MATHEMATICAL TABLES

A

APPENDIX

TABLE A.1
Future value of \$1 at the end of t periods $= (1 + r)^t$

TABLE A.2
Present value of \$1 to be received after t periods $= 1/(1 + r)^t$

TABLE A.3
Present value of an annuity of \$1 per period for t periods $= [1 - 1/(1 + r)^t]/r$

TABLE A.4
Future value of an annuity of \$1 per period for t periods $= [(1 + r)^t - 1]/r$

TABLE A.5
Cumulative normal distribution

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TABLE A.1 Future value of \$1 at the end of t periods $= (1 + r)^t$

	Interest Rate								
Period	**1%**	**2%**	**3%**	**4%**	**5%**	**6%**	**7%**	**8%**	**9%**
1	1.0100	1.0200	1.0300	1.0400	1.0500	1.0600	1.0700	1.0800	1.0900
2	1.0201	1.0404	1.0609	1.0816	1.1025	1.1236	1.1449	1.1664	1.1881
3	1.0303	1.0612	1.0927	1.1249	1.1576	1.1910	1.2250	1.2597	1.2950
4	1.0406	1.0824	1.1255	1.1699	1.2155	1.2625	1.3108	1.3605	1.4116
5	1.0510	1.1041	1.1593	1.2167	1.2763	1.3382	1.4026	1.4693	1.5386
6	1.0615	1.1262	1.1941	1.2653	1.3401	1.4185	1.5007	1.5869	1.6771
7	1.0721	1.1487	1.2299	1.3159	1.4071	1.5036	1.6058	1.7138	1.8280
8	1.0829	1.1717	1.2668	1.3686	1.4775	1.5938	1.7182	1.8509	1.9926
9	1.0937	1.1951	1.3048	1.4233	1.5513	1.6895	1.8385	1.9990	2.1719
10	1.1046	1.2190	1.3439	1.4802	1.6289	1.7908	1.9672	2.1589	2.3674
11	1.1157	1.2434	1.3842	1.5395	1.7103	1.8983	2.1049	2.3316	2.5804
12	1.1268	1.2682	1.4258	1.6010	1.7959	2.0122	2.2522	2.5182	2.8127
13	1.1381	1.2936	1.4685	1.6651	1.8856	2.1329	2.4098	2.7196	3.0658
14	1.1495	1.3195	1.5126	1.7317	1.9799	2.2609	2.5785	2.9372	3.3417
15	1.1610	1.3459	1.5580	1.8009	2.0789	2.3966	2.7590	3.1722	3.6425
16	1.1726	1.3728	1.6047	1.8730	2.1829	2.5404	2.9522	3.4259	3.9703
17	1.1843	1.4002	1.6528	1.9479	2.2920	2.6928	3.1588	3.7000	4.3276
18	1.1961	1.4282	1.7024	2.0258	2.4066	2.8543	3.3799	3.9960	4.7171
19	1.2081	1.4568	1.7535	2.1068	2.5270	3.0256	3.6165	4.3157	5.1417
20	1.2202	1.4859	1.8061	2.1911	2.6533	3.2071	3.8697	4.6610	5.6044
21	1.2324	1.5157	1.8603	2.2788	2.7860	3.3996	4.1406	5.0338	6.1088
22	1.2447	1.5460	1.9161	2.3699	2.9253	3.6035	4.4304	5.4365	6.6586
23	1.2572	1.5769	1.9736	2.4647	3.0715	3.8197	4.7405	5.8715	7.2579
24	1.2697	1.6084	2.0328	2.5633	3.2251	4.0489	5.0724	6.3412	7.9111
25	1.2824	1.6406	2.0938	2.6658	3.3864	4.2919	5.4274	6.8485	8.6231
30	1.3478	1.8114	2.4273	3.2434	4.3219	5.7435	7.6123	10.063	13.268
40	1.4889	2.2080	3.2620	4.8010	7.0400	10.286	14.974	21.725	31.409
50	1.6446	2.6916	4.3839	7.1067	11.467	18.420	29.457	46.902	74.358
60	1.8167	3.2810	5.8916	10.520	18.679	32.988	57.946	101.26	176.03

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10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1.1000	1.1200	1.1400	1.1500	1.1600	1.1800	1.2000	1.2400	1.2800	1.3200	1.3600
1.2100	1.2544	1.2996	1.3225	1.3456	1.3924	1.4400	1.5376	1.6384	1.7424	1.8496
1.3310	1.4049	1.4815	1.5209	1.5609	1.6430	1.7280	1.9066	2.0972	2.3000	2.5155
1.4641	1.5735	1.6890	1.7490	1.8106	1.9388	2.0736	2.3642	2.6844	3.0360	3.4210
1.6105	1.7623	1.9254	2.0114	2.1003	2.2878	2.4883	2.9316	3.4360	4.0075	4.6526
1.7716	1.9738	2.1950	2.3131	2.4364	2.6996	2.9860	3.6352	4.3980	5.2899	6.3275
1.9487	2.2107	2.5023	2.6600	2.8262	3.1855	3.5832	4.5077	5.6295	6.9826	8.6054
2.1436	2.4760	2.8526	3.0590	3.2784	3.7589	4.2998	5.5895	7.2058	9.2170	11.703
2.3579	2.7731	3.2519	3.5179	3.8030	4.4355	5.1598	6.9310	9.2234	12.166	15.917
2.5937	3.1058	3.7072	4.0456	4.4114	5.2338	6.1917	8.5944	11.806	16.060	21.647
2.8531	3.4785	4.2262	4.6524	5.1173	6.1759	7.4301	10.657	15.112	21.199	29.439
3.1384	3.8960	4.8179	5.3503	5.9360	7.2876	8.9161	13.215	19.343	27.983	40.037
3.4523	4.3635	5.4924	6.1528	6.8858	8.5994	10.699	16.386	24.759	36.937	54.451
3.7975	4.8871	6.2613	7.0757	7.9875	10.147	12.839	20.319	31.691	48.757	74.053
4.1772	5.4736	7.1379	8.1371	9.2655	11.974	15.407	25.196	40.565	64.359	100.71
4.5950	6.1304	8.1372	9.3576	10.748	14.129	18.488	31.243	51.923	84.954	136.97
5.0545	6.8660	9.2765	10.761	12.468	16.672	22.186	38.741	66.461	112.14	186.28
5.5599	7.6900	10.575	12.375	14.463	19.673	26.623	48.039	85.071	148.02	253.34
6.1159	8.6128	12.056	14.232	16.777	23.214	31.948	59.568	108.89	195.39	344.54
6.7275	9.6463	13.743	16.367	19.461	27.393	38.338	73.864	139.38	257.92	468.57
7.4002	10.804	15.668	18.822	22.574	32.324	46.005	91.592	178.41	340.45	637.26
8.1403	12.100	17.861	21.645	26.186	38.142	55.206	113.57	228.36	449.39	866.67
8.9543	13.552	20.362	24.891	30.376	45.008	66.247	140.83	292.30	593.20	1178.7
9.8497	15.179	23.212	28.625	35.236	53.109	79.497	174.63	374.14	783.02	1603.0
10.835	17.000	26.462	32.919	40.874	62.669	95.396	216.54	478.90	1033.6	2180.1
17.449	29.960	50.950	66.212	85.850	143.37	237.38	634.82	1645.5	4142.1	10143.
45.259	93.051	188.88	267.86	378.72	750.38	1469.8	5455.9	19427.	66521.	*
117.39	289.00	700.23	1083.7	1670.7	3927.4	9100.4	46890.	*	*	*
304.48	897.60	2595.9	4384.0	7370.2	20555.	56348.	*	*	*	*

*The factor is greater than 99,999.

TABLE A.2 Present value of $1 to be received after t periods $= 1/(1 + r)^t$

	Interest Rate								
Period	**1%**	**2%**	**3%**	**4%**	**5%**	**6%**	**7%**	**8%**	**9%**
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174
2	0.9803	0.9612	0.9426	0.9246	0.9070	0.8900	0.8734	0.8573	0.8417
3	0.9706	0.9423	0.9151	0.8890	0.8638	0.8396	0.8163	0.7938	0.7722
4	0.9610	0.9238	0.8885	0.8548	0.8227	0.7921	0.7629	0.7350	0.7084
5	0.9515	0.9057	0.8626	0.8219	0.7835	0.7473	0.7130	0.6806	0.6499
6	0.9420	0.8880	0.8375	0.7903	0.7462	0.7050	0.6663	0.6302	0.5963
7	0.9327	0.8706	0.8131	0.7599	0.7107	0.6651	0.6227	0.5835	0.5470
8	0.9235	0.8535	0.7894	0.7307	0.6768	0.6274	0.5820	0.5403	0.5019
9	0.9143	0.8368	0.7664	0.7026	0.6446	0.5919	0.5439	0.5002	0.4604
10	0.9053	0.8203	0.7441	0.6756	0.6139	0.5584	0.5083	0.4632	0.4224
11	0.8963	0.8043	0.7224	0.6496	0.5847	0.5268	0.4751	0.4289	0.3875
12	0.8874	0.7885	0.7014	0.6246	0.5568	0.4970	0.4440	0.3971	0.3555
13	0.8787	0.7730	0.6810	0.6006	0.5303	0.4688	0.4150	0.3677	0.3262
14	0.8700	0.7579	0.6611	0.5775	0.5051	0.4423	0.3878	0.3405	0.2992
15	0.8613	0.7430	0.6419	0.5553	0.4810	0.4173	0.3624	0.3152	0.2745
16	0.8528	0.7284	0.6232	0.5339	0.4581	0.3936	0.3387	0.2919	0.2519
17	0.8444	0.7142	0.6050	0.5134	0.4363	0.3714	0.3166	0.2703	0.2311
18	0.8360	0.7002	0.5874	0.4936	0.4155	0.3503	0.2959	0.2502	0.2120
19	0.8277	0.6864	0.5703	0.4746	0.3957	0.3305	0.2765	0.2317	0.1945
20	0.8195	0.6730	0.5537	0.4564	0.3769	0.3118	0.2584	0.2145	0.1784
21	0.8114	0.6598	0.5375	0.4388	0.3589	0.2942	0.2415	0.1987	0.1637
22	0.8034	0.6468	0.5219	0.4220	0.3418	0.2775	0.2257	0.1839	0.1502
23	0.7954	0.6342	0.5067	0.4057	0.3256	0.2618	0.2109	0.1703	0.1378
24	0.7876	0.6217	0.4919	0.3901	0.3101	0.2470	0.1971	0.1577	0.1264
25	0.7798	0.6095	0.4776	0.3751	0.2953	0.2330	0.1842	0.1460	0.1160
30	0.7419	0.5521	0.4120	0.3083	0.2314	0.1741	0.1314	0.0994	0.0754
40	0.6717	0.4529	0.3066	0.2083	0.1420	0.0972	0.0668	0.0460	0.0318
50	0.6080	0.3715	0.2281	0.1407	0.0872	0.0543	0.0339	0.0213	0.0134

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10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576	0.7353
0.8264	0.7972	0.7695	0.7561	0.7432	0.7182	0.6944	0.6504	0.6104	0.5739	0.5407
0.7513	0.7118	0.6750	0.6575	0.6407	0.6086	0.5787	0.5245	0.4768	0.4348	0.3975
0.6830	0.6355	0.5921	0.5718	0.5523	0.5158	0.4823	0.4230	0.3725	0.3294	0.2923
0.6209	0.5674	0.5194	0.4972	0.4761	0.4371	0.4019	0.3411	0.2910	0.2495	0.2149
0.5645	0.5066	0.4556	0.4323	0.4104	0.3704	0.3349	0.2751	0.2274	0.1890	0.1580
0.5132	0.4523	0.3996	0.3759	0.3538	0.3139	0.2791	0.2218	0.1776	0.1432	0.1162
0.4665	0.4039	0.3506	0.3269	0.3050	0.2660	0.2326	0.1789	0.1388	0.1085	0.0854
0.4241	0.3606	0.3075	0.2843	0.2630	0.2255	0.1938	0.1443	0.1084	0.0822	0.0628
0.3855	0.3220	0.2697	0.2472	0.2267	0.1911	0.1615	0.1164	0.0847	0.0623	0.0462
0.3505	0.2875	0.2366	0.2149	0.1954	0.1619	0.1346	0.0938	0.0662	0.0472	0.0340
0.3186	0.2567	0.2076	0.1869	0.1685	0.1372	0.1122	0.0757	0.0517	0.0357	0.0250
0.2897	0.2292	0.1821	0.1625	0.1452	0.1163	0.0935	0.0610	0.0404	0.0271	0.0184
0.2633	0.2046	0.1597	0.1413	0.1252	0.0985	0.0779	0.0492	0.0316	0.0205	0.0135
0.2394	0.1827	0.1401	0.1229	0.1079	0.0835	0.0649	0.0397	0.0247	0.0155	0.0099
0.2176	0.1631	0.1229	0.1069	0.0930	0.0708	0.0541	0.0320	0.0193	0.0118	0.0073
0.1978	0.1456	0.1078	0.0929	0.0802	0.0600	0.0451	0.0258	0.0150	0.0089	0.0054
0.1799	0.1300	0.0946	0.0808	0.0691	0.0508	0.0376	0.0208	0.0118	0.0068	0.0039
0.1635	0.1161	0.0829	0.0703	0.0596	0.0431	0.0313	0.0168	0.0092	0.0051	0.0029
0.1486	0.1037	0.0728	0.0611	0.0514	0.0365	0.0261	0.0135	0.0072	0.0039	0.0021
0.1351	0.0926	0.0638	0.0531	0.0443	0.0309	0.0217	0.0109	0.0056	0.0029	0.0016
0.1228	0.0826	0.0560	0.0462	0.0382	0.0262	0.0181	0.0088	0.0044	0.0022	0.0012
0.1117	0.0738	0.0491	0.0402	0.0329	0.0222	0.0151	0.0071	0.0034	0.0017	0.0008
0.1015	0.0659	0.0431	0.0349	0.0284	0.0188	0.0126	0.0057	0.0027	0.0013	0.0006
0.0923	0.0588	0.0378	0.0304	0.0245	0.0160	0.0105	0.0046	0.0021	0.0010	0.0005
0.0573	0.0334	0.0196	0.0151	0.0116	0.0070	0.0042	0.0016	0.0006	0.0002	0.0001
0.0221	0.0107	0.0053	0.0037	0.0026	0.0013	0.0007	0.0002	0.0001	*	*
0.0085	0.0035	0.0014	0.0009	0.0006	0.0003	0.0001	*	*	*	*

*The factor is zero to four decimal places.

TABLE A.3 Present value of an annuity of $1 per period for t periods $= [1 - 1/(1 + r)^t]/r$

Number of Periods	Interest Rate								
	1%	2%	3%	4%	5%	6%	7%	8%	9%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285
21	18.8570	17.0112	15.4150	14.0292	12.8212	11.7641	10.8355	10.0168	9.2922
22	19.6604	17.6580	15.9369	14.4511	13.1630	12.0416	11.0612	10.2007	9.4424
23	20.4558	18.2922	16.4436	14.8568	13.4886	12.3034	11.2722	10.3741	9.5802
24	21.2434	18.9139	16.9355	15.2470	13.7986	12.5504	11.4693	10.5288	9.7066
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617

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10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576	0.7353
1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315	1.2760
2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663	1.6735
3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957	1.9658
3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452	2.1807
4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342	2.3388
4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775	2.4550
5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860	2.5404
5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681	2.6033
6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304	2.6495
6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776	2.6834
6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133	2.7084
7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404	2.7268
7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609	2.7403
7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764	2.7502
7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882	2.7575
8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971	2.7629
8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039	2.7668
8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090	2.7697
8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129	2.7718
8.6487	7.5620	6.6870	6.3125	5.9731	5.3837	4.8913	4.1212	3.5514	3.1158	2.7734
8.7715	7.6446	6.7429	6.3587	6.0113	5.4099	4.9094	4.1300	3.5558	3.1180	2.7746
8.8832	7.7184	6.7921	6.3988	6.0442	5.4321	4.9245	4.1371	3.5592	3.1197	2.7754
8.9847	7.7843	6.8351	6.4338	6.0726	5.4509	4.9371	4.1428	3.5619	3.1210	2.7760
9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220	2.7765
9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242	2.7775
9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250	2.7778
9.9148	8.3045	7.1327	6.6605	6.2463	5.5541	4.9995	4.1666	3.5714	3.1250	2.7778

TABLE A.4 Future value of an annuity of \$1 per period for t periods $= [(1 + r)^t - 1]/r$

Number of Periods	Interest Rate								
	1%	2%	3%	4%	5%	6%	7%	8%	9%
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0100	2.0200	2.0300	2.0400	2.0500	2.0600	2.0700	2.0800	2.0900
3	3.0301	3.0604	3.0909	3.1216	3.1525	3.1836	3.2149	3.2464	3.2781
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746	4.4399	4.5061	4.5731
5	5.1010	5.2040	5.3091	5.4163	5.5256	5.6371	5.7507	5.8666	5.9847
6	6.1520	6.3081	6.4684	6.6330	6.8019	6.9753	7.1533	7.3359	7.5233
7	7.2135	7.4343	7.6625	7.8983	8.1420	8.3938	8.6540	8.9228	9.2004
8	8.2857	8.5830	8.8932	9.2142	9.5491	9.8975	10.260	10.637	11.028
9	9.3685	9.7546	10.159	10.583	11.027	11.491	11.978	12.488	13.021
10	10.462	10.950	11.464	12.006	12.578	13.181	13.816	14.487	15.193
11	11.567	12.169	12.808	13.486	14.207	14.972	15.784	16.645	17.560
12	12.683	13.412	14.192	15.026	15.917	16.870	17.888	18.977	20.141
13	13.809	14.680	15.618	16.627	17.713	18.882	20.141	21.495	22.953
14	14.947	15.974	17.086	18.292	19.599	21.015	22.550	24.215	26.019
15	16.097	17.293	18.599	20.024	21.579	23.276	25.129	27.152	29.361
16	17.258	18.639	20.157	21.825	23.657	25.673	27.888	30.324	33.003
17	18.430	20.012	21.762	23.698	25.840	28.213	30.840	33.750	36.974
18	19.615	21.412	23.414	25.645	28.132	30.906	33.999	37.450	41.301
19	20.811	22.841	25.117	27.671	30.539	33.760	37.379	41.446	46.018
20	22.019	24.297	26.870	29.778	33.066	36.786	40.995	45.762	51.160
21	23.239	25.783	28.676	31.969	35.719	39.993	44.865	50.423	56.765
22	24.472	27.299	30.537	34.248	38.505	43.392	49.006	55.457	62.873
23	25.716	28.845	32.453	36.618	41.430	46.996	53.436	60.893	69.532
24	26.973	30.422	34.426	39.083	44.502	50.816	58.177	66.765	76.790
25	28.243	32.030	36.459	41.646	47.727	54.865	63.249	73.106	84.701
30	34.785	40.568	47.575	56.085	66.439	79.058	94.461	113.28	136.31
40	48.886	60.402	75.401	95.026	120.80	154.76	199.64	259.06	337.88
50	64.463	84.579	112.80	152.67	209.35	290.34	406.53	573.77	815.08
60	81.670	114.05	163.05	237.99	353.58	533.13	813.52	1253.2	1944.8

continued on next page

	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	2.1000	2.1200	2.1400	2.1500	2.1600	2.1800	2.2000	2.2400	2.2800	2.3200	2.3600
	3.3100	3.3744	3.4396	3.4725	3.5056	3.5724	3.6400	3.7776	3.9184	4.0624	4.2096
	4.6410	4.7793	4.9211	4.9934	5.0665	5.2154	5.3680	5.6842	6.0156	6.3624	6.7251
	6.1051	6.3528	6.6101	6.7424	6.8771	7.1542	7.4416	8.0484	8.6999	9.3983	10.146
	7.7156	8.1152	8.5355	8.7537	8.9775	9.4420	9.9299	10.980	12.136	13.406	14.799
	9.4872	10.089	10.730	11.067	11.414	12.142	12.916	14.615	16.534	18.696	21.126
	11.436	12.300	13.233	13.727	14.240	15.327	16.499	19.123	22.163	25.678	29.732
	13.579	14.776	16.085	16.786	17.519	19.086	20.799	24.712	29.369	34.895	41.435
	15.937	17.549	19.337	20.304	21.321	23.521	25.959	31.643	38.593	47.062	57.352
	18.531	20.655	23.045	24.349	25.733	28.755	32.150	40.238	50.398	63.122	78.998
	21.384	24.133	27.271	29.002	30.850	34.931	39.581	50.895	65.510	84.320	108.44
	24.523	28.029	32.089	34.352	36.786	42.219	48.497	64.110	84.853	112.30	148.47
	27.975	32.393	37.581	40.505	43.672	50.818	59.196	80.496	109.61	149.24	202.93
	31.772	37.280	43.842	47.580	51.660	60.965	72.035	100.82	141.30	198.00	276.98
	35.950	42.753	50.980	55.717	60.925	72.939	87.442	126.01	181.87	262.36	377.69
	40.545	48.884	59.118	65.075	71.673	87.068	105.93	157.25	233.79	347.31	514.66
	45.599	55.750	68.394	75.836	84.141	103.74	128.12	195.99	300.25	459.45	700.94
	51.159	63.440	78.969	88.212	98.603	123.41	154.74	244.03	385.32	607.47	954.28
	57.275	72.052	91.025	102.44	115.38	146.63	186.69	303.60	494.21	802.86	1298.8
	64.002	81.699	104.77	118.81	134.84	174.02	225.03	377.46	633.59	1060.8	1767.4
	71.403	92.503	120.44	137.63	157.41	206.34	271.03	469.06	812.00	1401.2	2404.7
	79.543	104.60	138.30	159.28	183.60	244.49	326.24	582.63	1040.4	1850.6	3271.3
	88.497	118.16	158.66	184.17	213.98	289.49	392.48	723.46	1332.7	2443.8	4450.0
	98.347	133.33	181.87	212.79	249.21	342.60	471.98	898.09	1706.8	3226.8	6053.0
	164.49	241.33	356.79	434.75	530.31	790.95	1181.9	2640.9	5873.2	12941.	28172.
	442.59	767.09	1342.0	1779.1	2360.8	4163.2	7343.9	22729.	69377.	*	*
	1163.9	2400.0	4994.5	7217.7	10436.	21813.	45497.	*	*	*	*
	3043.8	7471.6	18535.	29220.	46058.	*	*	*	*	*	*

*The factor is greater than 99,999.

TABLE A.5 Cumulative normal distribution

d	N(*d*)	*d*	N(*d*)	*d*	N(*d*)	*d*	N(*d*)	*d*	N(*d*)	*d*	N(*d*)
−3.00	.0013	−1.58	.0571	−0.76	.2236	0.06	.5239	0.86	.8051	1.66	.9515
−2.95	.0016	−1.56	.0594	−0.74	.2297	0.08	.5319	0.88	.8106	1.68	.9535
−2.90	.0019	−1.54	.0618	−0.72	.2358	0.10	.5398	0.90	.8159	1.70	.9554
−2.85	.0022	−1.52	.0643	−0.70	.2420	0.12	.5478	0.92	.8212	1.72	.9573
−2.80	.0026	−1.50	.0668	−0.68	.2483	0.14	.5557	0.94	.8264	1.74	.9591
−2.75	.0030	−1.48	.0694	−0.66	.2546	0.16	.5636	0.96	.8315	1.76	.9608
−2.70	.0035	−1.46	.0721	−0.64	.2611	0.18	.5714	0.98	.8365	1.78	.9625
−2.65	.0040	−1.44	.0749	−0.62	.2676	0.20	.5793	1.00	.8414	1.80	.9641
−2.60	.0047	−1.42	.0778	−0.60	.2743	0.22	.5871	1.02	.8461	1.82	.9656
−2.55	.0054	−1.40	.0808	−0.58	.2810	0.24	.5948	1.04	.8508	1.84	.9671
−2.50	.0062	−1.38	.0838	−0.56	.2877	0.26	.6026	1.06	.8554	1.86	.9686
−2.45	.0071	−1.36	.0869	−0.54	.2946	0.28	.6103	1.08	.8599	1.88	.9699
−2.40	.0082	−1.34	.0901	−0.52	.3015	0.30	.6179	1.10	.8643	1.90	.9713
−2.35	.0094	−1.32	.0934	−0.50	.3085	0.32	.6255	1.12	.8686	1.92	.9726
−2.30	.0107	−1.30	.0968	−0.48	.3156	0.34	.6331	1.14	.8729	1.94	.9738
−2.25	.0122	−1.28	.1003	−0.46	.3228	0.36	.6406	1.16	.8770	1.96	.9750
−2.20	.0139	−1.26	.1038	−0.44	.3300	0.38	.6480	1.18	.8810	1.98	.9761
−2.15	.0158	−1.24	.1075	−0.42	.3373	0.40	.6554	1.20	.8849	2.00	.9772
−2.10	.0179	−1.22	.1112	−0.40	.3446	0.42	.6628	1.22	.8888	2.05	.9798
−2.05	.0202	−1.20	.1151	−0.38	.3520	0.44	.6700	1.24	.8925	2.10	.9821
−2.00	.0228	−1.18	.1190	−0.36	.3594	0.46	.6773	1.26	.8962	2.15	.9842
−1.98	.0239	−1.16	.1230	−0.34	.3669	0.48	.6844	1.28	.8997	2.20	.9861
−1.96	.0250	−1.14	.1271	−0.32	.3745	0.50	.6915	1.30	.9032	2.25	.9878
−1.94	.0262	−1.12	.1314	−0.30	.3821	0.52	.6985	1.32	.9066	2.30	.9893
−1.92	.0274	−1.10	.1357	−0.28	.3897	0.54	.7054	1.34	.9099	2.35	.9906
−1.90	.0287	−1.08	.1401	−0.26	.3974	0.56	.7123	1.36	.9131	2.40	.9918
−1.88	.0301	−1.06	.1446	−0.24	.4052	0.58	.7191	1.38	.9162	2.45	.9929
−1.86	.0314	−1.04	.1492	−0.22	.4129	0.60	.7258	1.40	.9192	2.50	.9938
−1.84	.0329	−1.02	.1539	−0.20	.4207	0.62	.7324	1.42	.9222	2.55	.9946
−1.82	.0344	−1.00	.1587	−0.18	.4286	0.64	.7389	1.44	.9251	2.60	.9953
−1.80	.0359	−0.98	.1635	−0.16	.4365	0.66	.7454	1.46	.9279	2.65	.9960
−1.78	.0375	−0.96	.1685	−0.14	.4443	0.68	.7518	1.48	.9306	2.70	.9965
−1.76	.0392	−0.94	.1736	−0.12	.4523	0.70	.7580	1.50	.9332	2.75	.9970
−1.74	.0409	−0.92	.1788	−0.10	.4602	0.72	.7642	1.52	.9357	2.80	.9974
−1.72	.0427	−0.90	.1841	−0.08	.4681	0.74	.7704	1.54	.9382	2.85	.9978
−1.70	.0446	−0.88	.1894	−0.06	.4761	0.76	.7764	1.56	.9406	2.90	.9981
−1.68	.0465	−0.86	.1949	−0.04	.4841	0.78	.7823	1.58	.9429	2.95	.9984
−1.66	.0485	−0.84	.2005	−0.02	.4920	0.80	.7882	1.60	.9452	3.00	.9986
−1.64	.0505	−0.82	.2061	0.00	.5000	0.82	.7939	1.62	.9474	3.05	.9989
−1.62	.0526	−0.80	.2119	0.02	.5080	0.84	.7996	1.64	.9495		
−1.60	.0548	−0.78	.2177	0.04	.5160						

This table shows the probability [N(*d*)] of observing a value less than or equal to *d*. For example, as illustrated, if *d* is −.24, then N(*d*) is .4052.

KEY EQUATIONS

APPENDIX B

CHAPTER 2

1. The balance sheet identity or equation:

$$\text{Assets} = \text{Liabilities} + \text{Shareholders' equity} \quad \textbf{[2.1]}$$

2. The income statement equation:

$$\text{Revenues} - \text{Expenses} = \text{Income} \quad \textbf{[2.2]}$$

3. The cash flow identity:

$$\text{Cash flow from assets} = \text{Cash flow to creditors} + \text{Cash flow to stockholders} \quad \textbf{[2.3]}$$

where

a. Cash flow from assets = Operating cash flow (OCF) − Net capital spending − Change in net working capital (NWC)
   (1) Operating cash flow = Earnings before interest and taxes (EBIT) + Depreciation − Taxes
   (2) Net capital spending = Ending net fixed assets − Beginning net fixed assets + Depreciation
   (3) Change in net working capital = Ending NWC − Beginning NWC

b. Cash flow to creditors = Interest paid − Net new borrowing

c. Cash flow to stockholders = Dividends paid − Net new equity raised

CHAPTER 3

1. The current ratio:

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} \quad \textbf{[3.1]}$$

2. The quick or acid-test ratio:

$$\text{Quick ratio} = \frac{\text{Current assets} - \text{Inventory}}{\text{Current liabilities}} \quad \textbf{[3.2]}$$

3. The cash ratio:

$$\text{Cash ratio} = \frac{\text{Cash}}{\text{Current liabilities}} \quad \textbf{[3.3]}$$

4. The ratio of net working capital to total assets:

$$\text{Net working capital to total assets} = \frac{\text{Net working capital}}{\text{Total assets}} \quad \textbf{[3.4]}$$

5. The interval measure:

$$\text{Interval measure} = \frac{\text{Current assets}}{\text{Average daily operating costs}} \quad \textbf{[3.5]}$$

6. The total debt ratio:

$$\text{Total debt ratio} = \frac{\text{Total assets} - \text{Total equity}}{\text{Total assets}} \quad \textbf{[3.6]}$$

7. The debt-equity ratio:

$$\text{Debt-equity ratio} = \text{Total debt}/\text{Total equity} \quad \textbf{[3.7]}$$

8. The equity multiplier:

$$\text{Equity multiplier} = \text{Total assets}/\text{Total equity} \quad \textbf{[3.8]}$$

9. The long-term debt ratio:

$$\text{Long-term debt ratio} = \frac{\text{Long-term debt}}{\text{Long-term debt} + \text{Total equity}} \quad \textbf{[3.9]}$$

10. The times interest earned (TIE) ratio:

$$\text{Times interest earned ratio} = \frac{\text{EBIT}}{\text{Interest}} \quad \textbf{[3.10]}$$

11. The cash coverage ratio:

$$\text{Cash coverage ratio} = \frac{\text{EBIT} + \text{Depreciation}}{\text{Interest}} \quad \textbf{[3.11]}$$

12. The inventory turnover ratio:

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Inventory}} \quad \textbf{[3.12]}$$

13. The average days' sales in inventory:

$$\text{Days' sales in inventory} = \frac{365 \text{ days}}{\text{Inventory turnover}} \quad \textbf{[3.13]}$$

14. The receivables turnover ratio:

$$\text{Receivables turnover} = \frac{\text{Sales}}{\text{Accounts receivable}} \quad \textbf{[3.14]}$$

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15. The days' sales in receivables:

$$\text{Days' sales in receivables} = \frac{365 \text{ days}}{\text{Receivables turnover}} \quad \textbf{[3.15]}$$

16. The net working capital (NWC) turnover ratio:

$$\text{NWC turnover} = \frac{\text{Sales}}{\text{NWC}} \quad \textbf{[3.16]}$$

17. The fixed asset turnover ratio:

$$\text{Fixed asset turnover} = \frac{\text{Sales}}{\text{Net fixed assets}} \quad \textbf{[3.17]}$$

18. The total asset turnover ratio:

$$\text{Total asset turnover} = \frac{\text{Sales}}{\text{Total assets}} \quad \textbf{[3.18]}$$

19. Profit margin:

$$\text{Profit margin} = \frac{\text{Net income}}{\text{Sales}} \quad \textbf{[3.19]}$$

20. Return on assets (ROA):

$$\text{Return on assets} = \frac{\text{Net income}}{\text{Total assets}} \quad \textbf{[3.20]}$$

21. Return on equity (ROE):

$$\text{Return on equity} = \frac{\text{Net income}}{\text{Total equity}} \quad \textbf{[3.21]}$$

22. The price-earnings (PE) ratio:

$$\text{PE ratio} = \frac{\text{Price per share}}{\text{Earnings per share}} \quad \textbf{[3.22]}$$

23. The market-to-book ratio:

$$\text{Market-to-book ratio} = \frac{\text{Market value per share}}{\text{Book value per share}} \quad \textbf{[3.23]}$$

24. The Du Pont identity:

$$\text{ROE} = \underbrace{\frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}}}_{\text{Return on assets}} \times \frac{\text{Assets}}{\text{Equity}} \quad \textbf{[3.24]}$$

ROE = Profit margin
× Total asset turnover
× Equity multiplier

CHAPTER 4

1. The dividend payout ratio:

$$\text{Dividend payout ratio} = \text{Cash dividends}/\text{Net income} \quad \textbf{[4.1]}$$

2. The internal growth rate:

$$\text{Internal growth rate} = \frac{\text{ROA} \times b}{1 - \text{ROA} \times b} \quad \textbf{[4.2]}$$

3. The sustainable growth rate:

$$\text{Sustainable growth rate} = \frac{\text{ROE} \times b}{1 - \text{ROE} \times b} \quad \textbf{[4.3]}$$

4. The capital intensity ratio:

$$\text{Capital intensity ratio} = \frac{\text{Total assets}}{\text{Sales}} = \frac{1}{\text{Total asset turnover}}$$

CHAPTER 5

1. The future value of $1 invested for t periods at rate of r per period:

$$\text{Future value} = \$1 \times (1 + r)^t \quad \textbf{[5.1]}$$

2. The present value of $1 to be received t periods in the future at a discount rate of r:

$$\text{PV} = \$1 \times [1/(1 + r)^t] = \$1/(1 + r)^t \quad \textbf{[5.2]}$$

3. The relationship between future value and present value (the basic present value equation):

$$\text{PV} \times (1 + r)^t = \text{FV}_t \quad \textbf{[5.3]}$$
$$\text{PV} = \text{FV}_t/(1 + r)^t = \text{FV}_t \times [1/(1 + r)^t]$$

CHAPTER 6

1. The present value of an annuity of C dollars per period for t periods when the rate of return or interest rate is r:

$$\text{Annuity present value} = C \times \left(\frac{1 - \text{Present value factor}}{r}\right) = C \times \left\{\frac{1 - [1/(1 + r)^t]}{r}\right\} \quad \textbf{[6.1]}$$

2. The future value factor for an annuity:

$$\text{Annuity FV factor} = (\text{Future value factor} - 1)/r = [(1 + r)^t - 1]/r \quad \textbf{[6.2]}$$

3. Annuity due value = Ordinary annuity value × $(1 + r)$ **[6.3]**

4. Present value for a perpetuity:

$$\text{PV for a perpetuity} = C/r = C \times (1/r) \quad \textbf{[6.4]}$$

5. Effective annual rate (EAR), where m is the number of times the interest is compounded during the year:

$$\text{EAR} = [1 + (\text{Quoted rate}/m)]^m - 1 \quad \textbf{[6.5]}$$

6. Effective annual rate (EAR), where q stands for the continuously compounded quoted rate:

$$\text{EAR} = e^q - 1 \quad \textbf{[6.6]}$$

CHAPTER 7

1. Bond value if bond has (1) a face value of F paid at maturity, (2) a coupon of C paid per period, (3) t periods to maturity, and (4) a yield of r per period:

$$\text{Bond value} = C \times [1 - 1/(1 + r)^t]/r + F/(1 + r)^t \quad \textbf{[7.1]}$$

$$\text{Bond value} = \text{Present value of the coupons} + \text{Present value of the face amount}$$

2. The Fisher effect:

$$1 + R = (1 + r) \times (1 + h) \quad [7.2]$$
$$R = r + h + r \times h \quad [7.3]$$
$$R \approx r + h \quad [7.4]$$

CHAPTER 8

1. The dividend growth model:

$$P_0 = \frac{D_0 \times (1 + g)}{R - g} = \frac{D_1}{R - g} \quad [8.3]$$

2. Required return:

$$R = D_1/P_0 + g \quad [8.5]$$

CHAPTER 9

1. Net present value (NPV):

   NPV = Present value of future cash flows − Investment cost

2. Payback period:

   Payback period = Number of years that pass before the sum of an investment's cash flows equals the cost of the investment

3. Discounted payback period:

   Discounted payback period = Number of years that pass before the sum of an investment's *discounted* cash flows equals the cost of the investment

4. The average accounting return (AAR):

$$\text{AAR} = \frac{\text{Average net income}}{\text{Average book value}}$$

5. Internal rate of return (IRR):

   IRR = Discount rate of required return such that the net present value of an investment is zero

6. Profitability index:

$$\text{Profitability index} = \frac{\text{PV of cash flows}}{\text{Cost of investment}}$$

CHAPTER 10

1. Bottom-up approach to operating cash flow (OCF):

$$\text{OCF} = \text{Net income} + \text{Depreciation} \quad [10.1]$$

2. Top-down approach to operating cash flow (OCF):

$$\text{OCF} = \text{Sales} - \text{Costs} - \text{Taxes} \quad [10.2]$$

3. Tax shield approach to operating cash flow (OCF):

$$\text{OCF} = (\text{Sales} - \text{Costs}) \times (1 - T) + \text{Depreciation} \times T \quad [10.3]$$

CHAPTER 11

1. Accounting break-even level:

$$Q = (\text{FC} + D)/(P - v) \quad [11.1]$$

2. Relationship between operating cash flow (OCF) and sales volume:

$$Q = (\text{FC} + \text{OCF})/(P - v) \quad [11.3]$$

3. Cash break-even level:

$$Q = \text{FC}/(P - v)$$

4. Financial break-even level:

$$Q = (\text{FC} + \text{OCF*})/(P - v)$$

   where

   OCF* = Zero NPV cash flow

5. Degree of operating leverage (DOL):

$$\text{DOL} = 1 + \text{FC}/\text{OCF} \quad [11.4]$$

CHAPTER 12

1. Variance of returns, Var(R) or σ^2:

$$\text{Var}(R) = \frac{1}{T - 1}[(R_1 - \bar{R})^2 + \cdots + (R_T - \bar{R})^2] \quad [12.3]$$

2. Standard deviation of returns, SD(R) or σ:

$$\text{SD}(R) = \sqrt{\text{Var}(R)}$$

CHAPTER 13

1. Risk premium:

   Risk premium = Expected return − Risk-free rate [13.1]

2. Expected return on a portfolio:

$$\text{E}(R_P) = x_1 \times \text{E}(R_1) + x_2 \times \text{E}(R_2) + \cdots + x_n \times \text{E}(R_n) \quad [13.2]$$

3. The reward-to-risk ratio:

$$\text{Reward-to-risk ratio} = \frac{\text{E}[R_i] - R_f}{\beta_i}$$

4. The capital asset pricing model (CAPM):

$$\text{E}(R_i) = R_f + [\text{E}(R_M) - R_f] \times \beta_i \quad [13.7]$$

CHAPTER 14

1. Value of a call option at maturity:

   a. $C_1 = 0$ if $(S_1 - E) \leq 0$ [14.1]

   b. $C_1 = S_1 - E$ if $(S_1 - E) > 0$ [14.2]

2. Bounds on the value of a call option:

   a. Upper bound:

$$C_0 \leq S_0 \quad [14.3]$$

   b. Lower bound:

$$C_0 \geq 0 \text{ if } S_0 - E < 0$$
$$C_0 \geq S_0 - E \text{ if } S_0 - E \geq 0 \quad [14.4]$$

3. $S_0 = C_0 + E/(1 + R_f)$

$$C_0 = S_0 - E/(1 + R_f) \quad [14.5]$$

4. Value of a call that is certain to finish in-the-money:

Call option value
= Stock value
− Present value of the exercise price

$$C_0 = S_0 - E/(1 + R_f)^t \quad \textbf{[14.6]}$$

CHAPTER 15

1. Required return on equity, R_E (dividend growth model):

$$R_E = D_1/P_0 + g \quad \textbf{[15.1]}$$

2. Required return on equity, R_E (CAPM):

$$R_E = R_f + \beta_E \times (R_M - R_f) \quad \textbf{[15.2]}$$

3. Required return on preferred stock, R_P:

$$R_P = D/P_0 \quad \textbf{[15.3]}$$

4. The weighted average cost of capital (WACC):

$$\text{WACC} = (E/V) \times R_E + (D/V) \times R_D \times (1 - T_C) \quad \textbf{[15.6]}$$

5. Weighted average flotation cost, f_A:

$$f_A = \frac{E}{V} \times f_E + \frac{D}{V} \times f_D \quad \textbf{[15.8]}$$

CHAPTER 16

1. Rights offerings:

a. Number of new shares:

Number of new shares

$$= \frac{\text{Funds to be raised}}{\text{Subscription price}} \quad \textbf{[16.1]}$$

b. Number of rights needed:

Number of rights needed to buy a share of stock

$$= \frac{\text{Old shares}}{\text{New shares}} \quad \textbf{[16.2]}$$

c. Value of a right:

Value of a right = Rights-on price − Ex-rights price

CHAPTER 17

1. Modigliani-Miller Propositions (no taxes):

a. Proposition I:

$$V_L = V_U$$

b. Proposition II:

$$R_E = R_A + (R_A - R_D) \times (D/E) \quad \textbf{[17.1]}$$

2. Modigliani-Miller propositions (with taxes):

a. Value of the interest tax shield:

Value of the interest tax shield
$= (T_C \times R_D \times D)/R_D$ **[17.2]**
$= T_C \times D$

b. Proposition I:

$$V_L = V_U + T_C \times D \quad \textbf{[17.3]}$$

c. Proposition II:

$$R_E = R_U + (R_U - R_D) \times (D/E) \times (1 - T_C) \quad \textbf{[17.4]}$$

CHAPTER 19

1. The operating cycle:

Operating cycle = Inventory period
+ Accounts receivable period **[19.4]**

2. The cash cycle:

Cash cycle = Operating cycle
− Accounts payable period **[19.5]**

CHAPTER 20

1. Float measurement:

a. Average daily float:

$$\text{Average daily float} = \frac{\text{Total float}}{\text{Total days}} \quad \textbf{[20.1]}$$

b. Average daily float:

Average daily float
= Average daily receipts
× Weighted average delay **[20.2]**

2. The Baumol-Allais-Tobin (BAT) model:

a. Opportunity costs:

$$\text{Opportunity costs} = (C/2) \times R \quad \textbf{[20A.1]}$$

b. Trading costs:

$$\text{Trading costs} = (T/C) \times F \quad \textbf{[20A.2]}$$

c. Total cost:

Total cost = Opportunity costs
+ Trading costs **[20A.3]**

d. The optimal initial cash balance:

$$C^* = \sqrt{(2T \times F)/R} \quad \textbf{[20A.4]}$$

3. The Miller-Orr model:

a. The optimal cash balance:

$$C^* = L + (3/4 \times F \times \sigma^2/R)^{1/3} \quad \textbf{[20A.5]}$$

b. The upper limit:

$$U^* = 3 \times C^* - 2 \times L \quad \textbf{[20A.6]}$$

CHAPTER 21

1. The size of receivables:

Accounts receivable
= Average daily sales × ACP **[21.1]**

2. NPV of switching credit terms:

a. Present value of switching:

$$\text{PV} = [(P - v)(Q' - Q)]/R \quad \textbf{[21.4]}$$

b. Cost of switching:

$$\text{Cost of switching} = PQ + v(Q' - Q) \quad \textbf{[21.5]}$$

c. NPV of switching:

NPV of switching = $-[PQ + v(Q' - Q)] + (P - v) \times (Q' - Q)/R$ **[21.6]**

3. NPV of granting credit:
   a. With no repeat business:
   $$\text{NPV} = -v + (1 - \pi)P/(1 + R) \quad \textbf{[21.8]}$$
   b. With repeat business:
   $$\text{NPV} = -v + (1 - \pi)(P - v)/R \quad \textbf{[21.9]}$$
4. The economic order quantity (EOQ) model:
   a. Total carrying costs:
   $$\begin{aligned}&\text{Total carrying costs}\\&= \text{Average inventory}\\&\quad \times \text{Carrying costs per unit}\\&= (Q/2) \times \text{CC}\end{aligned} \quad \textbf{[21.10]}$$
   b. Total restocking costs:
   $$\begin{aligned}&\text{Total restocking costs}\\&= \text{Fixed cost per order}\\&\quad \times \text{Number of orders} = F \times (T/Q)\end{aligned} \quad \textbf{[21.11]}$$
   c. Total costs:
   $$\begin{aligned}\text{Total costs} &= \text{Carrying costs}\\&\quad + \text{Restocking costs}\\&= (Q/2) \times \text{CC}\\&\quad + F \times (T/Q)\end{aligned} \quad \textbf{[21.12]}$$
   d. The optimal order size Q^*:
   $$Q^* = \sqrt{\frac{2T \times F}{\text{CC}}} \quad \textbf{[21.16]}$$

CHAPTER 22

1. Purchasing power parity (PPP):
   $$\text{E}(S_t) = S_0 \times [1 + (h_{FC} - h_{US})]^t \quad \textbf{[22.3]}$$
2. Interest rate parity (IRP):
   a. Exact, single period:
   $$F_1/S_0 = (1 + R_{FC})/(1 + R_{US}) \quad \textbf{[22.4]}$$
   b. Approximate, multiperiod:
   $$F_t = S_0 \times [1 + (R_{FC} - R_{US})]^t \quad \textbf{[22.7]}$$
3. Uncovered interest parity (UIP):
   $$\text{E}(S_t) = S_0 \times [1 + (R_{FC} - R_{US})]^t \quad \textbf{[22.9]}$$
4. International Fisher effect (IFE):
   $$R_{US} - h_{US} = R_{FC} - h_{FC} \quad \textbf{[22.10]}$$

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ANSWERS TO SELECTED END-OF-CHAPTER PROBLEMS

APPENDIX C

CHAPTER 2

2.2 $165,100

2.6 $110,000

2.10 $200

2.14
a. $49,080
b. $22,900
c. $2,050
d. $3,730

2.18
a. Tax_{Growth} = $16,130
Tax_{Income} = $2,788,000
b. $3,400

2.22
a. 2006 = $1,845
2007 = $2,380
b. $25
c. Fixed assets sold = $70
Cash flow from assets = $2,105
d. Debt retired = $200
Cash flow to creditors = $134

2.26 Cash flow from assets = −$869.18
Cash flow to creditors = −$1,437.00
Cash flow to stockholders = $567.82

CHAPTER 3

3.2 Net income = $1.92 million
ROA = 10.67%
ROE = 17.45%

3.6 EPS = $2.43
DPS = $0.76
BVPS = $19.52
Market-to-book ratio = 2.97 times
PE ratio = 23.88 times

3.10 98.61 days

3.18 $195.27

3.22 Firm A: 44.44%
Firm B: 50.91%

3.26
a. 1.48 times; 1.46 times
b. 0.86 times; 0.86 times
c. 0.52 times; 0.53 times
d. 1.16 times
e. 8.25 times
f. 20.61 times
g. 0.52; 0.52
h. 2.10; 2.07
i. 2.10; 2.07
j. 5.94 times
k. 8.16 times
l. 11.10%
m. 12.91%
n. 26.69%

CHAPTER 4

4.2 −$2,035

4.5 5.60%

4.12 8.28%

4.16 11.11%

4.20 1.32 times

4.22 Sustainable growth rate = 11.39%
New borrowing = $13,671
Internal growth rate = 2.82%

4.28 16.26%

CHAPTER 5

5.2 $10,338.69
$23,802.15
$143,080.66
$413,943.81

5.6 10.04%

5.10 $136,931,471.85

5.14 $0.10

5.18 $327,975.21
$105,599.24

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CHAPTER 6

6.2 @ 5%: $PV_X = \$45,242.49$
$PV_Y = \$38,965.29$
@ 22%: $PV_X = \$25,334.87$
$PV_Y = \$25,772.76$

6.6 $366,546.89

6.10 $250,000

6.14 First National EAR = 13.92%
First United EAR = 13.85%

6.18 $23,260.62

6.22 APR = 1,733.33%
EAR = 313,916,515.69%

6.26 $22,536.47

6.30 8.63% semiannual
4.22% quarterly
1.39% monthly

6.38 $701,276.07

6.42 $392,025.82

6.46 Profit = $6,492.27
Breakeven = 15.54%

6.50 $59,507.30

6.54 $1,232.87

6.58 PV of lease payments = $12,128.49
PV of purchase = $16,191.18
Breakeven resale price = $20,161.86

6.60 EAR = 13.64%

6.64 Refundable fee:
APR = 7.27%
EAR = 7.52%
Nonrefundable fee:
APR = 7.20%
EAR = 7.40%

6.70 14.52%

6.74 8.47%

CHAPTER 7

7.4 5.83%

7.8 8.30%

7.12 8.45%

7.26 **a.** 20,000 coupon bonds; 152,241 zeroes
b. $21,400,000; $152,241,760

7.28 $6,112.81

CHAPTER 8

8.2 10.21%

8.6 $3.40

8.10 $47.55

8.14 $2.81

8.18 Close = $50.60
Net income = $89,947,090

8.22 **a.** $42.40
b. $44.26

CHAPTER 9

9.4 1.43 years; 2.38 years; 3.39 years

9.8 @ 11%: NPV = $5,906.83
@30%: NPV = −$3,295.40

9.12 **a.** $IRR_A = 20.30\%$
$IRR_B = 18.55\%$
b. $NPV_A = \$6,588.52$
$NPV_B = \$7,594.13$
c. Crossover rate = 14.25%

9.16 **a.** $PI_I = 1.119$
$PI_{II} = 1.264$
b. $NPV_I = \$4,763.34$
$NPV_{II} = \$3,169.80$

9.20 **a.** $C = I/N$
b. $C > I/\text{PVIFA}_{R\%,N}$
c. $C > 2.0^* I/\text{PVIFA}_{R\%,N}$

CHAPTER 10

10.2 $354,000,000

10.8 $1,645,532

10.12 $CF_0 = -\$4,500,000$
$CF_1 = \$1,864,451$
$CF_2 = \$2,024,768$
$CF_3 = \$2,134,781$
NPV = $295,637.42

10.16 −$99,136.87

10.22 $0.02757

CHAPTER 11

11.2 Total costs = $5,430,500
Marginal cost = $29.87
Average cost = $36.20
Minimum revenue = $297,800

11.8 $D = 582,500$
$P = \$75.22$
VC = $49.62

11.12 OCF = $39,091
DOL = 4.837

11.18 DOL = 1.3842
$DOL_A = 2.6522$

11.22 $\Delta NPV/\Delta P = \$140,210$
$DNPV/\Delta Q = \$1,100$

11.28 DOL = 1.1599
ΔOCF = +2.58%

CHAPTER 12

12.2 $R_d = 2.44\%$
$R_c = 15.48\%$

12.6 2.72%; 3.11%

12.16 $R_A = 11.83\%$
$R_G = 9.62\%$

12.20 12.51%; 12.15%; 11.42%

CHAPTER 13

13.2 13.98%

13.6 12.30%

13.10 **a.** 8.41%
b. $\sigma_P^2 = .03029$
$\sigma_P = 17.41\%$

13.14 1.21

13.18 0.0833

13.24 $C = \$313,333$
$R_F = \$211,667$

13.26 $\beta_I = 4.27$
$\sigma_I = 16.12\%$
$\beta_{II} = 0.99$
$\sigma_{II} = 26.39\%$

CHAPTER 14

14.4 **a.** \$9.25
b. \$1.38

14.8 **a.** $D_0 = \$900.93$
b. $E_0 = \$382.06$

14.12 \$5.11

14.14 76.67%; 23.33%

14.16 **a.** \$399,118.50
b. Abandon if Q < 4,676

14.22 **a.** \$4,811,802
b. \$12,403,973

CHAPTER 15

15.2 14.70%

15.4 $R_A = 13.27\%$; $R_G = 13.18\%$

15.8 Book value = \$120,000,000
Market value = \$106,100,000
Aftertax cost = 5.17%

15.12 **a.** $E/V = 0.3816$
$D/V = 0.6184$
b. $E/V = 0.8225$
$D/V = 0.1775$

15.16 **a.** $D/V = 0.2055$
$P/V = 0.0432$
$E/V = 0.7513$
b. 13.49%

15.20 Break-even cost = \$50,638,298

CHAPTER 16

16.2 **a.** \$60, anything greater than \$0
b. 909,091, 5.72
c. \$59.26, \$0.74

16.6 1,270,186

16.8 No change;
declines by \$0.83;
declines by \$1.67

16.14 \$3,964.88

CHAPTER 17

17.2 **a.** \$1.63, \$4.06, \$5.69
b. \$1.45, \$5.20, \$7.70

17.6 **a.** \$6.67, \$8.18, \$5.22
b. \$5,750
c. \$5,750
d. \$5,750

17.10 \$2,750,000

17.12 **a.** 16.78%
b. 13.92%
c. 21.63%, 17.77%, 13.92%

17.16 \$236.928.57

CHAPTER 18

18.2 **a.** 2,000 new shares
b. 5,000 new shares

18.4 **a.** \$45.00
b. \$65.22
c. \$52.63
d. 416,667; 287,000; 356,250, 142,857

18.8 Shares outstanding = 402,500
Capital surplus = \$2,647,500

18.10 New borrowings = \$1,332
Capital outlays = \$2,442

18.14 $P_0 = \$35.33$
$D = \$21.73$

CHAPTER 19

19.2 Cash = \$1,520
Current assets = \$5,150

19.4 **a.** *I,I*
b. *I,N*
c. *D,D*
d. *D,D*

e. *D,N*
f. *I,I*

19.6 Operating cycle = 87.67 days
Cash cycle = 39.31 days

19.8 **a.** $219.00; $234.00; $258.00; $234.60
b. $204.00; $219.00; $234.00; $258.00
c. $209.00; $224.00; $242.00; $250.20

19.10 **a.** $193,333.33
b. $222,857.14
c. $252,321.43
$280,780.57
$308,250.00

19.14 **a.** 4.47%
b. 7.99%
c. 7.82%

19.18 10.47%

CHAPTER 20

20.2 **a.** $68,000
−$58,000
$10,000
b. $68,000
−$29,000
$39,000

20.6 **a.** $21,600
b. 2.48 days
c. $21,600
d. $4.00
e. $13,050

20.10 NPV = $5,850,000
Net savings = $292,500

APPENDIX 20A

20A.2 $2,535.46

20A.4 **a.** Opportunity cost = $13.50
Trading cost = $388.89
b. $2,415.23

20A.10 6.80%

CHAPTER 21

21.2 $6,090,411

21.6 Sales = $373,690
Accounts receivable turnover = 8.691 times

21.10 NPV = $580,358.33

21.12 Carrying cost = $8,325
Order cost = $6,500
EOQ = 397.63
Orders = 58.85 per year

21.16 Net savings = $1,260

APPENDIX 21A

21A.2 **a.** 3/10, net 30
b. $264,000
d. NPV = −$2,169,600
Break-even price = $98.76
Break-even discount = 10.89%

21A.4 **b.** $69.94
c. NPV = −$189,046.97

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