287	209.13
193	2.87264	16.9205	0.8308	209.92
194	2.73998	16.7155	0.8328	210.72
195	2.61180	16.5113	0.8349	211.51
196	2.48802	16.3079	0.8369	212.31

Iowa Type curve L2

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
200	2.03522	15.5018	0.8450	215.50
201	1.93217	15.3014	0.8470	216.30
202	1.83299	15.1022	0.8490	217.10
203	1.73762	14.9037	0.8510	217.90
204	1.64596	14.7058	0.8529	218.71
205	1.55792	14.5086	0.8549	219.51
206	1.47341	14.3121	0.8569	220.31
207	1.39235	14.1162	0.8588	221.12
208	1.31465	13.9209	0.8608	221.92
209	1.24023	13.7263	0.8627	222.73
210	1.16899	13.5323	0.8647	223.53
211	1.10086	13.3388	0.8666	224.34
212	1.03574	13.1460	0.8685	225.15
213	0.97355	12.9539	0.8705	225.95
214	0.91421	12.7622	0.8724	226.76
215	0.85763	12.5712	0.8743	227.57
216	0.80372	12.3809	0.8762	228.38
217	0.75242	12.1909	0.8781	229.19
218	0.70363	12.0016	0.8800	230.00
219	0.65727	11.8128	0.8819	230.81
220	0.61326	11.6247	0.8838	231.62
221	0.57152	11.4372	0.8856	232.44
222	0.53198	11.2501	0.8875	233.25
223	0.49456	11.0635	0.8894	234.06
224	0.45918	10.8774	0.8912	234.88
225	0.42576	10.6920	0.8931	235.69
226	0.39424	10.5068	0.8949	236.51
227	0.36453	10.3224	0.8968	237.32
228	0.33657	10.1384	0.8986	238.14
229	0.31028	9.9550	0.9004	238.96
230	0.28560	9.7721	0.9023	239.77
231	0.26246	9.5896	0.9041	240.59
232	0.24079	9.4076	0.9059	241.41
233	0.22053	9.2259	0.9077	242.23
234	0.20161	9.0448	0.9096	243.04
235	0.18397	8.8641	0.9114	243.86
236	0.16754	8.6844	0.9132	244.68
237	0.15228	8.5045	0.9150	245.50
238	0.13812	8.3251	0.9167	246.33
239	0.12500	8.1465	0.9185	247.15
240	0.11287	7.9682	0.9203	247.97
241	0.10168	7.7901	0.9221	248.79
242	0.09137	7.6127	0.9239	249.61
243	0.08189	7.4361	0.9256	250.44
244	0.07320	7.2596	0.9274	251.26
245	0.06525	7.0831	0.9292	252.08
246	0.05799	6.9073	0.9309	252.91
247	0.05138	6.7316	0.9327	253.73
248	0.04537	6.5571	0.9344	254.56
249	0.03993	6.3823	0.9362	255.38
250	0.03501	6.2089	0.9379	256.21
251	0.03058	6.0360	0.9396	257.04
252	0.02661	5.8619	0.9414	257.86
253	0.02305	5.6900	0.9431	258.69
254	0.01988	5.5176	0.9448	259.52
255	0.01707	5.3436	0.9466	260.34
256	0.01457	5.1747	0.9483	261.17
257	0.01238	5.0016	0.9500	262.00
258	0.01045	4.8330	0.9517	262.83
259	0.00877	4.6630	0.9534	263.66
260	0.00731	4.4945	0.9551	264.49
261	0.00605	4.3264	0.9567	265.33
262	0.00497	4.1579	0.9584	266.16
263	0.00405	3.9888	0.9601	266.99
264	0.00327	3.8211	0.9618	267.82
265	0.00261	3.6609	0.9634	268.66
266	0.00207	3.4854	0.9651	269.49
267	0.00162	3.3147	0.9669	270.31
268	0.00125	3.1479	0.9685	271.15
269	0.00095	2.9841	0.9702	271.98
270	0.00071	2.8238	0.9718	272.82
271	0.00052	2.6728	0.9733	273.67
272	0.00038	2.4734	0.9753	274.47
273	0.00026	2.3842	0.9762	275.38
274	0.00018	2.2217	0.9778	276.22
275	0.00012	2.0826	0.9792	277.08
276	0.00008	1.8740	0.9813	277.87
277	0.00005	1.6985	0.9830	278.70
278	0.00003	1.4979	0.9850	279.50
279	0.00002	0.9971	0.9900	280.00
280	0.00001	0.4948	0.9951	280.49
281	0.00000	0.0000	1.0000	281.00

Age %AL	Iowa Type curve L3 Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	100.00000	98.9984	0.0100	100.00
2	100.00000	97.9984	0.0200	100.00
3	100.00000	96.9984	0.0300	100.00
4	100.00000	95.9984	0.0400	100.00
5	100.00000	94.9984	0.0500	100.00
6	100.00000	93.9984	0.0600	100.00
7	100.00000	92.9984	0.0700	100.00
8	100.00000	91.9984	0.0800	100.00
9	99.99994	90.9985	0.0900	100.00
10	99.99965	89.9988	0.1000	100.00
11	99.99892	88.9994	0.1100	100.00
12	99.99747	88.0007	0.1200	100.00
13	99.99501	87.0028	0.1300	100.00
14	99.99120	86.0061	0.1399	100.01
15	99.98571	85.0108	0.1499	100.01
16	99.97817	84.0172	0.1598	100.02
17	99.96820	83.0255	0.1697	100.03
18	99.95545	82.0361	0.1796	100.04
19	99.93952	81.0491	0.1896	100.05
20	99.92003	80.0648	0.1994	100.06
21	99.89660	79.0834	0.2092	100.08
22	99.86885	78.1053	0.2189	100.11
23	99.83641	77.1305	0.2287	100.13
24	99.79891	76.1593	0.2384	100.16
25	99.75597	75.1919	0.2481	100.19
26	99.70725	74.2283	0.2577	100.23
27	99.65238	73.2689	0.2673	100.27
28	99.59104	72.3138	0.2769	100.31
29	99.52289	71.3629	0.2864	100.36
30	99.44761	70.4166	0.2958	100.42
31	99.36486	69.4748	0.3053	100.47
32	99.27435	68.5377	0.3146	100.54
33	99.17576	67.6053	0.3239	100.61
34	99.06876	66.6778	0.3332	100.68
35	98.95305	65.7552	0.3424	100.76
36	98.82826	64.8376	0.3516	100.84
37	98.69405	63.9251	0.3607	100.93
38	98.55001	63.0178	0.3698	101.02
39	98.39571	62.1158	0.3788	101.12
40	98.23067	61.2193	0.3878	101.22
41	98.05433	60.3285	0.3967	101.33
42	97.86608	59.4436	0.4056	101.44
43	97.66522	58.5648	0.4144	101.56
44	97.45097	57.6925	0.4231	101.69
45	97.22245	56.8269	0.4317	101.83
46	96.97867	55.9685	0.4403	101.97
47	96.71856	55.1177	0.4488	102.12
48	96.44093	54.2749	0.4573	102.27
49	96.14450	53.4407	0.4656	102.44
50	95.82788	52.6156	0.4738	102.62
51	95.48963	51.8003	0.4820	102.80
52	95.12819	50.9952	0.4900	103.00
53	94.74196	50.2010	0.4980	103.20
54	94.32930	49.4184	0.5058	103.42
55	93.88854	48.6481	0.5135	103.65
56	93.41800	47.8906	0.5211	103.89
57	92.91602	47.1466	0.5285	104.15
58	92.38099	46.4168	0.5358	104.42
59	91.81137	45.7017	0.5430	104.70
60	91.20570	45.0018	0.5500	105.00
61	90.56264	44.3178	0.5568	105.32
62	89.88101	43.6501	0.5635	105.65
63	89.15978	42.9992	0.5700	106.00
64	88.39810	42.3654	0.5763	106.37
65	87.59534	41.7491	0.5825	106.75
66	86.75108	41.1505	0.5885	107.15
67	85.86515	40.5699	0.5943	107.57
68	84.93760	40.0075	0.5999	108.01
69	83.96877	39.4633	0.6054	108.46
70	82.95922	38.9375	0.6106	108.94
71	81.90980	38.4299	0.6157	109.43
72	80.82158	37.9406	0.6206	109.94
73	79.69691	37.4695	0.6253	110.47
74	78.53435	37.0163	0.6298	111.02
75	77.33872	36.5808	0.6342	111.58
76	76.11102	36.1628	0.6384	112.16
77	74.85346	35.7620	0.6424	112.76
78	73.56839	35.3779	0.6462	113.38
79	72.25836	35.0102	0.6499	114.01
80	70.92603	34.6585	0.6534	114.66
81	69.57415	34.3222	0.6568	115.32
82	68.20555	34.0009	0.6600	116.00
83	66.82314	33.6939	0.6631	116.69
84	65.42982	33.4008	0.6660	117.40
85	64.02853	33.1208	0.6688	118.12
86	62.62216	32.8534	0.6715	118.85
87	61.21358	32.5979	0.6740	119.60
88	59.80558	32.3536	0.6765	120.35
89	58.40088	32.1198	0.6788	121.12
90	57.00209	31.8957	0.6810	121.90
91	55.61170	31.6806	0.6832	122.68
92	54.23208	31.4739	0.6853	123.47
93	52.86543	31.2746	0.6873	124.27
94	51.51383	31.0820	0.6892	125.08
95	50.17916	30.8955	0.6910	125.90

Age %AL	Iowa Type curve L3 Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	43.81420	30.0256	0.6997	130.03
101	42.61133	29.8590	0.7014	130.86
102	41.43386	29.6934	0.7031	131.69
103	40.28232	29.5279	0.7047	132.53
104	39.15710	29.3620	0.7064	133.36
105	38.05846	29.1952	0.7080	134.20
106	36.98648	29.0269	0.7097	135.03
107	35.94118	28.8566	0.7114	135.86
108	34.92241	28.6838	0.7132	136.68
109	33.92995	28.5082	0.7149	137.51
110	32.96348	28.3293	0.7167	138.33
111	32.02260	28.1470	0.7185	139.15
112	31.10681	27.9610	0.7204	139.96
113	30.21559	27.7709	0.7223	140.77
114	29.34835	27.5768	0.7242	141.58
115	28.50446	27.3784	0.7262	142.38
116	27.68325	27.1757	0.7282	143.18
117	26.88404	26.9686	0.7303	143.97
118	26.10613	26.7575	0.7324	144.76
119	25.34879	26.5420	0.7346	145.54
120	24.61134	26.3223	0.7368	146.32
121	23.89304	26.0986	0.7390	147.10
122	23.19321	25.8710	0.7413	147.87
123	22.51117	25.6397	0.7436	148.64
124	21.84624	25.4048	0.7460	149.40
125	21.19779	25.1667	0.7483	150.17
126	20.56520	24.9254	0.7507	150.93
127	19.94787	24.6813	0.7532	151.68
128	19.34526	24.4346	0.7557	152.43
129	18.75682	24.1855	0.7581	153.19
130	18.18205	23.9342	0.7607	153.93
131	17.62050	23.6810	0.7632	154.68
132	17.07172	23.4262	0.7657	155.43
133	16.53530	23.1700	0.7683	156.17
134	16.01087	22.9125	0.7709	156.91
135	15.49809	22.6541	0.7735	157.65
136	14.99663	22.3948	0.7761	158.39
137	14.50621	22.1351	0.7786	159.14
138	14.02657	21.8749	0.7813	159.87
139	13.55745	21.6145	0.7839	160.61
140	13.09814	21.3549	0.7865	161.35
141	12.64995	21.0938	0.7891	162.09
142	12.21119	20.8338	0.7917	162.83
143	11.78221	20.5741	0.7943	163.57
144	11.36286	20.3149	0.7969	164.31
145	10.95300	20.0564	0.7994	165.06
146	10.55253	19.7986	0.8020	165.80
147	10.16132	19.5416	0.8046	166.54
148	9.77929	19.2864	0.8071	167.29
149	9.40634	19.0303	0.8097	168.03
150	9.04239	18.7761	0.8122	168.78
151	8.68735	18.5230	0.8148	169.52
152	8.34117	18.2710	0.8173	170.27
153	8.00375	18.0202	0.8198	171.02
154	7.67504	17.7706	0.8223	171.77
155	7.35497	17.5221	0.8248	172.52
156	7.04346	17.2750	0.8273	173.27
157	6.74047	17.0290	0.8297	174.03
158	6.44590	16.7844	0.8322	174.78
159	6.15971	16.5410	0.8346	175.54
160	5.88181	16.2989	0.8370	176.30
161	5.61213	16.0580	0.8394	177.06
162	5.35059	15.8185	0.8418	177.82
163	5.09713	15.5803	0.8442	178.58
164	4.85165	15.3433	0.8466	179.34
165	4.61407	15.1076	0.8489	180.11
166	4.38429	14.8731	0.8513	180.87
167	4.16224	14.6399	0.8536	181.64
168	3.94780	14.4080	0.8559	182.41
169	3.74089	14.1773	0.8582	183.18
170	3.54139	13.9477	0.8605	183.95
171	3.34919	13.7195	0.8628	184.72
172	3.16419	13.4924	0.8651	185.49
173	2.98628	13.2664	0.8673	186.27
174	2.81532	13.0416	0.8696	187.04
175	2.65120	12.8180	0.8718	187.82
176	2.49379	12.5955	0.8740	188.60
177	2.34297	12.3741	0.8763	189.37
178	2.19859	12.1539	0.8785	190.15
179	2.06054	11.9347	0.8807	190.93
180	1.92866	11.7166	0.8828	191.72
181	1.80282	11.4995	0.8850	192.50
182	1.68287	11.2835	0.8872	193.28
183	1.56867	11.0686	0.8893	194.07
184	1.46008	10.8546	0.8915	194.85
185	1.35694	10.6416	0.8936	195.64
186	1.25911	10.4296	0.8957	196.43
187	1.16643	10.2186	0.8978	197.22
188	1.07874	10.0086	0.8999	198.01
189	0.99591	9.7994	0.9020	198.80
190	0.91776	9.5913	0.9041	199.59
191	0.84415	9.3841	0.9062	200.38
192	0.77492	9.1778	0.9082	201.18
193	0.70992	8.9723	0.9103	201.97
194	0.64899	8.7677	0.9123	202.77
195	0.59197	8.5641	0.9144	203.56

Age %AL	Iowa Type curve L3 Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
200	0.36026	7.5582	0.9244	207.56
201	0.32353	7.3595	0.9264	208.36
202	0.28966	7.1615	0.9284	209.16
203	0.25850	6.9645	0.9304	209.96
204	0.22992	6.7681	0.9323	210.77
205	0.20377	6.5725	0.9343	211.57
206	0.17991	6.3778	0.9362	212.38
207	0.15822	6.1836	0.9382	213.18
208	0.13855	5.9905	0.9401	213.99
209	0.12079	5.7978	0.9420	214.80
210	0.10480	5.6061	0.9439	215.61
211	0.09047	5.4149	0.9459	216.41
212	0.07767	5.2249	0.9478	217.22
213	0.06630	5.0351	0.9496	218.04
214	0.05624	4.8464	0.9515	218.85
215	0.04739	4.6580	0.9534	219.66
216	0.03964	4.4710	0.9553	220.47
217	0.03291	4.2830	0.9572	221.28
218	0.02709	4.0975	0.9590	222.10
219	0.02208	3.9121	0.9609	222.91
220	0.01782	3.7278	0.9627	223.73
221	0.01422	3.5450	0.9646	224.54
222	0.01122	3.3592	0.9664	225.36
223	0.00872	3.1789	0.9682	226.18
224	0.00668	2.9970	0.9700	227.00
225	0.00503	2.8151	0.9718	227.82
226	0.00371	2.6401	0.9736	228.64
227	0.00268	2.4627	0.9754	229.46
228	0.00189	2.2830	0.9772	230.28
229	0.00129	2.1123	0.9789	231.11
230	0.00085	1.9470	0.9805	231.95
231	0.00054	1.7776	0.9822	232.78
232	0.00033	1.5907	0.9841	233.59
233	0.00018	1.4996	0.9850	234.50
234	0.00010	1.2994	0.9870	235.30
235	0.00005	1.0990	0.9890	236.10
236	0.00002	0.9977	0.9900	237.00
237	0.00001	0.4959	0.9950	237.50
238	0.00000	0.0000	1.0000	238.00

Age %AL	Iowa Type curve L4 Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	100.00000	99.0000	0.0100	100.00
2	100.00000	98.0000	0.0200	100.00
3	100.00000	97.0000	0.0300	100.00
4	100.00000	96.0000	0.0400	100.00
5	100.00000	95.0000	0.0500	100.00
6	100.00000	94.0000	0.0600	100.00
7	100.00000	93.0000	0.0700	100.00
8	100.00000	92.0000	0.0800	100.00
9	100.00000	91.0000	0.0900	100.00
10	100.00000	90.0000	0.1000	100.00
11	100.00000	89.0000	0.1100	100.00
12	100.00000	88.0000	0.1200	100.00
13	100.00000	87.0000	0.1300	100.00
14	100.00000	86.0000	0.1400	100.00
15	100.00000	85.0000	0.1500	100.00
16	100.00000	84.0000	0.1600	100.00
17	100.00000	83.0000	0.1700	100.00
18	100.00000	82.0000	0.1800	100.00
19	100.00000	81.0000	0.1900	100.00
20	100.00000	80.0000	0.2000	100.00
21	100.00000	79.0000	0.2100	100.00
22	100.00000	78.0000	0.2200	100.00
23	100.00000	77.0000	0.2300	100.00
24	99.99999	76.0000	0.2400	100.00
25	99.99995	75.0000	0.2500	100.00
26	99.99979	74.0002	0.2600	100.00
27	99.99940	73.0004	0.2700	100.00
28	99.99852	72.0010	0.2800	100.00
29	99.99721	71.0020	0.2900	100.00
30	99.99491	70.0036	0.3000	100.00
31	99.99136	69.0061	0.3099	100.01
32	99.98616	68.0097	0.3199	100.01
33	99.97887	67.0146	0.3299	100.01
34	99.96897	66.0212	0.3398	100.02
35	99.95590	65.0297	0.3497	100.03
36	99.93905	64.0406	0.3596	100.04
37	99.91775	63.0542	0.3695	100.05
38	99.89130	62.0707	0.3793	100.07
39	99.85898	61.0907	0.3891	100.09
40	99.81999	60.1143	0.3989	100.11
41	99.77353	59.1421	0.4086	100.14
42	99.71878	58.1743	0.4183	100.17
43	99.65489	57.2113	0.4279	100.21
44	99.58099	56.2533	0.4375	100.25
45	99.49620	55.3009	0.4470	100.30
46	99.39964	54.3541	0.4565	100.35
47	99.29042	53.4133	0.4659	100.41
48	99.16768	52.4788	0.4752	100.48
49	99.03052	51.5508	0.4845	100.55
50	98.87810	50.6295	0.4937	100.63
51	98.70957	49.7151	0.5028	100.72
52	98.52410	48.8077	0.5119	100.81
53	98.32089	47.9076	0.5209	100.91
54	98.09917	47.0147	0.5299	101.01
55	97.85817	46.1293	0.5387	101.13
56	97.59718	45.2513	0.5475	101.25
57	97.31548	44.3809	0.5562	101.38
58	97.01238	43.5180	0.5648	101.52
59	96.68719	42.6626	0.5734	101.66
60	96.33923	41.8149	0.5819	101.81
61	95.96778	40.9748	0.5903	101.97
62	95.57209	40.1424	0.5986	102.14
63	95.15133	39.3177	0.6068	102.32
64	94.70457	38.5008	0.6150	102.50
65	94.23074	37.6919	0.6231	102.69
66	93.72862	36.8912	0.6311	102.89
67	93.19676	36.0988	0.6390	103.10
68	92.63340	35.3153	0.6468	103.32
69	92.03658	34.5411	0.6546	103.54
70	91.40395	33.7767	0.6622	103.78
71	90.73280	33.0228	0.6698	104.02
72	90.02010	32.2803	0.6772	104.28
73	89.26241	31.5501	0.6845	104.55
74	88.45601	30.8332	0.6917	104.83
75	87.59685	30.1307	0.6987	105.13
76	86.68071	29.4438	0.7056	105.44
77	85.70325	28.7740	0.7123	105.77
78	84.66015	28.1223	0.7188	106.12
79	83.54726	27.4903	0.7251	106.49
80	82.36077	26.8791	0.7312	106.88
81	81.09741	26.2900	0.7371	107.29
82	79.75459	25.7242	0.7428	107.72
83	78.33065	25.1828	0.7482	108.18
84	76.82500	24.6665	0.7533	108.67
85	75.23825	24.1762	0.7582	109.18
86	73.57239	23.7123	0.7629	109.71
87	71.83081	23.2751	0.7672	110.28
88	70.01839	22.8646	0.7714	110.86
89	68.14144	22.4806	0.7752	111.48
90	66.20766	22.1226	0.7788	112.12
91	64.22597	21.7898	0.7821	112.79
92	62.20638	21.4810	0.7852	113.48
93	60.15975	21.1948	0.7881	114.19
94	58.09754	20.9294	0.7907	114.93
95	56.03106	20.6828	0.7932	115.68

Table A continued

Iowa Type curve L4

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	45.92922	19.6873	0.8031	119.69
101	44.00648	19.5257	0.8047	120.53
102	42.13058	19.3728	0.8063	121.37
103	40.30620	19.2270	0.8077	122.23
104	38.53722	19.0867	0.8091	123.09
105	36.82570	18.9500	0.8105	123.95
106	35.17587	18.8153	0.8118	124.82
107	33.58913	18.6811	0.8132	125.68
108	32.06415	18.5458	0.8146	126.55
109	30.60191	18.4080	0.8159	127.41
110	29.20175	18.2667	0.8173	128.27
111	27.86244	18.1207	0.8188	129.12
112	26.58234	17.9693	0.8203	129.97
113	25.35938	17.8117	0.8219	130.81
114	24.19124	17.6477	0.8235	131.65
115	23.07537	17.4769	0.8252	132.48
116	22.00912	17.2993	0.8270	133.30
117	20.98977	17.1152	0.8288	134.12
118	20.01462	16.9247	0.8308	134.92
119	19.08103	16.7283	0.8327	135.73
120	18.18649	16.5265	0.8347	136.53
121	17.32859	16.3200	0.8368	137.32
122	16.50514	16.1093	0.8389	138.11
123	15.71409	15.8950	0.8410	138.90
124	14.95359	15.6780	0.8432	139.68
125	14.22200	15.4587	0.8454	140.46
126	13.51785	15.2379	0.8476	141.24
127	12.83984	15.0162	0.8498	142.02
128	12.18685	14.7940	0.8521	142.79
129	11.55789	14.5718	0.8543	143.57
130	10.95212	14.3502	0.8565	144.35
131	10.36880	14.1293	0.8587	145.13
132	9.80734	13.9096	0.8609	145.91
133	9.26707	13.6914	0.8631	146.69
134	8.74754	13.4748	0.8653	147.47
135	8.24831	13.2601	0.8674	148.26
136	7.76897	13.0474	0.8695	149.05
137	7.30912	12.8368	0.8716	149.84
138	6.86841	12.6284	0.8737	150.63
139	6.44648	12.4223	0.8758	151.42
140	6.04296	12.2184	0.8778	152.22
141	5.65750	12.0168	0.8798	153.02
142	5.28973	11.8175	0.8818	153.82
143	4.93928	11.6205	0.8838	154.62
144	4.60575	11.4258	0.8857	155.43
145	4.28876	11.2333	0.8877	156.23
146	3.98790	11.0431	0.8896	157.04
147	3.70273	10.8551	0.8914	157.86
148	3.43284	10.6692	0.8933	158.67
149	3.17776	10.4855	0.8951	159.49
150	2.93706	10.3038	0.8970	160.30
151	2.71026	10.1242	0.8988	161.12
152	2.49689	9.9466	0.9005	161.95
153	2.29648	9.7710	0.9023	162.77
154	2.10855	9.5973	0.9040	163.60
155	1.93260	9.4256	0.9057	164.43
156	1.76816	9.2557	0.9074	165.26
157	1.61474	9.0875	0.9091	166.09
158	1.47185	8.9212	0.9108	166.92
159	1.33901	8.7567	0.9124	167.76
160	1.21574	8.5939	0.9141	168.59
161	1.10158	8.4327	0.9157	169.43
162	0.99604	8.2732	0.9173	170.27
163	0.89868	8.1153	0.9188	171.12
164	0.80905	7.9590	0.9204	171.96
165	0.72670	7.8043	0.9220	172.80
166	0.65120	7.6511	0.9235	173.65
167	0.58215	7.4993	0.9250	174.50
168	0.51912	7.3492	0.9265	175.35
169	0.46174	7.2003	0.9280	176.20
170	0.40962	7.0529	0.9295	177.05
171	0.36239	6.9069	0.9309	177.91
172	0.31971	6.7622	0.9324	178.76
173	0.28123	6.6190	0.9338	179.62
174	0.24665	6.4769	0.9352	180.48
175	0.21565	6.3361	0.9366	181.34
176	0.18794	6.1966	0.9380	182.20
177	0.16324	6.0585	0.9394	183.06
178	0.14130	5.9216	0.9408	183.92
179	0.12188	5.7854	0.9421	184.79
180	0.10473	5.6510	0.9435	185.65
181	0.08965	5.5174	0.9448	186.52
182	0.07643	5.3853	0.9461	187.39
183	0.06489	5.2540	0.9475	188.25
184	0.05486	5.1232	0.9488	189.12
185	0.04616	4.9946	0.9501	189.99
186	0.03866	4.8665	0.9513	190.87
187	0.03222	4.7393	0.9526	191.74
188	0.02671	4.6138	0.9539	192.61
189	0.02203	4.4877	0.9551	193.49
190	0.01806	4.3643	0.9564	194.36
191	0.01472	4.2412	0.9576	195.24
192	0.01192	4.1200	0.9588	196.12
193	0.00959	3.9995	0.9600	197.00
194	0.00767	3.8755	0.9612	197.88
195	0.00608	3.7582	0.9624	198.76

Iowa Type curve L4

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
200	0.00168	3.1725	0.9683	203.17
201	0.00126	3.0634	0.9694	204.06
202	0.00094	2.9360	0.9706	204.94
203	0.00069	2.8187	0.9718	205.82
204	0.00050	2.6998	0.9730	206.70
205	0.00036	2.5553	0.9744	207.56
206	0.00025	2.4596	0.9754	208.46
207	0.00017	2.3818	0.9762	209.38
208	0.00012	2.1659	0.9783	210.17
209	0.00008	1.9990	0.9800	211.00
210	0.00005	1.8985	0.9810	211.90
211	0.00003	1.8312	0.9817	212.83
212	0.00002	1.4971	0.9850	213.50
213	0.00001	1.4948	0.9851	214.49
214	0.00001	0.4959	0.9950	214.50
215	0.00000	0.0000	1.0000	215.00

Table A continued

Iowa Type curve L5

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	100.00000	99.0000	0.0100	100.00
2	100.00000	98.0000	0.0200	100.00
3	100.00000	97.0000	0.0300	100.00
4	100.00000	96.0000	0.0400	100.00
5	100.00000	95.0000	0.0500	100.00
6	100.00000	94.0000	0.0600	100.00
7	100.00000	93.0000	0.0700	100.00
8	100.00000	92.0000	0.0800	100.00
9	100.00000	91.0000	0.0900	100.00
10	100.00000	90.0000	0.1000	100.00
11	100.00000	89.0000	0.1100	100.00
12	100.00000	88.0000	0.1200	100.00
13	100.00000	87.0000	0.1300	100.00
14	100.00000	86.0000	0.1400	100.00
15	100.00000	85.0000	0.1500	100.00
16	100.00000	84.0000	0.1600	100.00
17	100.00000	83.0000	0.1700	100.00
18	100.00000	82.0000	0.1800	100.00
19	100.00000	81.0000	0.1900	100.00
20	100.00000	80.0000	0.2000	100.00
21	100.00000	79.0000	0.2100	100.00
22	100.00000	78.0000	0.2200	100.00
23	100.00000	77.0000	0.2300	100.00
24	100.00000	76.0000	0.2400	100.00
25	100.00000	75.0000	0.2500	100.00
26	100.00000	74.0000	0.2600	100.00
27	100.00000	73.0000	0.2700	100.00
28	100.00000	72.0000	0.2800	100.00
29	100.00000	71.0000	0.2900	100.00
30	100.00000	70.0000	0.3000	100.00
31	100.00000	69.0000	0.3100	100.00
32	100.00000	68.0000	0.3200	100.00
33	100.00000	67.0000	0.3300	100.00
34	100.00000	66.0000	0.3400	100.00
35	100.00000	65.0000	0.3500	100.00
36	100.00000	64.0000	0.3600	100.00
37	100.00000	63.0000	0.3700	100.00
38	100.00000	62.0000	0.3800	100.00
39	100.00000	61.0000	0.3900	100.00
40	100.00000	60.0000	0.4000	100.00
41	100.00000	59.0000	0.4100	100.00
42	100.00000	58.0000	0.4200	100.00
43	100.00000	57.0000	0.4300	100.00
44	99.99999	56.0000	0.4400	100.00
45	99.99994	55.0000	0.4500	100.00
46	99.99975	54.0001	0.4600	100.00
47	99.99925	53.0004	0.4700	100.00
48	99.99814	52.0010	0.4800	100.00
49	99.99600	51.0021	0.4900	100.00
50	99.99221	50.0040	0.5000	100.00
51	99.98600	49.0071	0.5099	100.01
52	99.97639	48.0117	0.5199	100.01
53	99.96220	47.0185	0.5298	100.02
54	99.94206	46.0279	0.5397	100.03
55	99.91441	45.0405	0.5496	100.04
56	99.87749	44.0569	0.5594	100.06
57	99.82938	43.0779	0.5692	100.08
58	99.76802	42.1041	0.5790	100.10
59	99.69121	41.1362	0.5886	100.14
60	99.59667	40.1747	0.5983	100.17
61	99.48202	39.2205	0.6078	100.22
62	99.34487	38.2739	0.6173	100.27
63	99.18277	37.3356	0.6266	100.34
64	98.99333	36.4061	0.6359	100.41
65	98.77418	35.4858	0.6451	100.49
66	98.52303	34.5750	0.6543	100.57
67	98.23757	33.6740	0.6633	100.67
68	97.91601	32.7829	0.6722	100.78
69	97.55607	31.9021	0.6810	100.90
70	97.15593	31.0314	0.6897	101.03
71	96.71371	30.1710	0.6983	101.17
72	96.22749	29.3209	0.7068	101.32
73	95.69515	28.4812	0.7152	101.48
74	95.11423	27.6521	0.7235	101.65
75	94.48180	26.8339	0.7317	101.83
76	93.79419	26.0269	0.7397	102.03
77	93.04688	25.2320	0.7477	102.23
78	92.23432	24.4498	0.7555	102.45
79	91.34990	23.6817	0.7632	102.68
80	90.38589	22.9290	0.7707	102.93
81	89.33357	22.1932	0.7781	103.19
82	88.18348	21.4761	0.7852	103.48
83	86.92572	20.7796	0.7922	103.78
84	85.55036	20.1056	0.7989	104.11
85	84.04805	19.4561	0.8054	104.46
86	82.41051	18.8327	0.8117	104.83
87	80.63117	18.2373	0.8176	105.24
88	78.70573	17.6712	0.8233	105.67
89	76.63271	17.1357	0.8286	106.14
90	74.41381	16.6318	0.8337	106.63
91	72.05424	16.1600	0.8384	107.16
92	69.56276	15.7209	0.8428	107.72
93	66.95171	15.3145	0.8469	108.31
94	64.23671	14.9407	0.8506	108.94
95	61.43633	14.5989	0.8540	109.60

Iowa Type curve L5

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	46.93011	13.3373	0.8666	113.34
101	44.09070	13.1641	0.8684	114.16
102	41.32246	13.0124	0.8699	115.01
103	38.64318	12.8800	0.8712	115.88
104	36.06787	12.7639	0.8724	116.76
105	33.60849	12.6614	0.8734	117.66
106	31.27390	12.5692	0.8743	118.57
107	29.06982	12.4843	0.8752	119.48
108	26.99903	12.4035	0.8760	120.40
109	25.06161	12.3237	0.8768	121.32
110	23.25529	12.2421	0.8776	122.24
111	21.57580	12.1561	0.8784	123.16
112	20.01734	12.0636	0.8794	124.06
113	18.57295	11.9629	0.8804	124.96
114	17.23495	11.8528	0.8815	125.85
115	15.99530	11.7326	0.8827	126.73
116	14.84589	11.6023	0.8840	127.60
117	13.77886	11.4620	0.8854	128.46
118	12.78675	11.3126	0.8869	129.31
119	11.86267	11.1549	0.8885	130.15
120	11.00040	10.9900	0.8901	130.99
121	10.19442	10.8194	0.8918	131.82
122	9.43990	10.6442	0.8936	132.64
123	8.73269	10.4657	0.8953	133.47
124	8.06922	10.2851	0.8971	134.29
125	7.44648	10.1035	0.8990	135.10
126	6.86191	9.9216	0.9008	135.92
127	6.31332	9.7403	0.9026	136.74
128	5.79883	9.5601	0.9044	137.56
129	5.31678	9.3815	0.9062	138.38
130	4.86569	9.2049	0.9080	139.20
131	4.44419	9.0305	0.9097	140.03
132	4.05101	8.8585	0.9114	140.86
133	3.68493	8.6889	0.9131	141.69
134	3.34475	8.5217	0.9148	142.52
135	3.02930	8.3570	0.9164	143.36
136	2.73741	8.1948	0.9181	144.19
137	2.46795	8.0350	0.9197	145.03
138	2.21975	7.8775	0.9212	145.88
139	1.99168	7.7223	0.9228	146.72
140	1.78262	7.5693	0.9243	147.57
141	1.59146	7.4184	0.9258	148.42
142	1.41710	7.2697	0.9273	149.27
143	1.25848	7.1229	0.9288	150.12
144	1.11456	6.9781	0.9302	150.98
145	0.98432	6.8353	0.9316	151.84
146	0.86680	6.6942	0.9331	152.69
147	0.76105	6.5549	0.9345	153.56
148	0.66616	6.4174	0.9358	154.42
149	0.58128	6.2815	0.9372	155.28
150	0.50557	6.1473	0.9385	156.15
151	0.43826	6.0146	0.9399	157.01
152	0.37861	5.8835	0.9412	157.88
153	0.32592	5.7538	0.9425	158.75
154	0.27953	5.6257	0.9437	159.63
155	0.23884	5.4989	0.9450	160.50
156	0.20328	5.3734	0.9463	161.37
157	0.17231	5.2493	0.9475	162.25
158	0.14545	5.1263	0.9487	163.13
159	0.12224	5.0047	0.9500	164.00
160	0.10227	4.8844	0.9512	164.88
161	0.08516	4.7653	0.9523	165.77
162	0.07057	4.6471	0.9535	166.65
163	0.05818	4.5302	0.9547	167.53
164	0.04771	4.4147	0.9559	168.41
165	0.03891	4.3000	0.9570	169.30
166	0.03155	4.1865	0.9581	170.19
167	0.02543	4.0737	0.9593	171.07
168	0.02037	3.9615	0.9604	171.96
169	0.01621	3.8498	0.9615	172.85
170	0.01280	3.7422	0.9626	173.74
171	0.01004	3.6334	0.9637	174.63
172	0.00782	3.5230	0.9648	175.52
173	0.00604	3.4139	0.9659	176.41
174	0.00462	3.3095	0.9669	177.31
175	0.00350	3.2085	0.9679	178.21
176	0.00263	3.1045	0.9690	179.10
177	0.00196	2.9948	0.9701	179.99
178	0.00144	2.8958	0.9710	180.90
179	0.00106	2.7856	0.9721	181.79
180	0.00075	2.6999	0.9730	182.70
181	0.00053	2.6130	0.9739	183.61
182	0.00037	2.5268	0.9747	184.53
183	0.00026	2.3843	0.9762	185.38
184	0.00017	2.3819	0.9762	186.38
185	0.00012	2.1660	0.9783	187.17
186	0.00008	1.9991	0.9800	188.00
187	0.00005	1.8987	0.9810	188.90
188	0.00003	1.8316	0.9817	189.83
189	0.00002	1.4977	0.9850	190.50
190	0.00001	1.4959	0.9850	191.50
191	0.00001	0.4971	0.9950	191.50
192	0.00000	0.0000	1.0000	192.00

Table B

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve S0				
0	100.00000	100.0000	0.0000	100.00
1	99.97910	99.0208	0.0098	100.02
2	99.92921	98.0700	0.0193	100.07
3	99.85617	97.1414	0.0286	100.14
4	99.76252	96.2321	0.0377	100.23
5	99.64988	95.3403	0.0466	100.34
6	99.51946	94.4646	0.0554	100.46
7	99.37223	93.6038	0.0640	100.60
8	99.20898	92.7570	0.0724	100.76
9	99.03038	91.9234	0.0808	100.92
10	98.83704	91.1022	0.0890	101.10
11	98.62946	90.2929	0.0971	101.29
12	98.40814	89.4948	0.1051	101.49
13	98.17349	88.7076	0.1129	101.71
14	97.92592	87.9306	0.1207	101.93
15	97.66579	87.1634	0.1284	102.16
16	97.39345	86.4058	0.1359	102.41
17	97.10922	85.6572	0.1434	102.66
18	96.81340	84.9174	0.1508	102.92
19	96.50628	84.1861	0.1581	103.19
20	96.18813	83.4629	0.1654	103.46
21	95.85922	82.7475	0.1725	103.75
22	95.51979	82.0398	0.1796	104.04
23	95.17008	81.3394	0.1866	104.34
24	94.81032	80.6462	0.1935	104.65
25	94.44074	79.9598	0.2004	104.96
26	94.06155	79.2801	0.2072	105.28
27	93.67296	78.6069	0.2139	105.61
28	93.27517	77.9400	0.2206	105.94
29	92.86837	77.2792	0.2272	106.28
30	92.45276	76.6244	0.2338	106.62
31	92.02851	75.9753	0.2402	106.98
32	91.59582	75.3319	0.2467	107.33
33	91.15485	74.6939	0.2531	107.69
34	90.70578	74.0612	0.2594	108.06
35	90.24878	73.4337	0.2657	108.43
36	89.78402	72.8112	0.2719	108.81
37	89.31165	72.1937	0.2781	109.19
38	88.83183	71.5809	0.2842	109.58
39	88.34472	70.9729	0.2903	109.97
40	87.85047	70.3693	0.2963	110.37
41	87.34924	69.7703	0.3023	110.77
42	86.84117	69.1755	0.3082	111.18
43	86.32640	68.5851	0.3141	111.59
44	85.80509	67.9987	0.3200	112.00
45	85.27737	67.4164	0.3258	112.42
46	84.74338	66.8381	0.3316	112.84
47	84.20327	66.2636	0.3374	113.26
48	83.65716	65.6929	0.3431	113.69
49	83.10519	65.1259	0.3487	114.13
50	82.54749	64.5625	0.3544	114.56
51	81.98420	64.0027	0.3600	115.00
52	81.41545	63.4463	0.3655	115.45
53	80.84136	62.8933	0.3711	115.89
54	80.26206	62.3436	0.3766	116.34
55	79.67768	61.7972	0.3820	116.80
56	79.08834	61.2540	0.3875	117.25
57	78.49416	60.7138	0.3929	117.71
58	77.89528	60.1768	0.3982	118.18
59	77.29180	59.6427	0.4036	118.64
60	76.68386	59.1116	0.4089	119.11
61	76.07156	58.5834	0.4142	119.58
62	75.45503	58.0580	0.4194	120.06
63	74.83439	57.5353	0.4246	120.54
64	74.20976	57.0154	0.4298	121.02
65	73.58124	56.4981	0.4350	121.50
66	72.94896	55.9835	0.4402	121.98
67	72.31303	55.4714	0.4453	122.47
68	71.67356	54.9619	0.4504	122.96
69	71.03067	54.4548	0.4555	123.45
70	70.38447	53.9502	0.4605	123.95
71	69.73508	53.4479	0.4655	124.45
72	69.08260	52.9480	0.4705	124.95
73	68.42714	52.4504	0.4755	125.45
74	67.76882	51.9551	0.4804	125.96
75	67.10774	51.4619	0.4854	126.46
76	66.44402	50.9710	0.4903	126.97
77	65.77777	50.4822	0.4952	127.48
78	65.10909	49.9955	0.5000	128.00
79	64.43809	49.5109	0.5049	128.51
80	63.76487	49.0284	0.5097	129.03
81	63.08956	48.5478	0.5145	129.55
82	62.41225	48.0693	0.5193	130.07
83	61.73305	47.5926	0.5241	130.59
84	61.05207	47.1179	0.5288	131.12
85	60.36941	46.6451	0.5335	131.65
86	59.68518	46.1741	0.5383	132.17
87	58.99949	45.7049	0.5430	132.70
88	58.31244	45.2375	0.5476	133.24
89	57.62413	44.7719	0.5523	133.77
90	56.93468	44.3080	0.5569	134.31
91	56.24418	43.8458	0.5615	134.85
92	55.55274	43.3853	0.5661	135.39
93	54.86047	42.9265	0.5707	135.93
94	54.16747	42.4693	0.5753	136.47
95	53.47385	42.0137	0.5799	137.01

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve S0				
100	50.00000	39.7589	0.6024	139.76
101	49.30481	39.3125	0.6069	140.31
102	48.60973	38.8674	0.6113	140.87
103	47.91486	38.4238	0.6158	141.42
104	47.22030	37.9817	0.6202	141.98
105	46.52615	37.5409	0.6246	142.54
106	45.83253	37.1014	0.6290	143.10
107	45.13953	36.6634	0.6334	143.66
108	44.44726	36.2266	0.6377	144.23
109	43.75582	35.7912	0.6421	144.79
110	43.06532	35.3570	0.6464	145.36
111	42.37587	34.9241	0.6508	145.92
112	41.68756	34.4925	0.6551	146.49
113	41.00051	34.0621	0.6594	147.06
114	40.31482	33.6330	0.6637	147.63
115	39.63059	33.2050	0.6679	148.21
116	38.94793	32.7783	0.6722	148.78
117	38.26695	32.3527	0.6765	149.35
118	37.58775	31.9282	0.6807	149.93
119	36.91044	31.5050	0.6850	150.50
120	36.23513	31.0828	0.6892	151.08
121	35.56191	30.6618	0.6934	151.66
122	34.89091	30.2418	0.6976	152.24
123	34.22223	29.8229	0.7018	152.82
124	33.55598	29.4051	0.7059	153.41
125	32.89226	28.9884	0.7101	153.99
126	32.23118	28.5727	0.7143	154.57
127	31.57286	28.1581	0.7184	155.16
128	30.91740	27.7444	0.7226	155.74
129	30.26492	27.3318	0.7267	156.33
130	29.61553	26.9201	0.7308	156.92
131	28.96933	26.5095	0.7349	157.51
132	28.32644	26.0998	0.7390	158.10
133	27.68697	25.6910	0.7431	158.69
134	27.05104	25.2832	0.7472	159.28
135	26.41876	24.8764	0.7512	159.88
136	25.79024	24.4704	0.7553	160.47
137	25.16561	24.0654	0.7593	161.07
138	24.54497	23.6613	0.7634	161.66
139	23.92844	23.2580	0.7674	162.26
140	23.31615	22.8557	0.7714	162.86
141	22.70820	22.4542	0.7755	163.45
142	22.10472	22.0536	0.7795	164.05
143	21.50584	21.6538	0.7835	164.65
144	20.91166	21.2548	0.7875	165.25
145	20.32232	20.8567	0.7914	165.86
146	19.73794	20.4594	0.7954	166.46
147	19.15864	20.0629	0.7994	167.06
148	18.58455	19.6672	0.8033	167.67
149	18.01580	19.2723	0.8073	168.27
150	17.45251	18.8782	0.8112	168.88
151	16.89481	18.4849	0.8152	169.48
152	16.34285	18.0923	0.8191	170.09
153	15.79674	17.7005	0.8230	170.70
154	15.25662	17.3094	0.8269	171.31
155	14.72263	16.9191	0.8308	171.92
156	14.19491	16.6295	0.8347	172.53
157	13.67360	16.1406	0.8386	173.14
158	13.15883	15.7525	0.8425	173.75
159	12.65076	15.3651	0.8463	174.37
160	12.14953	14.9783	0.8502	174.98
161	11.65528	14.5923	0.8541	175.59
162	11.16817	14.2069	0.8579	176.21
163	10.68836	13.8223	0.8618	176.82
164	10.21598	13.4383	0.8656	177.44
165	9.75122	13.0549	0.8695	178.05
166	9.29422	12.6723	0.8733	178.67
167	8.84515	12.2902	0.8771	179.29
168	8.40418	11.9089	0.8809	179.91
169	7.97149	11.5282	0.8847	180.53
170	7.54724	11.1481	0.8885	181.15
171	7.13163	10.7686	0.8923	181.77
172	6.72483	10.3898	0.8961	182.39
173	6.32704	10.0116	0.8999	183.01
174	5.93845	9.6340	0.9037	183.63
175	5.55926	9.2570	0.9074	184.26
176	5.18968	8.8806	0.9112	184.88
177	4.82992	8.5048	0.9150	185.50
178	4.48022	8.1297	0.9187	186.13
179	4.14079	7.7551	0.9224	186.76
180	3.81187	7.3811	0.9262	187.38
181	3.49372	7.0077	0.9299	188.01
182	3.18660	6.6349	0.9337	188.63
183	2.89078	6.2627	0.9374	189.26
184	2.60655	5.8911	0.9411	189.89
185	2.33421	5.5201	0.9448	190.52
186	2.07408	5.1497	0.9485	191.15
187	1.82651	4.7800	0.9522	191.78
188	1.59186	4.4109	0.9559	192.41
189	1.37054	4.0424	0.9596	193.04
190	1.16296	3.6747	0.9633	193.67
191	0.96962	3.3077	0.9669	194.31
192	0.79102	2.9417	0.9706	194.94
193	0.62777	2.5767	0.9742	195.58
194	0.48054	2.2129	0.9779	196.21
195	0.35012	1.8510	0.9815	196.85

Table B continued

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve S0				
200	0.00000	0.0000	1.0000	200.00

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve S1				
0	100.00000	100.0000	0.0000	100.00
1	99.99975	99.0002	0.0100	100.00
2	99.99824	98.0017	0.0200	100.00
3	99.99449	97.0054	0.0299	100.01
4	99.98766	96.0120	0.0399	100.01
5	99.97697	95.0222	0.0498	100.02
6	99.96169	94.0366	0.0596	100.04
7	99.94116	93.0559	0.0694	100.06
8	99.91476	92.0803	0.0792	100.08
9	99.88188	91.1105	0.0889	100.11
10	99.84198	90.1467	0.0985	100.15
11	99.79453	89.1893	0.1081	100.19
12	99.73904	88.2386	0.1176	100.24
13	99.67505	87.2950	0.1271	100.29
14	99.60210	86.3585	0.1364	100.36
15	99.51978	85.4296	0.1457	100.43
16	99.42771	84.5082	0.1549	100.51
17	99.32552	83.5946	0.1641	100.59
18	99.21285	82.6890	0.1731	100.69
19	99.08937	81.7914	0.1821	100.79
20	98.95479	80.9020	0.1910	100.90
21	98.80882	80.0208	0.1998	101.02
22	98.65118	79.1478	0.2085	101.15
23	98.48164	78.2832	0.2172	101.28
24	98.29995	77.4270	0.2257	101.43
25	98.10590	76.5791	0.2342	101.58
26	97.89930	75.7397	0.2426	101.74
27	97.67997	74.9086	0.2509	101.91
28	97.44773	74.0860	0.2591	102.09
29	97.20244	73.2717	0.2673	102.27
30	96.94397	72.4657	0.2753	102.47
31	96.67219	71.6680	0.2833	102.67
32	96.38701	70.8786	0.2912	102.88
33	96.08832	70.0973	0.2990	103.10
34	95.77605	69.3243	0.3068	103.32
35	95.45014	68.5593	0.3144	103.56
36	95.11053	67.8023	0.3220	103.80
37	94.75719	67.0532	0.3295	104.05
38	94.39009	66.3121	0.3369	104.31
39	94.00922	65.5787	0.3442	104.58
40	93.61458	64.8531	0.3515	104.85
41	93.20617	64.1350	0.3586	105.14
42	92.78401	63.4246	0.3658	105.42
43	92.34815	62.7216	0.3728	105.72
44	91.89862	62.0259	0.3797	106.03
45	91.43547	61.3376	0.3866	106.34
46	90.95878	60.6564	0.3934	106.66
47	90.46861	59.9823	0.4002	106.98
48	89.96505	59.3153	0.4068	107.32
49	89.44819	58.6551	0.4134	107.66
50	88.91814	58.0018	0.4200	108.00
51	88.37500	57.3552	0.4264	108.36
52	87.81891	56.7152	0.4328	108.72
53	87.24999	56.0818	0.4392	109.08
54	86.66838	55.4548	0.4455	109.45
55	86.07422	54.8341	0.4517	109.83
56	85.46768	54.2197	0.4578	110.22
57	84.84891	53.6115	0.4639	110.61
58	84.21809	53.0093	0.4699	111.01
59	83.57540	52.4131	0.4759	111.41
60	82.92102	51.8228	0.4818	111.82
61	82.25514	51.2382	0.4876	112.24
62	81.57797	50.6594	0.4934	112.66
63	80.88971	50.0862	0.4991	113.09
64	80.19057	49.5185	0.5048	113.52
65	79.48078	48.9563	0.5104	113.96
66	78.76056	48.3994	0.5160	114.40
67	78.03015	47.8477	0.5215	114.85
68	77.28977	47.3013	0.5270	115.30
69	76.53969	46.7599	0.5324	115.76
70	75.78013	46.2236	0.5378	116.22
71	75.01136	45.6922	0.5431	116.69
72	74.23364	45.1657	0.5483	117.17
73	73.44723	44.6439	0.5536	117.64
74	72.65240	44.1269	0.5587	118.13
75	71.84942	43.6144	0.5639	118.61
76	71.03858	43.1065	0.5689	119.11
77	70.22014	42.6031	0.5740	119.60
78	69.39441	42.1041	0.5790	120.10
79	68.56167	41.6094	0.5839	120.61
80	67.72221	41.1190	0.5888	121.12
81	66.87633	40.6328	0.5937	121.63
82	66.02433	40.1507	0.5985	122.15
83	65.16651	39.6726	0.6033	122.67
84	64.30319	39.1985	0.6080	123.20
85	63.43467	38.7284	0.6127	123.73
86	62.56125	38.2621	0.6174	124.26
87	61.68327	37.7996	0.6220	124.80
88	60.80103	37.3408	0.6266	125.34
89	59.91485	36.8857	0.6311	125.89
90	59.02506	36.4342	0.6357	126.43
91	58.13198	35.9863	0.6401	126.99
92	57.23592	35.5418	0.6446	127.54
93	56.33723	35.1008	0.6490	128.10
94	55.43622	34.6632	0.6534	128.66
95	54.53322	34.2289	0.6577	129.23
96	53.62857	33.7979	0.6620	129.80

Table B continued

Iowa Type curve S1

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	50.00000	32.1054	0.6789	132.11
101	49.09203	31.6900	0.6831	132.69
102	48.18439	31.2775	0.6872	133.28
103	47.27741	30.8679	0.6913	133.87
104	46.37144	30.4612	0.6954	134.46
105	45.46678	30.0574	0.6994	135.06
106	44.56378	29.6563	0.7034	135.66
107	43.66277	29.2580	0.7074	136.26
108	42.76408	28.8623	0.7114	136.86
109	41.86803	28.4693	0.7153	137.47
110	40.97494	28.0789	0.7192	138.08
111	40.08515	27.6911	0.7231	138.69
112	39.19897	27.3058	0.7269	139.31
113	38.31673	26.9230	0.7308	139.92
114	37.43875	26.5427	0.7346	140.54
115	36.56534	26.1647	0.7384	141.16
116	35.69681	25.7892	0.7421	141.79
117	34.83349	25.4160	0.7458	142.42
118	33.97567	25.0450	0.7495	143.05
119	33.12367	24.6764	0.7532	143.68
120	32.27779	24.3099	0.7569	144.31
121	31.43833	23.9457	0.7605	144.95
122	30.60559	23.5836	0.7642	145.58
123	29.77986	23.2237	0.7678	146.22
124	28.96142	22.8659	0.7713	146.87
125	28.15058	22.5101	0.7749	147.51
126	27.34760	22.1563	0.7784	148.16
127	26.55277	21.8046	0.7820	148.80
128	25.76636	21.4548	0.7855	149.45
129	24.98864	21.1070	0.7889	150.11
130	24.21987	20.7611	0.7924	150.76
131	23.46032	20.4171	0.7958	151.42
132	22.71023	20.0749	0.7993	152.07
133	21.96985	19.7346	0.8027	152.73
134	21.23944	19.3961	0.8060	153.40
135	20.51922	19.0593	0.8094	154.06
136	19.80943	18.7243	0.8128	154.72
137	19.11030	18.3910	0.8161	155.39
138	18.42203	18.0594	0.8194	156.06
139	17.74486	17.7295	0.8227	156.73
140	17.07899	17.4013	0.8260	157.40
141	16.42460	17.0747	0.8293	158.07
142	15.78191	16.7496	0.8325	158.75
143	15.15109	16.4262	0.8357	159.43
144	14.53232	16.1043	0.8390	160.10
145	13.92578	15.7840	0.8422	160.78
146	13.33163	15.4651	0.8453	161.47
147	12.75001	15.1478	0.8485	162.15
148	12.18109	14.8319	0.8517	162.83
149	11.62500	14.5175	0.8548	163.52
150	11.08187	14.2045	0.8580	164.20
151	10.55181	13.8929	0.8611	164.89
152	10.03495	13.5827	0.8642	165.58
153	9.53139	13.2739	0.8673	166.27
154	9.04122	12.9665	0.8703	166.97
155	8.56453	12.6603	0.8734	167.66
156	8.10138	12.3555	0.8764	168.36
157	7.65185	12.0520	0.8795	169.05
158	7.21599	11.7498	0.8825	169.75
159	6.79383	11.4488	0.8855	170.45
160	6.38542	11.1491	0.8885	171.15
161	5.99078	10.8506	0.8915	171.85
162	5.60991	10.5533	0.8945	172.55
163	5.24281	10.2573	0.8974	173.26
164	4.88947	9.9624	0.9004	173.96
165	4.54986	9.6687	0.9033	174.67
166	4.22395	9.3761	0.9062	175.38
167	3.91168	9.0847	0.9092	176.08
168	3.61300	8.7944	0.9121	176.79
169	3.32781	8.5052	0.9149	177.51
170	3.05603	8.2171	0.9178	178.22
171	2.79756	7.9301	0.9207	178.93
172	2.55227	7.6442	0.9236	179.64
173	2.32003	7.3594	0.9264	180.36
174	2.10070	7.0755	0.9292	181.08
175	1.89410	6.7928	0.9321	181.79
176	1.70005	6.5110	0.9349	182.51
177	1.51836	6.2303	0.9377	183.23
178	1.34882	5.9506	0.9405	183.95
179	1.19118	5.6719	0.9433	184.67
180	1.04521	5.3942	0.9461	185.39
181	0.91063	5.1175	0.9488	186.12
182	0.78716	4.8418	0.9516	186.84
183	0.67448	4.5671	0.9543	187.57
184	0.57229	4.2934	0.9571	188.29
185	0.48022	4.0207	0.9598	189.02
186	0.39790	3.7491	0.9625	189.75
187	0.32495	3.4785	0.9652	190.48
188	0.26096	3.2088	0.9679	191.21
189	0.20547	2.9404	0.9706	191.94
190	0.15802	2.6731	0.9733	192.67
191	0.11812	2.4072	0.9759	193.41
192	0.08524	2.1429	0.9786	194.14
193	0.05884	1.8800	0.9812	194.88
194	0.03831	1.6195	0.9838	195.62
195	0.02303	1.3624	0.9864	196.36
196	0.01234	1.1004	0.9889	197.11

Iowa Type curve S1

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
200	0.00000	0.0000	1.0000	200.00

Table B continued

Iowa Type curve S2

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	100.00000	99.0000	0.0100	100.00
2	100.00000	98.0000	0.0200	100.00
3	99.99998	97.0000	0.0300	100.00
4	99.99992	96.0001	0.0400	100.00
5	99.99977	95.0002	0.0500	100.00
6	99.99946	94.0005	0.0600	100.00
7	99.99890	93.0010	0.0700	100.00
8	99.99797	92.0019	0.0800	100.00
9	99.99652	91.0032	0.0900	100.00
10	99.99438	90.0052	0.0999	100.01
11	99.99134	89.0079	0.1099	100.01
12	99.98717	88.0116	0.1199	100.01
13	99.98160	87.0165	0.1298	100.02
14	99.97435	86.0227	0.1398	100.02
15	99.96509	85.0306	0.1497	100.03
16	99.95348	84.0405	0.1596	100.04
17	99.93914	83.0525	0.1695	100.05
18	99.92167	82.0669	0.1793	100.07
19	99.90065	81.0840	0.1892	100.08
20	99.87563	80.1042	0.1990	100.10
21	99.84613	79.1278	0.2087	100.13
22	99.81167	78.1549	0.2185	100.15
23	99.77175	77.1860	0.2281	100.19
24	99.72583	76.2213	0.2378	100.22
25	99.67362	75.2609	0.2474	100.26
26	99.61381	74.3058	0.2569	100.31
27	99.54659	73.3557	0.2664	100.36
28	99.47113	72.4109	0.2759	100.41
29	99.38684	71.4719	0.2853	100.47
30	99.29314	70.5389	0.2946	100.54
31	99.18942	69.6121	0.3039	100.61
32	99.07508	68.6919	0.3131	100.69
33	98.94953	67.7784	0.3222	100.78
34	98.81215	66.8720	0.3313	100.87
35	98.66236	65.9727	0.3403	100.97
36	98.49956	65.0809	0.3492	101.08
37	98.32317	64.1968	0.3580	101.20
38	98.13260	63.3205	0.3668	101.32
39	97.92728	62.4522	0.3755	101.45
40	97.70666	61.5921	0.3841	101.59
41	97.47019	60.7403	0.3926	101.74
42	97.21735	59.8970	0.4010	101.90
43	96.94761	59.0622	0.4094	102.06
44	96.66048	58.2362	0.4176	102.24
45	96.35548	57.4190	0.4258	102.42
46	96.03215	56.6106	0.4339	102.61
47	95.69007	55.8112	0.4419	102.81
48	95.32881	55.0208	0.4498	103.02
49	94.94799	54.2395	0.4576	103.24
50	94.54723	53.4673	0.4653	103.47
51	94.12622	52.7042	0.4730	103.70
52	93.68462	51.9502	0.4805	103.95
53	93.22216	51.2055	0.4879	104.21
54	92.73860	50.4699	0.4953	104.47
55	92.23370	49.7434	0.5026	104.74
56	91.70727	49.0261	0.5097	105.03
57	91.15914	48.3179	0.5168	105.32
58	90.58920	47.6187	0.5238	105.62
59	89.99734	46.9286	0.5307	105.93
60	89.38350	46.2474	0.5375	106.25
61	88.74764	45.5752	0.5442	106.58
62	88.08976	44.9118	0.5509	106.91
63	87.40990	44.2573	0.5574	107.26
64	86.70813	43.6114	0.5639	107.61
65	85.98455	42.9742	0.5703	107.97
66	85.23928	42.3456	0.5765	108.35
67	84.47253	41.7254	0.5827	108.73
68	83.68447	41.1136	0.5889	109.11
69	82.87533	40.5101	0.5949	109.51
70	82.04540	39.9149	0.6009	109.91
71	81.19498	39.3277	0.6067	110.33
72	80.32439	38.7485	0.6125	110.75
73	79.43401	38.1773	0.6182	111.18
74	78.52423	37.6138	0.6239	111.61
75	77.59548	37.0580	0.6294	112.06
76	76.64822	36.5098	0.6349	112.51
77	75.68294	35.9691	0.6403	112.97
78	74.70016	35.4357	0.6456	113.44
79	73.70042	34.9096	0.6509	113.91
80	72.68429	34.3907	0.6561	114.39
81	71.65238	33.8788	0.6612	114.88
82	70.60530	33.3738	0.6663	115.37
83	69.54371	32.8756	0.6712	115.88
84	68.46828	32.3841	0.6762	116.38
85	67.37970	31.8992	0.6810	116.90
86	66.27869	31.4208	0.6858	117.42
87	65.16598	30.9488	0.6905	117.95
88	64.04234	30.4830	0.6952	118.48
89	62.90852	30.0234	0.6998	119.02
90	61.76532	29.5699	0.7043	119.57
91	60.61354	29.1222	0.7088	120.12
92	59.45400	28.6805	0.7132	120.68
93	58.28754	28.2444	0.7176	121.24
94	57.11498	27.8140	0.7219	121.81
95	55.93719	27.3891	0.7261	122.39
96	54.75503	26.9697	0.7303	122.97

Iowa Type curve S2

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	50.00000	25.3441	0.7466	125.34
101	48.80904	24.9503	0.7505	125.95
102	47.61897	24.5614	0.7544	126.56
103	46.43065	24.1772	0.7582	127.18
104	45.24498	23.7977	0.7620	127.80
105	44.06281	23.4227	0.7658	128.42
106	42.88502	23.0523	0.7695	129.05
107	41.71246	22.6862	0.7731	129.69
108	40.54600	22.3245	0.7768	130.32
109	39.38646	21.9670	0.7803	130.97
110	38.23468	21.6137	0.7839	131.61
111	37.09148	21.2644	0.7874	132.26
112	35.95767	20.9192	0.7908	132.92
113	34.83402	20.5778	0.7942	133.58
114	33.72131	20.2403	0.7976	134.24
115	32.62030	19.9066	0.8009	134.91
116	31.53172	19.5766	0.8042	135.58
117	30.45629	19.2502	0.8075	136.25
118	29.39470	18.9274	0.8107	136.93
119	28.34762	18.6080	0.8139	137.61
120	27.31571	18.2921	0.8171	138.29
121	26.29958	17.9795	0.8202	138.98
122	25.29984	17.6702	0.8233	139.67
123	24.31706	17.3642	0.8264	140.36
124	23.35178	17.0613	0.8294	141.06
125	22.40452	16.7615	0.8324	141.76
126	21.47577	16.4648	0.8354	142.46
127	20.56550	16.1714	0.8383	143.17
128	19.67561	15.8802	0.8412	143.88
129	18.80502	15.5922	0.8441	144.59
130	17.95470	15.3070	0.8469	145.31
131	17.12467	15.0246	0.8498	146.02
132	16.31553	14.7450	0.8526	146.74
133	15.52747	14.4679	0.8553	147.47
134	14.76071	14.1935	0.8581	148.19
135	14.01545	13.9217	0.8608	148.92
136	13.29187	13.6523	0.8635	149.65
137	12.59010	13.3854	0.8661	150.39
138	11.91024	13.1209	0.8688	151.12
139	11.25237	12.8588	0.8714	151.86
140	10.61650	12.5990	0.8740	152.60
141	10.00264	12.3416	0.8766	153.34
142	9.41080	12.0863	0.8791	154.09
143	8.84086	11.8332	0.8817	154.83
144	8.29274	11.5823	0.8842	155.58
145	7.76631	11.3335	0.8867	156.33
146	7.26140	11.0868	0.8891	157.09
147	6.77784	10.8421	0.8916	157.84
148	6.31538	10.5994	0.8940	158.60
149	5.87399	10.3583	0.8964	159.36
150	5.45277	10.1199	0.8988	160.12
151	5.05201	9.8830	0.9012	160.88
152	4.67119	9.6479	0.9035	161.65
153	4.30993	9.4147	0.9059	162.41
154	3.96784	9.1833	0.9082	163.18
155	3.64452	8.9536	0.9105	163.95
156	3.33952	8.7257	0.9127	164.73
157	3.05239	8.4994	0.9150	165.50
158	2.78265	8.2749	0.9173	166.27
159	2.52981	8.0519	0.9195	167.05
160	2.29334	7.8306	0.9217	167.83
161	2.07272	7.6109	0.9239	168.61
162	1.86740	7.3927	0.9261	169.39
163	1.67683	7.1761	0.9282	170.18
164	1.50044	6.9609	0.9304	170.96
165	1.33764	6.7473	0.9325	171.75
166	1.18785	6.5351	0.9346	172.54
167	1.05048	6.3243	0.9368	173.32
168	0.92493	6.1148	0.9389	174.11
169	0.81058	5.9069	0.9409	174.91
170	0.70686	5.7003	0.9430	175.70
171	0.61316	5.4950	0.9450	176.50
172	0.52887	5.2911	0.9471	177.29
173	0.45341	5.0885	0.9491	178.09
174	0.38619	4.8871	0.9511	178.89
175	0.32664	4.6870	0.9531	179.69
176	0.27418	4.4881	0.9551	180.49
177	0.22825	4.2906	0.9571	181.29
178	0.18833	4.0941	0.9591	182.09
179	0.15387	3.8990	0.9610	182.90
180	0.12438	3.7049	0.9630	183.70
181	0.09935	3.5123	0.9649	184.51
182	0.07833	3.3206	0.9668	185.32
183	0.06086	3.1303	0.9687	186.13
184	0.04651	2.9418	0.9706	186.94
185	0.03491	2.7532	0.9725	187.75
186	0.02565	2.5667	0.9743	188.57
187	0.01840	2.3810	0.9762	189.38
188	0.01284	2.1955	0.9780	190.20
189	0.00866	2.0138	0.9799	191.01
190	0.00563	1.8286	0.9817	191.83
191	0.00348	1.6494	0.9835	192.65
192	0.00203	1.4704	0.9853	193.47
193	0.00110	1.2909	0.9871	194.29
194	0.00054	1.1111	0.9889	195.11
195	0.00023	0.9347	0.9907	195.93
196	0.00008	0.7497	0.9925	196.75

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve S3				
0	100.00000	100.0000	0.0000	100.00
1	100.00000	99.0050	0.0099	100.01
2	100.00000	98.0050	0.0199	100.01
3	100.00000	97.0050	0.0299	100.01
4	100.00000	96.0050	0.0399	100.01
5	100.00000	95.0050	0.0499	100.01
6	100.00000	94.0050	0.0599	100.01
7	100.00000	93.0050	0.0599	100.01
8	100.00000	92.0050	0.0799	100.01
9	99.99999	91.0050	0.0899	100.01
10	99.99998	90.0050	0.0999	100.01
11	99.99996	89.0050	0.1099	100.01
12	99.99991	88.0051	0.1199	100.01
13	99.99984	87.0051	0.1299	100.01
14	99.99973	86.0052	0.1399	100.01
15	99.99955	85.0054	0.1499	100.01
16	99.99927	84.0056	0.1599	100.01
17	99.99886	83.0060	0.1699	100.01
18	99.99826	82.0065	0.1799	100.01
19	99.99742	81.0072	0.1899	100.01
20	99.99626	80.0081	0.1999	100.01
21	99.99468	79.0093	0.2099	100.01
22	99.99257	78.0110	0.2199	100.01
23	99.98980	77.0131	0.2299	100.01
24	99.98620	76.0159	0.2398	100.02
25	99.98158	75.0194	0.2498	100.02
26	99.97573	74.0237	0.2598	100.02
27	99.96840	73.0291	0.2697	100.03
28	99.95930	72.0357	0.2796	100.04
29	99.94813	71.0437	0.2896	100.04
30	99.93451	70.0534	0.2995	100.05
31	99.91805	69.0648	0.3094	100.06
32	99.89831	68.0784	0.3192	100.08
33	99.87481	67.0943	0.3291	100.09
34	99.84701	66.1128	0.3389	100.11
35	99.81435	65.1343	0.3487	100.13
36	99.77620	64.1590	0.3584	100.16
37	99.73190	63.1873	0.3681	100.19
38	99.68073	62.2194	0.3778	100.22
39	99.62192	61.2559	0.3874	100.26
40	99.55468	60.2969	0.3970	100.30
41	99.47816	59.3429	0.4066	100.34
42	99.39145	58.3942	0.4161	100.39
43	99.29363	57.4513	0.4255	100.45
44	99.18371	56.5144	0.4349	100.51
45	99.06070	55.5839	0.4442	100.58
46	98.92355	54.6603	0.4534	100.66
47	98.77119	53.7439	0.4626	100.74
48	98.60251	52.8349	0.4717	100.83
49	98.41639	51.9339	0.4807	100.93
50	98.21171	51.0411	0.4896	101.04
51	97.98729	50.1569	0.4984	101.16
52	97.74199	49.2815	0.5072	101.28
53	97.47464	48.4153	0.5158	101.42
54	97.18408	47.5585	0.5244	101.56
55	96.86915	46.7116	0.5329	101.71
56	96.52871	45.8745	0.5413	101.87
57	96.16165	45.0477	0.5495	102.05
58	95.76687	44.2314	0.5577	102.23
59	95.34330	43.4256	0.5657	102.43
60	94.88992	42.6307	0.5737	102.63
61	94.40574	41.8468	0.5815	102.85
62	93.88982	41.0740	0.5893	103.07
63	93.34129	40.3124	0.5969	103.31
64	92.75933	39.5622	0.6044	103.56
65	92.14318	38.8234	0.6118	103.82
66	91.49216	38.0961	0.6190	104.10
67	90.80565	37.3803	0.6262	104.38
68	90.08316	36.6761	0.6332	104.68
69	89.32423	35.9835	0.6402	104.98
70	88.52851	35.3024	0.6470	105.30
71	87.69574	34.6329	0.6537	105.63
72	86.82577	33.9749	0.6603	105.97
73	85.91855	33.3284	0.6667	106.33
74	84.97412	32.6933	0.6731	106.69
75	83.99263	32.0695	0.6793	107.07
76	82.97434	31.4569	0.6854	107.46
77	81.91963	30.8555	0.6914	107.86
78	80.82896	30.2651	0.6973	108.27
79	79.70293	29.6856	0.7031	108.69
80	78.54224	29.1169	0.7088	109.12
81	77.34768	28.5588	0.7144	109.56
82	76.12018	28.0113	0.7199	110.01
83	74.86076	27.4741	0.7253	110.47
84	73.57053	26.9472	0.7305	110.95
85	72.25073	26.4303	0.7357	111.43
86	70.90268	25.9233	0.7408	111.92
87	69.52779	25.4261	0.7457	112.43
88	68.12758	24.9384	0.7506	112.94
89	66.70864	24.4600	0.7554	113.46
90	65.25765	23.9910	0.7601	113.99
91	63.79136	23.5309	0.7647	114.53
92	62.30659	23.0797	0.7692	115.08
93	60.80523	22.6373	0.7736	115.64
94	59.28922	22.2033	0.7780	116.20
95	57.76056	21.7777	0.7822	116.78
96	56.22128	21.3603	0.7864	117.36

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve S3				
100	50.00000	19.7687	0.8023	119.77
101	48.43931	19.3896	0.8061	120.39
102	46.88077	19.0175	0.8098	121.02
103	45.32653	18.6525	0.8135	121.65
104	43.77872	18.2943	0.8171	122.29
105	42.73945	17.7270	0.8227	122.73
106	40.71078	17.5854	0.8241	123.59
107	39.19477	17.2463	0.8275	124.25
108	37.69341	16.9133	0.8309	124.91
109	36.20864	16.5863	0.8341	125.59
110	34.74235	16.2653	0.8373	126.27
111	33.29636	15.9499	0.8405	126.95
112	31.87242	15.6402	0.8436	127.64
113	30.47221	15.3358	0.8466	128.34
114	29.09733	15.0369	0.8496	129.04
115	27.74927	14.7431	0.8526	129.74
116	26.42947	14.4543	0.8555	130.45
117	25.13924	14.1705	0.8583	131.17
118	23.87982	13.8915	0.8611	131.89
119	22.65232	13.6171	0.8638	132.62
120	21.45776	13.3474	0.8665	133.35
121	20.29707	13.0820	0.8692	134.08
122	19.17104	12.8211	0.8718	134.82
123	18.08037	12.5643	0.8744	135.56
124	17.02566	12.3117	0.8769	136.31
125	16.00737	12.0631	0.8794	137.06
126	15.02588	11.8184	0.8818	137.82
127	14.08145	11.5775	0.8842	138.58
128	13.17423	11.3403	0.8866	139.34
129	12.30425	11.1068	0.8889	140.11
130	11.47150	10.8768	0.8912	140.88
131	10.67577	10.6502	0.8935	141.65
132	9.91684	10.4270	0.8957	142.43
133	9.19434	10.2071	0.8979	143.21
134	8.50784	9.9903	0.9001	143.99
135	7.85682	9.7767	0.9022	144.78
136	7.24067	9.5661	0.9043	145.57
137	6.65871	9.3585	0.9064	146.36
138	6.11018	9.1537	0.9085	147.15
139	5.59427	8.9518	0.9105	147.95
140	5.11008	8.7526	0.9125	148.75
141	4.65670	8.5561	0.9144	149.56
142	4.23313	8.3622	0.9164	150.36
143	3.83835	8.1708	0.9183	151.17
144	3.47129	7.9819	0.9202	151.98
145	3.13085	7.7955	0.9220	152.80
146	2.81592	7.6114	0.9239	153.61
147	2.52536	7.4297	0.9257	154.43
148	2.25801	7.2501	0.9275	155.25
149	2.01271	7.0728	0.9293	156.07
150	1.78829	6.8977	0.9310	156.90
151	1.58361	6.7245	0.9328	157.72
152	1.39749	6.5535	0.9345	158.55
153	1.22881	6.3845	0.9362	159.38
154	1.07645	6.2174	0.9378	160.22
155	0.93930	6.0522	0.9395	161.05
156	0.81629	5.8889	0.9411	161.89
157	0.70638	5.7274	0.9427	162.73
158	0.60855	5.5678	0.9443	163.57
159	0.52185	5.4097	0.9459	164.41
160	0.44532	5.2535	0.9475	165.25
161	0.37808	5.0988	0.9490	166.10
162	0.31927	4.9460	0.9505	166.95
163	0.26810	4.7945	0.9521	167.79
164	0.22380	4.6446	0.9536	168.64
165	0.18565	4.4963	0.9550	169.50
166	0.15299	4.3494	0.9565	170.35
167	0.12519	4.2042	0.9580	171.20
168	0.10169	4.0602	0.9594	172.06
169	0.08195	3.9178	0.9608	172.92
170	0.06549	3.7768	0.9622	173.78
171	0.05188	3.6365	0.9636	174.64
172	0.04070	3.4980	0.9650	175.50
173	0.03160	3.3614	0.9664	176.36
174	0.02427	3.2256	0.9677	177.23
175	0.01842	3.0912	0.9691	178.09
176	0.01381	2.9562	0.9704	178.96
177	0.01020	2.8255	0.9717	179.83
178	0.00743	2.6924	0.9731	180.69
179	0.00532	2.5620	0.9744	181.56
180	0.00374	2.4331	0.9757	182.43
181	0.00258	2.3023	0.9770	183.30
182	0.00174	2.1723	0.9783	184.17
183	0.00114	2.0525	0.9795	185.05
184	0.00073	1.9245	0.9808	185.92
185	0.00045	1.8109	0.9819	186.81
186	0.00027	1.6848	0.9832	187.68
187	0.00016	1.4994	0.9850	188.50
188	0.00009	1.2768	0.9872	189.28
189	0.00004	1.2480	0.9875	190.25
190	0.00002	0.9965	0.9900	191.00
191	0.00001	0.4936	0.9951	191.49
192	0.00000	0.0000	1.0000	192.00

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve S4				
0	100.00000	100.0000	0.0000	100.00
1	100.00000	99.0000	0.0100	100.00
2	100.00000	98.0000	0.0200	100.00
3	100.00000	97.0000	0.0300	100.00
4	100.00000	96.0000	0.0400	100.00
5	100.00000	95.0000	0.0500	100.00
6	100.00000	94.0000	0.0600	100.00
7	100.00000	93.0000	0.0700	100.00
8	100.00000	92.0000	0.0800	100.00
9	100.00000	91.0000	0.0900	100.00
10	100.00000	90.0000	0.1000	100.00
11	100.00000	89.0000	0.1100	100.00
12	100.00000	88.0000	0.1200	100.00
13	100.00000	87.0000	0.1300	100.00
14	100.00000	86.0000	0.1400	100.00
15	100.00000	85.0000	0.1500	100.00
16	100.00000	84.0000	0.1600	100.00
17	100.00000	83.0000	0.1700	100.00
18	100.00000	82.0000	0.1800	100.00
19	100.00000	81.0000	0.1900	100.00
20	100.00000	80.0000	0.2000	100.00
21	100.00000	79.0000	0.2100	100.00
22	100.00000	78.0000	0.2200	100.00
23	100.00000	77.0000	0.2300	100.00
24	100.00000	76.0000	0.2400	100.00
25	100.00000	75.0000	0.2500	100.00
26	100.00000	74.0000	0.2600	100.00
27	99.99999	73.0000	0.2700	100.00
28	99.99998	72.0000	0.2800	100.00
29	99.99997	71.0000	0.2900	100.00
30	99.99994	70.0000	0.3000	100.00
31	99.99990	69.0001	0.3100	100.00
32	99.99982	68.0001	0.3200	100.00
33	99.99971	67.0002	0.3300	100.00
34	99.99953	66.0003	0.3400	100.00
35	99.99925	65.0005	0.3500	100.00
36	99.99884	64.0008	0.3600	100.00
37	99.99824	63.0011	0.3700	100.00
38	99.99738	62.0017	0.3800	100.00
39	99.99615	61.0024	0.3900	100.00
40	99.99445	60.0035	0.4000	100.00
41	99.99210	59.0049	0.4100	100.00
42	99.98892	58.0067	0.4199	100.01
43	99.98465	57.0092	0.4299	100.01
44	99.97901	56.0124	0.4399	100.01
45	99.97162	55.0165	0.4498	100.02
46	99.96204	54.0217	0.4598	100.02
47	99.94977	53.0283	0.4697	100.03
48	99.93418	52.0365	0.4796	100.04
49	99.91455	51.0466	0.4895	100.05
50	99.89007	50.0590	0.4994	100.06
51	99.85976	49.0740	0.5093	100.07
52	99.82255	48.0921	0.5191	100.09
53	99.77721	47.1138	0.5289	100.11
54	99.72235	46.1394	0.5386	100.14
55	99.65644	45.1696	0.5483	100.17
56	99.57779	44.2049	0.5580	100.20
57	99.48452	43.2458	0.5675	100.25
58	99.37460	42.2931	0.5771	100.29
59	99.24585	41.3473	0.5865	100.35
60	99.09588	40.4092	0.5959	100.41
61	98.92218	39.4792	0.6052	100.48
62	98.72208	38.5582	0.6144	100.56
63	98.49276	37.6469	0.6235	100.65
64	98.23128	36.7457	0.6325	100.75
65	97.93460	35.8555	0.6414	100.86
66	97.59959	34.9769	0.6502	100.98
67	97.22304	34.1104	0.6589	101.11
68	96.80170	33.2567	0.6674	101.26
69	96.33234	32.4163	0.6758	101.42
70	95.81171	31.5897	0.6841	101.59
71	95.23664	30.7775	0.6922	101.78
72	94.60402	29.9799	0.7002	101.98
73	93.91087	29.1975	0.7080	102.20
74	93.15439	28.4306	0.7157	102.43
75	92.33195	27.6794	0.7232	102.68
76	91.44115	26.9441	0.7306	102.94
77	90.47988	26.2251	0.7377	103.23
78	89.44630	25.5223	0.7448	103.52
79	88.33893	24.8360	0.7516	103.84
80	87.15666	24.1661	0.7583	104.17
81	85.89877	23.5127	0.7649	104.51
82	84.56495	22.8757	0.7712	104.88
83	83.15535	22.2550	0.7775	105.25
84	81.67059	21.6505	0.7835	105.65
85	80.11173	21.0620	0.7894	106.06
86	78.48036	20.4894	0.7951	106.49
87	76.77853	19.9325	0.8007	106.93
88	75.00878	19.3910	0.8061	107.39
89	73.17417	18.8646	0.8114	107.86
90	71.27816	18.3531	0.8165	108.35
91	69.32473	17.8562	0.8214	108.86
92	67.31826	17.3735	0.8263	109.37
93	65.26353	16.9048	0.8310	109.90
94	63.16571	16.4496	0.8355	110.45
95	61.03029	16.0077	0.8399	111.01
96	58.86808	15.5786	0.8442	111.58

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve S4				
100	50.00000	13.9843	0.8602	113.98
101	47.76789	13.6144	0.8639	114.61
102	45.54234	13.2552	0.8674	115.26
103	43.32988	12.9065	0.8709	115.91
104	41.13692	12.5679	0.8743	116.57
105	38.96971	12.2390	0.8776	117.24
106	36.83429	11.9196	0.8808	117.92
107	34.73647	11.6093	0.8839	118.61
108	32.68174	11.3077	0.8869	119.31
109	30.67527	11.0146	0.8899	120.01
110	28.72184	10.7298	0.8927	120.73
111	26.82583	10.4528	0.8955	121.45
112	24.99122	10.1834	0.8982	122.18
113	23.22147	9.9214	0.9008	122.92
114	21.51964	9.6665	0.9033	123.67
115	19.88827	9.4184	0.9058	124.42
116	18.32942	9.1769	0.9082	125.18
117	16.84465	8.9417	0.9106	125.94
118	15.43505	8.7126	0.9129	126.71
119	14.10123	8.4894	0.9151	127.49
120	12.84334	8.2719	0.9173	128.27
121	11.66107	8.0599	0.9194	129.06
122	10.55370	7.8531	0.9215	129.85
123	9.52012	7.6515	0.9235	130.65
124	8.55885	7.4547	0.9255	131.45
125	7.66805	7.2626	0.9274	132.26
126	6.84561	7.0751	0.9292	133.08
127	6.08913	6.8919	0.9311	133.89
128	5.39599	6.7130	0.9329	134.71
129	4.76336	6.5381	0.9346	135.54
130	4.18829	6.3672	0.9363	136.37
131	3.66766	6.2000	0.9380	137.20
132	3.19830	6.0365	0.9396	138.04
133	2.77697	5.8766	0.9412	138.88
134	2.40041	5.7200	0.9428	139.72
135	2.06540	5.5667	0.9443	140.57
136	1.76872	5.4165	0.9458	141.42
137	1.50724	5.2695	0.9473	142.27
138	1.27792	5.1254	0.9487	143.13
139	1.07782	4.9841	0.9502	143.98
140	0.90412	4.8456	0.9515	144.85
141	0.75416	4.7096	0.9529	145.71
142	0.62540	4.5763	0.9542	146.58
143	0.51548	4.4456	0.9555	147.45
144	0.42222	4.3171	0.9568	148.32
145	0.34356	4.1910	0.9581	149.19
146	0.27765	4.0672	0.9593	150.07
147	0.22279	3.9456	0.9605	150.95
148	0.17745	3.8260	0.9617	151.83
149	0.14024	3.7084	0.9629	152.71
150	0.10994	3.5927	0.9641	153.59
151	0.08545	3.4791	0.9652	154.48
152	0.06582	3.3675	0.9663	155.37
153	0.05023	3.2575	0.9674	156.26
154	0.03796	3.1488	0.9685	157.15
155	0.02838	3.0430	0.9696	158.04
156	0.02099	2.9383	0.9706	168.94
157	0.01535	2.8342	0.9717	159.83
158	0.01108	2.7337	0.9727	160.73
159	0.00790	2.6329	0.9737	161.63
160	0.00555	2.5360	0.9746	162.54
161	0.00385	2.4350	0.9766	163.44
162	0.00262	2.3435	0.9766	164.34
163	0.00176	2.2443	0.9776	165.24
164	0.00116	2.1465	0.9785	166.15
165	0.00075	2.0466	0.9795	167.05
166	0.00047	1.9680	0.9803	167.97
167	0.00029	1.8792	0.9812	168.88
168	0.00018	1.7221	0.9828	169.72
169	0.00010	1.6999	0.9830	170.70
170	0.00006	1.5000	0.9850	171.50
171	0.00003	1.5002	0.9850	172.50
172	0.00002	1.0006	0.9900	173.00
173	0.00001	0.5018	0.9950	173.50
174	0.00000	0.0000	1.0000	174.00

Iowa Type curve S5

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	100.00000	99.0000	0.0100	100.00
2	100.00000	98.0000	0.0200	100.00
3	100.00000	97.0000	0.0300	100.00
4	100.00000	96.0000	0.0400	100.00
5	100.00000	95.0000	0.0500	100.00
6	100.00000	94.0000	0.0600	100.00
7	100.00000	93.0000	0.0700	100.00
8	100.00000	92.0000	0.0800	100.00
9	100.00000	91.0000	0.0900	100.00
10	100.00000	90.0000	0.1000	100.00
11	100.00000	89.0000	0.1100	100.00
12	100.00000	88.0000	0.1200	100.00
13	100.00000	87.0000	0.1300	100.00
14	100.00000	86.0000	0.1400	100.00
15	100.00000	85.0000	0.1500	100.00
16	100.00000	84.0000	0.1600	100.00
17	100.00000	83.0000	0.1700	100.00
18	100.00000	82.0000	0.1800	100.00
19	100.00000	81.0000	0.1900	100.00
20	100.00000	80.0000	0.2000	100.00
21	100.00000	79.0000	0.2100	100.00
22	100.00000	78.0000	0.2200	100.00
23	100.00000	77.0000	0.2300	100.00
24	100.00000	76.0000	0.2400	100.00
25	100.00000	75.0000	0.2500	100.00
26	100.00000	74.0000	0.2600	100.00
27	100.00000	73.0000	0.2700	100.00
28	100.00000	72.0000	0.2800	100.00
29	100.00000	71.0000	0.2900	100.00
30	100.00000	70.0000	0.3000	100.00
31	100.00000	69.0000	0.3100	100.00
32	100.00000	68.0000	0.3200	100.00
33	100.00000	67.0000	0.3300	100.00
34	100.00000	66.0000	0.3400	100.00
35	100.00000	65.0000	0.3500	100.00
36	100.00000	64.0000	0.3600	100.00
37	100.00000	63.0000	0.3700	100.00
38	100.00000	62.0000	0.3800	100.00
39	100.00000	61.0000	0.3900	100.00
40	100.00000	60.0000	0.4000	100.00
41	100.00000	59.0000	0.4100	100.00
42	100.00000	58.0000	0.4200	100.00
43	100.00000	57.0000	0.4300	100.00
44	100.00000	56.0000	0.4400	100.00
45	100.00000	55.0000	0.4500	100.00
46	99.99999	54.0000	0.4600	100.00
47	99.99998	53.0000	0.4700	100.00
48	99.99996	52.0000	0.4800	100.00
49	99.99993	51.0000	0.4900	100.00
50	99.99987	50.0001	0.5000	100.00
51	99.99976	49.0001	0.5100	100.00
52	99.99958	48.0002	0.5200	100.00
53	99.99928	47.0004	0.5300	100.00
54	99.99880	46.0006	0.5400	100.00
55	99.99803	45.0009	0.5500	100.00
56	99.99685	44.0015	0.5600	100.00
57	99.99503	43.0022	0.5700	100.00
58	99.99232	42.0034	0.5800	100.00
59	99.98831	41.0051	0.5899	100.01
60	99.98250	40.0074	0.5999	100.01
61	99.97418	39.0107	0.6099	100.01
62	99.96247	38.0152	0.6198	100.02
63	99.94620	37.0213	0.6298	100.02
64	99.92390	36.0295	0.6397	100.03
65	99.89372	35.0402	0.6496	100.04
66	99.85338	34.0542	0.6595	100.05
67	99.80012	33.0721	0.6693	100.07
68	99.73061	32.0948	0.6791	100.09
69	99.64087	31.1232	0.6888	100.12
70	99.52630	30.1585	0.6984	100.16
71	99.38154	29.2017	0.7080	100.20
72	99.20049	28.2541	0.7175	100.25
73	98.97629	27.3169	0.7268	100.32
74	98.70131	26.3916	0.7361	100.39
75	98.36721	25.4796	0.7452	100.48
76	97.96496	24.5821	0.7542	100.58
77	97.48497	23.7007	0.7630	100.70
78	96.91718	22.8366	0.7716	100.84
79	96.25125	21.9912	0.7801	100.99
80	95.47669	21.1655	0.7883	101.17
81	94.58312	20.3608	0.7964	101.36
82	93.56050	19.5778	0.8042	101.58
83	92.39937	18.8176	0.8118	101.82
84	91.09114	18.0807	0.8192	102.08
85	89.62837	17.3676	0.8263	102.37
86	88.00503	16.6787	0.8332	102.68
87	86.21677	16.0143	0.8399	103.01
88	84.26116	15.3744	0.8463	103.37
89	82.13791	14.7589	0.8524	103.76
90	79.84903	14.1676	0.8583	104.17
91	77.39893	13.6002	0.8640	104.60
92	74.79456	13.0564	0.8694	105.06
93	72.04530	12.5356	0.8746	105.54
94	69.16299	12.0371	0.8796	106.04
95	66.16179	11.5605	0.8844	106.56
96	[illegible]	[illegible]	[illegible]	[illegible]

Iowa Type curve S5

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	50.00000	9.4783	0.9052	109.48
101	46.68073	9.1168	0.9088	110.12
102	43.38363	8.7716	0.9123	110.77
103	40.13043	8.4422	0.9156	111.44
104	36.94207	8.1276	0.9187	112.13
105	33.83821	7.8273	0.9217	112.83
106	30.83701	7.5404	0.9246	113.54
107	27.95470	7.2663	0.9273	114.27
108	25.20544	7.0043	0.9300	115.00
109	22.60107	6.7539	0.9325	115.75
110	20.15098	6.5142	0.9349	116.51
111	17.86209	6.2849	0.9372	117.28
112	15.73884	6.0653	0.9393	118.07
113	13.78323	5.8550	0.9415	118.85
114	11.99497	5.6533	0.9435	119.65
115	10.37163	5.4599	0.9454	120.46
116	8.90886	5.2743	0.9473	121.27
117	7.60064	5.0960	0.9490	122.10
118	6.43950	4.9247	0.9508	122.92
119	5.41688	4.7601	0.9524	123.76
120	4.52331	4.6016	0.9540	124.60
121	3.74875	4.4491	0.9555	125.45
122	3.08282	4.3021	0.9570	126.30
123	2.51503	4.1605	0.9584	127.16
124	2.03504	4.0239	0.9598	128.02
125	1.63279	3.8920	0.9611	128.89
126	1.29869	3.7647	0.9624	129.76
127	1.02371	3.6416	0.9636	130.64
128	0.79951	3.5225	0.9648	131.52
129	0.61846	3.4074	0.9659	132.41
130	0.47370	3.2958	0.9670	133.30
131	0.35913	3.1878	0.9681	134.19
132	0.26940	3.0830	0.9692	135.08
133	0.19988	2.9814	0.9702	135.98
134	0.14662	2.8828	0.9712	136.88
135	0.10628	2.7872	0.9721	137.79
136	0.07610	2.6942	0.9731	138.69
137	0.05380	2.6037	0.9740	139.60
138	0.03753	2.5157	0.9748	140.52
139	0.02582	2.4299	0.9757	141.43
140	0.01751	2.3458	0.9765	142.35
141	0.01169	2.2647	0.9774	143.26
142	0.00768	2.1862	0.9781	144.19
143	0.00497	2.1056	0.9789	145.11
144	0.00315	2.0333	0.9797	146.03
145	0.00197	1.9517	0.9805	146.95
146	0.00120	1.8833	0.9812	147.88
147	0.00072	1.8054	0.9819	148.81
148	0.00042	1.7379	0.9826	149.74
149	0.00024	1.6664	0.9833	150.67
150	0.00014	1.4996	0.9850	151.50
151	0.00007	1.4993	0.9850	152.50
152	0.00004	1.2488	0.9875	153.25
153	0.00002	0.9983	0.9900	154.00
154	0.00001	0.4971	0.9950	154.50
155	0.00000	0.0000	1.0000	155.00

Iowa Type curve S6

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	100.00000	99.0000	0.0100	100.00
2	100.00000	98.0000	0.0200	100.00
3	100.00000	97.0000	0.0300	100.00
4	100.00000	96.0000	0.0400	100.00
5	100.00000	95.0000	0.0500	100.00
6	100.00000	94.0000	0.0600	100.00
7	100.00000	93.0000	0.0700	100.00
8	100.00000	92.0000	0.0800	100.00
9	100.00000	91.0000	0.0900	100.00
10	100.00000	90.0000	0.1000	100.00
11	100.00000	89.0000	0.1100	100.00
12	100.00000	88.0000	0.1200	100.00
13	100.00000	87.0000	0.1300	100.00
14	100.00000	86.0000	0.1400	100.00
15	100.00000	85.0000	0.1500	100.00
16	100.00000	84.0000	0.1600	100.00
17	100.00000	83.0000	0.1700	100.00
18	100.00000	82.0000	0.1800	100.00
19	100.00000	81.0000	0.1900	100.00
20	100.00000	80.0000	0.2000	100.00
21	100.00000	79.0000	0.2100	100.00
22	100.00000	78.0000	0.2200	100.00
23	100.00000	77.0000	0.2300	100.00
24	100.00000	76.0000	0.2400	100.00
25	100.00000	75.0000	0.2500	100.00
26	100.00000	74.0000	0.2600	100.00
27	100.00000	73.0000	0.2700	100.00
28	100.00000	72.0000	0.2800	100.00
29	100.00000	71.0000	0.2900	100.00
30	100.00000	70.0000	0.3000	100.00
31	100.00000	69.0000	0.3100	100.00
32	100.00000	68.0000	0.3200	100.00
33	100.00000	67.0000	0.3300	100.00
34	100.00000	66.0000	0.3400	100.00
35	100.00000	65.0000	0.3500	100.00
36	100.00000	64.0000	0.3600	100.00
37	100.00000	63.0000	0.3700	100.00
38	100.00000	62.0000	0.3800	100.00
39	100.00000	61.0000	0.3900	100.00
40	100.00000	60.0000	0.4000	100.00
41	100.00000	59.0000	0.4100	100.00
42	100.00000	58.0000	0.4200	100.00
43	100.00000	57.0000	0.4300	100.00
44	100.00000	56.0000	0.4400	100.00
45	100.00000	55.0000	0.4500	100.00
46	100.00000	54.0000	0.4600	100.00
47	100.00000	53.0000	0.4700	100.00
48	100.00000	52.0000	0.4800	100.00
49	100.00000	51.0000	0.4900	100.00
50	100.00000	50.0000	0.5000	100.00
51	100.00000	49.0000	0.5100	100.00
52	100.00000	48.0000	0.5200	100.00
53	100.00000	47.0000	0.5300	100.00
54	100.00000	46.0000	0.5400	100.00
55	100.00000	45.0000	0.5500	100.00
56	100.00000	44.0000	0.5600	100.00
57	100.00000	43.0000	0.5700	100.00
58	100.00000	42.0000	0.5800	100.00
59	100.00000	41.0000	0.5900	100.00
60	100.00000	40.0000	0.6000	100.00
61	100.00000	39.0000	0.6100	100.00
62	100.00000	38.0000	0.6200	100.00
63	99.99999	37.0000	0.6300	100.00
64	99.99998	36.0000	0.6400	100.00
65	99.99996	35.0000	0.6500	100.00
66	99.99991	34.0000	0.6600	100.00
67	99.99981	33.0001	0.6700	100.00
68	99.99960	32.0001	0.6800	100.00
69	99.99917	31.0003	0.6900	100.00
70	99.99835	30.0005	0.7000	100.00
71	99.99682	29.0010	0.7100	100.00
72	99.99405	28.0018	0.7200	100.00
73	99.98917	27.0031	0.7300	100.00
74	99.98079	26.0053	0.7399	100.01
75	99.96681	25.0089	0.7499	100.01
76	99.94405	24.0145	0.7599	100.01
77	99.90793	23.0230	0.7698	100.02
78	99.85194	22.0356	0.7796	100.04
79	99.76716	21.0539	0.7895	100.05
80	99.64167	20.0798	0.7992	100.08
81	99.45998	19.1156	0.8088	100.12
82	99.20251	18.1639	0.8184	100.16
83	98.84525	17.2277	0.8277	100.23
84	98.35961	16.3103	0.8369	100.31
85	97.71260	15.4150	0.8459	100.41
86	96.86741	14.5451	0.8545	100.55
87	95.78452	13.7039	0.8630	100.70
88	94.42320	12.8943	0.8711	100.89
89	92.74358	12.1187	0.8788	101.12
90	90.70910	11.3793	0.8862	101.38
91	88.28921	10.6775	0.8932	101.68
92	85.46213	10.0142	0.8999	102.01
93	82.21749	9.3897	0.9061	102.39
94	78.55859	8.8037	0.9120	102.80
95	74.50386	8.2556	0.9174	103.26
96	[illegible]	[illegible]	[illegible]	[illegible]

Iowa Type curve S6

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	50.00000	6.0351	0.9396	106.04
101	44.76385	5.6826	0.9432	106.68
102	39.61599	5.3560	0.9464	107.36
103	34.64028	5.0535	0.9495	108.05
104	29.91234	4.7733	0.9523	108.77
105	25.49614	4.5136	0.9549	109.51
106	21.44141	4.2724	0.9573	110.27
107	17.78251	4.0486	0.9595	111.05
108	14.53787	3.8406	0.9616	111.84
109	11.71079	3.6471	0.9635	112.65
110	9.29090	3.4668	0.9653	113.47
111	7.25642	3.2986	0.9670	114.30
112	5.57680	3.1415	0.9686	115.14
113	4.21648	2.9945	0.9701	115.99
114	3.13259	2.8568	0.9714	116.86
115	2.28740	2.7276	0.9727	117.73
116	1.64039	2.6063	0.9739	118.61
117	1.15475	2.4921	0.9751	119.49
118	0.79749	2.3845	0.9762	120.38
119	0.54002	2.2830	0.9772	121.28
120	0.35833	2.1870	0.9781	122.19
121	0.23284	2.0963	0.9790	123.10
122	0.14806	2.0103	0.9799	124.01
123	0.09207	1.9288	0.9807	124.93
124	0.05595	1.8512	0.9815	125.85
125	0.03319	1.7778	0.9822	126.78
126	0.01921	1.7077	0.9829	127.71
127	0.01084	1.6402	0.9836	128.64
128	0.00595	1.5773	0.9842	129.58
129	0.00318	1.5157	0.9848	130.52
130	0.00165	1.4575	0.9854	131.46
131	0.00083	1.4036	0.9860	132.40
132	0.00040	1.3749	0.9863	133.37
133	0.00019	1.3419	0.9866	134.34
134	0.00009	1.2775	0.9872	135.28
135	0.00004	1.2494	0.9875	136.25
136	0.00002	0.9994	0.9900	137.00
137	0.00001	0.4994	0.9950	137.50
138	0.00000	0.0000	1.0000	138.00

Iowa Type curve R1

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	99.74192	99.2593	0.0074	100.26
2	99.48020	98.5191	0.0148	100.52
3	99.21484	97.7812	0.0222	100.78
4	98.94584	97.0457	0.0295	101.05
5	98.67319	96.3125	0.0369	101.31
6	98.39691	95.5815	0.0442	101.58
7	98.11700	94.8528	0.0515	101.85
8	97.83345	94.1262	0.0587	102.13
9	97.54628	93.4019	0.0660	102.40
10	97.25548	92.6796	0.0732	102.68
11	96.96107	91.9595	0.0804	102.96
12	96.66305	91.2415	0.0876	103.24
13	96.36142	90.5255	0.0947	103.53
14	96.05620	89.8116	0.1019	103.81
15	95.74739	89.0997	0.1090	104.10
16	95.43500	88.3897	0.1161	104.39
17	95.11905	87.6816	0.1232	104.68
18	94.79953	86.9755	0.1302	104.98
19	94.47648	86.2711	0.1373	105.27
20	94.14988	85.5687	0.1443	105.57
21	93.81977	84.8680	0.1513	105.87
22	93.48615	84.1691	0.1583	106.17
23	93.14904	83.4719	0.1653	106.47
24	92.80845	82.7764	0.1722	106.78
25	92.46439	82.0825	0.1792	107.08
26	92.11689	81.3903	0.1861	107.39
27	91.76597	80.6996	0.1930	107.70
28	91.41163	80.0105	0.1999	108.01
29	91.05389	79.3229	0.2068	108.32
30	90.69276	78.6367	0.2136	108.64
31	90.32821	77.9521	0.2205	108.95
32	89.96022	77.2689	0.2273	109.27
33	89.58873	76.5872	0.2341	109.59
34	89.21370	75.9071	0.2409	109.91
35	88.83506	75.2285	0.2477	110.23
36	88.45275	74.5515	0.2545	110.55
37	88.06668	73.8761	0.2612	110.88
38	87.67678	73.2024	0.2680	111.20
39	87.28297	72.5305	0.2747	111.53
40	86.88515	71.8603	0.2814	111.86
41	86.48324	71.1919	0.2881	112.19
42	86.07713	70.5254	0.2947	112.53
43	85.66673	69.8609	0.3014	112.86
44	85.25194	69.1984	0.3080	113.20
45	84.83266	68.5379	0.3146	113.54
46	84.40879	67.8795	0.3212	113.88
47	83.98023	67.2234	0.3278	114.22
48	83.54688	66.5695	0.3343	114.57
49	83.10863	65.9179	0.3408	114.92
50	82.66538	65.2687	0.3473	115.27
51	82.21704	64.6218	0.3538	115.62
52	81.76351	63.9775	0.3602	115.98
53	81.30468	63.3357	0.3666	116.34
54	80.84048	62.6966	0.3730	116.70
55	80.37080	62.0600	0.3794	117.06
56	79.89555	61.4262	0.3857	117.43
57	79.41465	60.7952	0.3920	117.80
58	78.92801	60.1669	0.3983	118.17
59	78.43556	59.5415	0.4046	118.54
60	77.93721	58.9190	0.4108	118.92
61	77.43289	58.2995	0.4170	119.30
62	76.92254	57.6830	0.4232	119.68
63	76.40608	57.0695	0.4293	120.07
64	75.88346	56.4591	0.4354	120.46
65	75.35463	55.8518	0.4415	120.85
66	74.81952	55.2477	0.4475	121.25
67	74.27809	54.6468	0.4535	121.65
68	73.73030	54.0491	0.4595	122.05
69	73.17611	53.4546	0.4655	122.45
70	72.61549	52.8635	0.4714	122.86
71	72.04841	52.2756	0.4772	123.28
72	71.47486	51.6911	0.4831	123.69
73	70.89482	51.1099	0.4889	124.11
74	70.30827	50.5321	0.4947	124.53
75	69.71523	49.9577	0.5004	124.96
76	69.11567	49.3868	0.5061	125.39
77	58.50963	48.8192	0.5118	125.82
78	67.89711	48.2551	0.5174	126.26
79	67.27813	47.6945	0.5231	126.69
80	66.65272	47.1373	0.5286	127.14
81	66.02091	46.5836	0.5342	127.58
82	65.38275	46.0334	0.5397	128.03
83	64.73828	45.4867	0.5451	128.49
84	64.08756	44.9435	0.5506	128.94
85	63.43064	44.4038	0.5560	129.40
86	62.76760	43.8675	0.5613	129.87
87	62.09850	43.3348	0.5667	130.33
88	61.42343	42.8056	0.5719	130.81
89	60.74247	42.2799	0.5772	131.28
90	60.05571	41.7576	0.5824	131.76
91	59.36327	41.2389	0.5876	132.24
92	58.66524	40.7236	0.5928	132.72
93	57.96175	40.2118	0.5979	133.21
94	57.25290	39.7035	0.6030	133.70
95	56.53884	39.1986	0.6080	134.20
96	55.81060	38.6070	0.6130	134.70

Iowa Type curve R1

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	52.89519	36.7257	0.6327	136.73
101	52.15288	36.2413	0.6376	137.24
102	51.40644	35.7603	0.6424	137.76
103	50.65605	35.2826	0.6472	138.28
104	49.90189	34.8082	0.6519	138.81
105	49.14417	34.3372	0.6566	139.34
106	48.38308	33.8695	0.6613	139.87
107	47.61883	33.4051	0.6659	140.41
108	46.85164	32.9439	0.6706	140.94
109	46.08172	32.4859	0.6751	141.49
110	45.30930	32.0312	0.6797	142.03
111	44.53462	31.5797	0.6842	142.58
112	43.75790	31.1314	0.6887	143.13
113	42.97940	30.6862	0.6931	143.69
114	42.19937	30.2442	0.6976	144.24
115	41.41805	29.8053	0.7019	144.81
116	40.63572	29.3695	0.7063	145.37
117	39.85262	28.9368	0.7106	145.94
118	39.06904	28.5071	0.7149	146.51
119	38.28526	28.0805	0.7192	147.08
120	37.50154	27.6569	0.7234	147.66
121	36.71818	27.2362	0.7276	148.24
122	35.93546	26.8186	0.7318	148.82
123	35.15368	26.4039	0.7360	149.40
124	34.37314	25.9921	0.7401	149.99
125	33.59414	25.5832	0.7442	150.58
126	32.81698	25.1772	0.7482	151.18
127	32.04198	24.7741	0.7523	151.77
128	31.26944	24.3738	0.7563	152.37
129	30.49969	23.9763	0.7602	152.98
130	29.73303	23.5817	0.7642	153.58
131	28.96980	23.1898	0.7681	154.19
132	28.21032	22.8006	0.7720	154.80
133	27.45491	22.4142	0.7759	155.41
134	26.70390	22.0305	0.7797	156.03
135	25.95763	21.6495	0.7835	156.65
136	25.21641	21.2712	0.7873	157.27
137	24.48060	20.8955	0.7910	157.90
138	23.75051	20.5225	0.7948	158.52
139	23.02648	20.1521	0.7985	159.15
140	22.30885	19.7842	0.8022	159.78
141	21.59795	19.4190	0.8058	160.42
142	20.89412	19.0563	0.8094	161.06
143	20.19768	18.6961	0.8130	161.70
144	19.50898	18.3385	0.8166	162.34
145	18.82834	17.9833	0.8202	162.98
146	18.15608	17.6307	0.8237	163.63
147	17.49255	17.2805	0.8272	164.28
148	16.83806	16.9327	0.8307	164.93
149	16.19292	16.5874	0.8341	165.59
150	15.55747	16.2445	0.8376	166.24
151	14.93201	15.9040	0.8410	166.90
152	14.31686	15.5659	0.8443	167.57
153	13.71231	15.2301	0.8477	168.23
154	13.11867	14.8966	0.8510	168.90
155	12.53623	14.5655	0.8543	169.57
156	11.96528	14.2367	0.8576	170.24
157	11.40609	13.9101	0.8609	170.91
158	10.85895	13.5858	0.8641	171.59
159	10.32411	13.2637	0.8674	172.26
160	9.80182	12.9438	0.8706	172.94
161	9.29235	12.6261	0.8737	173.63
162	8.79592	12.3105	0.8769	174.31
163	8.31275	11.9970	0.8800	175.00
164	7.84307	11.6854	0.8831	175.69
165	7.38707	11.3759	0.8862	176.38
166	6.94493	11.0683	0.8893	177.07
167	6.51684	10.7626	0.8924	177.76
168	6.10295	10.4585	0.8954	178.46
169	5.70340	10.1562	0.8984	179.16
170	5.31832	9.8553	0.9014	179.86
171	4.94781	9.5559	0.9044	180.56
172	4.59195	9.2577	0.9074	181.26
173	4.25081	8.9605	0.9104	181.96
174	3.92444	8.6642	0.9134	182.66
175	3.61284	8.3683	0.9163	183.37
176	3.31601	8.0726	0.9193	184.07
177	3.03391	7.7767	0.9222	184.78
178	2.76646	7.4802	0.9252	185.48
179	2.51357	7.1825	0.9282	186.18
180	2.27508	6.8830	0.9312	186.88
181	2.05081	6.5810	0.9342	187.58
182	1.84053	6.2758	0.9372	188.28
183	1.64396	5.9664	0.9403	188.97
184	1.46075	5.6520	0.9435	189.65
185	1.29047	5.3318	0.9467	190.33
186	1.13261	5.0053	0.9499	191.01
187	0.98656	4.6722	0.9533	191.67
188	0.85156	4.3337	0.9567	192.33
189	0.72632	3.9947	0.9601	192.99
190	0.61061	3.6570	0.9634	193.66
191	0.50457	3.3204	0.9668	194.32
192	0.40831	2.9854	0.9701	194.99
193	0.32197	2.6518	0.9735	195.65
194	0.24565	2.3204	0.9768	196.32
195	0.17949	1.9914	0.9801	196.99

Iowa Type curve R1

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
200	0.00456	0.5000	0.9950	200.50
201	0.00000	0.0000	1.0000	201.00

Iowa Type curve R2

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	99.90517	99.0944	0.0091	100.09
2	99.80707	98.1913	0.0181	100.19
3	99.70561	97.2908	0.0271	100.29
4	99.60070	96.3927	0.0361	100.39
5	99.49224	95.4972	0.0450	100.50
6	99.38016	94.6044	0.0540	100.60
7	99.26435	93.7142	0.0629	100.71
8	99.14472	92.8266	0.0717	100.83
9	99.02117	91.9418	0.0806	100.94
10	98.89359	91.0598	0.0894	101.06
11	98.76190	90.1806	0.0982	101.18
12	98.62598	89.3042	0.1070	101.30
13	98.48574	88.4306	0.1157	101.43
14	98.34106	87.5600	0.1244	101.56
15	98.19184	86.6923	0.1331	101.69
16	98.03796	85.8276	0.1417	101.83
17	97.87933	84.9659	0.1503	101.97
18	97.71581	84.1072	0.1589	102.11
19	97.54731	83.2516	0.1675	102.25
20	97.37369	82.3992	0.1760	102.40
21	97.19485	81.5499	0.1845	102.55
22	97.01065	80.7038	0.1930	102.70
23	96.82099	79.8609	0.2014	102.86
24	96.62573	79.0212	0.2098	103.02
25	96.42474	78.1849	0.2182	103.18
26	96.21790	77.3519	0.2265	103.35
27	96.00508	76.5223	0.2348	103.52
28	95.78615	75.6960	0.2430	103.70
29	95.56096	74.8732	0.2513	103.87
30	95.32938	74.0539	0.2595	104.05
31	95.09128	73.2381	0.2676	104.24
32	94.84651	72.4258	0.2757	104.43
33	94.59492	71.6171	0.2838	104.62
34	94.33638	70.8120	0.2919	104.81
35	94.07074	70.0105	0.2999	105.01
36	93.79784	69.2128	0.3079	105.21
37	93.51754	68.4187	0.3158	105.42
38	93.22967	67.6284	0.3237	105.63
39	92.93409	66.8419	0.3316	105.84
40	92.63064	66.0593	0.3394	106.06
41	92.31914	65.2805	0.3472	106.28
42	91.99946	64.5056	0.3549	106.51
43	91.67141	63.7346	0.3627	106.73
44	91.33483	62.9677	0.3703	106.97
45	90.98955	62.2047	0.3780	107.20
46	90.63541	61.4458	0.3855	107.45
47	90.27222	60.6910	0.3931	107.69
48	89.89982	59.9403	0.4006	107.94
49	89.51803	59.1939	0.4081	108.19
50	89.12668	58.4516	0.4155	108.45
51	88.72557	57.7136	0.4229	108.71
52	88.31454	56.9798	0.4302	108.98
53	87.89341	56.2505	0.4375	109.25
54	87.46198	55.5255	0.4447	109.53
55	87.02008	54.8049	0.4520	109.80
56	86.56753	54.0888	0.4591	110.09
57	86.10413	53.3772	0.4662	110.38
58	85.62971	52.6701	0.4733	110.67
59	85.14408	51.9677	0.4803	110.97
60	84.64707	51.2699	0.4873	111.27
61	84.13847	50.5768	0.4942	111.58
62	83.61813	49.8884	0.5011	111.89
63	83.08585	49.2048	0.5080	112.20
64	82.54146	48.5260	0.5147	112.53
65	81.98479	47.8521	0.5215	112.85
66	81.41567	47.1831	0.5282	113.18
67	80.83392	46.5191	0.5348	113.52
68	80.23938	45.8601	0.5414	113.86
69	79.63191	46.2061	0.5479	114.21
70	79.01133	44.5573	0.5544	114.56
71	78.37752	43.9135	0.5609	114.91
72	77.73032	43.2750	0.5672	115.28
73	77.06961	42.6417	0.5736	115.64
74	76.39526	42.0137	0.5799	116.01
75	75.70717	41.3910	0.5861	116.39
76	75.00523	40.7737	0.5923	116.77
77	74.28934	40.1618	0.5984	117.16
78	73.55943	39.5553	0.6044	117.56
79	72.81544	38.9544	0.6105	117.95
80	72.05732	38.3590	0.6164	118.36
81	71.28502	37.7691	0.6223	118.77
82	70.49853	37.1849	0.6282	119.18
83	69.69785	36.6063	0.6339	119.61
84	68.88299	36.0335	0.6397	120.03
85	68.05401	35.4663	0.6453	120.47
86	67.21095	34.9049	0.6510	120.90
87	66.35390	34.3493	0.6565	121.35
88	65.48296	33.7995	0.6620	121.80
89	64.59828	33.2555	0.6674	122.26
90	63.70000	32.7174	0.6728	122.72
91	62.78831	32.1852	0.6781	123.19
92	61.86342	31.6590	0.6834	123.66
93	60.92558	31.1386	0.6886	124.14
94	59.97507	30.6242	0.6938	124.62
95	59.01217	30.1157	0.6988	125.12
96	58.03725	29.6132	0.7039	125.61

Iowa Type curve R2

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	54.02510	27.6829	0.7234	127.66
101	52.99624	27.1902	0.7281	128.19
102	51.95810	26.7235	0.7328	128.72
103	50.91125	26.2627	0.7374	129.26
104	49.85632	25.8078	0.7419	129.81
105	48.79396	25.3588	0.7464	130.36
106	47.72486	24.9157	0.7508	130.92
107	46.64974	24.4784	0.7552	131.48
108	45.56937	24.0469	0.7596	132.05
109	44.48452	23.6211	0.7638	132.62
110	43.39604	23.2011	0.7680	133.20
111	42.30477	22.7867	0.7721	133.79
112	41.21160	22.3778	0.7762	134.38
113	40.11743	21.9745	0.7803	134.97
114	39.02321	21.5767	0.7842	135.58
115	37.92987	21.1842	0.7882	136.18
116	36.83841	20.7971	0.7920	136.80
117	35.74981	20.4151	0.7958	137.42
118	34.66508	20.0383	0.7996	138.04
119	33.58525	19.6665	0.8033	138.67
120	32.51131	19.2996	0.8070	139.30
121	31.44431	18.9375	0.8106	139.94
122	30.38528	18.5801	0.8142	140.58
123	29.33517	18.2274	0.8177	141.23
124	28.29510	17.8790	0.8212	141.88
125	27.26603	17.5349	0.8247	142.53
126	26.24893	17.1950	0.8281	143.19
127	25.24478	16.8590	0.8314	143.86
128	24.25449	16.5270	0.8347	144.53
129	23.27898	16.1986	0.8380	145.20
130	22.31913	15.8737	0.8413	145.87
131	21.37516	15.5526	0.8445	146.55
132	20.44967	15.2339	0.8477	147.23
133	19.54162	14.9185	0.8508	147.92
134	18.65230	14.6060	0.8539	148.61
135	17.78236	14.2961	0.8570	149.30
136	16.93241	13.9886	0.8601	149.99
137	16.10298	13.6833	0.8632	150.68
138	15.29456	13.3802	0.8662	151.38
139	14.50757	13.0789	0.8692	152.08
140	13.74239	12.7793	0.8722	152.78
141	12.99932	12.4812	0.8752	153.48
142	12.27861	12.1844	0.8782	154.18
143	11.58045	11.8889	0.8811	154.89
144	10.90498	11.5943	0.8841	155.59
145	10.25227	11.3006	0.8870	156.30
146	9.62235	11.0077	0.8899	157.01
147	9.01519	10.7154	0.8928	157.72
148	8.43072	10.4235	0.8958	158.42
149	7.86883	10.1322	0.8987	159.13
150	7.32937	9.8411	0.9016	159.84
151	6.81214	9.5504	0.9045	160.55
152	6.31692	9.2599	0.9074	161.26
153	5.84347	8.9696	0.9103	161.97
154	5.39151	8.6796	0.9132	162.68
155	4.96076	8.3899	0.9161	163.39
156	4.55091	8.1004	0.9190	164.10
157	4.16166	7.8113	0.9219	164.81
158	3.79266	7.5226	0.9248	165.52
159	3.44361	7.2345	0.9277	166.23
160	3.11416	6.9469	0.9306	166.95
161	2.80398	6.6601	0.9334	167.66
162	2.51274	6.3740	0.9363	168.37
163	2.24009	6.0890	0.9391	169.09
164	1.98570	5.8050	0.9419	169.81
165	1.74922	5.5222	0.9448	170.52
166	1.53029	5.2407	0.9476	171.24
167	1.32853	4.9607	0.9504	171.96
168	1.14356	4.6822	0.9532	172.68
169	0.97498	4.4053	0.9559	173.41
170	0.82235	4.1301	0.9587	174.13
171	0.68519	3.8568	0.9614	174.86
172	0.56299	3.5854	0.9641	175.59
173	0.45521	3.3159	0.9668	176.32
174	0.36123	3.0485	0.9695	177.05
175	0.28040	2.7832	0.9722	177.78
176	0.21198	2.5201	0.9748	178.52
177	0.15520	2.2592	0.9774	179.26
178	0.10918	2.0007	0.9800	180.00
179	0.07298	1.7451	0.9825	180.75
180	0.04561	1.4923	0.9851	181.49
181	0.02596	1.2435	0.9876	182.24
182	0.01287	0.9996	0.9900	183.00
183	0.00508	0.7657	0.9923	183.77
184	0.00128	0.5547	0.9945	184.55
185	0.00007	0.5003	0.9950	185.50
186	0.00000	0.0000	1.0000	186.00

Iowa Type curve R3

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	99.98452	99.0154	0.0098	100.02
2	99.96768	98.0320	0.0197	100.03
3	99.94939	97.0498	0.0295	100.05
4	99.92954	96.0690	0.0393	100.07
5	99.90802	95.0896	0.0491	100.09
6	99.88474	94.1117	0.0589	100.11
7	99.85958	93.1352	0.0686	100.14
8	99.83241	92.1605	0.0784	100.16
9	99.80311	91.1874	0.0881	100.19
10	99.77155	90.2161	0.0978	100.22
11	99.73759	89.2466	0.1075	100.25
12	99.70109	88.2791	0.1172	100.28
13	99.66191	87.3136	0.1269	100.31
14	99.61990	86.3502	0.1365	100.35
15	99.57488	85.3890	0.1461	100.39
16	99.52671	84.4301	0.1557	100.43
17	99.47520	83.4736	0.1653	100.47
18	99.42019	82.5195	0.1748	100.52
19	99.36149	81.5679	0.1843	100.57
20	99.29891	80.6190	0.1938	100.62
21	99.23227	79.6728	0.2033	100.67
22	99.16136	78.7294	0.2127	100.73
23	99.08598	77.7890	0.2221	100.79
24	99.00592	76.8515	0.2315	100.85
25	98.92096	75.9170	0.2408	100.92
26	98.83088	74.9858	0.2501	100.99
27	98.73545	74.0578	0.2594	101.06
28	98.63445	73.1331	0.2687	101.13
29	98.52763	72.2118	0.2779	101.21
30	98.41475	71.2941	0.2871	101.29
31	98.29557	70.3799	0.2962	101.38
32	98.16982	69.4694	0.3053	101.47
33	98.03725	68.5627	0.3144	101.56
34	97.89760	67.6598	0.3234	101.66
35	97.75059	66.7608	0.3324	101.76
36	97.59596	65.8658	0.3413	101.87
37	97.43343	64.9748	0.3503	101.97
38	97.26271	64.0880	0.3591	102.09
39	97.08351	63.2054	0.3679	102.21
40	96.89555	62.3270	0.3767	102.33
41	96.69853	61.4530	0.3855	102.45
42	96.49214	60.5833	0.3942	102.58
43	96.27608	59.7182	0.4028	102.72
44	96.05003	58.8575	0.4114	102.86
45	95.81369	58.0015	0.4200	103.00
46	95.56673	57.1501	0.4285	103.15
47	95.30882	56.3034	0.4370	103.30
48	95.03964	55.4614	0.4454	103.46
49	94.75883	54.6243	0.4538	103.62
50	94.46607	53.7920	0.4621	103.79
51	94.16099	52.9647	0.4704	103.96
52	93.84325	52.1423	0.4786	104.14
53	93.51246	51.3250	0.4867	104.33
54	93.16827	50.5128	0.4949	104.51
55	92.81029	49.7057	0.5029	104.71
56	92.43813	48.9038	0.5110	104.90
57	92.05139	48.1072	0.5189	105.11
58	91.64965	47.3158	0.5268	105.32
59	91.23249	46.5299	0.5347	105.53
60	90.79948	45.7494	0.5425	105.75
61	90.35018	44.9744	0.5503	105.97
62	89.88412	44.2050	0.5579	106.21
63	89.40083	43.4413	0.5656	106.44
64	88.89983	42.6833	0.5732	106.68
65	88.38061	41.9311	0.5807	106.93
66	87.84267	41.1848	0.5882	107.18
67	87.28547	40.4446	0.5956	107.44
68	86.70847	39.7104	0.6029	107.71
69	86.11111	38.9824	0.6102	107.98
70	85.49283	38.2607	0.6174	108.26
71	84.85304	37.5454	0.6245	108.55
72	84.19116	36.8366	0.6316	108.84
73	83.50659	36.1345	0.6387	109.13
74	82.79872	35.4392	0.6456	109.44
75	82.06693	34.7507	0.6525	109.75
76	81.31063	34.0693	0.6593	110.07
77	80.52919	33.3950	0.6660	110.40
78	79.72202	32.7281	0.6727	110.73
79	78.88853	32.0686	0.6793	111.07
80	78.02814	31.4167	0.6858	111.42
81	77.14030	30.7725	0.6923	111.77
82	76.22450	30.1362	0.6986	112.14
83	75.28024	29.5080	0.7049	112.51
84	74.30707	28.8879	0.7111	112.89
85	73.30451	28.2761	0.7172	113.28
86	72.27252	27.6727	0.7233	113.67
87	71.21053	27.0780	0.7292	114.08
88	70.11845	26.4919	0.7351	114.49
89	68.99618	25.9147	0.7409	114.91
90	67.84370	25.3464	0.7465	115.35
91	66.66112	24.7872	0.7521	115.79
92	65.44864	24.2371	0.7576	116.24
93	64.20660	23.6963	0.7630	116.70
94	62.93546	23.1648	0.7684	117.16
95	61.63582	22.6427	0.7736	117.64

Iowa Type curve R3

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	54.74208	20.1748	0.7983	120.17
101	53.29286	19.7098	0.8029	120.71
102	51.82380	19.2543	0.8075	121.25
103	50.33681	18.8084	0.8119	121.81
104	48.83395	18.3718	0.8163	122.37
105	47.31746	17.9446	0.8206	122.94
106	45.78970	17.5266	0.8247	123.53
107	44.25318	17.1178	0.8288	124.12
108	42.71054	16.7180	0.8328	124.72
109	41.16453	16.3271	0.8367	125.33
110	39.61801	15.9449	0.8406	125.94
111	38.07390	15.5713	0.8443	126.57
112	36.53519	15.2060	0.8479	127.21
113	35.00491	14.8489	0.8515	127.85
114	33.48610	14.4997	0.8550	128.50
115	31.98179	14.1582	0.8584	129.16
116	30.49498	13.8242	0.8618	129.82
117	29.02861	13.4972	0.8650	130.50
118	27.58556	13.1771	0.8682	131.18
119	26.16856	12.8636	0.8714	131.86
120	24.78027	12.5562	0.8744	132.56
121	23.42315	12.2548	0.8775	133.25
122	22.09951	11.9588	0.8804	133.96
123	20.81147	11.6680	0.8833	134.67
124	19.56094	11.3820	0.8862	135.38
125	18.34962	11.1003	0.8890	136.10
126	17.17897	10.8227	0.8918	136.82
127	16.05021	10.5486	0.8945	137.55
128	14.96433	10.2778	0.8972	138.28
129	13.92208	10.0098	0.8999	139.01
130	12.92397	9.7443	0.9026	139.74
131	11.97027	9.4808	0.9052	140.48
132	11.06104	9.2190	0.9078	141.22
133	10.19612	8.9586	0.9104	141.96
134	9.37516	8.6993	0.9130	142.70
135	8.59763	8.4408	0.9156	143.44
136	7.86284	8.1829	0.9182	144.18
137	7.16997	7.9253	0.9207	144.93
138	6.51807	7.6680	0.9233	145.67
139	5.90611	7.4107	0.9259	146.41
140	5.33296	7.1534	0.9285	147.15
141	4.79745	6.8961	0.9310	147.90
142	4.29836	6.6388	0.9336	148.64
143	3.83446	6.3814	0.9362	149.38
144	3.40449	6.1242	0.9388	150.12
145	3.00720	5.8673	0.9413	150.87
146	2.64136	5.6107	0.9439	151.61
147	2.30572	5.3546	0.9465	152.35
148	1.99908	5.0993	0.9490	153.10
149	1.72022	4.8448	0.9516	153.84
150	1.46794	4.5915	0.9541	154.59
151	1.24106	4.3395	0.9566	155.34
152	1.03836	4.0890	0.9591	156.09
153	0.85865	3.8402	0.9616	156.84
154	0.70069	3.5932	0.9641	157.59
155	0.56322	3.3481	0.9665	158.35
156	0.44495	3.1052	0.9689	159.11
157	0.34453	2.8645	0.9714	159.86
158	0.26059	2.6262	0.9737	160.63
159	0.19170	2.3902	0.9761	161.39
160	0.13638	2.1570	0.9784	162.16
161	0.09313	1.9265	0.9807	162.93
162	0.06042	1.6988	0.9830	163.70
163	0.03668	1.4746	0.9853	164.47
164	0.02038	1.2542	0.9875	165.25
165	0.00998	1.0401	0.9896	166.04
166	0.00404	0.8341	0.9917	166.83
167	0.00118	0.6440	0.9936	167.64
168	0.00017	0.4996	0.9950	168.50
169	0.00000	0.0000	1.0000	169.00

Iowa Type curve R4

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	99.99917	99.0013	0.0100	100.00
2	99.99821	98.0023	0.0200	100.00
3	99.99710	97.0033	0.0300	100.00
4	99.99581	96.0046	0.0400	100.00
5	99.99432	95.0060	0.0499	100.01
6	99.99261	94.0076	0.0599	100.01
7	99.99064	93.0095	0.0699	100.01
8	99.98839	92.0116	0.0799	100.01
9	99.98581	91.0139	0.0899	100.01
10	99.98287	90.0166	0.0998	100.02
11	99.97952	89.0196	0.1098	100.02
12	99.97570	88.0230	0.1198	100.02
13	99.97137	87.0267	0.1297	100.03
14	99.96646	86.0310	0.1397	100.03
15	99.96090	85.0358	0.1496	100.04
16	99.95463	84.0411	0.1596	100.04
17	99.94755	83.0470	0.1695	100.05
18	99.93959	82.0536	0.1795	100.05
19	99.93064	81.0609	0.1894	100.06
20	99.92061	80.0689	0.1993	100.07
21	99.90936	79.0779	0.2092	100.08
22	99.89679	78.0878	0.2191	100.09
23	99.88275	77.0987	0.2290	100.10
24	99.86710	76.1107	0.2389	100.11
25	99.84968	75.1239	0.2488	100.12
26	99.83032	74.1384	0.2586	100.14
27	99.80883	73.1542	0.2685	100.15
28	99.78501	72.1716	0.2783	100.17
29	99.75865	71.1905	0.2881	100.19
30	99.72953	70.2111	0.2979	100.21
31	99.69738	69.2336	0.3077	100.23
32	99.66196	68.2580	0.3174	100.26
33	99.62298	67.2846	0.3272	100.28
34	99.58013	66.3133	0.3369	100.31
35	99.53311	65.3444	0.3466	100.34
36	99.48157	64.3780	0.3562	100.38
37	99.42514	63.4142	0.3659	100.41
38	99.36345	62.4533	0.3755	100.45
39	99.29610	61.4953	0.3850	100.50
40	99.22264	60.5405	0.3946	100.54
41	99.14264	59.5889	0.4041	100.59
42	99.05561	58.6408	0.4136	100.64
43	98.96106	57.6964	0.4230	100.70
44	98.85847	56.7557	0.4324	100.76
45	98.74727	55.8191	0.4418	100.82
46	98.62690	54.8866	0.4511	100.89
47	98.49675	53.9585	0.4604	100.96
48	98.35620	53.0349	0.4697	101.03
49	98.20459	52.1160	0.4788	101.12
50	98.04125	51.2020	0.4880	101.20
51	97.86547	50.2930	0.4971	101.29
52	97.67652	49.3894	0.5061	101.39
53	97.47365	48.4911	0.5151	101.49
54	97.25609	47.5985	0.5240	101.60
55	97.02304	46.7116	0.5329	101.71
56	96.77368	45.8307	0.5417	101.83
57	96.50717	44.9559	0.5504	101.96
58	96.22265	44.0873	0.5591	102.09
59	95.91925	43.2252	0.5677	102.23
60	95.59608	42.3696	0.5763	102.37
61	95.25224	41.5207	0.5848	102.52
62	94.88682	40.6787	0.5932	102.68
63	94.49889	39.8437	0.6016	102.84
64	94.08753	39.0157	0.6098	103.02
65	93.65182	38.1949	0.6181	103.19
66	93.19084	37.3813	0.6262	103.38
67	92.70366	36.5752	0.6342	103.58
68	92.18937	35.7764	0.6422	103.78
69	91.64709	34.9851	0.6501	103.99
70	91.07592	34.2014	0.6580	104.20
71	90.47502	33.4252	0.6657	104.43
72	89.84356	32.6566	0.6734	104.66
73	89.18073	31.8957	0.6810	104.90
74	88.48579	31.1422	0.6886	105.14
75	87.75801	30.3963	0.6960	105.40
76	86.99674	29.6579	0.7034	105.66
77	86.20134	28.9270	0.7107	105.93
78	85.37129	28.2034	0.7180	106.20
79	84.50608	27.4870	0.7251	106.49
80	83.60532	26.7778	0.7322	106.78
81	82.66866	26.0755	0.7392	107.08
82	81.69587	25.3801	0.7462	107.38
83	80.68667	24.6912	0.7531	107.69
84	79.64019	24.0091	0.7599	108.01
85	78.55460	23.3340	0.7667	108.33
86	77.42712	22.6665	0.7733	108.67
87	76.25416	22.0075	0.7799	109.01
88	75.03161	21.3579	0.7864	109.36
89	73.75505	20.7189	0.7928	109.72
90	72.42015	20.0916	0.7991	110.09
91	71.02281	19.4771	0.8052	110.48
92	69.55955	18.8763	0.8112	110.88
93	68.02768	18.2901	0.8171	111.29
94	66.42545	17.7192	0.8228	111.72
95	64.75218	17.1642	0.8284	112.16

Iowa Type curve R4

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	55.38004	14.6344	0.8537	114.63
101	53.33268	14.1770	0.8582	115.18
102	51.24196	13.7350	0.8626	115.74
103	49.11568	13.3080	0.8669	116.31
104	46.96222	12.8953	0.8710	116.90
105	44.79042	12.4963	0.8750	117.50
106	42.60935	12.1104	0.8789	118.11
107	40.42821	11.7368	0.8826	118.74
108	38.25614	11.3747	0.8863	119.37
109	36.10212	11.0236	0.8898	120.02
110	33.97478	10.6825	0.8932	120.68
111	31.88233	10.3508	0.8965	121.35
112	29.83244	10.0277	0.8997	122.03
113	27.83215	9.7124	0.9029	122.71
114	25.88782	9.4043	0.9060	123.40
115	24.00508	9.1027	0.9090	124.10
116	22.18878	8.8069	0.9119	124.81
117	20.44302	8.5163	0.9148	125.52
118	18.77112	8.2303	0.9177	126.23
119	17.17567	7.9483	0.9205	126.95
120	15.65853	7.6700	0.9233	127.67
121	14.22090	7.3948	0.9261	128.39
122	12.86339	7.1225	0.9288	129.12
123	11.58601	6.8526	0.9315	129.85
124	10.38833	6.5850	0.9341	130.59
125	9.26945	6.3195	0.9368	131.32
126	8.22813	6.0560	0.9394	132.06
127	7.26282	5.7945	0.9421	132.79
128	6.37174	5.5349	0.9447	133.53
129	5.55286	5.2774	0.9472	134.28
130	4.80402	5.0221	0.9498	135.02
131	4.12291	4.7691	0.9523	135.77
132	3.50709	4.5187	0.9548	136.52
133	2.95402	4.2712	0.9573	137.27
134	2.46101	4.0266	0.9597	138.03
135	2.02527	3.7854	0.9621	138.79
136	1.64387	3.5476	0.9645	139.55
137	1.31370	3.3136	0.9669	140.31
138	1.03149	3.0834	0.9692	141.08
139	0.79375	2.8572	0.9714	141.86
140	0.59682	2.6349	0.9737	142.63
141	0.43685	2.4167	0.9758	143.42
142	0.30983	2.2025	0.9780	144.20
143	0.21164	1.9924	0.9801	144.99
144	0.13815	1.7863	0.9821	145.79
145	0.08525	1.5845	0.9842	146.58
146	0.04899	1.3871	0.9861	147.39
147	0.02564	1.1950	0.9880	148.20
148	0.01181	1.0089	0.9899	149.01
149	0.00451	0.8326	0.9917	149.83
150	0.00128	0.6719	0.9933	150.67
151	0.00021	0.5480	0.9945	151.55
152	0.00001	0.5087	0.9949	152.51
153	0.00000	0.0000	1.0000	153.00

Iowa Type curve R5

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	100.00000	98.9993	0.0100	100.00
2	100.00000	97.9993	0.0200	100.00
3	100.00000	96.9993	0.0300	100.00
4	100.00000	95.9993	0.0400	100.00
5	100.00000	94.9993	0.0500	100.00
6	100.00000	93.9993	0.0600	100.00
7	100.00000	92.9993	0.0700	100.00
8	100.00000	91.9993	0.0800	100.00
9	100.00000	90.9993	0.0900	100.00
10	100.00000	89.9993	0.1000	100.00
11	100.00000	88.9993	0.1100	100.00
12	100.00000	87.9993	0.1200	100.00
13	100.00000	86.9993	0.1300	100.00
14	100.00000	85.9993	0.1400	100.00
15	100.00000	84.9993	0.1500	100.00
16	100.00000	83.9993	0.1600	100.00
17	100.00000	82.9993	0.1700	100.00
18	100.00000	81.9993	0.1800	100.00
19	100.00000	80.9993	0.1900	100.00
20	100.00000	79.9993	0.2000	100.00
21	100.00000	78.9993	0.2100	100.00
22	100.00000	77.9993	0.2200	100.00
23	100.00000	76.9993	0.2300	100.00
24	100.00000	75.9993	0.2400	100.00
25	100.00000	74.9993	0.2500	100.00
26	100.00000	73.9993	0.2600	100.00
27	100.00000	72.9993	0.2700	100.00
28	100.00000	71.9993	0.2800	100.00
29	100.00000	70.9993	0.2900	100.00
30	100.00000	69.9993	0.3000	100.00
31	100.00000	68.9993	0.3100	100.00
32	100.00000	67.9993	0.3200	100.00
33	100.00000	66.9993	0.3300	100.00
34	100.00000	65.9993	0.3400	100.00
35	99.99998	64.9993	0.3500	100.00
36	99.99995	63.9993	0.3600	100.00
37	99.99989	62.9993	0.3700	100.00
38	99.99977	61.9994	0.3800	100.00
39	99.99954	60.9996	0.3900	100.00
40	99.99916	59.9998	0.4000	100.00
41	99.99854	59.0002	0.4100	100.00
42	99.99758	58.0007	0.4200	100.00
43	99.99612	57.0016	0.4300	100.00
44	99.99401	56.0027	0.4400	100.00
45	99.99100	55.0044	0.4500	100.00
46	99.98684	54.0067	0.4599	100.01
47	99.98120	53.0097	0.4699	100.01
48	99.97368	52.0137	0.4799	100.01
49	99.96384	51.0187	0.4898	100.02
50	99.95114	50.0251	0.4997	100.03
51	99.93499	49.0331	0.5097	100.03
52	99.91470	48.0430	0.5196	100.04
53	99.88961	47.0550	0.5295	100.05
54	99.85855	46.0694	0.5393	100.07
55	99.82089	45.0866	0.5491	100.09
56	99.77649	44.1069	0.5589	100.11
57	99.72121	43.1306	0.5687	100.13
58	99.65684	42.1582	0.5784	100.16
59	99.58107	41.1899	0.5881	100.19
60	99.49249	40.2261	0.5977	100.23
61	99.38962	39.2672	0.6073	100.27
62	99.27089	38.3136	0.6169	100.31
63	99.13466	37.3655	0.6263	100.37
64	98.97921	36.4234	0.6358	100.42
65	98.80275	35.4876	0.6451	100.49
66	98.60337	34.5584	0.6544	100.56
67	98.37911	33.6360	0.6636	100.64
68	98.12785	32.7208	0.6728	100.72
69	97.84733	31.8132	0.6819	100.81
70	97.53512	30.9134	0.6909	100.91
71	97.18856	30.0219	0.6998	101.02
72	96.80476	29.1389	0.7086	101.14
73	96.38056	28.2650	0.7174	101.26
74	95.91248	27.4005	0.7260	101.40
75	95.39673	26.5459	0.7345	101.55
76	94.82918	25.7018	0.7430	101.70
77	94.20535	24.8687	0.7513	101.87
78	93.52043	24.0472	0.7595	102.05
79	92.76930	23.2378	0.7676	102.24
80	91.94656	22.4413	0.7756	102.44
81	91.04658	21.6582	0.7834	102.66
82	90.06358	20.8891	0.7911	102.89
83	88.99168	20.1347	0.7987	103.13
84	87.82505	19.3955	0.8060	103.40
85	86.55794	18.6721	0.8133	103.67
86	85.18490	17.9650	0.8203	103.97
87	83.70084	17.2747	0.8273	104.27
88	82.10122	16.6015	0.8340	104.60
89	80.38218	15.9458	0.8405	104.95
90	78.54068	15.3080	0.8469	105.31
91	76.57472	14.6882	0.8531	105.69
92	74.48341	14.0865	0.8591	106.09
93	72.26719	13.5032	0.8650	106.50
94	69.92791	12.9382	0.8706	106.94
95	67.46899	12.3915	0.8761	107.39

Iowa Type curve R5

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	53.61839	9.9293	0.9007	109.93
101	50.60957	9.4898	0.9051	110.49
102	47.55343	9.0676	0.9093	111.07
103	44.46594	8.6623	0.9134	111.66
104	41.36834	8.2737	0.9173	112.27
105	38.27696	7.9015	0.9210	112.90
106	35.21285	7.5455	0.9245	113.55
107	32.19655	7.2056	0.9279	114.21
108	29.24865	6.8814	0.9312	114.88
109	26.38945	6.5728	0.9343	115.57
110	23.63847	6.2796	0.9372	116.28
111	21.01406	6.0014	0.9400	117.00
112	18.53286	5.7379	0.9426	117.74
113	16.20943	5.4887	0.9451	118.49
114	14.05572	5.2531	0.9475	119.25
115	12.08071	5.0302	0.9497	120.03
116	10.29003	4.8185	0.9518	120.82
117	8.68570	4.6162	0.9538	121.62
118	7.26591	4.4205	0.9558	122.42
119	6.02505	4.2280	0.9577	123.23
120	4.95374	4.0342	0.9597	124.03
121	4.03925	3.8343	0.9617	124.83
122	3.26602	3.6237	0.9638	125.62
123	2.61654	3.3991	0.9660	126.40
124	2.07253	3.1600	0.9684	127.16
125	1.61653	2.9104	0.9709	127.91
126	1.23390	2.6579	0.9734	128.66
127	0.91519	2.4093	0.9759	129.41
128	0.65554	2.1656	0.9783	130.17
129	0.44994	1.9267	0.9807	130.93
130	0.29276	1.6926	0.9831	131.69
131	0.17779	1.4638	0.9854	132.46
132	0.09844	1.2408	0.9876	133.24
133	0.04783	1.0246	0.9898	134.02
134	0.01903	0.8184	0.9918	134.82
135	0.00536	0.6306	0.9937	135.63
136	0.00070	0.5001	0.9950	136.50
137	0.00000	0.0000	1.0000	137.00

Table D

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve 01				
0	100.00000	100.0000	0.0000	100.00
1	99.50000	99.5000	0.0050	100.50
2	99.00000	99.0000	0.0100	101.00
3	98.50000	98.5000	0.0150	101.50
4	98.00000	98.0000	0.0200	102.00
5	97.50000	97.5000	0.0250	102.50
6	97.00000	97.0000	0.0300	103.00
7	96.50000	96.5000	0.0350	103.50
8	96.00000	96.0000	0.0400	104.00
9	95.50000	95.5000	0.0450	104.50
10	95.00000	95.0000	0.0500	105.00
11	94.50000	94.5000	0.0550	105.50
12	94.00000	94.0000	0.0600	106.00
13	93.50000	93.5000	0.0650	106.50
14	93.00000	93.0000	0.0700	107.00
15	92.50000	92.5000	0.0750	107.50
16	92.00000	92.0000	0.0800	108.00
17	91.50000	91.5000	0.0850	108.50
18	91.00000	91.0000	0.0900	109.00
19	90.50000	90.5000	0.0950	109.50
20	90.00000	90.0000	0.1000	110.00
21	89.50000	89.5000	0.1050	110.50
22	89.00000	89.0000	0.1100	111.00
23	88.50000	88.5000	0.1150	111.50
24	88.00000	88.0000	0.1200	112.00
25	87.50000	87.5000	0.1250	112.50
26	87.00000	87.0000	0.1300	113.00
27	86.50000	86.5000	0.1350	113.50
28	86.00000	86.0000	0.1400	114.00
29	85.50000	85.5000	0.1450	114.50
30	85.00000	85.0000	0.1500	115.00
31	84.50000	84.5000	0.1550	115.50
32	84.00000	84.0000	0.1600	116.00
33	83.50000	83.5000	0.1650	116.50
34	83.00000	83.0000	0.1700	117.00
35	82.50000	82.5000	0.1750	117.50
36	82.00000	82.0000	0.1800	118.00
37	81.50000	81.5000	0.1850	118.50
38	81.00000	81.0000	0.1900	119.00
39	80.50000	80.5000	0.1950	119.50
40	80.00000	80.0000	0.2000	120.00
41	79.50000	79.5000	0.2050	120.50
42	79.00000	79.0000	0.2100	121.00
43	78.50000	78.5000	0.2150	121.50
44	78.00000	78.0000	0.2200	122.00
45	77.50000	77.5000	0.2250	122.50
46	77.00000	77.0000	0.2300	123.00
47	76.50000	76.5000	0.2350	123.50
48	76.00000	76.0000	0.2400	124.00
49	75.50000	75.5000	0.2450	124.50
50	75.00000	75.0000	0.2500	125.00
51	74.50000	74.5000	0.2550	125.50
52	74.00000	74.0000	0.2600	126.00
53	73.50000	73.5000	0.2650	126.50
54	73.00000	73.0000	0.2700	127.00
55	72.50000	72.5000	0.2750	127.50
56	72.00000	72.0000	0.2800	128.00
57	71.50000	71.5000	0.2850	128.50
58	71.00000	71.0000	0.2900	129.00
59	70.50000	70.5000	0.2950	129.50
60	70.00000	70.0000	0.3000	130.00
61	69.50000	69.5000	0.3050	130.50
62	69.00000	69.0000	0.3100	131.00
63	68.50000	68.5000	0.3150	131.50
64	68.00000	68.0000	0.3200	132.00
65	67.50000	67.5000	0.3250	132.50
66	67.00000	67.0000	0.3300	133.00
67	66.50000	66.5000	0.3350	133.50
68	66.00000	66.0000	0.3400	134.00
69	65.50000	65.5000	0.3450	134.50
70	65.00000	65.0000	0.3500	135.00
71	64.50000	64.5000	0.3550	135.50
72	64.00000	64.0000	0.3600	136.00
73	63.50000	63.5000	0.3650	136.50
74	63.00000	63.0000	0.3700	137.00
75	62.50000	62.5000	0.3750	137.50
76	62.00000	62.0000	0.3800	138.00
77	61.50000	61.5000	0.3850	138.50
78	61.00000	61.0000	0.3900	139.00
79	60.50000	60.5000	0.3950	139.50
80	60.00000	60.0000	0.4000	140.00
81	59.50000	59.5000	0.4050	140.50
82	59.00000	59.0000	0.4100	141.00
83	58.50000	58.5000	0.4150	141.50
84	58.00000	58.0000	0.4200	142.00
85	57.50000	57.5000	0.4250	142.50
86	57.00000	57.0000	0.4300	143.00
87	56.50000	56.5000	0.4350	143.50
88	56.00000	56.0000	0.4400	144.00
89	55.50000	55.5000	0.4450	144.50
90	55.00000	55.0000	0.4500	145.00
91	54.50000	54.5000	0.4550	145.50
92	54.00000	54.0000	0.4600	146.00
93	53.50000	53.5000	0.4650	146.50
94	53.00000	53.0000	0.4700	147.00
95	52.50000	52.5000	0.4750	147.50

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve 01				
100	50.00000	50.0000	0.5000	150.00
101	49.50000	49.5000	0.5050	150.50
102	49.00000	49.0000	0.5100	151.00
103	48.50000	48.5000	0.5150	151.50
104	48.00000	48.0000	0.5200	152.00
105	47.50000	47.5000	0.5250	152.50
106	47.00000	47.0000	0.5300	153.00
107	46.50000	46.5000	0.5350	153.50
108	46.00000	46.0000	0.5400	154.00
109	45.50000	45.5000	0.5450	154.50
110	45.00000	45.0000	0.5500	155.00
111	44.50000	44.5000	0.5550	155.50
112	44.00000	44.0000	0.5600	156.00
113	43.50000	43.5000	0.5650	156.50
114	43.00000	43.0000	0.5700	157.00
115	42.50000	42.5000	0.5750	157.50
116	42.00000	42.0000	0.5800	158.00
117	41.50000	41.5000	0.5850	158.50
118	41.00000	41.0000	0.5900	159.00
119	40.50000	40.5000	0.5950	159.50
120	40.00000	40.0000	0.6000	160.00
121	39.50000	39.5000	0.6050	160.50
122	39.00000	39.0000	0.6100	161.00
123	38.50000	38.5000	0.6150	161.50
124	38.00000	38.0000	0.6200	162.00
125	37.50000	37.5000	0.6250	162.50
126	37.00000	37.0000	0.6300	163.00
127	36.50000	36.5000	0.6350	163.50
128	36.00000	36.0000	0.6400	164.00
129	35.50000	35.5000	0.6450	164.50
130	35.00000	35.0000	0.6500	165.00
131	34.50000	34.5000	0.6550	165.50
132	34.00000	34.0000	0.6600	166.00
133	33.50000	33.5000	0.6650	166.50
134	33.00000	33.0000	0.6700	167.00
135	32.50000	32.5000	0.6750	167.50
136	32.00000	32.0000	0.6800	168.00
137	31.50000	31.5000	0.6850	168.50
138	31.00000	31.0000	0.6900	169.00
139	30.50000	30.5000	0.6950	169.50
140	30.00000	30.0000	0.7000	170.00
141	29.50000	29.5000	0.7050	170.50
142	29.00000	29.0000	0.7100	171.00
143	28.50000	28.5000	0.7150	171.50
144	28.00000	28.0000	0.7200	172.00
145	27.50000	27.5000	0.7250	172.50
146	27.00000	27.0000	0.7300	173.00
147	26.50000	26.5000	0.7350	173.50
148	26.00000	26.0000	0.7400	174.00
149	25.50000	25.5000	0.7450	174.50
150	25.00000	25.0000	0.7500	175.00
151	24.50000	24.5000	0.7550	175.50
152	24.00000	24.0000	0.7600	176.00
153	23.50000	23.5000	0.7650	176.50
154	23.00000	23.0000	0.7700	177.00
155	22.50000	22.5000	0.7750	177.50
156	22.00000	22.0000	0.7800	178.00
157	21.50000	21.5000	0.7850	178.50
158	21.00000	21.0000	0.7900	179.00
159	20.50000	20.5000	0.7950	179.50
160	20.00000	20.0000	0.8000	180.00
161	19.50000	19.5000	0.8050	180.50
162	19.00000	19.0000	0.8100	181.00
163	18.50000	18.5000	0.8150	181.50
164	18.00000	18.0000	0.8200	182.00
165	17.50000	17.5000	0.8250	182.50
166	17.00000	17.0000	0.8300	183.00
167	16.50000	16.5000	0.8350	183.50
168	16.00000	16.0000	0.8400	184.00
169	15.50000	15.5000	0.8450	184.50
170	15.00000	15.0000	0.8500	185.00
171	14.50000	14.5000	0.8550	185.50
172	14.00000	14.0000	0.8600	186.00
173	13.50000	13.5000	0.8650	186.50
174	13.00000	13.0000	0.8700	187.00
175	12.50000	12.5000	0.8750	187.50
176	12.00000	12.0000	0.8800	188.00
177	11.50000	11.5000	0.8850	188.50
178	11.00000	11.0000	0.8900	189.00
179	10.50000	10.5000	0.8950	189.50
180	10.00000	10.0000	0.9000	190.00
181	9.50000	9.5000	0.9050	190.50
182	9.00000	9.0000	0.9100	191.00
183	8.50000	8.5000	0.9150	191.50
184	8.00000	8.0000	0.9200	192.00
185	7.50000	7.5000	0.9250	192.50
186	7.00000	7.0000	0.9300	193.00
187	6.50000	6.5000	0.9350	193.50
188	6.00000	6.0000	0.9400	194.00
189	5.50000	5.5000	0.9450	194.50
190	5.00000	5.0000	0.9500	195.00
191	4.50000	4.5000	0.9550	195.50
192	4.00000	4.0000	0.9600	196.00
193	3.50000	3.5000	0.9650	196.50
194	3.00000	3.0000	0.9700	197.00
195	2.50000	2.5000	0.9750	197.50

Table D continued

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve 01				
200	0.00000	0.0000	1.0000	200.00

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve 02				
0	100.00000	100.0000	0.0000	100.00
1	99.43868	99.1126	0.0089	100.11
2	98.87721	98.6726	0.0133	100.67
3	98.31559	98.2334	0.0177	101.23
4	97.75384	97.7950	0.0220	101.80
5	97.19199	97.3575	0.0264	102.36
6	96.63003	96.9208	0.0308	102.92
7	96.06800	96.4849	0.0352	103.48
8	95.50589	96.0498	0.0395	104.05
9	94.94372	95.6165	0.0438	104.62
10	94.38150	95.1821	0.0482	105.18
11	93.81923	94.7496	0.0525	105.75
12	93.25692	94.3179	0.0568	106.32
13	92.69459	93.8870	0.0611	106.89
14	92.13222	93.4570	0.0654	107.46
15	91.56984	93.0279	0.0697	108.03
16	91.00744	92.5997	0.0740	108.60
17	90.44502	92.1725	0.0783	109.17
18	89.88259	91.7461	0.0825	109.75
19	89.32016	91.3206	0.0868	110.32
20	88.75771	90.8962	0.0910	110.90
21	88.19526	90.4727	0.0953	111.47
22	87.63280	90.0501	0.0995	112.05
23	87.07034	89.6286	0.1037	112.63
24	86.50788	89.2081	0.1079	113.21
25	85.94542	88.7886	0.1121	113.79
26	85.38295	88.3703	0.1163	114.37
27	84.82048	87.9530	0.1205	114.95
28	84.25802	87.5367	0.1246	115.54
29	83.69555	87.1217	0.1288	116.12
30	83.13308	86.7077	0.1329	116.71
31	82.57061	86.2950	0.1371	117.29
32	82.00815	85.8834	0.1412	117.88
33	81.44568	85.4731	0.1453	118.47
34	80.88321	85.0640	0.1494	119.06
35	80.32074	84.6562	0.1534	119.66
36	79.75827	84.2497	0.1575	120.25
37	79.19580	83.8445	0.1616	120.84
38	78.63334	83.4406	0.1656	121.44
39	78.07087	83.0382	0.1696	122.04
40	77.50840	82.6372	0.1736	122.64
41	76.94593	82.2376	0.1776	123.24
42	76.38346	81.8395	0.1816	123.84
43	75.82099	81.4429	0.1856	124.44
44	75.25852	81.0478	0.1895	125.05
45	74.69606	80.6544	0.1935	125.65
46	74.13359	80.2625	0.1974	126.26
47	73.57112	79.8723	0.2013	126.87
48	73.00865	79.4838	0.2052	127.48
49	72.44618	79.0970	0.2090	128.10
50	71.88371	78.7120	0.2129	128.71
51	71.32125	78.3288	0.2167	129.33
52	70.75878	77.9475	0.2205	129.95
53	70.19631	77.5681	0.2243	130.57
54	69.63385	77.1906	0.2281	131.19
55	69.07138	76.8151	0.2318	131.82
56	68.50892	76.4417	0.2356	132.44
57	67.94645	76.0703	0.2393	133.07
58	67.38399	75.7011	0.2430	133.70
59	66.82154	75.3341	0.2467	134.33
60	66.25909	74.9693	0.2503	134.97
61	65.69664	74.6069	0.2539	135.61
62	65.13420	74.2468	0.2575	136.25
63	64.57177	73.8892	0.2611	136.89
64	64.00936	73.5340	0.2647	137.53
65	63.44696	73.1814	0.2682	138.18
66	62.88457	72.8314	0.2717	138.83
67	62.32221	72.4840	0.2752	139.48
68	61.75987	72.1395	0.2786	140.14
69	61.19757	71.7977	0.2820	140.80
70	60.63530	71.4589	0.2854	141.46
71	60.07308	71.1230	0.2888	142.12
72	59.51091	70.7901	0.2921	142.79
73	58.94880	70.4604	0.2954	143.46
74	58.38676	70.1338	0.2987	144.13
75	57.82481	69.8105	0.3019	144.81
76	57.26295	69.4906	0.3051	145.49
77	56.70121	69.1741	0.3083	146.17
78	56.13959	68.8611	0.3114	146.86
79	55.57812	68.5517	0.3145	147.55
80	55.01681	68.2460	0.3175	148.25
81	54.45568	67.9441	0.3206	148.94
82	53.89477	67.6460	0.3235	149.65
83	53.33410	67.3519	0.3265	150.35
84	52.77370	67.0618	0.3294	151.06
85	52.21359	66.7758	0.3322	151.78
86	51.65382	66.4940	0.3351	152.49
87	51.09442	66.2165	0.3378	153.22
88	50.53544	65.9434	0.3406	153.94
89	49.97692	65.6748	0.3433	154.67
90	49.41890	65.4107	0.3459	155.41
91	48.86144	65.1513	0.3485	156.15
92	48.30460	64.8966	0.3510	156.90
93	47.74843	64.6467	0.3535	157.65
94	47.19301	64.4016	0.3560	158.40
95	46.63840	64.1615	0.3584	159.16

Iowa Type curve 02

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	43.88026	63.0376	0.3696	163.04
101	43.33224	62.8285	0.3717	163.83
102	42.78565	62.6247	0.3738	164.62
103	42.24059	62.4264	0.3757	165.43
104	41.69720	62.2334	0.3777	166.23
105	41.15557	62.0458	0.3795	167.05
106	40.61584	61.8637	0.3814	167.86
107	40.07814	61.6870	0.3831	168.69
108	39.54259	61.5156	0.3848	169.52
109	39.00935	61.3497	0.3865	170.35
110	38.47853	61.1891	0.3881	171.19
111	37.95031	61.0339	0.3897	172.03
112	37.42481	60.8838	0.3912	172.88
113	36.90220	60.7390	0.3926	173.74
114	36.38262	60.5993	0.3940	174.60
115	35.86624	60.4645	0.3954	175.46
116	35.35322	60.3347	0.3967	176.33
117	34.84370	60.2097	0.3979	177.21
118	34.33786	60.0893	0.3991	178.09
119	33.83584	59.9734	0.4003	178.97
120	33.33782	59.8618	0.4014	179.86
121	32.84393	59.7545	0.4025	180.75
122	32.35435	59.6511	0.4035	181.65
123	31.86922	59.5515	0.4045	182.55
124	31.38869	59.4556	0.4054	183.46
125	30.91290	59.3630	0.4064	184.36
126	30.44199	59.2735	0.4073	185.27
127	29.97610	59.1870	0.4081	186.19
128	29.51535	59.1031	0.4090	187.10
129	29.05986	59.0217	0.4098	188.02
130	28.60975	58.9424	0.4106	188.94
131	28.16512	58.8650	0.4114	189.86
132	27.72606	58.7892	0.4121	190.79
133	27.29268	58.7148	0.4129	191.71
134	26.86504	58.6415	0.4136	192.64
135	26.44322	58.5689	0.4143	193.57
136	26.02729	58.4969	0.4150	194.50
137	25.61729	58.4252	0.4157	195.43
138	25.21326	58.3534	0.4165	196.35
139	24.81526	58.2813	0.4172	197.28
140	24.42329	58.2086	0.4179	198.21
141	24.03737	58.1351	0.4186	199.14
142	23.65752	58.0605	0.4194	200.06
143	23.28374	57.9845	0.4202	200.98
144	22.91600	57.9070	0.4209	201.91
145	22.55431	57.8276	0.4217	202.83
146	22.19862	57.7462	0.4225	203.75
147	21.84892	57.6624	0.4234	204.66
148	21.50515	57.5762	0.4242	205.58
149	21.16729	57.4872	0.4251	206.49
150	20.83526	57.3954	0.4260	207.40
151	20.50902	57.3004	0.4270	208.30
152	20.18851	57.2021	0.4280	209.20
153	19.87365	57.1005	0.4290	210.10
154	19.56438	56.9952	0.4300	211.00
155	19.26062	56.8862	0.4311	211.89
156	18.96230	56.7733	0.4323	212.77
157	18.66932	56.6564	0.4334	213.66
158	18.38161	56.5354	0.4346	214.54
159	18.09908	56.4101	0.4359	215.41
160	17.82163	56.2805	0.4372	216.28
161	17.54919	56.1465	0.4385	217.15
162	17.28166	56.0079	0.4399	218.01
163	17.01894	55.8648	0.4414	218.86
164	16.76094	55.7170	0.4428	219.72
165	16.50757	55.5645	0.4444	220.56
166	16.25873	55.4073	0.4459	221.41
167	16.01432	55.2453	0.4475	222.25
168	15.77426	55.0784	0.4492	223.08
169	15.53845	54.9067	0.4509	223.91
170	15.30680	54.7300	0.4527	224.73
171	15.07921	54.5485	0.4545	225.55
172	14.85559	54.3621	0.4564	226.36
173	14.63585	54.1708	0.4583	227.17
174	14.41990	53.9746	0.4603	227.97
175	14.20766	53.7734	0.4623	228.77
176	13.99903	53.5673	0.4643	229.57
177	13.79393	53.3564	0.4664	230.36
178	13.59228	53.1405	0.4686	231.14
179	13.39398	52.9199	0.4708	231.92
180	13.19897	52.6944	0.4731	232.69
181	13.00715	52.4641	0.4754	233.46
182	12.81846	52.2290	0.4777	234.23
183	12.63280	51.9893	0.4801	234.99
184	12.45012	51.7448	0.4826	235.74
185	12.27033	51.4956	0.4850	236.50
186	12.09336	51.2419	0.4876	237.24
187	11.91915	50.9835	0.4902	237.98
188	11.74762	50.7206	0.4928	238.72
189	11.57870	50.4533	0.4955	239.45
190	11.41233	50.1815	0.4982	240.18
191	11.24845	49.9053	0.5009	240.91
192	11.08699	49.6248	0.5038	241.62
193	10.92789	49.3401	0.5066	242.34
194	10.77109	49.0510	0.5095	243.05
195	10.61654	48.7578	0.5124	243.76

Iowa Type curve 02

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
200	9.87552	47.2309	0.5277	247.23
201	9.73330	46.9137	0.5309	247.91
202	9.59295	46.5928	0.5341	248.59
203	9.45444	46.2680	0.5373	249.27
204	9.31771	45.9397	0.5406	249.94
205	9.18273	45.6076	0.5439	250.61
206	9.04944	45.2720	0.5473	251.27
207	8.91780	44.9329	0.5507	251.93
208	8.78778	44.5903	0.5541	252.59
209	8.65934	44.2443	0.5576	253.24
210	8.53243	43.8949	0.5611	253.89
211	8.40702	43.5422	0.5646	254.54
212	8.28307	43.1863	0.5681	255.19
213	8.16055	42.8272	0.5717	255.83
214	8.03942	42.4650	0.5754	256.46
215	7.91964	42.0997	0.5790	257.10
216	7.80120	41.7312	0.5827	257.73
217	7.68404	41.3599	0.5864	258.36
218	7.56815	40.9856	0.5901	258.99
219	7.45348	40.6084	0.5939	259.61
220	7.34002	40.2284	0.5977	260.23
221	7.22774	39.8456	0.6015	260.85
222	7.11660	39.4601	0.6054	261.46
223	7.00657	39.0719	0.6093	262.07
224	6.89764	38.6810	0.6132	262.68
225	6.78978	38.2875	0.6171	263.29
226	6.68296	37.8915	0.6211	263.89
227	6.57716	37.4930	0.6251	264.49
228	6.47235	37.0921	0.6291	265.09
229	6.36851	36.6887	0.6331	265.69
230	6.26562	36.2830	0.6372	266.28
231	6.16365	35.8750	0.6413	266.87
232	6.06260	35.4646	0.6454	267.46
233	5.96242	35.0521	0.6495	268.05
234	5.86312	34.6372	0.6536	268.64
235	5.76466	34.2203	0.6578	269.22
236	5.66702	33.8013	0.6620	269.80
237	5.57019	33.3802	0.6662	270.38
238	5.47415	32.9570	0.6704	270.96
239	5.37889	32.5319	0.6747	271.53
240	5.28438	32.1047	0.6790	272.10
241	5.19061	31.6757	0.6832	272.68
242	5.09756	31.2448	0.6876	273.24
243	5.00521	30.8120	0.6919	273.81
244	4.91356	30.3774	0.6962	274.38
245	4.82259	29.9410	0.7006	274.94
246	4.73227	29.5029	0.7050	275.50
247	4.64260	29.0631	0.7094	276.06
248	4.55357	28.6216	0.7138	276.62
249	4.46516	28.1784	0.7182	277.18
250	4.37735	27.7336	0.7227	277.73
251	4.29014	27.2872	0.7271	278.29
252	4.20350	26.8393	0.7316	278.84
253	4.11744	26.3898	0.7361	279.39
254	4.03194	25.9389	0.7406	279.94
255	3.94697	25.4865	0.7451	280.49
256	3.86255	25.0326	0.7497	281.03
257	3.77866	24.5773	0.7542	281.58
258	3.69525	24.1207	0.7588	282.12
259	3.61236	23.6627	0.7634	282.66
260	3.52997	23.2034	0.7680	283.20
261	3.44805	22.7428	0.7726	283.74
262	3.36661	22.2808	0.7772	284.28
263	3.28563	21.8176	0.7818	284.82
264	3.20510	21.3533	0.7865	285.35
265	3.12501	20.8877	0.7911	285.89
266	3.04536	20.4209	0.7958	286.42
267	2.96614	19.9530	0.8005	286.95
268	2.88733	19.4840	0.8052	287.48
269	2.80894	19.0138	0.8099	288.01
270	2.73094	18.5425	0.8146	288.54
271	2.65334	18.0702	0.8193	289.07
272	2.57613	17.5968	0.8240	289.60
273	2.49929	17.1224	0.8288	290.12
274	2.42283	16.6470	0.8335	290.65
275	2.34673	16.1706	0.8383	291.17
276	2.27098	15.6933	0.8431	291.69
277	2.19559	15.2150	0.8478	292.22
278	2.12054	14.7358	0.8526	292.74
279	2.04583	14.2557	0.8574	293.26
280	1.97145	13.7747	0.8623	293.77
281	1.89739	13.2928	0.8671	294.29
282	1.82365	12.8101	0.8719	294.81
283	1.75023	12.3265	0.8767	295.33
284	1.67711	11.8421	0.8816	295.84
285	1.60429	11.3570	0.8864	296.36
286	1.53177	10.8710	0.8913	296.87
287	1.45953	10.3843	0.8962	297.38
288	1.38759	9.8967	0.9010	297.90
289	1.31592	9.4085	0.9059	298.41
290	1.24452	8.9196	0.9108	298.92
291	1.17340	8.4299	0.9157	299.43
292	1.10254	7.9396	0.9206	299.94
293	1.03194	7.4486	0.9255	300.45
294	0.96160	6.9568	0.9304	300.96
295	0.89151	6.4645	0.9354	301.46

Table D continued

Iowa Type curve 02

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
300	0.54464	3.9937	0.9601	303.99
301	0.47596	3.4978	0.9650	304.50
302	0.40751	3.0013	0.9700	305.00
303	0.33926	2.5045	0.9750	305.50
304	0.27124	2.0072	0.9799	306.01
305	0.20342	1.5097	0.9849	306.51
306	0.13581	1.0124	0.9899	307.01
307	0.06840	0.5174	0.9948	307.52
308	0.00119	0.5000	0.9950	308.50
309	0.00000	0.0000	1.0000	309.00

Iowa Type curve 03

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
0	100.00000	100.0000	0.0000	100.00
1	99.17103	98.4323	0.0157	99.43
2	98.34314	98.2567	0.0174	100.26
3	97.51638	98.0855	0.0191	101.09
4	96.69082	97.9187	0.0208	101.92
5	95.86652	97.7564	0.0224	102.76
6	95.04354	97.5985	0.0240	103.60
7	94.22196	97.4452	0.0255	104.45
8	93.40185	97.2964	0.0270	105.30
9	92.58328	97.1522	0.0285	106.15
10	91.76634	97.0127	0.0299	107.01
11	90.95110	96.8778	0.0312	107.88
12	90.13764	96.7475	0.0325	108.75
13	89.32605	96.6220	0.0338	109.62
14	88.51642	96.5012	0.0350	110.50
15	87.70882	96.3852	0.0361	111.39
16	86.90337	96.2739	0.0373	112.27
17	86.10014	96.1673	0.0383	113.17
18	85.29924	96.0656	0.0393	114.07
19	84.50076	95.9686	0.0403	114.97
20	83.70479	95.8765	0.0412	115.88
21	82.91146	95.7891	0.0421	116.79
22	82.12084	95.7065	0.0429	117.71
23	81.33306	95.6286	0.0437	118.63
24	80.54821	95.5555	0.0444	119.56
25	79.76641	95.4872	0.0451	120.49
26	78.98776	95.4236	0.0458	121.42
27	78.21237	95.3646	0.0464	122.36
28	77.44035	95.3103	0.0469	123.31
29	76.67182	95.2607	0.0474	124.26
30	75.90688	95.2156	0.0478	125.22
31	75.14565	95.1751	0.0482	126.18
32	74.38824	95.1391	0.0486	127.14
33	73.63476	95.1075	0.0489	128.11
34	72.88532	95.0803	0.0492	129.08
35	72.14004	95.0574	0.0494	130.06
36	71.39902	95.0388	0.0496	131.04
37	70.66238	95.0243	0.0498	132.02
38	69.93023	95.0139	0.0499	133.01
39	69.20266	95.0076	0.0499	134.01
40	68.47980	95.0052	0.0499	135.01
41	67.76174	95.0067	0.0499	136.01
42	67.04858	95.0119	0.0499	137.01
43	66.34043	95.0208	0.0498	138.02
44	65.63739	95.0332	0.0497	139.03
45	64.93954	95.0490	0.0495	140.05
46	64.24699	95.0682	0.0493	141.07
47	63.55981	95.0907	0.0491	142.09
48	62.87810	95.1162	0.0488	143.12
49	62.20194	95.1447	0.0486	144.14
50	61.53142	95.1761	0.0482	145.18
51	60.86660	95.2102	0.0479	146.21
52	60.20756	95.2469	0.0475	147.25
53	59.55436	95.2861	0.0471	148.29
54	58.90708	95.3276	0.0467	149.33
55	58.26577	95.3713	0.0463	150.37
56	57.63049	95.4171	0.0458	151.42
57	57.00130	95.4649	0.0454	152.46
58	56.37823	95.5144	0.0449	153.51
59	55.76133	95.5655	0.0443	154.57
60	55.15065	95.6182	0.0438	155.62
61	54.54622	95.6722	0.0433	156.67
62	53.94807	95.7274	0.0427	157.73
63	53.35622	95.7837	0.0422	158.78
64	52.77070	95.8410	0.0416	159.84
65	52.19152	95.8990	0.0410	160.90
66	51.61870	95.9576	0.0404	161.96
67	51.05225	96.0168	0.0398	163.02
68	50.49217	96.0763	0.0392	164.08
69	49.93847	96.1360	0.0386	165.14
70	49.39113	96.1958	0.0380	166.20
71	48.85016	96.2556	0.0374	167.26
72	48.31555	96.3151	0.0368	168.32
73	47.78727	96.3743	0.0363	169.37
74	47.26531	96.4331	0.0357	170.43
75	46.74965	96.4912	0.0351	171.49
76	46.24027	96.5487	0.0345	172.55
77	45.73714	96.6053	0.0339	173.61
78	45.24022	96.6609	0.0334	174.66
79	44.74949	96.7154	0.0328	175.72
80	44.26490	96.7687	0.0323	176.77
81	43.78642	96.8207	0.0318	177.82
82	43.31400	96.8712	0.0313	178.87
83	42.84761	96.9202	0.0308	179.92
84	42.38719	96.9676	0.0303	180.97
85	41.93269	97.0132	0.0299	182.01
86	41.48407	97.0569	0.0294	183.06
87	41.04127	97.0987	0.0290	184.10
88	40.60424	97.1384	0.0286	185.14
89	40.17293	97.1759	0.0282	186.18
90	39.74727	97.2112	0.0279	187.21
91	39.32720	97.2442	0.0276	188.24
92	38.91267	97.2748	0.0273	189.27
93	38.50362	97.3029	0.0270	190.30
94	38.09998	97.3285	0.0267	191.33
95	37.70170	97.3514	0.0265	192.35

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve 03				
100	35.78829	97.4240	0.0258	197.42
101	35.42076	97.4297	0.0257	198.43
102	35.05812	97.4324	0.0257	199.43
103	34.70031	97.4319	0.0257	200.43
104	34.34726	97.4282	0.0257	201.43
105	33.99891	97.4213	0.0258	202.42
106	33.65519	97.4112	0.0259	203.41
107	33.31603	97.3977	0.0260	204.40
108	32.98137	97.3810	0.0262	205.38
109	32.65114	97.3608	0.0264	206.36
110	32.32527	97.3373	0.0266	207.34
111	32.00370	97.3103	0.0269	208.31
112	31.68637	97.2798	0.0272	209.28
113	31.37321	97.2458	0.0275	210.25
114	31.06415	97.2084	0.0279	211.21
115	30.75914	97.1673	0.0283	212.17
116	30.45811	97.1227	0.0288	213.12
117	30.16099	97.0746	0.0293	214.07
118	29.86773	97.0228	0.0298	215.02
119	29.57826	96.9674	0.0303	215.97
120	29.29252	96.9084	0.0309	216.91
121	29.01046	96.8458	0.0315	217.85
122	28.73202	96.7795	0.0322	218.78
123	28.45712	96.7095	0.0329	219.71
124	28.18573	96.6359	0.0336	220.64
125	27.91777	96.5586	0.0344	221.56
126	27.65320	96.4777	0.0352	222.48
127	27.39195	96.3931	0.0361	223.39
128	27.13398	96.3047	0.0370	224.30
129	26.87923	96.2127	0.0379	225.21
130	26.62764	96.1171	0.0388	226.12
131	26.37916	96.0178	0.0398	227.02
132	26.13374	95.9148	0.0409	227.91
133	25.89133	95.8081	0.0419	228.81
134	25.65188	95.6977	0.0430	229.70
135	25.41533	95.5838	0.0442	230.58
136	25.18165	95.4661	0.0453	231.47
137	24.95077	95.3449	0.0466	232.34
138	24.72266	95.2200	0.0478	233.22
139	24.49727	95.0915	0.0491	234.09
140	24.27454	94.9594	0.0504	234.96
141	24.05444	94.8237	0.0518	235.82
142	23.83692	94.6845	0.0532	236.68
143	23.62194	94.5416	0.0546	237.54
144	23.40946	94.3952	0.0560	238.40
145	23.19942	94.2453	0.0575	239.25
146	22.99180	94.0918	0.0591	240.09
147	22.78654	93.9349	0.0607	240.93
148	22.58362	93.7745	0.0623	241.77
149	22.38298	93.6106	0.0639	242.61
150	22.18460	93.4432	0.0656	243.44
151	21.98843	93.2724	0.0673	244.27
152	21.79443	93.0982	0.0690	245.10
153	21.60257	92.9206	0.0708	245.92
154	21.41282	92.7396	0.0726	246.74
155	21.22513	92.5552	0.0744	247.56
156	21.03947	92.3675	0.0763	248.37
157	20.85582	92.1765	0.0782	249.18
158	20.67412	91.9822	0.0802	249.98
159	20.49436	91.7846	0.0822	250.78
160	20.31650	91.5838	0.0842	251.58
161	20.14050	91.3797	0.0862	252.38
162	19.96634	91.1724	0.0883	253.17
163	19.79398	90.9620	0.0904	253.96
164	19.62340	90.7483	0.0925	254.75
165	19.45456	90.5316	0.0947	255.53
166	19.28744	90.3117	0.0969	256.31
167	19.12201	90.0887	0.0991	257.09
168	18.95824	89.8626	0.1014	257.86
169	18.79610	89.6334	0.1037	258.63
170	18.63556	89.4013	0.1060	259.40
171	18.47660	89.1661	0.1083	260.17
172	18.31920	88.9280	0.1107	260.93
173	18.16332	88.6869	0.1131	261.69
174	18.00895	88.4428	0.1156	262.44
175	17.85605	88.1958	0.1180	263.20
176	17.70460	87.9460	0.1205	263.95
177	17.55459	87.6933	0.1231	264.69
178	17.40598	87.4377	0.1256	265.44
179	17.25875	87.1794	0.1282	266.18
180	17.11289	86.9182	0.1308	266.92
181	16.96836	86.6542	0.1335	267.65
182	16.82515	86.3876	0.1361	268.39
183	16.68324	86.1181	0.1388	269.12
184	16.54260	85.8460	0.1415	269.85
185	16.40322	85.5712	0.1443	270.57
186	16.26508	85.2937	0.1471	271.29
187	16.12814	85.0137	0.1499	272.01
188	15.99241	84.7310	0.1527	272.73
189	15.85785	84.4457	0.1555	273.45
190	15.72445	84.1579	0.1584	274.16
191	15.59219	83.8675	0.1613	274.87
192	15.46105	83.5746	0.1643	275.57
193	15.33101	83.2793	0.1672	276.28
194	15.20206	82.9814	0.1702	276.98
195	15.07418	82.6812	0.1732	277.68

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve 03				
200	14.45027	81.1438	0.1886	281.14
201	14.32847	80.8293	0.1917	281.83
202	14.20763	80.5125	0.1949	282.51
203	14.08773	80.1935	0.1981	283.19
204	13.96876	79.8722	0.2013	283.87
205	13.85071	79.5487	0.2045	284.55
206	13.73356	79.2230	0.2078	285.22
207	13.61730	78.8951	0.2110	285.90
208	13.50192	78.5651	0.2143	286.57
209	13.38739	78.2329	0.2177	287.23
210	13.27371	77.8987	0.2210	287.90
211	13.16087	77.5623	0.2244	288.56
212	13.04886	77.2238	0.2278	289.22
213	12.93765	76.8833	0.2312	289.88
214	12.82725	76.5407	0.2346	290.54
215	12.71762	76.1962	0.2380	291.20
216	12.60878	75.8496	0.2415	291.85
217	12.50070	75.5010	0.2450	292.50
218	12.39337	75.1506	0.2485	293.15
219	12.28679	74.7981	0.2520	293.80
220	12.18093	74.4438	0.2556	294.44
221	12.07579	74.0876	0.2591	295.09
222	11.97137	73.7295	0.2627	295.73
223	11.86764	73.3696	0.2663	296.37
224	11.76460	73.0078	0.2699	297.01
225	11.66224	72.6442	0.2736	297.64
226	11.56055	72.2788	0.2772	298.28
227	11.45952	71.9116	0.2809	298.91
228	11.35914	71.5427	0.2846	299.54
229	11.25940	71.1720	0.2883	300.17
230	11.16030	70.7995	0.2920	300.80
231	11.06181	70.4255	0.2957	301.43
232	10.96394	70.0496	0.2995	302.05
233	10.86668	69.6721	0.3033	302.67
234	10.77001	69.2930	0.3071	303.29
235	10.67393	68.9122	0.3109	303.91
236	10.57843	68.5299	0.3147	304.53
237	10.48350	68.1459	0.3185	305.15
238	10.38914	67.7603	0.3224	305.76
239	10.29533	67.3731	0.3263	306.37
240	10.20207	66.9845	0.3302	306.98
241	10.10934	66.5943	0.3341	307.59
242	10.01716	66.2025	0.3380	308.20
243	9.92549	65.8093	0.3419	308.81
244	9.83435	65.4146	0.3459	309.41
245	9.74372	65.0184	0.3498	310.02
246	9.65359	64.6207	0.3538	310.62
247	9.56396	64.2217	0.3578	311.22
248	9.47483	63.8211	0.3618	311.82
249	9.38617	63.4192	0.3658	312.42
250	9.29800	63.0159	0.3698	313.02
251	9.21029	62.6112	0.3739	313.61
252	9.12305	62.2051	0.3779	314.21
253	9.03627	61.7977	0.3820	314.80
254	8.94994	61.3890	0.3861	315.39
255	8.86406	60.9789	0.3902	315.98
256	8.77862	60.5675	0.3943	316.57
257	8.69361	60.1549	0.3985	317.15
258	8.60903	59.7410	0.4026	317.74
259	8.52488	59.3258	0.4067	318.33
260	8.44114	58.9094	0.4109	318.91
261	8.35782	58.4916	0.4151	319.49
262	8.27490	58.0728	0.4193	320.07
263	8.19238	57.6527	0.4235	320.65
264	8.11026	57.2314	0.4277	321.23
265	8.02854	56.8088	0.4319	321.81
266	7.94719	56.3852	0.4361	322.39
267	7.86623	55.9604	0.4404	322.96
268	7.78564	55.5345	0.4447	323.53
269	7.70543	55.1074	0.4489	324.11
270	7.62558	54.6792	0.4532	324.68
271	7.54610	54.2498	0.4575	325.25
272	7.46697	53.8194	0.4618	325.82
273	7.38819	53.3880	0.4661	326.39
274	7.30976	52.9554	0.4704	326.96
275	7.23168	52.5218	0.4748	327.52
276	7.15394	52.0871	0.4791	328.09
277	7.07653	51.6514	0.4835	328.65
278	6.99945	51.2147	0.4879	329.21
279	6.92270	50.7769	0.4922	329.78
280	6.84627	50.3382	0.4966	330.34
281	6.77016	49.8985	0.5010	330.90
282	6.69436	49.4578	0.5054	331.46
283	6.61888	49.0161	0.5098	332.02
284	6.54370	48.5735	0.5143	332.57
285	6.46883	48.1299	0.5187	333.13
286	6.39425	47.6855	0.5231	333.69
287	6.31998	47.2400	0.5276	334.24
288	6.24599	46.7937	0.5321	334.79
289	6.17229	46.3464	0.5365	335.35
290	6.09888	45.8983	0.5410	335.90
291	6.02575	45.4492	0.5455	336.45
292	5.95290	44.9993	0.5500	337.00
293	5.88032	44.5486	0.5545	337.55
294	5.80801	44.0970	0.5590	338.10
295	5.73597	43.6445	0.5636	338.64

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve 03				
300	5.37970	41.3698	0.5863	341.37
301	5.30921	40.9124	0.5909	341.91
302	5.23896	40.4543	0.5955	342.45
303	5.16895	39.9955	0.6000	343.00
304	5.09919	39.5358	0.6046	343.54
305	5.02967	39.0753	0.6092	344.08
306	4.96038	38.6142	0.6139	344.61
307	4.89132	38.1523	0.6185	345.15
308	4.82250	37.6896	0.6231	345.69
309	4.75390	37.2263	0.6277	346.23
310	4.68552	36.7623	0.6324	346.76
311	4.61737	36.2975	0.6370	347.30
312	4.54943	35.8321	0.6417	347.83
313	4.48172	35.3659	0.6463	348.37
314	4.41422	34.8990	0.6510	348.90
315	4.34693	34.4315	0.6557	349.43
316	4.27984	33.9634	0.6604	349.96
317	4.21297	33.4946	0.6651	350.49
318	4.14630	33.0251	0.6697	351.03
319	4.07984	32.5549	0.6745	351.55
320	4.01357	32.0842	0.6792	352.08
321	3.94750	31.6128	0.6839	352.61
322	3.88163	31.1408	0.6886	353.14
323	3.81596	30.6682	0.6933	353.67
324	3.75046	30.1950	0.6981	354.19
325	3.68516	29.7212	0.7028	354.72
326	3.62005	29.2468	0.7075	355.25
327	3.55513	28.7717	0.7123	355.77
328	3.49038	28.2962	0.7170	356.30
329	3.42582	27.8200	0.7218	356.82
330	3.36144	27.3432	0.7266	357.34
331	3.29723	26.8660	0.7313	357.87
332	3.23320	26.3881	0.7361	358.39
333	3.16934	25.9098	0.7409	358.91
334	3.10565	25.4309	0.7457	359.43
335	3.04213	24.9514	0.7505	359.95
336	2.97878	24.4714	0.7553	360.47
337	2.91560	23.9909	0.7601	360.99
338	2.85258	23.5098	0.7649	361.51
339	2.78972	23.0283	0.7697	362.03
340	2.72702	22.5463	0.7745	362.55
341	2.66448	22.0638	0.7794	363.06
342	2.60209	21.5808	0.7842	363.58
343	2.53986	21.0973	0.7890	364.10
344	2.47779	20.6133	0.7939	364.61
345	2.41587	20.1288	0.7987	365.13
346	2.35409	19.6439	0.8036	365.64
347	2.29247	19.1585	0.8084	366.16
348	2.23099	18.6727	0.8133	366.67
349	2.16966	18.1864	0.8181	367.19
350	2.10848	17.6995	0.8230	367.70
351	2.04743	17.2124	0.8279	368.21
352	1.98653	16.7247	0.8328	368.72
353	1.92576	16.2367	0.8376	369.24
354	1.86514	15.7482	0.8425	369.75
355	1.80465	15.2593	0.8474	370.26
356	1.74429	14.7700	0.8523	370.77
357	1.68407	14.2803	0.8572	371.28
358	1.62399	13.7901	0.8621	371.79
359	1.56403	13.2996	0.8670	372.30
360	1.50420	12.8087	0.8719	372.81
361	1.44450	12.3174	0.8768	373.32
362	1.38493	11.8257	0.8817	373.83
363	1.32549	11.3336	0.8867	374.33
364	1.26616	10.8413	0.8916	374.84
365	1.20697	10.3484	0.8965	375.35
366	1.14789	9.8553	0.9014	375.86
367	1.08893	9.3618	0.9064	376.36
368	1.03010	8.8680	0.9113	376.87
369	0.97138	8.3738	0.9163	377.37
370	0.91278	7.8793	0.9212	377.88
371	0.85429	7.3845	0.9262	378.38
372	0.79592	6.8894	0.9311	378.89
373	0.73767	6.3939	0.9361	379.39
374	0.67952	5.8983	0.9410	379.90
375	0.62149	5.4024	0.9460	380.40
376	0.56357	4.9062	0.9509	380.91
377	0.50575	4.4100	0.9559	381.41
378	0.44805	3.9135	0.9609	381.91
379	0.39045	3.4170	0.9658	382.42
380	0.33295	2.9208	0.9708	382.92
381	0.27557	2.4249	0.9758	383.42
382	0.21828	1.9301	0.9807	383.93
383	0.16110	1.4377	0.9856	384.44
384	0.10402	0.9522	0.9905	384.95
385	0.04704	0.5000	0.9950	385.50
386	0.00000	0.0000	1.0000	386.00

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve 04				
0	100.00000	100.0000	0.0000	100.00
1	98.87130	100.4034	-0.0040	101.40
2	97.74568	100.5538	-0.0055	102.55
3	96.62338	100.7160	-0.0072	103.72
4	95.50465	100.8899	-0.0089	104.89
5	94.38974	101.0757	-0.0108	106.08
6	93.27892	101.2734	-0.0127	107.27
7	92.17248	101.4831	-0.0148	108.48
8	91.07069	101.7048	-0.0170	109.70
9	89.97385	101.9385	-0.0194	110.94
10	88.88226	102.1843	-0.0218	112.18
11	87.79625	102.4421	-0.0244	113.44
12	86.71613	102.7119	-0.0271	114.71
13	85.64223	102.9936	-0.0299	115.99
14	84.57489	103.2871	-0.0329	117.29
15	83.51443	103.5922	-0.0359	118.59
16	82.46120	103.9090	-0.0391	119.91
17	81.41555	104.2371	-0.0424	121.24
18	80.37782	104.5764	-0.0458	122.58
19	79.34834	104.9267	-0.0493	123.93
20	78.32747	105.2878	-0.0529	125.29
21	77.31554	105.6593	-0.0566	126.66
22	76.31289	106.0409	-0.0604	128.04
23	75.31983	106.4324	-0.0643	129.43
24	74.33669	106.8334	-0.0683	130.83
25	73.36379	107.2435	-0.0724	132.24
26	72.40141	107.6624	-0.0766	133.66
27	71.44985	108.0896	-0.0809	135.09
28	70.50937	108.5247	-0.0852	136.52
29	69.58025	108.9671	-0.0897	137.97
30	68.66272	109.4166	-0.0942	139.42
31	67.75702	109.8724	-0.0987	140.87
32	66.86334	110.3343	-0.1033	142.33
33	65.98189	110.8016	-0.1080	143.80
34	65.11284	111.2737	-0.1127	145.27
35	64.25634	111.7503	-0.1175	146.75
36	63.41253	112.2307	-0.1223	148.23
37	62.58152	112.7143	-0.1271	149.71
38	61.76340	113.2007	-0.1320	151.20
39	60.95826	113.6893	-0.1369	152.69
40	60.16614	114.1795	-0.1418	154.18
41	59.38708	114.6707	-0.1467	155.67
42	58.62110	115.1626	-0.1516	157.16
43	57.86820	115.6544	-0.1565	158.65
44	57.12835	116.1457	-0.1615	160.15
45	56.40153	116.6360	-0.1664	161.64
46	55.68767	117.1247	-0.1712	163.12
47	54.98671	117.6115	-0.1761	164.61
48	54.29856	118.0957	-0.1810	166.10
49	53.62313	118.5769	-0.1858	167.58
50	52.96030	119.0547	-0.1905	169.05
51	52.30995	119.5286	-0.1953	170.53
52	51.67195	119.9983	-0.2000	172.00
53	51.04616	120.4633	-0.2046	173.46
54	50.43241	120.9232	-0.2092	174.92
55	49.83055	121.3777	-0.2138	176.38
56	49.24040	121.8264	-0.2183	177.83
57	48.66179	122.2690	-0.2227	179.27
58	48.09455	122.7052	-0.2271	180.71
59	47.53847	123.1347	-0.2313	182.13
60	46.99337	123.5572	-0.2356	183.56
61	46.45905	123.9725	-0.2397	184.97
62	45.93532	124.3802	-0.2438	186.38
63	45.42197	124.7803	-0.2478	187.78
64	44.91881	125.1724	-0.2517	189.17
65	44.42562	125.5565	-0.2556	190.56
66	43.94221	125.9322	-0.2593	191.93
67	43.46837	126.2995	-0.2630	193.30
68	43.00390	126.6582	-0.2666	194.66
69	42.54859	127.0083	-0.2701	196.01
70	42.10225	127.3494	-0.2735	197.35
71	41.66467	127.6816	-0.2768	198.68
72	41.23566	128.0048	-0.2800	200.00
73	40.81502	128.3189	-0.2832	201.32
74	40.40256	128.6238	-0.2862	202.62
75	39.99808	128.9194	-0.2892	203.92
76	39.60140	129.2058	-0.2921	205.21
77	39.21233	129.4828	-0.2948	206.48
78	38.83069	129.7505	-0.2975	207.75
79	38.45630	130.0088	-0.3001	209.01
80	38.08898	130.2577	-0.3026	210.26
81	37.72857	130.4973	-0.3050	211.50
82	37.37488	130.7275	-0.3073	212.73
83	37.02776	130.9483	-0.3095	213.95
84	36.68704	131.1598	-0.3116	215.16
85	36.35257	131.3620	-0.3136	216.36
86	36.02418	131.5549	-0.3155	217.55
87	35.70172	131.7386	-0.3174	218.74
88	35.38506	131.9130	-0.3191	219.91
89	35.07403	132.0784	-0.3208	221.08
90	34.76850	132.2346	-0.3223	222.23
91	34.46834	132.3818	-0.3238	223.38
92	34.17339	132.5201	-0.3252	224.52
93	33.88355	132.6494	-0.3265	225.65
94	33.59867	132.7699	-0.3277	226.77
95	33.31862	132.8816	-0.3288	227.88

Iowa Type curve 04

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
100	31.98687	133.3114	-0.3331	233.31
101	31.73341	133.3721	-0.3337	234.37
102	31.48401	133.4247	-0.3342	235.42
103	31.23856	133.4691	-0.3347	236.47
104	30.99696	133.5055	-0.3351	237.51
105	30.75912	133.5340	-0.3353	238.53
106	30.52493	133.5546	-0.3355	239.55
107	30.29432	133.5675	-0.3357	240.57
108	30.06719	133.5727	-0.3357	241.57
109	29.84346	133.5703	-0.3357	242.57
110	29.62304	133.5604	-0.3356	243.56
111	29.40585	133.5432	-0.3354	244.54
112	29.19181	133.5187	-0.3352	245.52
113	28.98086	133.4869	-0.3349	246.49
114	28.77290	133.4481	-0.3345	247.45
115	28.56787	133.4023	-0.3340	248.40
116	28.36569	133.3496	-0.3335	249.35
117	28.16631	133.2900	-0.3329	250.29
118	27.96965	133.2236	-0.3322	251.22
119	27.77564	133.1507	-0.3315	252.15
120	27.58423	133.0712	-0.3307	253.07
121	27.39534	132.9853	-0.3299	253.99
122	27.20893	132.8929	-0.3289	254.89
123	27.02493	132.7943	-0.3279	255.79
124	26.84329	132.6895	-0.3269	256.69
125	26.66395	132.5786	-0.3258	257.58
126	26.48685	132.4617	-0.3246	258.46
127	26.31195	132.3389	-0.3234	259.34
128	26.13919	132.2103	-0.3221	260.21
129	25.96853	132.0758	-0.3208	261.08
130	25.79992	131.9357	-0.3194	261.94
131	25.63330	131.7901	-0.3179	262.79
132	25.46864	131.6389	-0.3164	263.64
133	25.30588	131.4823	-0.3148	264.48
134	25.14499	131.3204	-0.3132	265.32
135	24.98593	131.1532	-0.3115	266.15
136	24.82864	130.9809	-0.3098	266.98
137	24.67310	130.8035	-0.3080	267.80
138	24.51927	130.6210	-0.3062	268.62
139	24.36710	130.4336	-0.3043	269.43
140	24.21655	130.2413	-0.3024	270.24
141	24.06761	130.0442	-0.3004	271.04
142	23.92022	129.8424	-0.2984	271.84
143	23.77435	129.6360	-0.2964	272.64
144	23.62997	129.4251	-0.2943	273.43
145	23.48705	129.2096	-0.2921	274.21
146	23.34556	128.9897	-0.2899	274.99
147	23.20547	128.7653	-0.2877	275.77
148	23.06674	128.5368	-0.2854	276.54
149	22.92935	128.3039	-0.2830	277.30
150	22.79326	128.0670	-0.2807	278.07
151	22.65846	127.8259	-0.2783	278.83
152	22.52491	127.5808	-0.2758	279.58
153	22.39259	127.3318	-0.2733	280.33
154	22.26147	127.0788	-0.2708	281.08
155	22.13152	126.8221	-0.2682	281.82
156	22.00273	126.5615	-0.2656	282.56
157	21.87507	126.2971	-0.2630	283.30
158	21.74851	126.0292	-0.2603	284.03
159	21.62303	125.7576	-0.2576	284.76
160	21.49862	125.4825	-0.2548	285.48
161	21.37524	125.2039	-0.2520	286.20
162	21.25288	124.9219	-0.2492	286.92
163	21.13152	124.6364	-0.2464	287.64
164	21.01113	124.3477	-0.2435	288.35
165	20.89170	124.0557	-0.2406	289.06
166	20.77321	123.7605	-0.2376	289.76
167	20.65564	123.4620	-0.2346	290.46
168	20.53897	123.1605	-0.2316	291.16
169	20.42318	122.8560	-0.2286	291.86
170	20.30826	122.5483	-0.2255	292.55
171	20.19419	122.2377	-0.2224	293.24
172	20.08096	121.9242	-0.2192	293.92
173	19.96853	121.6078	-0.2161	294.61
174	19.85691	121.2886	-0.2129	295.29
175	19.74608	120.9666	-0.2097	295.97
176	19.63601	120.6419	-0.2064	296.64
177	19.52671	120.3143	-0.2031	297.31
178	19.41814	119.9842	-0.1998	297.98
179	19.31030	119.6515	-0.1965	298.65
180	19.20317	119.3162	-0.1932	299.32
181	19.09675	118.9784	-0.1898	299.98
182	18.99101	118.6380	-0.1864	300.64
183	18.88594	118.2953	-0.1830	301.30
184	18.78154	117.9501	-0.1795	301.95
185	18.67779	117.6025	-0.1760	302.60
186	18.57467	117.2526	-0.1725	303.25
187	18.47218	116.9004	-0.1690	303.90
188	18.37030	116.5459	-0.1655	304.55
189	18.26903	116.1892	-0.1619	305.19
190	18.16834	115.8303	-0.1583	305.83
191	18.06824	115.4693	-0.1547	306.47
192	17.96871	115.1061	-0.1511	307.11
193	17.86974	114.7408	-0.1474	307.74
194	17.77132	114.3735	-0.1437	308.37
195	17.67344	114.0042	-0.1400	309.00
196	17.57600	113.6320	-0.1363	309.63

Iowa Type curve 04

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
200	17.19183	112.1281	-0.1213	312.13
201	17.09700	111.7473	-0.1175	312.75
202	17.00264	111.3647	-0.1136	313.36
203	16.90876	110.9802	-0.1098	313.98
204	16.81534	110.5940	-0.1059	314.59
205	16.72237	110.2061	-0.1021	315.21
206	16.62984	109.8165	-0.0982	315.82
207	16.53776	109.4252	-0.0943	316.43
208	16.44610	109.0323	-0.0903	317.03
209	16.35487	108.6377	-0.0864	317.64
210	16.26405	108.2415	-0.0824	318.24
211	16.17365	107.8437	-0.0784	318.84
212	16.08364	107.4445	-0.0744	319.44
213	15.99403	107.0436	-0.0704	320.04
214	15.90481	106.6413	-0.0664	320.64
215	15.81597	106.2376	-0.0624	321.24
216	15.72751	105.8322	-0.0583	321.83
217	15.63942	105.4255	-0.0543	322.43
218	15.55169	105.0174	-0.0502	323.02
219	15.46432	104.6079	-0.0461	323.61
220	15.37730	104.1971	-0.0420	324.20
221	15.29062	103.7849	-0.0378	324.78
222	15.20429	103.3714	-0.0337	325.37
223	15.11829	102.9566	-0.0296	325.96
224	15.03262	102.5404	-0.0254	326.54
225	14.94728	102.1230	-0.0212	327.12
226	14.86225	101.7044	-0.0170	327.70
227	14.77754	101.2846	-0.0128	328.28
228	14.69314	100.8635	-0.0086	328.86
229	14.60904	100.4413	-0.0044	329.44
230	14.52525	100.0178	-0.0002	330.02
231	14.44174	99.5933	0.0041	330.59
232	14.35853	99.1675	0.0083	331.17
233	14.27560	98.7407	0.0126	331.74
234	14.19296	98.3127	0.0169	332.31
235	14.11059	97.8837	0.0212	332.88
236	14.02849	97.4536	0.0255	333.45
237	13.94666	97.0225	0.0298	334.02
238	13.86510	96.5903	0.0341	334.59
239	13.78380	96.1570	0.0384	335.16
240	13.70275	95.7228	0.0428	335.72
241	13.62195	95.2876	0.0471	336.29
242	13.54141	94.8514	0.0515	336.85
243	13.46111	94.4142	0.0559	337.41
244	13.38105	93.9761	0.0602	337.98
245	13.30122	93.5372	0.0646	338.54
246	13.22163	93.0972	0.0690	339.10
247	13.14227	92.6564	0.0734	339.66
248	13.06314	92.2146	0.0779	340.21
249	12.98423	91.7720	0.0823	340.77
250	12.90555	91.3284	0.0867	341.33
251	12.82708	90.8841	0.0912	341.88
252	12.74882	90.4389	0.0956	342.44
253	12.67077	89.9929	0.1001	342.99
254	12.59294	89.5460	0.1045	343.55
255	12.51530	89.0984	0.1090	344.10
256	12.43787	88.6500	0.1135	344.65
257	12.36064	88.2008	0.1180	345.20
258	12.28360	87.7508	0.1225	345.75
259	12.20676	87.3000	0.1270	346.30
260	12.13010	86.8486	0.1315	346.85
261	12.05364	86.3963	0.1360	347.40
262	11.97735	85.9434	0.1406	347.94
263	11.90126	85.4897	0.1451	348.49
264	11.82534	85.0354	0.1496	349.04
265	11.74960	84.5803	0.1542	349.58
266	11.67403	84.1246	0.1588	350.12
267	11.59864	83.6681	0.1633	350.67
268	11.52341	83.2111	0.1679	351.21
269	11.44836	82.7533	0.1725	351.75
270	11.37347	82.2949	0.1771	352.29
271	11.29874	81.8359	0.1816	352.84
272	11.22417	81.3763	0.1862	353.38
273	11.14976	80.9160	0.1908	353.92
274	11.07551	80.4551	0.1954	354.46
275	11.00141	79.9937	0.2001	354.99
276	10.92746	79.5316	0.2047	355.53
277	10.85366	79.0690	0.2093	356.07
278	10.78001	78.6058	0.2139	356.61
279	10.70651	78.1420	0.2186	357.14
280	10.63315	77.6777	0.2232	357.68
281	10.55993	77.2128	0.2279	358.21
282	10.48686	76.7473	0.2325	358.75
283	10.41392	76.2813	0.2372	359.28
284	10.34111	75.8149	0.2419	359.81
285	10.26845	75.3478	0.2465	360.35
286	10.19591	74.8804	0.2512	360.88
287	10.12351	74.4123	0.2559	361.41
288	10.05123	73.9438	0.2606	361.94
289	9.97908	73.4748	0.2653	362.47
290	9.90706	73.0053	0.2699	363.01
291	9.83517	72.5353	0.2746	363.54
292	9.76339	72.0649	0.2794	364.06
293	9.69174	71.5940	0.2841	364.59
294	9.62021	71.1226	0.2888	365.12
295	9.54879	70.6508	0.2935	365.65
296	9.47740	70.1785	0.2982	366.18

Iowa Type curve 04

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
300	9.19343	68.2852	0.3171	368.29
301	9.12270	67.8107	0.3219	368.81
302	9.05206	67.3360	0.3266	369.34
303	8.98154	66.8608	0.3314	369.86
304	8.91112	66.3852	0.3361	370.39
305	8.84081	65.9092	0.3409	370.91
306	8.77060	65.4328	0.3457	371.43
307	8.70048	64.9561	0.3504	371.96
308	8.63047	64.4790	0.3552	372.48
309	8.56056	64.0015	0.3600	373.00
310	8.49075	63.5236	0.3648	373.52
311	8.42103	63.0454	0.3695	374.05
312	8.35141	62.5668	0.3743	374.57
313	8.28188	62.0878	0.3791	375.09
314	8.21244	61.6086	0.3839	375.61
315	8.14309	61.1290	0.3887	376.13
316	8.07384	60.6490	0.3935	376.65
317	8.00468	60.1687	0.3983	377.17
318	7.93560	59.6881	0.4031	377.69
319	7.86661	59.2072	0.4079	378.21
320	7.79771	58.7260	0.4127	378.73
321	7.72889	58.2444	0.4176	379.24
322	7.66016	57.7625	0.4224	379.76
323	7.59151	57.2803	0.4272	380.28
324	7.52294	56.7979	0.4320	380.80
325	7.45445	56.3151	0.4368	381.32
326	7.38604	55.8321	0.4417	381.83
327	7.31772	55.3487	0.4465	382.35
328	7.24947	54.8651	0.4513	382.87
329	7.18130	54.3811	0.4562	383.38
330	7.11320	53.8970	0.4610	383.90
331	7.04518	53.4125	0.4659	384.41
332	6.97724	52.9277	0.4707	384.93
333	6.90937	52.4427	0.4756	385.44
334	6.84157	51.9575	0.4804	385.95
335	6.77384	51.4720	0.4853	386.47
336	6.70619	50.9862	0.4901	386.99
337	6.63860	50.5002	0.4950	387.50
338	6.57109	50.0139	0.4999	388.01
339	6.50364	49.5274	0.5047	388.53
340	6.43627	49.0406	0.5096	389.04
341	6.36896	48.5536	0.5145	389.55
342	6.30171	48.0664	0.5193	390.07
343	6.23453	47.5790	0.5242	390.58
344	6.16742	47.0912	0.5291	391.09
345	6.10037	46.6033	0.5340	391.60
346	6.03339	46.1152	0.5388	392.12
347	5.96647	45.6268	0.5437	392.63
348	5.89961	45.1382	0.5486	393.14
349	5.83281	44.6494	0.5535	393.65
350	5.76607	44.1604	0.5584	394.16
351	5.69939	43.6712	0.5633	394.67
352	5.63278	43.1818	0.5682	395.18
353	5.56622	42.6921	0.5731	395.69
354	5.49971	42.2024	0.5780	396.20
355	5.43327	41.7123	0.5829	396.71
356	5.36688	41.2221	0.5878	397.22
357	5.30055	40.7317	0.5927	397.73
358	5.23428	40.2411	0.5976	398.24
359	5.16806	39.7503	0.6025	398.75
360	5.10189	39.2594	0.6074	399.26
361	5.03578	38.7682	0.6123	399.77
362	4.96972	38.2769	0.6172	400.28
363	4.90371	37.7854	0.6221	400.79
364	4.83776	37.2937	0.6271	401.29
365	4.77186	36.8018	0.6320	401.80
366	4.70601	36.3098	0.6369	402.31
367	4.64020	35.8177	0.6418	402.82
368	4.57445	35.3253	0.6467	403.33
369	4.50875	34.8328	0.6517	403.83
370	4.44310	34.3400	0.6566	404.34
371	4.37749	33.8472	0.6615	404.85
372	4.31193	33.3543	0.6665	405.35
373	4.24642	32.8611	0.6714	405.86
374	4.18096	32.3678	0.6763	406.37
375	4.11554	31.8743	0.6813	406.87
376	4.05017	31.3807	0.6862	407.38
377	3.98485	30.8869	0.6911	407.89
378	3.91956	30.3931	0.6961	408.39
379	3.85433	29.8990	0.7010	408.90
380	3.78913	29.4049	0.7060	409.40
381	3.72398	28.9106	0.7109	409.91
382	3.65888	28.4160	0.7158	410.42
383	3.59381	27.9215	0.7208	410.92
384	3.52879	27.4268	0.7257	411.43
385	3.46381	26.9319	0.7307	411.93
386	3.39887	26.4369	0.7356	412.44
387	3.33397	25.9418	0.7406	412.94
388	3.26911	25.4466	0.7455	413.45
389	3.20430	24.9511	0.7505	413.95
390	3.13952	24.4557	0.7554	414.46
391	3.07478	23.9601	0.7604	414.96
392	3.01008	23.4643	0.7654	415.46
393	2.94542	22.9684	0.7703	415.97
394	2.88079	22.4725	0.7753	416.47
395	2.81621	21.9764	0.7802	416.98

Iowa Type curve 04

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
400	2.49382	19.4943	0.8051	419.49
401	2.42945	18.9976	0.8100	420.00
402	2.36512	18.5007	0.8150	420.50
403	2.30082	18.0038	0.8200	421.00
404	2.23656	17.5067	0.8249	421.51
405	2.17233	17.0096	0.8299	422.01
406	2.10813	16.5123	0.8349	422.51
407	2.04397	16.0150	0.8399	423.01
408	1.97983	15.5176	0.8448	423.52
409	1.91574	15.0200	0.8498	424.02
410	1.85167	14.5224	0.8548	424.52
411	1.78764	14.0247	0.8598	425.02
412	1.72364	13.5268	0.8647	425.53
413	1.65966	13.0290	0.8697	426.03
414	1.59573	12.5310	0.8747	426.53
415	1.53182	12.0329	0.8797	427.03
416	1.46794	11.5348	0.8847	427.53
417	1.40409	11.0366	0.8896	428.04
418	1.34027	10.5383	0.8946	428.54
419	1.27649	10.0399	0.8996	429.04
420	1.21273	9.5415	0.9046	429.54
421	1.14900	9.0430	0.9096	430.04
422	1.08530	8.5444	0.9146	430.54
423	1.02162	8.0458	0.9196	431.05
424	0.95798	7.5471	0.9245	431.55
425	0.89436	7.0484	0.9295	432.05
426	0.83078	6.5495	0.9345	432.55
427	0.76722	6.0507	0.9395	433.05
428	0.70369	5.5518	0.9445	433.55
429	0.64018	5.0530	0.9495	434.05
430	0.57670	4.5542	0.9545	434.55
431	0.51325	4.0553	0.9594	435.06
432	0.44982	3.5557	0.9644	435.56
433	0.38642	3.0582	0.9694	436.06
434	0.32305	2.5600	0.9744	436.56
435	0.25970	2.0625	0.9794	437.06
436	0.19637	1.5665	0.9843	437.57
437	0.13307	1.0738	0.9893	438.07
438	0.06980	0.5938	0.9941	438.59
439	0.00655	0.5000	0.9950	439.50
440	0.00000	0.0000	1.0000	440.00

Table D continued

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve SQ				
0	100.00000	100.0000	0.0000	100.00
1	100.00000	99.5000	0.0050	100.50
2	100.00000	98.5000	0.0150	100.50
3	100.00000	97.5000	0.0250	100.50
4	100.00000	96.5000	0.0350	100.50
5	100.00000	95.5000	0.0450	100.50
6	100.00000	94.5000	0.0550	100.50
7	100.00000	93.5000	0.0650	100.50
8	100.00000	92.5000	0.0750	100.50
9	100.00000	91.5000	0.0850	100.50
10	100.00000	90.5000	0.0950	100.50
11	100.00000	89.5000	0.1050	100.50
12	100.00000	88.5000	0.1150	100.50
13	100.00000	87.5000	0.1250	100.50
14	100.00000	86.5000	0.1350	100.50
15	100.00000	85.5000	0.1450	100.50
16	100.00000	84.5000	0.1550	100.50
17	100.00000	83.5000	0.1650	100.50
18	100.00000	82.5000	0.1750	100.50
19	100.00000	81.5000	0.1850	100.50
20	100.00000	80.5000	0.1950	100.50
21	100.00000	79.5000	0.2050	100.50
22	100.00000	78.5000	0.2150	100.50
23	100.00000	77.5000	0.2250	100.50
24	100.00000	76.5000	0.2350	100.50
25	100.00000	75.5000	0.2450	100.50
26	100.00000	74.5000	0.2550	100.50
27	100.00000	73.5000	0.2650	100.50
28	100.00000	72.5000	0.2750	100.50
29	100.00000	71.5000	0.2850	100.50
30	100.00000	70.5000	0.2950	100.50
31	100.00000	69.5000	0.3050	100.50
32	100.00000	68.5000	0.3150	100.50
33	100.00000	67.5000	0.3250	100.50
34	100.00000	66.5000	0.3350	100.50
35	100.00000	65.5000	0.3450	100.50
36	100.00000	64.5000	0.3550	100.50
37	100.00000	63.5000	0.3650	100.50
38	100.00000	62.5000	0.3750	100.50
39	100.00000	61.5000	0.3850	100.50
40	100.00000	60.5000	0.3950	100.50
41	100.00000	59.5000	0.4050	100.50
42	100.00000	58.5000	0.4150	100.50
43	100.00000	57.5000	0.4250	100.50
44	100.00000	56.5000	0.4350	100.50
45	100.00000	55.5000	0.4450	100.50
46	100.00000	54.5000	0.4550	100.50
47	100.00000	53.5000	0.4650	100.50
48	100.00000	52.5000	0.4750	100.50
49	100.00000	51.5000	0.4850	100.50
50	100.00000	50.5000	0.4950	100.50
51	100.00000	49.5000	0.5050	100.50
52	100.00000	48.5000	0.5150	100.50
53	100.00000	47.5000	0.5250	100.50
54	100.00000	46.5000	0.5350	100.50
55	100.00000	45.5000	0.5450	100.50
56	100.00000	44.5000	0.5550	100.50
57	100.00000	43.5000	0.5650	100.50
58	100.00000	42.5000	0.5750	100.50
59	100.00000	41.5000	0.5850	100.50
60	100.00000	40.5000	0.5950	100.50
61	100.00000	39.5000	0.6050	100.50
62	100.00000	38.5000	0.6150	100.50
63	100.00000	37.5000	0.6250	100.50
64	100.00000	36.5000	0.6350	100.50
65	100.00000	35.5000	0.6450	100.50
66	100.00000	34.5000	0.6550	100.50
67	100.00000	33.5000	0.6650	100.50
68	100.00000	32.5000	0.6750	100.50
69	100.00000	31.5000	0.6850	100.50
70	100.00000	30.5000	0.6950	100.50
71	100.00000	29.5000	0.7050	100.50
72	100.00000	28.5000	0.7150	100.50
73	100.00000	27.5000	0.7250	100.50
74	100.00000	26.5000	0.7350	100.50
75	100.00000	25.5000	0.7450	100.50
76	100.00000	24.5000	0.7550	100.50
77	100.00000	23.5000	0.7650	100.50
78	100.00000	22.5000	0.7750	100.50
79	100.00000	21.5000	0.7850	100.50
80	100.00000	20.5000	0.7950	100.50
81	100.00000	19.5000	0.8050	100.50
82	100.00000	18.5000	0.8150	100.50
83	100.00000	17.5000	0.8250	100.50
84	100.00000	16.5000	0.8350	100.50
85	100.00000	15.5000	0.8450	100.50
86	100.00000	14.5000	0.8550	100.50
87	100.00000	13.5000	0.8650	100.50
88	100.00000	12.5000	0.8750	100.50
89	100.00000	11.5000	0.8850	100.50
90	100.00000	10.5000	0.8950	100.50
91	100.00000	9.5000	0.9050	100.50
92	100.00000	8.5000	0.9150	100.50
93	100.00000	7.5000	0.9250	100.50
94	100.00000	6.5000	0.9350	100.50
95	100.00000	5.5000	0.9450	100.50

Age %AL	Percent Surviving	Remaining Life	CAD Ratio	Prob. Life
Iowa Type curve SQ				
100	100.00000	0.5000	0.9950	100.50
101	0.00000	0.0000	1.0000	101.00

APPENDIX II

Moments of Iowa Curves

Independent Statistics & Analysis
U.S. Energy Information Administration

Annual Energy Outlook 2022

with projections to 2050

Narrative

Independent Statistics & Analysis
www.eia.gov

U.S. Department of Energy
Washington, DC 20585

Introduction

Key takeaways from the Reference case and side cases

Petroleum and natural gas remain the most-consumed sources of energy in the United States through 2050, but renewable energy is the fastest growing

- Motor gasoline remains the most prevalent transportation fuel despite electric vehicles gaining market share
- Energy-related carbon dioxide (CO_2) emissions dip through 2035 before climbing later in the projection years
- Energy consumption increases through 2050 as population and economic growth outweighs efficiency gains
- Electricity continues to be the fastest-growing energy source in buildings, with renewables and natural gas providing most of the incremental electricity supply

Wind and solar incentives, along with falling technology costs, support robust competition with natural gas for electricity generation, while the shares of coal and nuclear power decrease in the U.S. electricity mix

- Electricity demand grows slowly across the projection period, which increases competition among fuels
- Renewable electricity generation increases more rapidly than overall electricity demand through 2050
- Battery storage complements growth in renewables generation and reduces natural gas-fired and oil-fired generation during peak hours
- As coal and nuclear generating capacity retire, new capacity additions come largely from wind and solar technologies

U.S. crude oil production reaches record highs, while natural gas production is increasingly driven by natural gas exports

- U.S. production of natural gas and petroleum and other liquids rises amid growing demand for exports and industrial uses
- Driven by rising prices, U.S. crude oil production in the Reference case returns to pre-pandemic levels in 2023 and stabilizes over the long term
- Refinery closures lower domestic crude oil distillation operating capacity, but refinery utilization rates remain flat over the long term
- Consumption of renewable diesel increases as a share of the domestic fuel mix

The *Annual Energy Outlook 2022* explores long-term energy trends in the United States

- Projections in the Reference case of our *Annual Energy Outlook 2022* (AEO2022) are not predictions of what will happen, but rather, they are modeled projections of what may happen given certain assumptions and methodologies. The Reference case serves as a baseline for comparison between side cases that explain alternative trends. By varying Reference case assumptions and methodologies in side cases, AEO2022 can illustrate important factors in future energy production and use in the United States.
- Energy market projections are uncertain because we cannot foresee with certainty many of the events that shape energy markets—as well as future developments in technologies, demographics, and resources. To illustrate the importance of key assumptions, AEO2022 includes a baseline Reference case and several side cases that systematically vary important underlying assumptions.
- We developed AEO2022 by using the National Energy Modeling System (NEMS), an integrated model that captures interactions of economic changes and energy supply, demand, and prices.
- We publish the AEO2022 to satisfy the Department of Energy Organization Act of 1977, which requires the EIA Administrator to prepare annual reports on trends and projections for energy use and supply.

What is the AEO2022 Reference case?

- The AEO2022 Reference case represents our assessment of how U.S. and world energy markets would operate through 2050. Our key assumptions in the Reference case provides a baseline for exploring long-term trends, based on current laws and regulations as of November 2021. The current laws and regulations included in the AEO and a paper addressing the Bipartisan Infrastructure Law are available on the AEO website.
- We based the economic and demographic trends reflected in the Reference case on the current views of leading economic forecasters and demographers. For example, the Reference case projection assumes improvement in known energy production, delivery, and consumption technologies.
- The Reference case serves as the benchmark to compare with alternative policy-based cases, so in general, it assumes that current laws and regulations that affect the energy sector, including laws that have end dates, remain unchanged throughout the projection period.

What are the side cases?

- We run eight standard side cases each year in addition to the Reference case. We also publish Issues *in Focus* analyses to explore emerging issues in the energy sector. The standard side cases are:
  - High Oil Price case
  - Low Oil Price case
  - High Oil and Gas Supply case
  - Low Oil and Gas Supply case
  - High Economic Growth case
  - Low Economic Growth case
  - High Renewable Cost case
  - Low Renewable Cost case

- Global market balances, primarily non-domestic supply and demand factors, will drive future crude oil prices. To account for these factors, oil prices are an external assumption in our analysis. In the AEO2022 High Oil Price case, the price of Brent crude oil, in 2021 dollars, reaches $170 per barrel (b) by 2050, compared with $90/b in the Reference case and $45/b in the Low Oil Price case.

- Compared with the Reference case, the High Oil and Gas Supply case assumes that the estimated ultimate recovery per well for tight oil, tight gas, or shale gas in the United States is 50% higher. This side case assumes that undiscovered resources in Alaska and the offshore Lower 48 states are 50% higher than in the Reference case. Rates of technological improvement that reduce costs and increase productivity in the United States are also 50% higher than in the Reference case. Conversely, the Low Oil and Gas Supply case assumes that the estimated ultimate recovery per well for tight oil, tight gas, or shale gas in the United States; the undiscovered resources in Alaska and the offshore Lower 48 states; and rates of technological improvement are all 50% lower.

- The High Renewables Cost case and the Low Renewables Cost case examine the sensitivities surrounding capital costs for renewable electric power generation and diurnal storage technologies. We assume capital cost reductions for an electric power-generating technology occur from learning by doing as commercialization expands and construction and manufacturing experience accelerates. The High Renewables Cost case assumes no cost reductions from learning by doing for any renewable generation or diurnal storage technologies. The Low Renewables Cost case assumes faster technology learning for renewable generation and diurnal storage technologies through 2050, resulting in a cost reduction of about 40%, compared with the Reference case, by 2050. In addition, we assume fixed operating and maintenance costs will decline along with the capital cost from technology improvement.

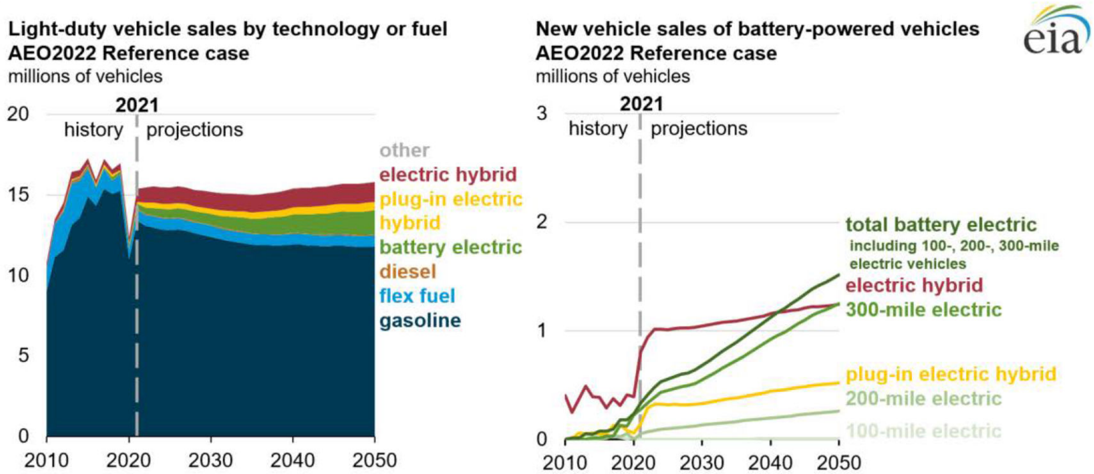
- The High Economic Growth case and Low Economic Growth case address the effects of economic assumptions on the energy consumption modeled in the AEO2022. From 2021 to 2050, the High Economic Growth case assumes the compound annual growth rate for U.S. GDP is 2.7%, and the Low Economic Growth case assumes a rate of 1.8%. However, the Reference case assumes the U.S. GDP annual growth rate is 2.2% over the projection period.

- AEO2022 cases do not include the potential effects of proposed legislation, regulations, or standards, except as specifically noted in *Issues in Focus* analyses.

Consumption

Motor gasoline remains the most prevalent transportation fuel despite electric vehicles gaining market share

Figure 1



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

Gasoline remains the dominant light-duty vehicle (LDV) fuel, but consumption does not return to pre-pandemic levels during the projection period

LDVs accounted for 54% of the energy consumed in U.S. transportation in 2021. Their share falls to 51% by 2050. LDV energy consumption generally decreases through 2038 and then increases through the end of the projection period. Total LDV sales do not return to 2019 pre-pandemic levels by 2050, and sales of conventional motor gasoline vehicles decrease through the projection period because of increasing sales of battery-electric vehicles (BEVs), hybrid-electric vehicles (HEVs), and plug-in hybrid-electric vehicles (PHEVs).

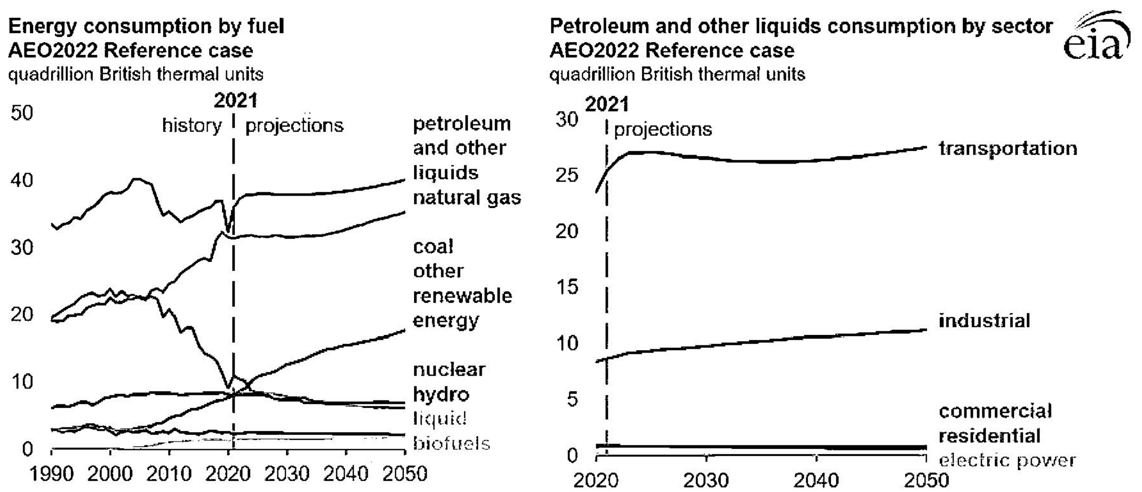
We project that the combined share of sales of internal combustion engine (ICE) LDVs—including gasoline, diesel, flex-fuel, natural gas, and propane powertrains—will decrease from 92% in 2021 to 79% in 2050 because of growth in sales of BEVs, PHEVs, and HEVs. Through the projection period, 200- and 300-mile BEV sales grow, increasing from 0.34 million in 2021 to 1.52 million in 2050, while sales of PHEVs increase from 144,000 in 2021 to 521,000 in 2050. PHEVs demonstrate fast growth and market penetration between 2021 and 2024. Growth in PHEV sales slows after 2024 as a result of declining battery prices, which pushes BEVs into the highest electric LDV market share. We project BEVs and PHEVs combined account for 13% of total LDV sales in 2050.

The on-road vehicle stock shifts more slowly than sales because electric vehicles replace older, retired ICE vehicles

We project that the total electric vehicle share—including BEVs and PHEVs—of on-road LDV stock grows from less than 1% in 2021 to 9% in 2050, based on current laws and regulations as of November 2021. This shift occurs even as the on-road LDV stock likely grows from 260 million to 288 million vehicles over that timeframe. Increased electrification of the on-road LDV fleet increases electricity consumption from less than 0.5% to more than 2% of total consumption of energy in the transportation sector between 2019 and 2050 in the Reference case.

Energy-related carbon dioxide (CO_2) emissions dip through 2035 before climbing later in the projection years

Figure 2



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case
Note: Biofuels are shown separately and included in petroleum and other liquids.

Vehicles and industrial processes are the main consumers of petroleum in the Reference case

Petroleum and other liquids remain the most-consumed fuels in the Reference case. In the United States, petroleum and other liquids, particularly motor gasoline and distillate fuel oil, are mostly consumed in transportation. In the Reference case, we assume that current fuel economy standards remain constant after 2026 for light-duty vehicles and after 2027 for heavy-duty vehicles. As travel continues to increase, consumption of petroleum and other liquids increases later in the projection period.

In the U.S. industrial sector through 2050, hydrocarbon gas liquids (HGLs) used as a feedstock drive most of the growth in demand for petroleum. Petroleum also remains a major fuel for refining processes and in nonmanufacturing industries (agriculture, construction, and mining).

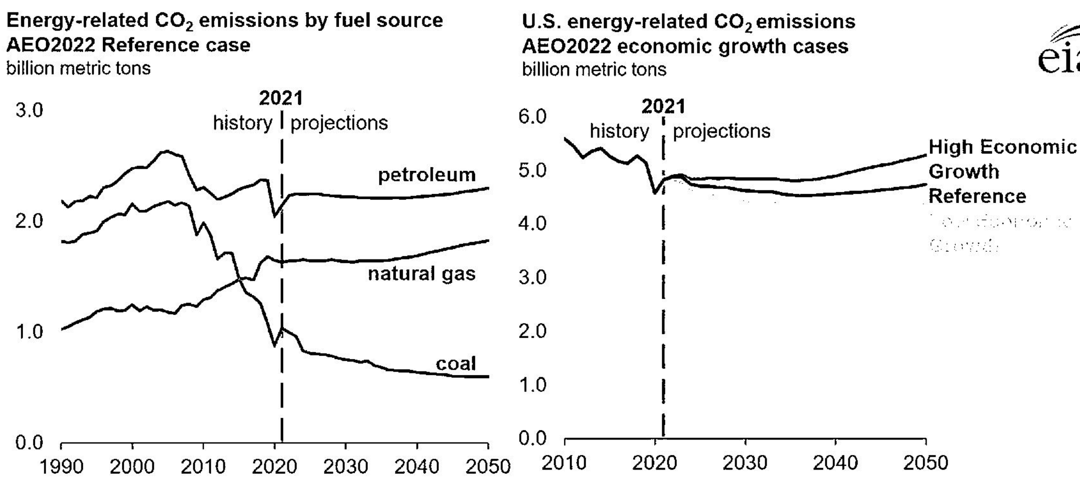
Consumption of renewable energy increases steadily as natural gas maintains a large market share and coal continues a steady decline

In all cases, we project that renewable energy will be the fastest-growing U.S. energy source through 2050. Policies at the state and federal levels continue to provide incentives for significant investment in renewable resources for electricity generation and transportation fuels. New technologies continue to lower the cost to install wind and solar generation, further increasing their competitiveness in the electricity market, even as the policy effects we assume level out over time. Federal regulations continue to provide incentives for using biofuels, primarily ethanol, as energy during the projection period. However, relatively modest increases in demand for electricity and liquid fuels limit the projected growth of renewable energy in the Reference case.

We project that consumption of natural gas will keep growing as well, maintaining the second-largest market share overall. The expected growth in natural gas consumption is driven by expectations that natural gas prices will remain low compared with historical levels. In the Reference case, the industrial sector has the largest share of natural gas consumption, starting in the early 2020s, driven by greater use of natural gas as a feedstock in the chemical industries and by increased heat-and-power consumption across multiple industries.

Changes in fuel mix reduce energy-related CO_2 emissions in the Reference case through 2037, despite steadily increasing energy consumption

Figure 3.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022)

Note: Series does not include greenhouse gases other than carbon dioxide (CO_2). Industrial sector CO_2 emissions do not include process emissions, such as the emissions from cement clinker production.

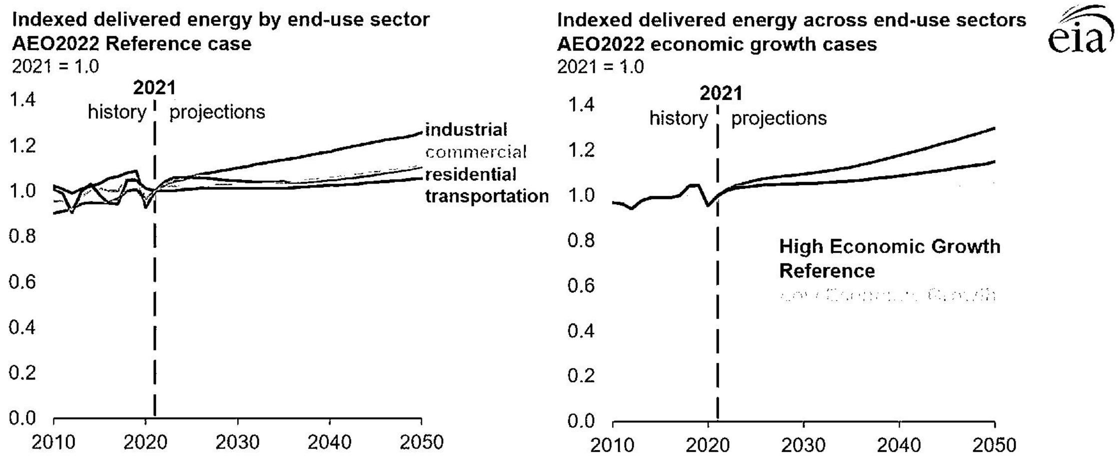
Changes over time in U.S. energy-related CO_2 emissions in the Reference case reflect shifts in the quantity and CO_2 intensity (CO_2 per unit of energy) of fuel consumption. Emissions decrease from 2022 to 2037 because of a transition away from more carbon-intensive coal to less carbon-intensive natural gas and renewable energy for electricity generation and because of an overall decrease in energy intensity (energy consumption per unit of GDP). After 2037, CO_2 emissions begin to trend upward as increasing energy consumption, resulting from population and economic growth, outpaces continuing reductions in energy intensity and CO_2 intensity. This trend occurs in all AEO2022 side cases. The High Economic Growth case has the highest level of CO_2 emissions over the projection period, and the Low Oil and Gas Supply case has the lowest. Even in the High Economic Growth case, annual energy-related CO_2 emissions through 2050 remain below the 2007 peak of 6 billion metric tons.

Energy consumption increases through 2050 as population and economic growth outweighs efficiency gains

U.S. energy consumption grows through 2050, driven by population and economic growth

Economic growth is a key driver of the longer-term trends in energy consumption, and the High and Low Economic Growth cases explore future growth trajectories in the U.S. economy. These cases modify population growth and productivity assumptions throughout the projection period to yield higher or lower compound annual growth rates for U.S. GDP compared with the Reference case. The economic growth cases show the highest and lowest levels of projected energy consumption across cases. From 2021 to 2050, the High Economic Growth case assumes a U.S. GDP compound annual growth rate of 2.7%, the Low Economic Growth case assumes 1.8%, and the Reference case assumes 2.2%.

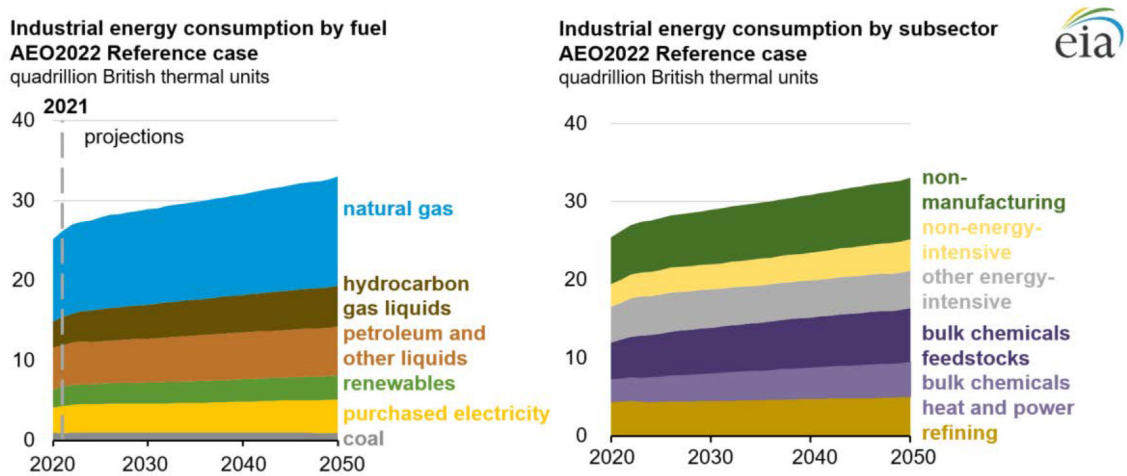
Figure 4.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022)

Overall industrial energy consumption grows rapidly, but not all industries return to pre-pandemic levels

Figure 5.



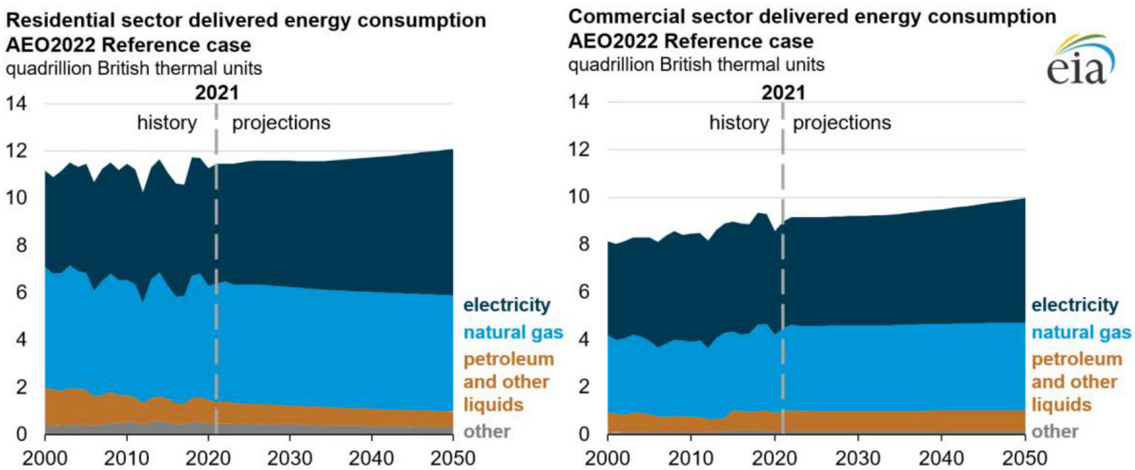
Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

In the Reference case, we project the U.S. industrial sector's energy consumption will grow more than twice as fast as any other end-use sector from 2021 to 2050. We expect industrial energy consumption in the United States to exceed pre-pandemic levels by 2022, although specific industries may remain below or take longer to return to pre-pandemic levels. For example, we do not project the glass and steel industries to return to 2019 levels of energy consumption by 2050. These industries were decreasing their energy use before the pandemic because shifts in their respective industrial production processes increased efficiencies. Moreover, U.S. steel production is more or less flat after 2025, further contributing to this industry's declining energy consumption in the long term. We assume that most major energy-consuming industries will have declines in energy intensity (the amount of energy used to produce a unit of output) as a result of efficiency gains, which results in energy consumption growth that is slower than the growth in shipments.

The U.S. bulk chemicals industry is the largest industrial energy user throughout the projection period and consumes the most energy in the industrial sector as a whole. We project that through the mid-2020s, the bulk chemicals industry will build facilities that use natural gas and HGL feedstocks to produce chemicals such as nitrogenous fertilizer and ethylene. Some chemical products derive from heavier liquid petrochemicals (mainly naphtha), but feedstock use of heavy petrochemicals does not grow during the projection period. Growth in natural gas and HGL feedstock consumption slows after the first half of the 2020s as growth in the bulk chemicals industry shifts to secondary chemical production (that is, derivative chemicals produced from commodity chemicals, as opposed to HGLs or natural gas).

Growth in residential housing stocks and commercial floorspace contributes to increasing energy consumption across the buildings sector

Figure 6.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

Housing stocks and commercial floorspace increase over the projection period and are key drivers of energy consumption in buildings. However, as a result of efficiency gains, delivered energy consumption in U.S. buildings[1] grows at 0.3% per year, more slowly than housing stocks (0.8% per year) and commercial floorspace (1.0% per year) grow between 2021 and 2050 in the Reference case.

Between 2021 and 2050, U.S. housing stocks, led by growth in single-family homes, increase by 23% in the Reference case. Single-family homes consume more energy per square foot, on average, than multifamily or mobile homes. However, efficiency gains in new homes cause energy use to grow more slowly than the U.S. housing stock overall, continuing the long-term decline in residential energy intensity per square foot.

Similarly, the commercial building stock expands by more than one-third between 2021 and 2050. However, energy consumption in commercial buildings grows more slowly than commercial floorspace. Energy efficiency improvements enable buildings to meet growing demand for energy-consuming services without a one-for-one increase in energy use. We project the energy intensity of the commercial building stock to decline at an average rate of 0.6% per year from 2021 through 2050.

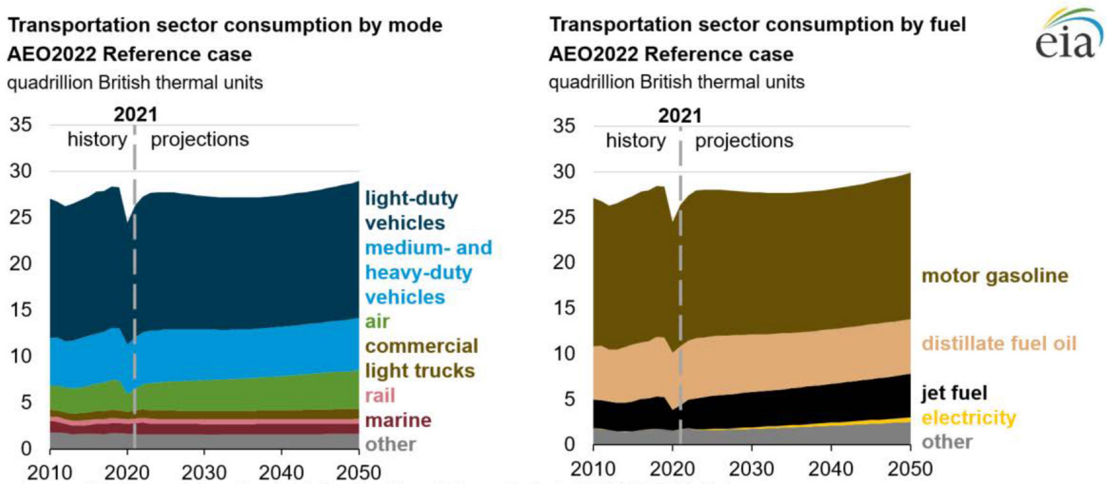
In our Reference case, we project that electricity consumption in U.S. residences will grow 22% between 2021 and 2050. Onsite generation, largely from solar photovoltaics (PV), reduces the amount of energy that must be delivered to buildings to meet energy demand. Energy consumption from onsite sources grows at an average annual rate of 6.1%. This growth occurs despite our expectation that PV system costs will decline more slowly than in the past. PV costs decline more slowly following near-term pandemic impacts and related supply constraints on materials needed to manufacture PV panels, as well as restrictions for certain PV panel imports, both of which have lasting effects through the projection period.

[1] Delivered energy excludes electricity-related losses. In addition, this measurement excludes onsite energy generated for use in a home or commercial building.

Natural gas consumption for space heating, which is the largest single contributor to both U.S. commercial and residential delivered energy consumption throughout the Reference case projection period, declines through 2050. We project that buildings will consume less energy for space heating as the United States experiences warmer winters and as the population increasingly migrates to warmer parts of the country, reducing the heating degree days we use to project space heating requirements.[2]

Despite steep declines during the pandemic, consumption of energy for transportation returns to pre-pandemic levels

Figure 7.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

In the Reference case, energy consumption in the transportation sector nearly returns to the 2019 pre-pandemic level of 28.4 quadrillion British thermal units (quads) in 2025 before declining slowly through 2035. Energy consumption in the sector then rises through the remainder of the projection period to 29.9 quads. Motor gasoline, distillate fuel oil, and jet fuel account for more than 90% of the transportation sector's energy consumption throughout the projection period. Electricity is the fastest-growing fuel used for transportation, growing from less than 0.5% of total consumption in 2019 to nearly 2% in 2050.

In the Reference case, on-road passenger light-duty vehicle (LDV) travel mainly uses motor gasoline as its energy source through 2050. LDV fuel economy and projected vehicle miles traveled (VMT) are key factors that determine the level of future gasoline consumption. New vehicle fuel economy improvements are driven by increasingly stringent fuel economy standards from the U.S. Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration through 2026, after which we assume that the standards remain constant and improvement in fuel economy slows. Passenger VMT grows steadily with population and income throughout the projection period, growing 26% higher in 2050 than it was in 2019. We project that the confluence of fuel economy improvement

[2] Heating degree days are a measure of how far temperatures fall below a reference temperature, indicating demand for indoor heating. Reference case projections use a 30-year trend of historical population-weighted degree days from the National Oceanic and Atmospheric Administration (NOAA).

and increasing VMT results in gasoline consumption falling through 2038 and then rising for the remainder of the projection period.

Rising diesel consumption is largely a result of projected medium- and heavy-duty freight truck travel, which accounts for around 77% of consumption of diesel in the transportation sector throughout the projection period. Both the trend and its explanation are similar to that of gasoline. After fuel economy returns to pre-pandemic levels, we project that fuel economy increases for trucks, which generally reduces consumption through 2041. Slowing gains in fuel economy and rising freight truck travel demand gradually cause consumption to rise through 2050. After returning from its 2020 pandemic low, commercial jet fuel consumption continues to grow throughout the projection period as a result of growing income and population. We project that U.S. commercial aircraft will consume 4.2 quads of jet fuel in 2050, a 32% increase from 2019.

We project that different transportation modes, and as a result, different fuels, will return to pre-pandemic (2019) levels at different rates:

- Light-duty vehicle travel as measured by VMT in 2022
- Freight truck VMT in 2021
- Air travel as measured in revenue passenger-miles (RPMs) in 2025
- Bus as measured in passenger-miles traveled (PMT) in 2028
- Passenger rail PMT in 2025

Improving efficiencies across all modes results in slower increases in consumption. Gasoline consumption does not reach its 2019 total during the projection period, diesel returns to its 2019 level in 2023, and commercial jet fuel returns to its 2019 level in 2027.

Electricity continues to be the fastest-growing energy source in buildings, with renewables and natural gas providing most of the incremental electricity supply

Over the projection period, use of electricity expands to meet a variety of needs in homes and commercial spaces

Electricity continues to be the fastest-growing source of energy used in buildings, even as lighting, air-conditioning, and other end uses see efficiency gains. In our Reference case, onsite generation from solar PV grows faster than purchased grid electricity for buildings during the projection period. We project distributed generation technologies such as solar PV will grow to supply 8% of electricity consumed in households and 6% of electricity consumed in commercial buildings in 2050, despite declining electricity prices.

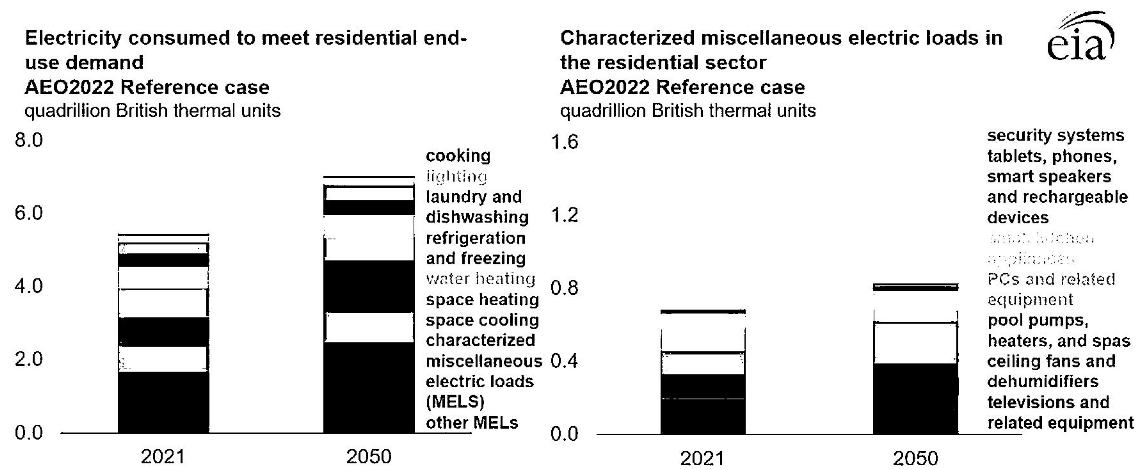
Federal minimum energy efficiency standards, the availability of subsidies for energy-efficient equipment, and technological improvements increase the efficiency of commercial equipment and household appliances in the Reference case. Incremental increases in equipment efficiency reduce consumption, offsetting the effects of household and floorspace growth.

The Reference case reflects evolving consumer demand for electricity over time

U.S. consumption of electricity for many major end uses—including space heating, water heating, refrigeration, and lighting—decreases over time. Growing adoption of space cooling equipment and increasing cooling demand in the residential sector cause associated electricity consumption to grow

77% from 2021 to 2050. At the same time, we project residential electricity used to serve *miscellaneous electric loads* (MELs) to grow 20% by 2050 for devices and technologies that we explicitly model. MELs include televisions, personal computers (PCs), smartphones, tablets, pool pumps, and other uses.

Figure 8.

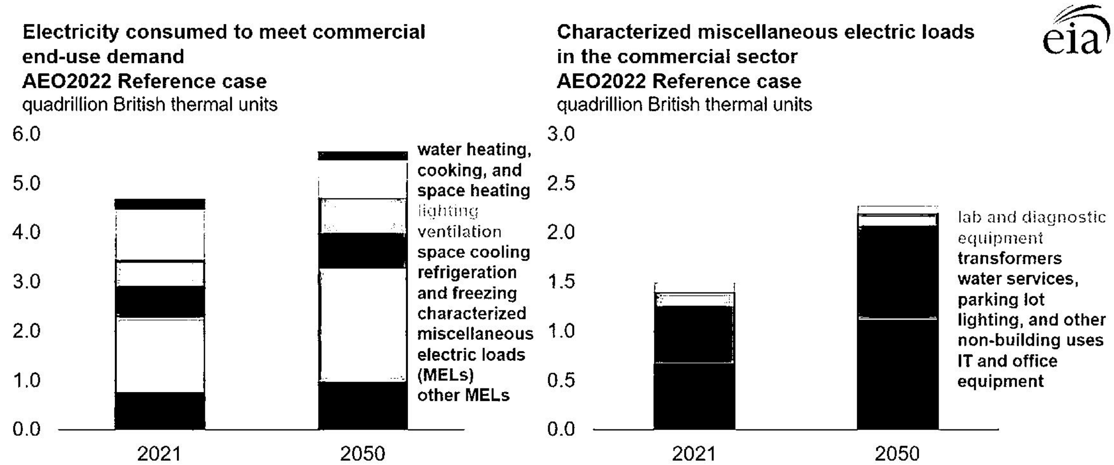


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

We project that energy consumed by traditional computing equipment, specifically desktop PCs and laptops, will decrease through 2050, offset in part by increasing numbers of monitors per computer. We project electricity consumed by tablets to increase over time, and we project electricity used to recharge smartphones in U.S. households will grow at a faster annual rate than population. We project the average number of smartphones per household to grow 8% between 2021 and 2050, up to 2.4 phones per household, on average. In 2050, we project that an average of 2.5 people live in each U.S. household.

Projected electricity used by televisions and related equipment declines as newer models replace less energy-efficient televisions through 2050, despite increased use of video game consoles. Consumption of electricity from other MELs generally continues to increase over time as personal disposable income grows.

Figure 9.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

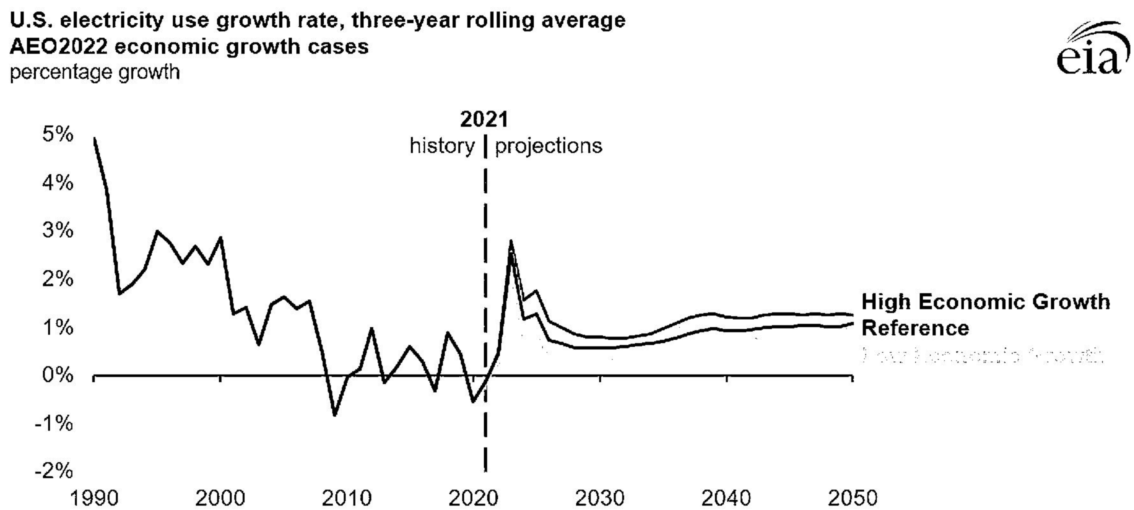
In the commercial sector, electricity for space cooling grows by 38% over the projection period. We project MELs to consume 29% more electricity in 2050 than in 2021 in U.S. commercial buildings. Not all equipment, appliances, and devices contribute to these increases. For example, we project the number of monitors per computer to increase relative to 2021 levels. However, we project the associated energy consumption to decrease by more than half in 2050 compared with 2021 as new monitors replace older models that consume more energy. Meanwhile, consumption by data center servers in commercial buildings expands through 2050. As a result, by 2050, we project energy use by commercial IT and office equipment to increase by 67% from 2021 levels. Projected increases in service sector output drives additional growth in other commercial MELs.

Electricity

Electricity demand grows slowly across the projection period, which increases competition among fuels

The U.S. annual average electricity growth rate remains below 1% for much of the projection period in the Reference case

Figure 10.

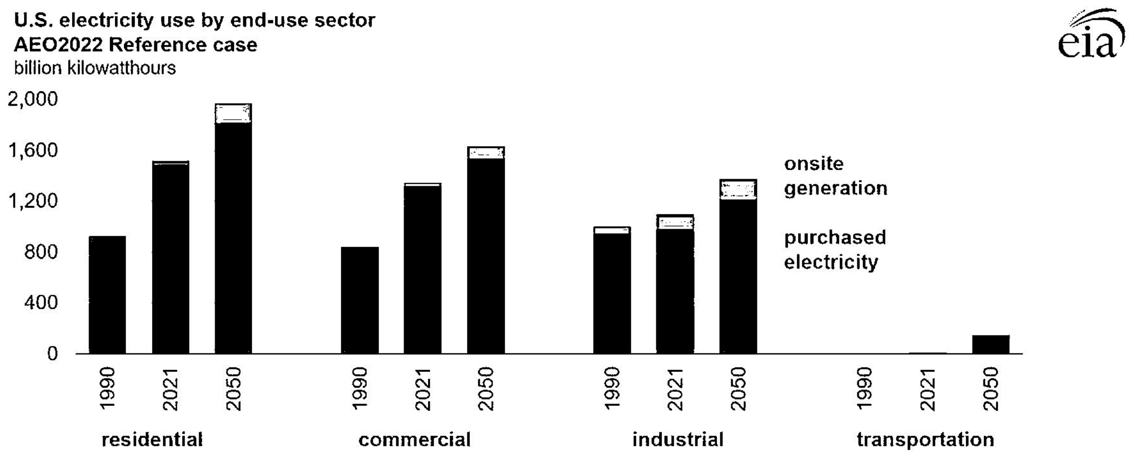


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022)

The three-year rolling average growth rate of electricity consumption in the United States peaks in 2023 as the economy returns to pre-pandemic levels of economic activity. In the short term, demand for electricity may fluctuate as a result of year-to-year weather, economic shocks, or other unpredictable events. Economic growth drives longer-term trends in electricity consumption, although the growth is somewhat offset by efficiency improvements. In the Reference case, the average annual growth rate of electricity consumption surpasses 1% but not until near the end of the projection period. Electricity demand in the AEO2022 High Economic Growth case grows about 0.25% faster than in the Reference case, and it grows about 0.25% slower in the Low Economic Growth case.

The share of onsite electricity generation increases across non-transportation sectors

Figure 11.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case
Note: Onsite generation is electricity produced onsite for own use.

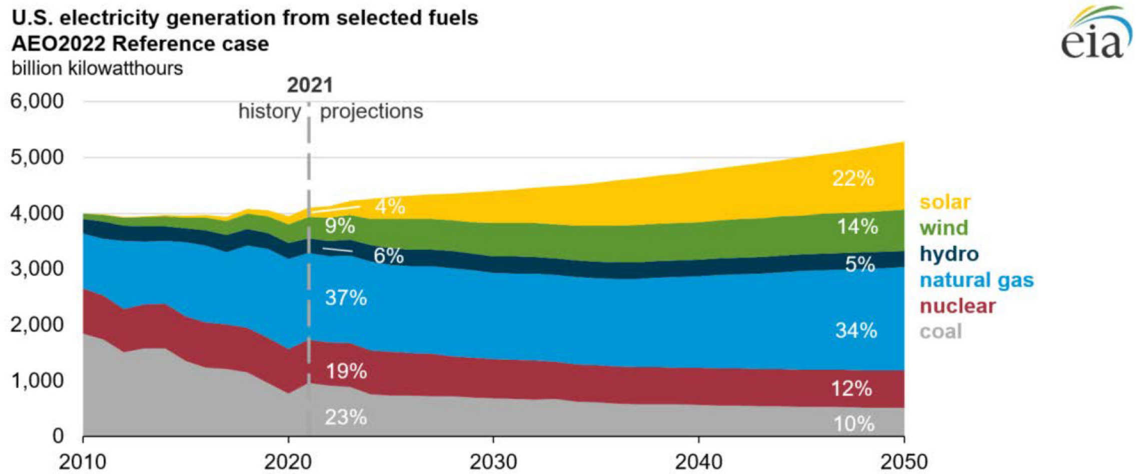
Through the projection period, onsite generation of electricity expands significantly in the U.S. residential, commercial, and industrial sectors, reducing growth in electricity purchased from centralized generators. We project that residential, commercial, and industrial sector onsite solar PV systems will account for more than 8% of total electricity generation by 2050, almost double the share held by onsite power generators in 2021.

Electricity demand in transportation remains low

We project that demand for electricity grows fastest in the transportation sector, even as consumption in that sector remains less than 3% of economy-wide electricity consumption in the Reference case. Fully electric vehicles grow from less than 1% of the on-road LDV fleet in 2021 to a little over 7% in 2050 in the Reference case. The increase in demand primarily follows evolutionary electric vehicle (EV) technology and market developments, as well as current fuel economy regulations. Both vehicle sales and utilization (miles driven) would need to increase substantially for EVs to raise electric power demand growth rates by more than a fraction of a percentage point per year. The transportation sector's share of electricity consumption is greatest in the High Oil Price case, where it reaches 5% of the total in 2050.

Renewable electricity generation increases more rapidly than overall electricity demand through 2050

Figure 12.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case
Note: Solar includes both utility-scale and end-use photovoltaic electricity generation.

Renewable electricity generation meets incremental demand growth

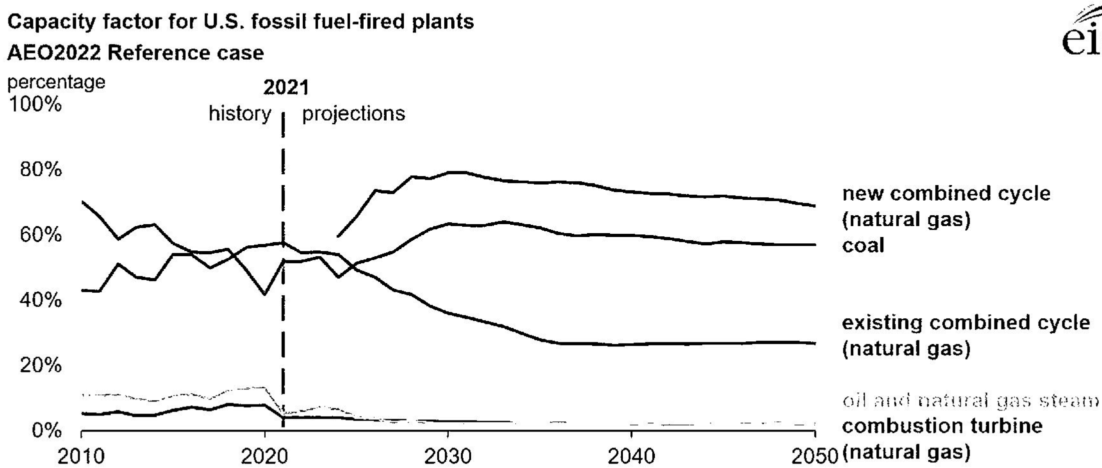
The share of renewables in the U.S. electricity generation mix more than doubles from 2021 to 2050. Wind grows more than any other renewable generation type from 2021 through 2024, accounting for more than two-thirds of those increases in electricity generation during that period. After the production tax credit (PTC) for wind phases out at the end of 2024, solar generation accounts for almost three-quarters of the increase for renewable energy. In the Reference case, we model existing legislation for the investment tax credit (ITC): solar receives a 30% tax credit through 2024, which then reduces to 26% for projects coming online in 2024 and 2025 before phasing down to a non-expiring credit of 10% starting in 2026.

Sustained low natural gas prices keep natural gas generation at the highest market share in the Reference case

The share of natural gas in the generation mix remains relatively constant, at about one-third from 2021 to 2050. Although the share remains the same, projected natural gas prices stay below $4.00 per million British thermal units (MMBtu) for most of the projection period. The natural gas share remains consistent despite significant projected coal and nuclear generating unit retirements, which cause the shares from those sources to drop by half. Generation from renewable sources increases to offset the natural gas share, largely because regulatory programs and market factors incentivize these sources.

After near-term natural gas prices stabilize, and as more solar and wind energy integrates into the electricity grid, natural gas-fired generating unit capacity factors steadily decrease. The average capacity factor of the coal fleet increases as inefficient units are retired throughout the projection period

Figure 13.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

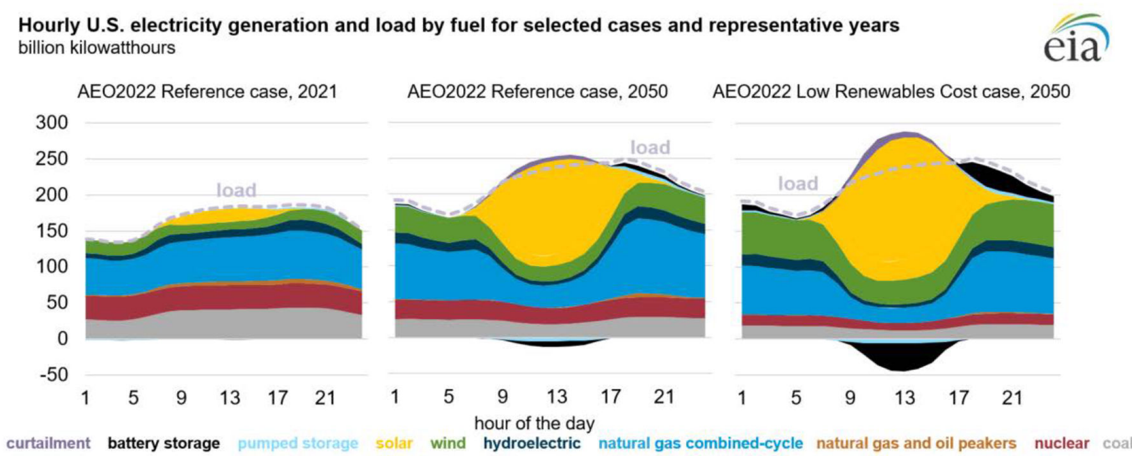
As more wind and solar capacity is added, both existing and new natural gas-fired generation is displaced, and capacity factors for existing combined-cycle units drop by nearly half from a peak of 60% in 2020. Because natural gas-fired generating capacity grows faster than natural gas-fired generation from 2020 to 2050, capacity factors for natural gas units decline steadily across all plant technology types. The average capacity factor of operating coal plants increases over the projection period as relatively old and inefficient coal plants retire and the more efficient and cost competitive plants remain. Natural gas accounts for more than 40% of cumulative capacity additions from 2020 to 2050. About half of natural gas capacity additions through 2050 are low-utilization combustion turbines, which are economically attractive when mostly used to provide infrequent peaking capacity.

Energy storage systems, such as stand-alone batteries or solar-battery hybrid systems, will compete with natural gas-fired turbines as sources of back-up capacity for nondispatchable renewable energy sources. Storage systems can act as an arbitrage tool to move solar and other generation from periods of high supply and low demand to periods of low supply and high demand, and they can provide capacity for grid reliability in times when nondispatchable generation is not available.

Battery storage complements growth in renewables generation and reduces natural gas-fired and oil-fired generation during peak hours

Battery storage complements solar capacity additions, captures solar generation that would otherwise be curtailed, and reduces nonrenewable generation to meet peak electric demand

Figure 14.

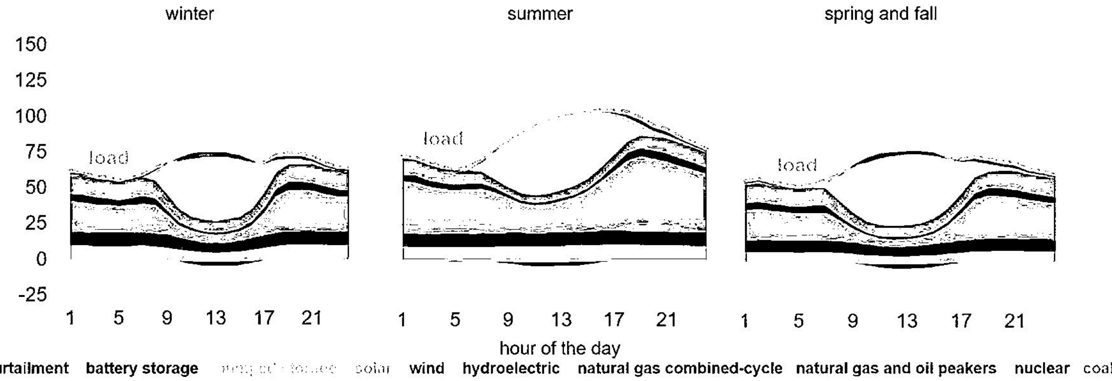


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022)
Note: Negative generation represents charging of energy storage technologies such as pumped hydro and battery storage. Hourly dispatch estimates are illustrative and are developed to determine curtailment and storage operations; final dispatch estimates are developed separately and may differ from total utilization as this figure shows. Solar includes both utility-scale and end-use photovoltaic electricity generation.

In 2021, limited surplus generation occurred throughout all hours of the day in the Reference case; however, by 2050, the large amounts of added solar capacity cause a surplus of generation in the middle of the day. Because solar has essentially zero variable operating costs, its high midday generation levels cause a large decrease in generation from natural gas-fired combined-cycle plants during these hours, as well as a slight decrease in generation from coal and nuclear plants. Once the solar generation is not available in the evening hours, the other generators ramp back up to meet demand. Batteries are also used to move excess solar generation during the daylight hours into the evening hours when demand is still relatively high.

Figure 15.

Hourly U.S. electricity generation and load by fuel type and season in 2050
AEO2022 Reference case
billion kilowatthours

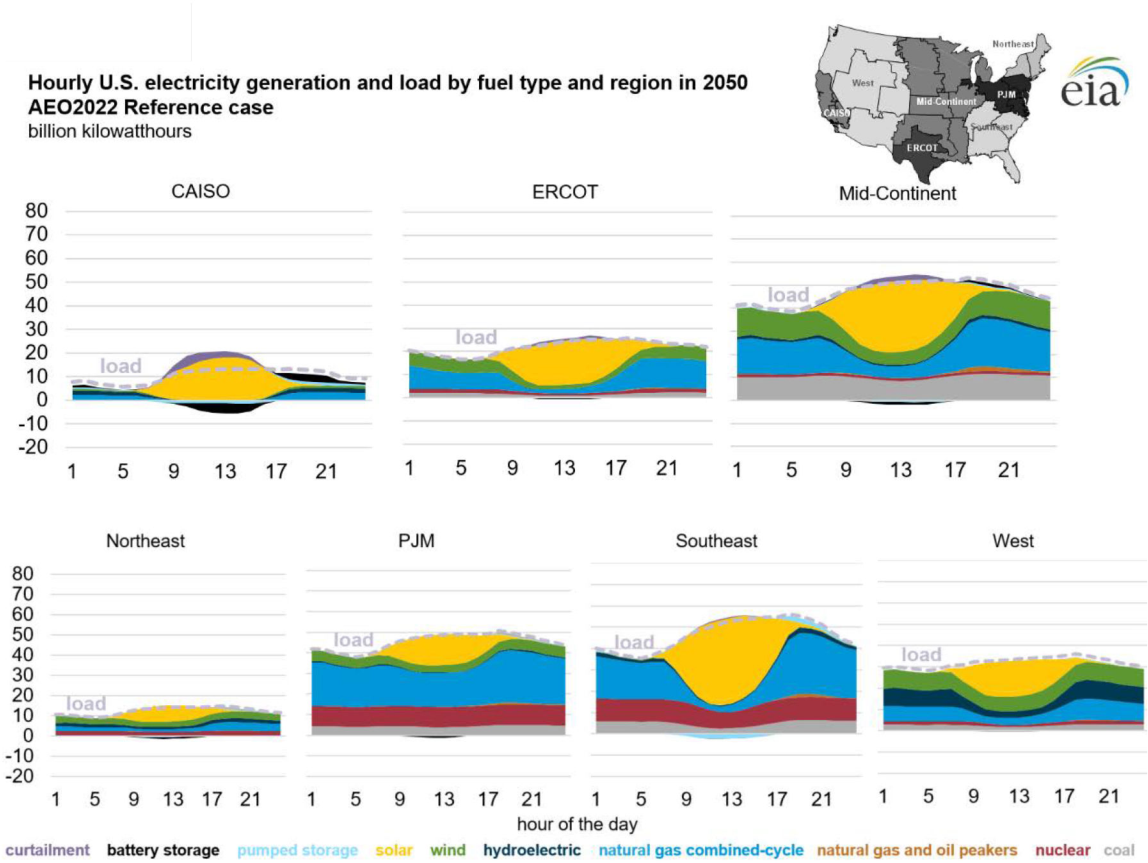


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case
Note: Negative generation represents charging of energy storage technologies such as pumped hydro and battery storage. Hourly dispatch estimates are illustrative and are developed to determine curtailment and storage operations; final dispatch estimates are developed separately and may differ from total utilization in Figure 15. Solar includes both utility-scale and end-use photovoltaic electricity generation.

When utilities generate more electricity than needed to meet load, the excess energy can either be *curtailed* (not used) by the grid operator or stored. Because solar and wind generators are not dispatchable, curtailment often happens during very sunny and windy periods when energy storage is not economical or available. Only a small percentage of solar and wind generation is curtailed through the projection period in the Reference case. Most curtailment occurs during the winter and shoulder (spring/fall) seasons when demand is low. In the summer months, higher demand in midday hours results in less curtailment.

Daily hourly generation patterns vary widely by season and region, affecting decisions on strategies to support solar generation

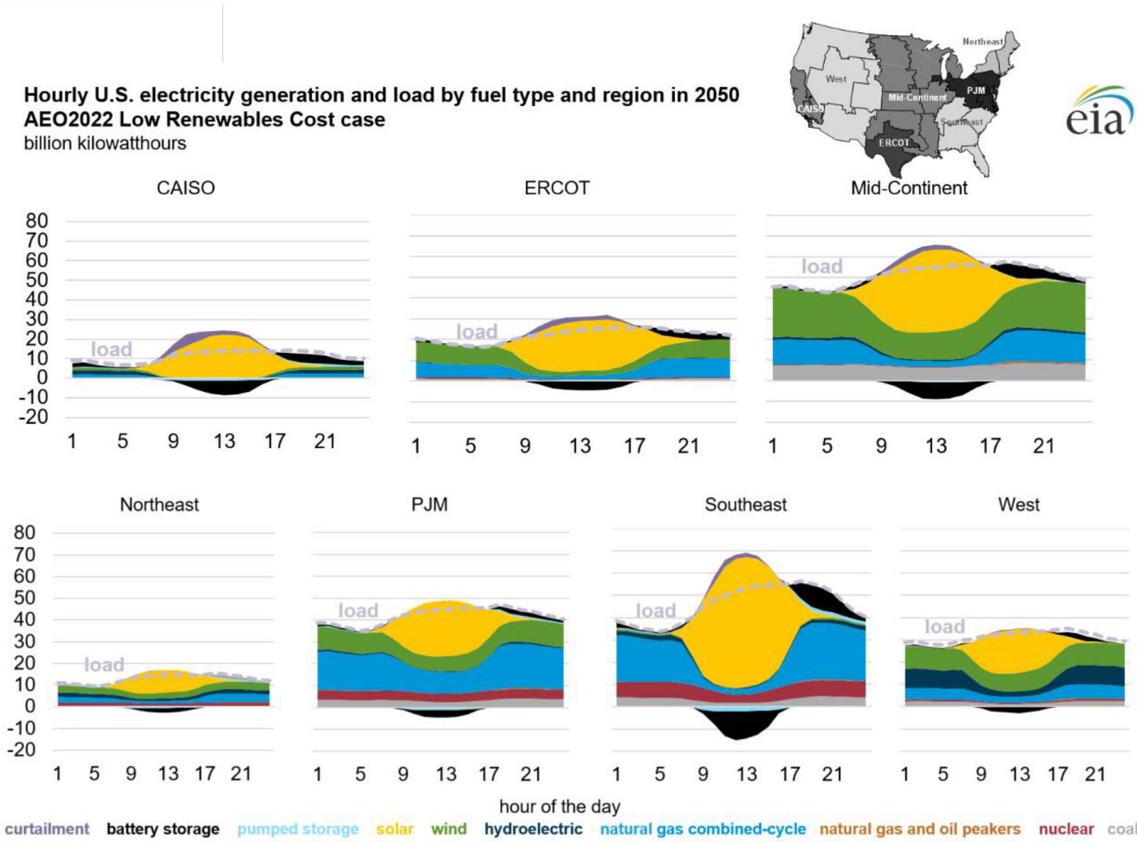
Figure 16.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case
Note: Negative generation represents charging of energy storage technologies such as pumped hydro and battery storage. Hourly dispatch estimates are illustrative and are developed to determine curtailment and storage operations; final dispatch estimates are developed separately and may differ from total utilization in Figure 16. Solar includes both utility-scale and end-use photovoltaic electricity generation.

In the Reference case, by 2050, most projected solar curtailments occur in the California ISO (CAISO), Electric Reliability Council of Texas (ERCOT), and Mid-Continent regions. These regions have a higher percentage of their load met by solar during the afternoon hours than most other regions. The Southeast region also has a relatively large percentage of load met by solar in midday hours, but it has fewer curtailments because its demand profile better coincides with solar generation than the other regions' profiles. Some of the energy that would otherwise be curtailed is used for charging pumped hydro or battery energy storage sites. In the Reference case, most of the electricity provided by battery storage is in CAISO due to the relatively larger proportion of midday solar curtailments and resulting larger price disparity between midday and evening hours. Other regions meet their respective evening ramp periods, when solar generation decreases, with natural gas units.

Figure 17.



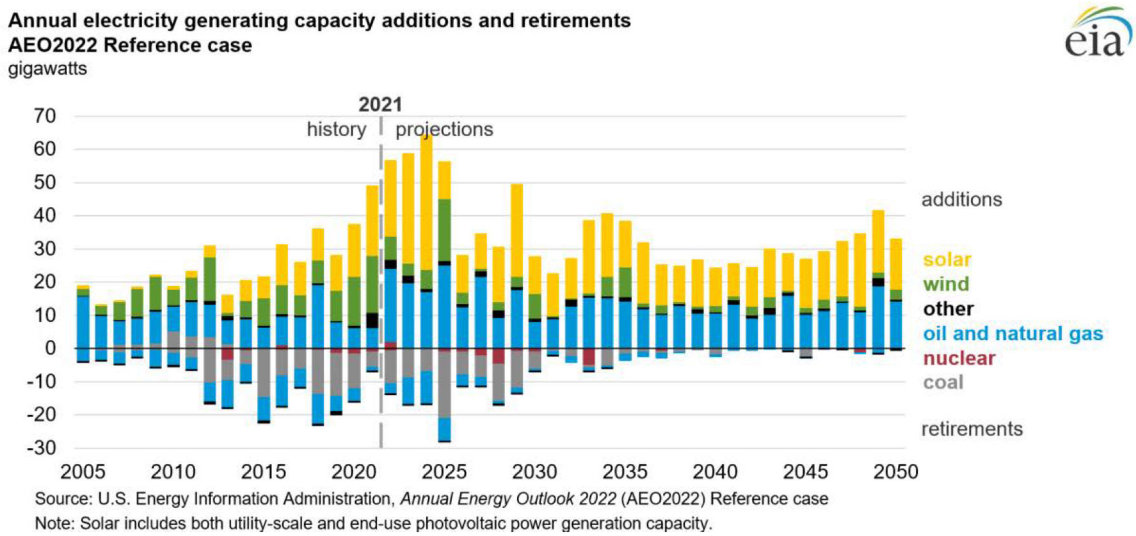
Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Low Renewables Cost case
Note: Negative generation represents charging of energy storage technologies such as pumped hydro and battery storage. Hourly dispatch estimates are illustrative and are developed to determine curtailment and storage operations; final dispatch estimates are developed separately and may differ from total utilization in Figure 17. Solar includes both utility-scale and end-use photovoltaic electricity generation.

In the Low Renewables Cost case, by 2050, lower costs for solar and battery storage signficantly affect the daily hourly electricity generation profiles in all regions. In additon to the CAISO, ERCOT, and Mid-Continent regions, the Southeast region also curtails significant amounts of generation. All regions use much more battery storage than in the Reference case, most notably in the Mid-Continent and Southeast. Use of battery storage in each of these regions surpass CAISO, the region with the largest amount of installed battery capacity in 2021.

As coal and nuclear generating capacity retire, new capacity additions come largely from wind and solar technologies

Renewable technologies account for the majority of the projected capacity additions

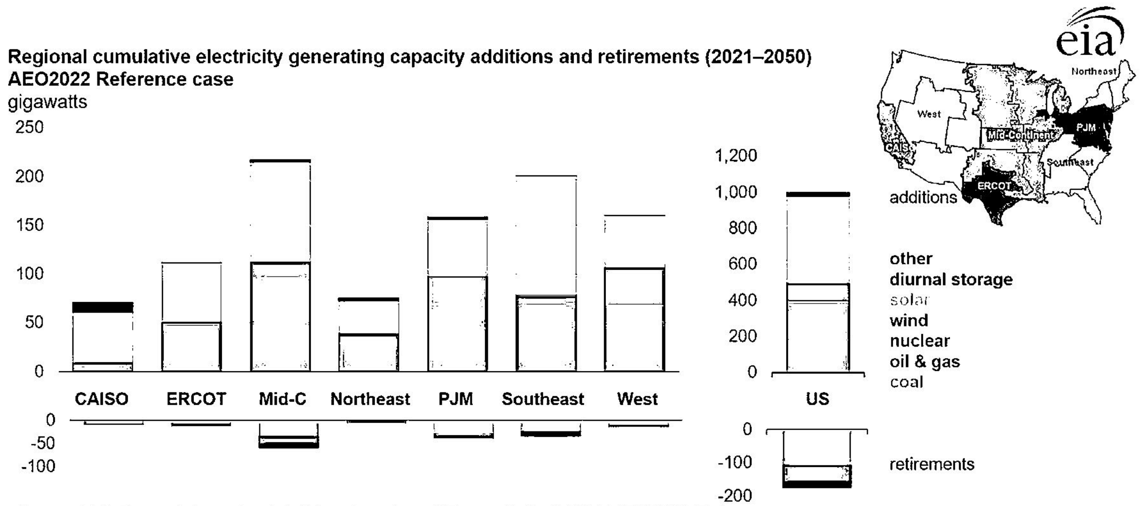
Figure 18.



Renewable electric generating technologies account for over 57% of the approximately 1,000 gigawatts (GW) of cumulative capacity additions that we project in the Reference case from 2021 to 2050. This large share is a result of not only declining capital costs, but also continuing legislative incentives, such as state renewable portfolio standard (RPS) targets and the extension of federal and state tax credits. Although wind capacity is added steadily throughout the projection period, much less wind capacity is added than solar. Solar capacity accounts for 47% of electric generating capacity additions, and wind accounts for about 10%. Generating technologies fueled by natural gas make up most of the remaining share of new capacity additions (39%), some of which is used to generate electricity when intermittent wind and solar resources are not available.

Solar accounts for the majority of U.S. capacity additions in most regions. The majority of coal and nuclear retirements come from the Mid-Continent, PJM, and Southeast regions

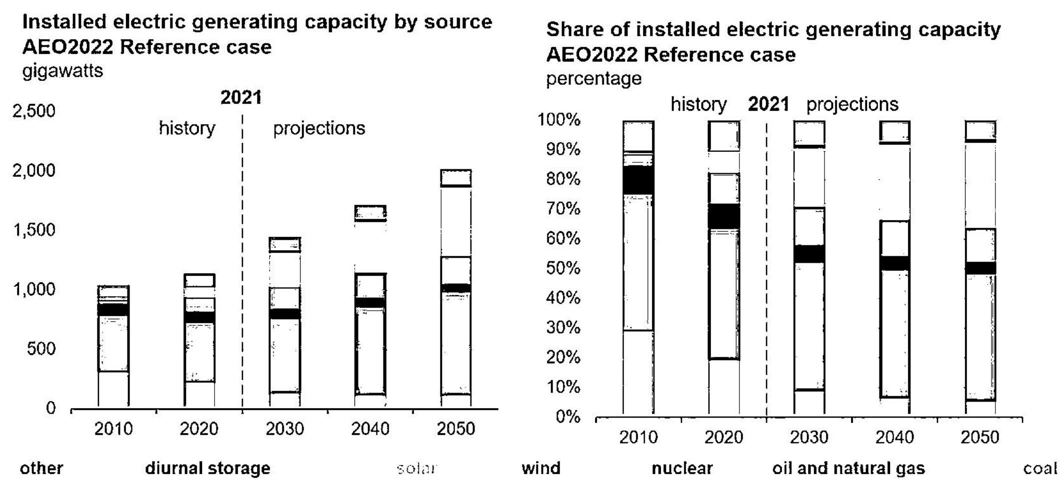
Figure 19.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case
Note: Solar includes both utility-scale and end-use photovoltaic power generation capacity.

Solar generating capacity grows steadily across all regions of the United States in the Reference case. Some regions build diurnal storage capacity to support larger daily price fluctuations from the solar capacity additions. We project that California will add nearly 13 GW of diurnal storage power capacity through 2050 in the Reference case, compared with 8.4 GW of natural gas-fired generation capacity. PJM and the West are the only regions that add more natural gas capacity than solar capacity, but these regions also show high growth in solar. Cheaper solar and wind energy, accompanied by natural gas-fired plants, replaces coal and nuclear in the Mid-Continent, PJM, and Southeast regions. Solar's share of total U.S. capacity increases from 7% in 2020 to 29% in 2050. About 70% of solar additions are utility-scale PV power plants, and 30% come from end-use PV such as residential and commercial rooftop solar installations.

Figure 20.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case
Note: Solar includes both utility-scale and end-use photovoltaic power generation capacity.

Wind additions are largely tied to policy

The Reference case assumes the production tax credit (PTC) for wind will be available through 2024, following a one-year extension in 2020. Although capital costs for wind continue to decline throughout the projection period, most projected wind additions take advantage of available federal tax credits. Nearly half of cumulative wind capacity additions from 2021 to 2050 occur before the PTC expires for projects coming online after 2025. The steadier pace of solar additions reflects, in part, the continued availability of a 10% investment tax credit (ITC), which has no fixed expiration date after 2026, when the current 30% phases out.

Natural gas continues to have the largest share of fossil fuel capacity additions in all regions

Although renewable electric-generating technologies account for about 60% of cumulative capacity additions throughout the projection period in the Reference case, natural gas-fired capacity accounts for almost the entire remaining balance of additions—about 40% through 2050. These natural gas-fired generator additions are almost evenly split between combined-cycle technologies and combustion turbines, which both provide energy and help balance the intermittent output from wind and solar generators.

Coal-fired generating unit retirements largely take place by 2030

EPA's Affordable Clean Energy (ACE) rule (84 FR 32520) was vacated by the U.S. Court of Appeals for the District of Columbia Circuit on January 19, 2021. This has been incorporated into the Reference case, leading some plants that retired in the AEO2021 Reference case to continue operating past 2025. Despite that development, the Reference case still shows substantial coal plant retirements, most of which take place by 2030. Those retirements are a result of both regulatory measures and market factors. In particular, low natural gas prices in the early years of the projection period contribute to the retirements of coal-fired plants and nuclear plants. Natural gas-fired generation sets power prices in wholesale electricity markets most of the time, and the lower natural gas prices affect the profitability of coal and nuclear units, which have high fixed costs. In addition, owners of many coal-fired plants have announced closings as part of meeting goals to decarbonize their systems.

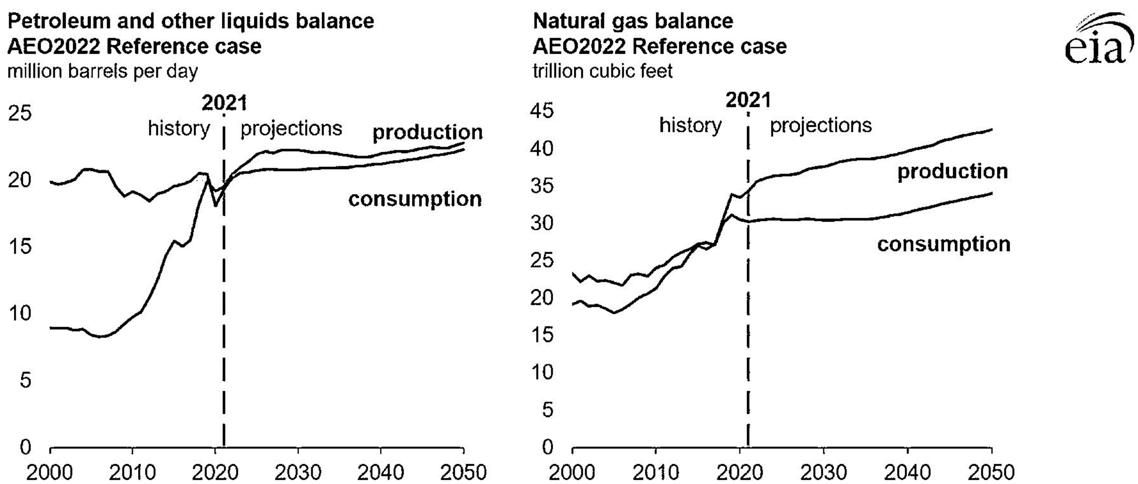
The civil nuclear credit program, passed as part of the Infrastructure Investment and Jobs Act, supports continued use of existing nuclear power facilities. This act, along with several state support programs, provides out-of-market payments that will likely keep reactors in affected regions profitable over the next 5–10 years. We project nuclear capacity retirements to occur after 2030, partially because we assume that these plants will no longer receive those credit payments when the current legislation expires.

Production

U.S. production of natural gas and petroleum and other liquids rises amid growing demand for exports and industrial uses

Oil and natural gas production in the Reference case remains at historically high levels through the projection period

Figure 21.

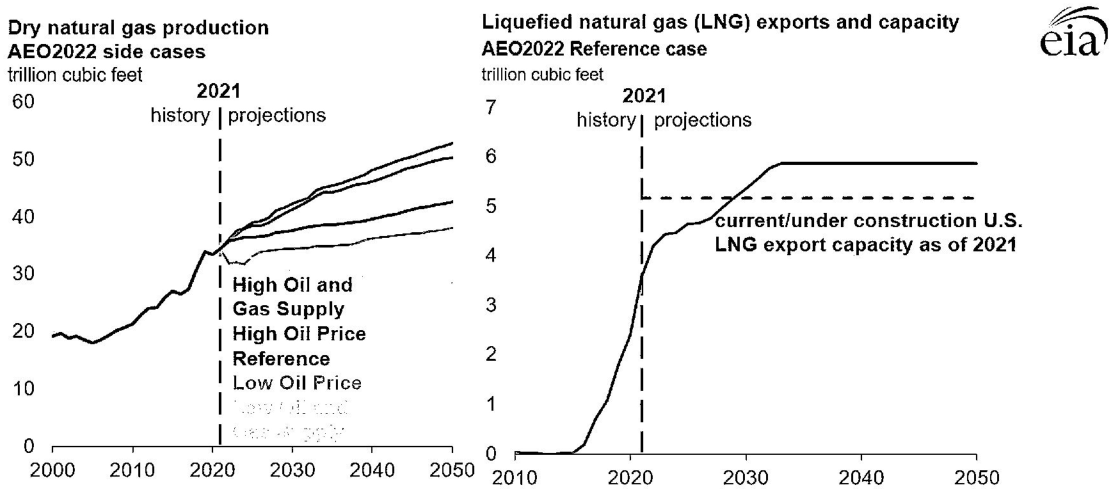


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

We project U.S. consumption and production of petroleum and other liquids to grow through 2050. Domestic consumption and production levels of petroleum and other liquids remain relatively close to one another through most of the projection period in the Reference case. Consumption increases by 15%, and production increases by 17% from 2021 to 2050. However, consumption and production of specific petroleum products vary. We also project consumption and production of natural gas to grow through 2050. During the projection period, natural gas production grows by almost 24%, approximately twice as fast as consumption. Much of this growth in natural gas production is exported as liquefied natural gas (LNG). By 2050, we project that approximately 25% more natural gas will be produced than consumed in the United States. Together, these Reference case trends highlight the continued growth in demand for U.S. natural gas and petroleum products.

Natural gas exports increase with production, driven by global demand and continued construction of new LNG export facilities

Figure 22.

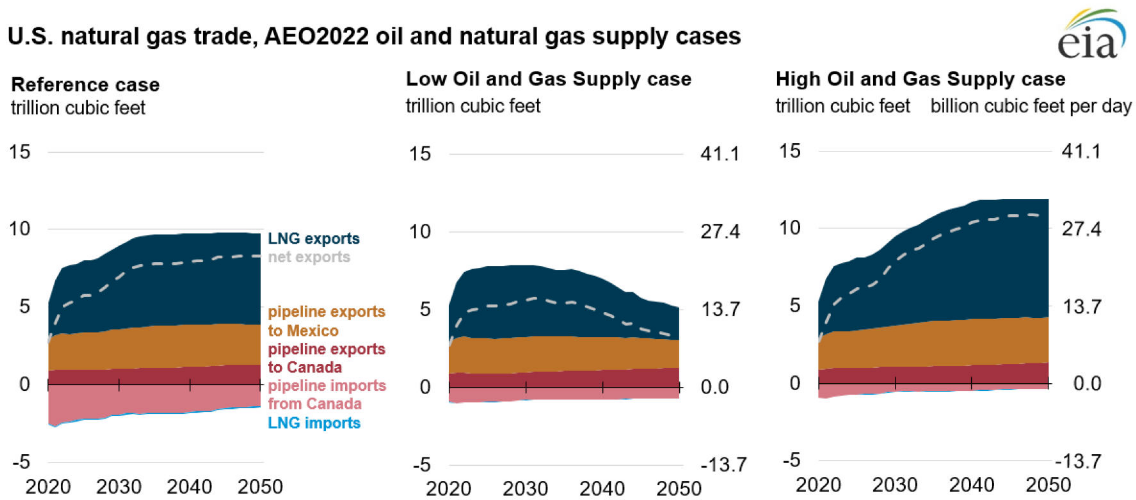


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022)

In the Reference case, U.S. natural gas production increases through 2050, and more than 35% of gross additions are exported. U.S. natural gas production increases in all cases except in the Low Oil and Gas Supply case. Projected U.S. natural gas exports rise through 2050, primarily driven by increased LNG capacity and growing global natural gas consumption.[3] Increases in pipeline exports to Mexico and Canada also contribute to the increase in U.S. natural gas exports.

[3] According the our *International Energy Outlook 2021*, we project global natural gas consumption to continue growing through 2050 in absolute terms (and as a share of the world energy mix) because of its economics and lower carbon emissions relative to other sources of energy.

Figure 23.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022)

In 2021, U.S. natural gas exports reached a record high. We project continued growth in natural gas exports through 2025 because of increases in LNG capacity from facilities currently under construction. LNG export facilities at Sabine Pass, Calcasieu Pass, and Golden Pass will likely enter service much earlier than we had anticipated in the AEO2021, increasing the amount of infrastructure available for converting natural gas to LNG for export. Additional completed natural gas pipeline infrastructure will also increase takeaway capacity into Mexico.

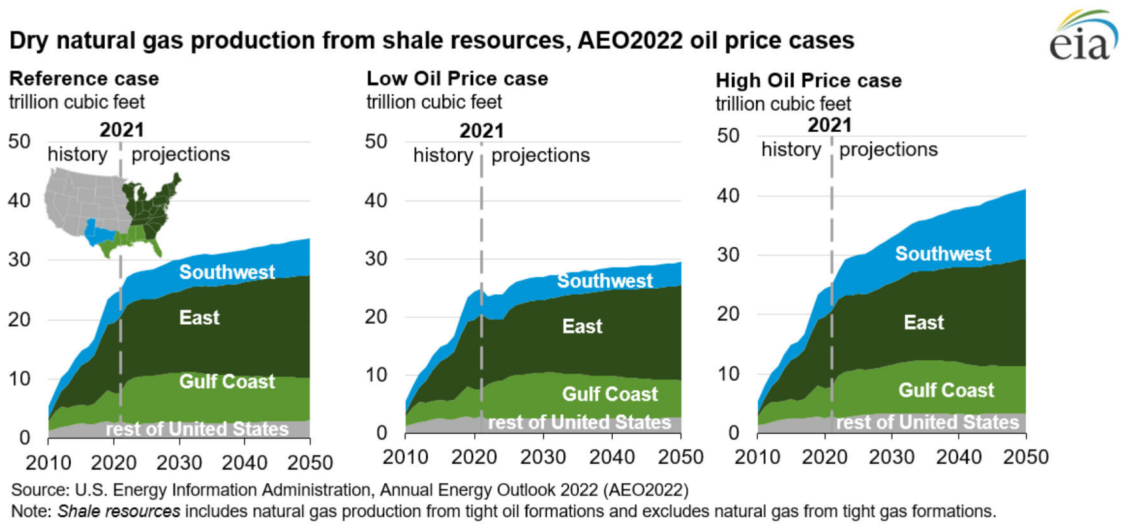
Beyond 2025, we project that natural gas production will ramp up to meet growing export demand, the majority of which will be LNG. We project global demand for U.S. natural gas to exceed current and announced LNG export capacity; therefore, additional LNG export facilities will be economical to build. These LNG capacity expansions, coupled with high demand for natural gas abroad, result in our projection of an increase in LNG exports to 5.86 trillion cubic feet (16.1 Bcf/d) by 2033 in the Reference case, prompting natural gas production growth in the medium and long term.

The oil and gas supply cases illustrate the relationship between LNG exports and production. The Low Oil and Gas Supply case assumes higher costs and less resource availability, which increases natural gas prices, so LNG exports begin to decline in the mid-2030s. In the High Oil and Gas Supply case, which assumes lower natural gas prices, LNG exports grow twice as fast as in the Reference case, leveling off during the mid-2040s.

More than half of projected U.S. natural gas production growth comes from associated natural gas produced from tight oil plays

Shale gas and associated natural gas from tight oil plays are the primary contributors to the long-term growth of U.S. natural gas production through 2050. In the Reference case, more than half of the growth in natural gas production between 2020 and 2050 is associated natural gas from tight oil plays, primarily the Wolfcamp play in the Permian Basin (Southwest region). For shale gas production during this same period, the Marcellus and Utica shale gas plays in the Appalachia Basin (East region) and the Haynesville play in the Mississippi-Louisiana Salt Basins (Gulf Coast region) account for the majority of growth.

Figure 24.

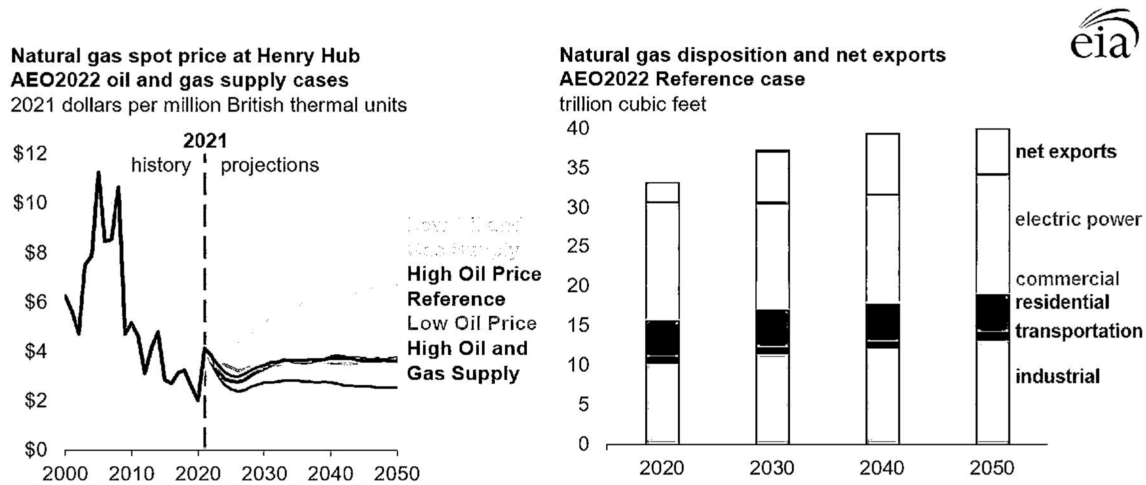


The amount of associated gas that will be available from tight oil plays in our projection is particularly sensitive to world oil price assumptions. Higher world oil prices, such as those in the High Oil Price case, increase the incentive to target oil plays, increasing the projected amount of associated natural gas. The opposite occurs in the Low Oil Price case: LNG exports are largest in the High Oil Price case, which is prompted by growth in production in the Southwest.

We project growth in natural gas production from the Wolfcamp and Haynesville plays, in part, because of these production regions' proximity to LNG export terminals. Natural gas from the Marcellus and Utica plays also reach export markets, but pipeline infrastructure constrains the Appalachia region's access to export terminals. So, natural gas production growth in the Appalachia region is predominantly driven by the region's relatively low production costs.

Despite LNG export growth and increased domestic demand for natural gas, we project that the Henry Hub price will remain below $4/MMBtu throughout the projection period in most cases

Figure 25.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022)

Amid growth in LNG exports, the natural gas spot price at the Henry Hub faces upward pressure from the mid-2020s through the early 2040s across all cases except the High Oil and Gas Supply case. Steady growth in natural gas demand in the industrial sector and growing electric power sector demand for natural gas after 2035 also put upward pressure on the Henry Hub price during this time.

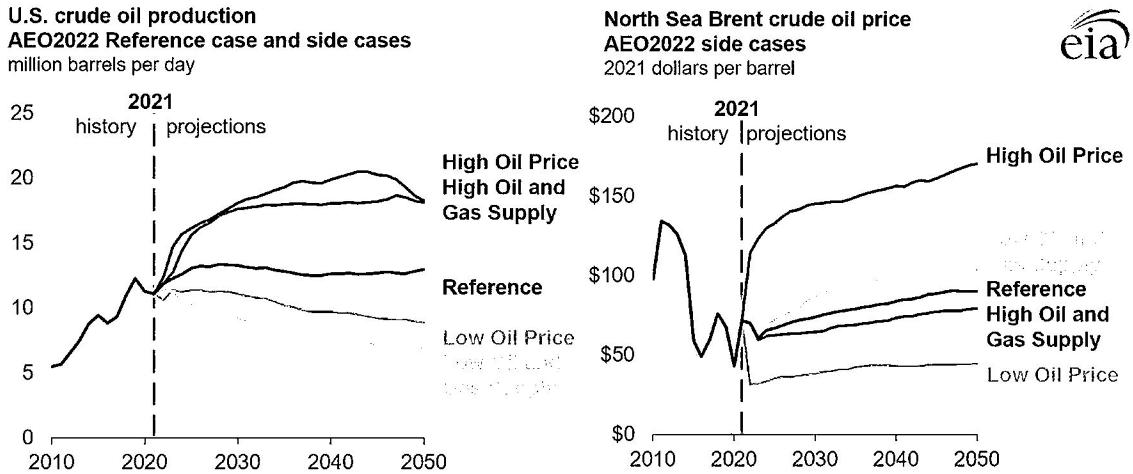
The oil and gas supply cases indicate that the natural gas spot price at Henry Hub is very sensitive to reduced supply and somewhat less sensitive to increased supply. In 2050, the projected natural gas price is almost twice as high in the Low Oil and Gas Supply case as in the Reference case, while in the High Oil and Gas Supply case, the price is approximately 29% lower than in the Reference case.

Driven by rising prices, U.S. crude oil production in the Reference case returns to pre-pandemic levels in 2023 and stabilizes over the long term

Projected U.S. crude oil production in the Reference case peaks in the late 2020s and remains near that peak through 2050

During 2021, crude oil production did not grow, even as benchmark prices increased substantially. However, as the global economy returns to pre-pandemic levels, we project that both demand and prices will remain elevated, resulting in crude oil production reaching pre-pandemic levels in the medium term.

Figure 26.

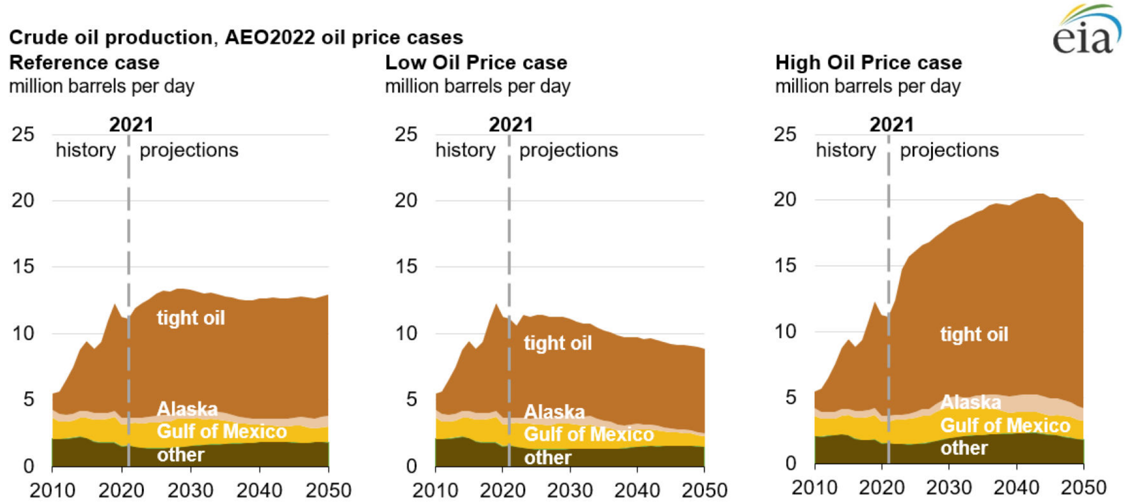


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022)

In the AEO2022, crude oil prices primarily drive drilling activity and crude oil production. In the Reference case, crude oil production returns to pre-pandemic levels in 2023 and peaks in the late 2020s. Production then remains relatively flat through 2050. The Reference case projects that prices are high enough to maintain investment at steady crude oil production levels but not high enough to elicit increasing volumes from those levels of investment. The production path involves many factors, including the amount of investment, technology change, costs of operations, and quality of resource geology.

The side cases illustrate how crude oil production responds to changing market conditions. Our analysis indicates that higher prices, such as those found in the High Oil Price case, projects more production, while the Low Oil Price case projects less production. In the High Oil and Gas Supply case, crude oil production increases by up to 40% from the Reference case, while in the Low Oil and Gas Supply case, crude oil production is almost 47% lower in 2050.

Figure 27.



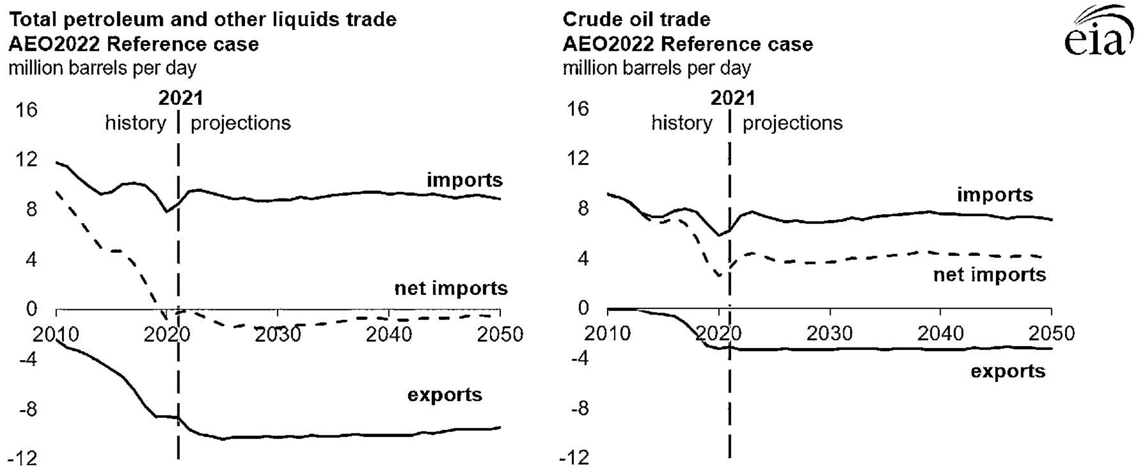
Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022)

The majority of new U.S. crude oil production comes from tight oil resources. The Wolfcamp play in the Permian Basin (Southwest region) and the Bakken play in the Williston Basin (Northern Great Plains region) lead the growth in U.S. tight oil production. However, estimates of technically recoverable tight or shale crude oil resources are uncertain. The high and low price cases demonstrate the sensitivity of crude oil production to higher and lower oil prices, including tight oil. In the High Oil Price case, high crude oil prices improve the economics of drilling particularly in tight oil formations, resulting in generally increasing domestic production through most of the projection period before declining as drilling moves to less productive areas. The Low Oil Price case results in generally decreasing U.S. crude oil production because of the lack of economic incentive for producers to drill.

U.S. crude oil net imports remain relatively flat over the long run

Although U.S. crude oil production and refinery throughput was less in 2021 than in 2019, crude oil exports have mostly increased in response to growing international demand. Throughout the projection period, from 2021 through 2050, crude oil exports remain near their projected peak, and they remain fairly stable in both gross terms and as a percentage of total domestic crude oil production, according to the Reference case. Projected crude oil imports, meanwhile, rise to pre-pandemic levels by 2023 in the Reference case, and then they remain relatively flat through 2050. We project that the United States will remain a net exporter of petroleum products through 2050 as net petroleum product exports remain mostly flat through the projection period.

Figure 28.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

Refinery closures lower domestic crude oil distillation operating capacity, but refinery utilization rates remain flat over the long term

A number of U.S. refineries have closed over the last two years as a result of pandemic-related demand decreases or conversion to renewable diesel production

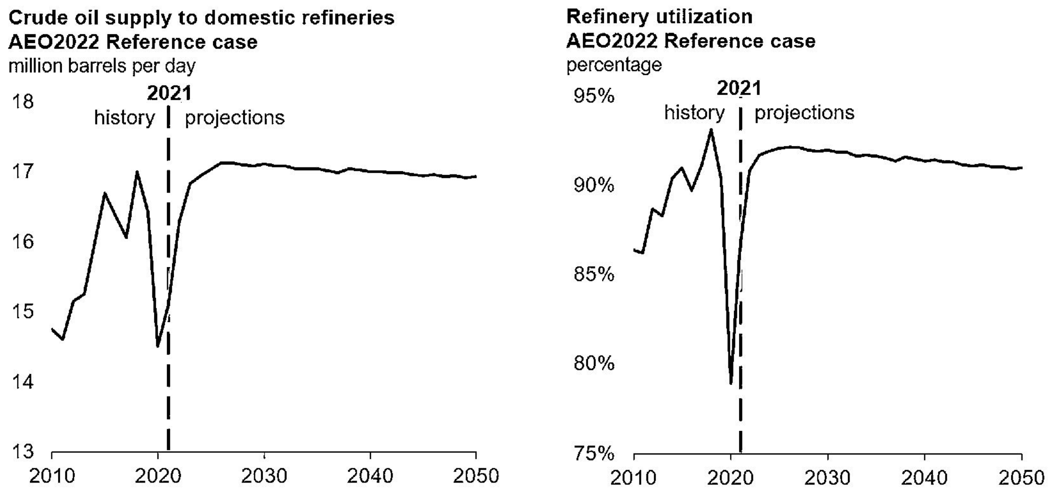
Between 2020 and 2021, six U.S. refineries closed, totaling 750,000 barrels per day (b/d) of total capacity:

- The Western Refining refinery in Gallup, New Mexico
- The Tesoro (Marathon) refinery in Martinez, California
- The Dakota Prairie refinery in Dickinson, North Dakota
- The HollyFrontier refinery in Cheyenne, Wyoming
- The Shell refinery in Convent, Louisiana
- Philadelphia Energy Solutions in Philadelphia, Pennsylvania

Some of these closures are related to decreased demand caused by responses to the global pandemic. However, other refineries, such as HollyFrontier in Cheyenne, Wyoming, and the Dakota Prairie refinery in Dickinson, North Dakota, are converting to produce renewable diesel. Cumulatively, these closures have reduced national crude oil distillation operating capacity by approximately 3.5%.

Refinery utilization rates remain stable over the long run in response to diminished demand

Figure 29.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

Despite the recent reduction in refinery capacity, we project that refinery utilization and throughput (the amount of crude oil processed at refineries) will remain relatively flat over the projection period. The refinery utilization rate (represented as a percentage) measures the volume of gross refinery inputs divided by the total operable crude oil distillation capacity. If capacity declines and utilization remains the same, production of petroleum products declines. We project that utilization rates will return to near historical averages in 2022, but it will not be cost-effective for refineries to make up for lost capacity by increasing utilization beyond this point. As a result of lower capacity and stable utilization, we expect total production of refined products to remain below peak levels over the long run.

Consumption of renewable diesel increases as a share of the domestic fuel mix

The share of renewable diesel in the biomass-based diesel market increases

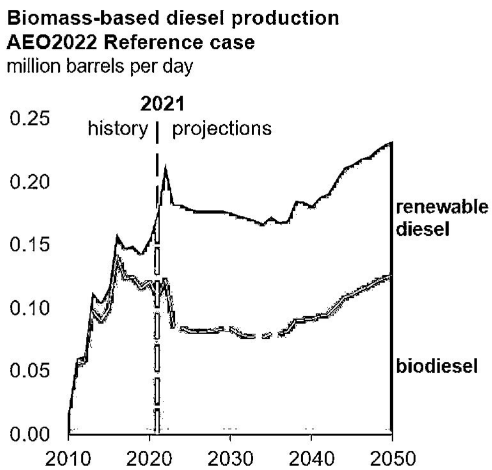
Although biodiesel has historically been the predominant biomass-based diesel fuel produced in the United States, we project a shift toward renewable diesel capacity in the medium to long term.

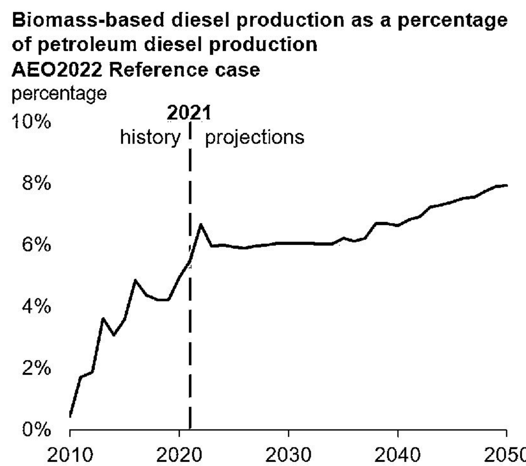
Biomass-based diesel fuels are fuels produced from biomass, such as waste fats and oils. These fuels are predominately used in diesel engines, but they can also be used as heating fuels.

Biomass-based diesel includes biodiesel and renewable diesel. Renewable diesel is chemically indistinguishable from petroleum diesel, meaning that it meets specifications for use in existing infrastructure and diesel engines. Biodiesel is a mixture of chemical compounds known as alkyl esters and is often combined with petroleum diesel in blends of 5% to 20%, known as B5 to B20, respectively. Renewable diesel is not subject to any blending limitations.

Renewable diesel's growth is a result of its fungibility, along with higher state and federal targets for renewable fuel production, favorable tax credits, and the conversion of existing petroleum refineries into renewable diesel refineries. These targets and incentives include the Renewable Fuel Standard, the California Low-Carbon Fuel Standard, and the U.S. biomass-based diesel blender credit, which applies through 2022 and allows qualified taxpayers to claim a credit of $1.00 per gallon for biodiesel or renewable diesel blended with petroleum diesel. In response to the improved economics of renewable diesel, capacity has increased in the form of new stand-alone facilities and converted petroleum refineries.

Figure 30.



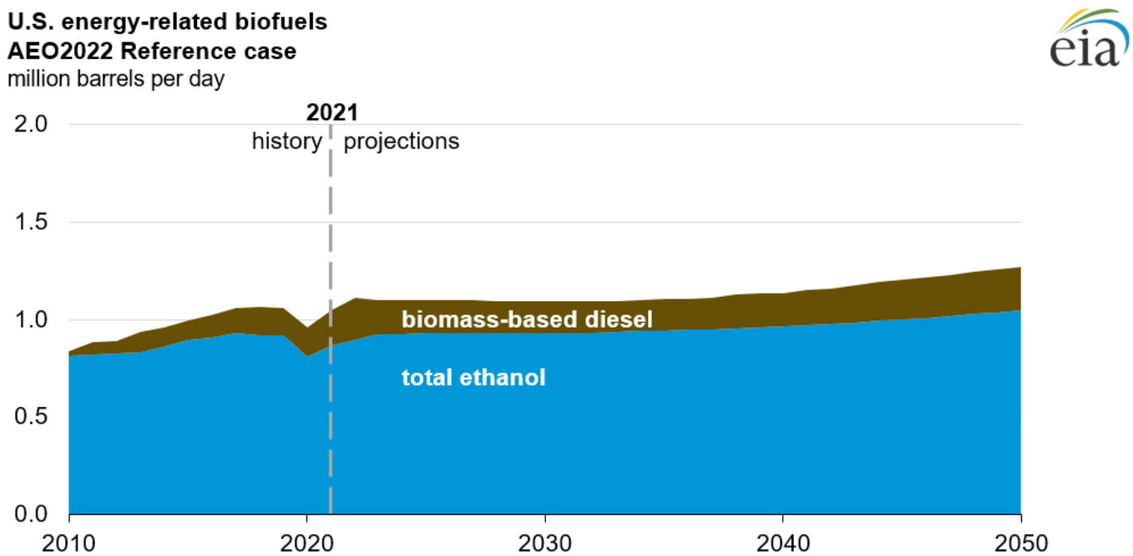


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

The current market for biomass-based diesel fuels is constrained by a combination of capacity, feedstock availability, and economics. Because the market penetration for biomass-based diesel fuels is limited by market demand, and renewable diesel and biodiesel compete for the same feedstocks, growth in renewable diesel comes partially at the expense of new biodiesel capacity. In the Reference case, the renewable diesel supply is supported by imported renewable diesel and remains higher than biodiesel supply through 2050.

Biomass-based fuels remain a small but important part of the total fuel mix

Figure 31.



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

Biomass-based diesel fuels remain a relatively small part of the total diesel market, contributing less than 8% of the total supply in 2050. By comparison, current ethanol consumption as energy in the United States approaches almost 1 million b/d in 2050, almost five times the quantity of biomass-based diesel. So, much more ethanol is consumed as energy than biomass-based diesel fuels because almost all finished motor gasoline sold in the United States is blended with 10% ethanol (E10). However, despite higher blend ratios, future growth of U.S. ethanol consumption as energy is constrained near current levels through 2050 by declining motor gasoline consumption. Renewable diesel, however, does not need to be blended, and biomass-based fuels continue to attract interest and investment because they represent a potential pathway for reducing carbon emissions in the transportation sector and provide an alternative fuel source to petroleum-based diesel fuel. We project that biomass-based diesel will continue to be a growing, but fractional, part of the total diesel fuel mix in the long term.

ENGINEERING VALUATION AND DEPRECIATION

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(3) as a means of checking the adequacy of the depreciation reserve balance or in obtaining an adjustment factor in appraisal procedure.

The process of smoothing and extending stub survivor curves by use of type curves is explained in Sec. 7.15; the procedure for estimating the probable life of a single unit by use of a type survivor curve is given in Secs. 7.21 and 7.22; and the use of type survivor curves and expectancy-life ratios is presented in Secs. 11.6 and 11.7.

METHODS OF CALCULATING SURVIVOR CURVES

Three systematic actuarial methods for calculating property survivor curves are discussed, the *annual rate*, or *retirement rate*, method, the *original group* method, and the *individual unit* method. Of these, the retirement rate method is much the best, because it is based on the collection and compilation of the data of all property in service during a period of recent years, both property retired and that still in service. The original group method uses only the data of one vintage installation. The individual unit method is a last-resort method because it uses only the data of property which has been retired.

7.9. Retirement Rate Method. The retirement data collected for use in the retirement rate method should be those for a recent normal period of, say 3 to 30 years, which will give retirement rates fairly representative of present and probable future policies and service conditions. The ideal period is one so short that it reflects only present policies and standards; yet it is long enough for sufficient retirements to have been made at each age to give reliable average retirement rates over a period that averages the ups and downs of the enterprise.

For any type of industrial property, the steps in the retirement rate method of compiling a survivor curve are as follows:

1. Determine the numbers of units, or their total costs, and the ages of the property retired each year of the experience band of years chosen for study. Table 7.3 illustrates the compilation of this information for the retirements from 1940 through 1950 for centrifugal gas pumps.

2. Determine the numbers of units, or their total costs, and ages of the property in service at the beginning of each year of the experience band. Table 7.4 illustrates the compilation of this information on exposures for the same property for which the retirements are given in Table 7.3. The experience band is 1940 to 1950, although the placement band is 1919 to 1950.

3. By using the retirements for each experience year from each vintage group as obtained in step 1, determine the total retirements during each age interval. Column (3) of Table 7.5 illustrates the result of this step. The total retirements at each age are obtained by adding the retirements from Table 7.3 on the diagonal stair-step line. Retirements on all such diagonals were made at the same average integral age. The line illustrated is for the retirements at an average age of 11 years or for the age interval of 10½–11½. The two retirements at this age are 689 from the 1939 vintage in 1950 and 10,609 from the 1935 vintage in 1946. The total retirements for the age interval are 11,298. Only one retirement, 618, was made during the age interval 0–0½ years.

4. From the property in service each year as obtained in step 2, determine the total number of units exposed to retirement at the beginning of each age interval. Column (2) of Table 7.5 illustrates the result of this step. The total exposures at each age are obtained by adding the property in service from Table 7.4 on the diagonal stair-step line in the same manner as for the retirements. For the age interval of 10½–11½ this sum is the total of 3,199, 962, 0, 996, . . . , 58,690, and 70,812, or 244,448. The exposure at the beginning of the age interval 0–0½ is the sum of the installations for each year of the experience band. For the example, this sum is obtained from column (2) of Table 7.4 by adding the installations from 1950 back to and including 1940, which are 90,676, 102,434, 180,111, . . . , 20,606, and 15,215. The total is 546,214.

5. Using the retirements at each age, as determined in step 3, and the amounts of property of each age in service determined as in step 4, calculate the retirement rate of the property at each age. These rates are illustrated in column (4) of Table 7.5 and result from the division of column (3) by column (2).

6. Calculate the percentage surviving at the beginning of each age interval by multiplying the retirement rate for each age interval by the percentage surviving at the beginning of that age interval and subtracting this product from the percentage surviving at the beginning of the same interval. Thus, using the retirement rate for the age interval of 10½–11½, the percent surviving for age 11½ is calculated as follows: 93.37 − (93.37)(0.046218) = 89.05. These surviving percentages are illustrated in column (5) of Table 7.5.

7. Plot the survivor curve from the survivor percentages found in step (6), as far as they extend. These percentages are illustrated in column (5) of Table 7.5 and plotted in Fig. 7.4. In Fig. 7.5 this curve is compared with survivor curves calculated by the original group and individual unit methods.

8. Determine the average service life from the area under the survivor curve. When the original survivor curve is not reasonably smooth or when it is a stub curve, the curve should be first smoothed and extended as explained in Secs. 7.12 to 7.15.

7.10. Original Group Method. The original group method of calculating survivor curves is applicable to vintage groups. When applied

Public Utility

Depreciation Practices

August 1996

Compiled and Edited by

Staff Subcommittee on Depreciation of

The Finance and Technology Committee

of the

National Association of Regulatory Utility Commissioners

Published by

National Association of Regulatory Utility Commissioners
1101 Vermont Avenue, N.W., Suite 200
Washington, DC 20005
Telephone (202) 898-2200
Facsimile (202) 898-2213

strictly to original cost terms. In all cases, some measure of depreciation occurring between estimates can be determined. The customary method is for a competent appraiser to study the effect of factors such as obsolescence, inadequacy, and public requirements, as well as to conduct a physical inspection of the property, or a scientific sample of it, to determine its loss in value since it was first constructed. Regardless of the method employed, in order to achieve consistency, the successive estimates must be made in the same way.

It would, however, be a staggering undertaking to attempt such estimates on an annual basis for complex and extensive utility plant. Therefore, the practice of conducting annual estimates has found little application in the utility industry. It is particularly cumbersome and inadequate because utilities need to record depreciation on a monthly basis for earnings and expense reports. A further complication, of course, is that major technological improvements tend to make questionable any year-to-year measure of depreciation that is determined by this process.

Cost Allocation Concept

This concept recognizes the original cost of the asset as a prepaid expense. As such, it must be allocated to specific accounting periods and realized on income statements during the time the asset is providing service. The unallocated amount, often called net plant or net book (gross plant less accumulated depreciation), is recorded on the asset side of the balance sheet. The cost allocation concept satisfies the accounting principle of matching expense and revenues.

On the income statement, the inflow of resources is revenue. The outflow is expense. Using up the productive capacity of assets in an accounting period is recorded in accounting records as depreciation expense.

As used above, "cost" is based on the cost valuation principle of accounting, with cost being a surrogate for value. The amount of money used to purchase the asset is the basis for the entry in accounting records. This amount is regarded as being definite and immediately determinable. The accounting objectives of verifiability and neutrality are also satisfied.

Equally important to the proper estimation of current net income is the recovery of the investment over its useful life. Depreciation accounting cannot, automatically and of itself, result in the recovery of investment in property. However, if revenues are adequate to cover depreciation expense in addition to other current expense, the investment will be recovered. On the other hand, if revenues are not sufficient to cover the depreciation expense, the investment will not be fully recovered. Recognition of depreciation merely records the fact that costs are being incurred.

Definitions

Before proceeding into an investigation of some of the associated procedures and problems, let us examine some important definitions of depreciation.

According to the Supreme Court of the United States:

> Broadly speaking, depreciation is the loss, not restored by current maintenance, which is due to all the factors causing the ultimate retirement of the property. These factors embrace wear and tear, decay, inadequacy and obsolescence. Annual depreciation is the loss which takes place in a year.[1]

The Interstate Commerce Commission defines depreciation as:

> Depreciation is the loss in service value not restored by current maintenance and incurred in connection with the consumption or prospective retirement of property in the course of service from causes against which the carrier is not protected by insurance, which are known to be in current operation, and whose effect can be forecast with a reasonable approach to accuracy.[2]

The National Association of Railroad and Utilities Commissioners in 1958 sanctioned the following definition:

> 'Depreciation,' as applied to depreciable utility plant, means the loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of utility plant in the course of service from causes which are known to be in current operation and against which the utility is not protected by insurance. Among the causes to be given consideration are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand, and requirements of public authorities.[3]

The Federal Communications Commission uses a definition in Part 32 of its rules that is almost identical to NARUC's, except that it applies to "telephone plant" instead of "utility plant," and it requires that the causes of depreciation "can be forecast with a reasonable approach to accuracy."

The definitions used by the Federal Energy Regulatory Commission for electric (Part 101 of the Code of Federal Regulations) and gas (Part 201 of the Code of Federal Regulations) companies are essentially the same as that used by NARUC. The only difference is that the definition for gas companies recognizes the exhaustion of natural resources as a cause of depreciation for natural gas companies.

Sec. 167 of the Internal Revenue Code states:

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[1] *Lindheimer v. Illinois Bell Telephone Company,* 292 U.S. 151, 167 (1934).

[2] 177 ICC 351, 422 (1931), 14700 Depreciation Charges of Telephone Companies, 15100 Depreciation Charges of Steam Railroad Companies.

[3] *Uniform System of Accounts for Class A and Class B Electric Utilities,* 1958, rev., 1962.

> There shall be allowed as a depreciation deduction a reasonable allowance for the exhaustion, wear and tear (including a reasonable allowance for obsolescence)—(1) of property used in the trade or business, or (2) the property held for the production of income.

Some of the definitions refer to depreciation as a loss in service value. "Service value" is used in a special sense, meaning the cost of plant less net salvage (net salvage is gross salvage less the cost of removal). The Uniform System of Accounts for electric utilities recommended by NARUC defines "service value" as follows:

> The difference between the original cost and the net salvage value of the utility plant.

"Loss in service value," therefore, must be understood and construed in light of its specially defined meaning.

The American Institute of Certified Public Accountants in Accounting Research and Terminology Bulletin #1 defines depreciation accounting as follows:

> Depreciation accounting is a system of accounting which aims to distribute cost or other basic value of tangible capital assets, less salvage (if any), over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not of valuation. Depreciation for the year is the portion of the total charge under such a system that is allocated to the year. Although the allocation may properly take into account occurrences during the year, it is not intended to be a measurement of the effect of all such occurrences.

This definition of depreciation accounting brings the "allocation of cost" concept into much clearer focus. It de-emphasizes the concept of depreciation expense as a "loss in service value" or an "allowance" and emphasizes the concept of depreciation expense as the cost of an asset which is allocable to a particular accounting period. This definition also clearly illustrates that the goal is recognizing cost, not providing funds for replacement of the asset.

Factors Which Affect the Retirement of Property

The sole reason for concern about depreciation is that all plant devoted to the pursuit of a business enterprise will ultimately reach the end of its useful life. Several factors cause property to be retired. They include:

1. Physical Factors
   a. Wear and tear
   b. Decay or deterioration
   c. Action of the elements and accidents

2. Functional Factors
   a. Inadequacy
   b. Obsolescence
   c. Changes in the art and technology
   d. Changes in demand
   e. Requirements of public authorities
   f. Management discretion

3. Contingent Factors
   a. Casualties or disasters
   b. Extraordinary obsolescence

Physical factors are the most readily observed causes of retirement. However, functional factors sometimes are the more frequent causes.

Inadequacy is a lack of capacity to supply what is required or demanded. For example, a telephone company's central office switch may not have sufficient capacity to process the traffic generated, or it may be unable to provide certain information services desired by customers. Thus, it may be more prudent to replace the entire switch in lieu of making additions.

Obsolescence may bring about retirements by rendering plant uneconomical, inefficient, or otherwise unfit for service because of improvements in technology or because of changes in function. Equipment manufacturers may contribute to obsolescence by discontinuing production of replacement parts or de-emphasizing maintenance, software, or other kinds of support for older equipment.

Technological advances have increased the frequency in which obsolescence causes the retirement of utility plant. Computers, the electronic chip, remote controlled operation and supervision of power distribution stations and natural gas regulating equipment, remote meter reading, fiber optic cable, as well as interest in nonutility power production and demand-side management are technological developments that have impacted utility operations.

Changes in demand reflect changing customer preferences requiring the replacement of plant which no longer permits the utility to fulfill its obligation to provide service. An example is the replacement of electric kilowatt hour meters with meters that also record usage by time of day.

Public authorities may require utility plant to be relocated because of its interference with public uses, such as highway relocations. They also may require utility plant to be replaced or refurbished because its design fails to meet current service, environmental, or safety standards. An example is the imminent expiration of operating licenses for hydraulic production plants. This has often resulted in an extensive review of the safety, environmental, recreational, as well as power generation aspects of these projects. Substantial requirements for additional maintenance and capital expenditures may be required to satisfy the concerns of regulatory agencies and their constituencies.

Although not included in the previous definitions, management discretion clearly is also a factor in the retirement of plant. This can occur when management decides to:

consumption with time (the age-life methods). The various age-life methods are presented below in accordance with the manner in which they spread depreciation expense over the life of property.

The Straight-Line Method

The straight-line method ratably charges a like amount to each accounting period over the service life of a plant item or plant group. Thus, it directly meets the depreciation objective, which perhaps accounts for its wide acceptance in utility practice. The basic formula is:

$$\text{Annual Depreciation Accrual} = \frac{\text{Depreciable Cost}}{\text{Service Life}} \qquad (1)$$

where Depreciable Cost is original or gross plant cost less estimated net salvage.
In actual practice a depreciation rate is applied to the book cost of plant.

The straight-line method is sometimes spoken of as the method of equal annual depreciation charges. For item or unit accounting, this is true if the service life and net salvage are correctly estimated from the beginning of placement in service. However, because of changes in depreciation rates, which reflect changing conditions of service and causes of retirement during the service life, the equal annual charges are not usually made even for unit depreciation. With group properties, equal annual charges seldom occur because, although the rate may be constant, the rate is applied to a changing plant balance by virtue of retirements and additions. Thus, the straight-line method is best described as the method of constant rate applied to the book cost of plant in service between depreciation review periods.

The following formula is used to determine the depreciation rate to be applied to the original or gross plant cost:

$$d = \frac{100 - c}{L} \qquad (2)$$

where d is the depreciation rate in percent
where c is the estimated average net salvage in percent
where L is the estimated average service life

The formula requires two basic estimates—service life and anticipated net salvage. With group properties, care must be exercised to be sure the life and net salvage estimates reflect averages for the entire group to which the rate will be applied. This is because the estimates are often based on consideration of the more prominent items within the account. The selection of depreciation categories discussed in Chapter III and the methods of weighting discussed in Chapter IX are factors to consider. With estimates related to an account or group of accounts, the straight-line