UNIVERSITI SAINS MALAYSIA
MASTER OF BUSINESS ADMINISTRATION

Second Semester Examination
Academic Session 1999/2000

February 2000

AGW 619 - CORPORATE FINANCE

Time: [3 hours]

INSTRUCTIONS:
Please ensure that this examination paper consist of **TWELVE (12)** printed pages before you begin.
Answer **ALL** Questions from SECTION A, and any **THREE (3)** Questions from SECTION B.

Section A **(COMPULSORY)**

1. Which of the following factors in the discounted cash flow (DCF) approach to estimating the cost of common equity is the *least* difficult to estimate?

   a) Expected growth rate, g.
   b) Dividend yield, D_1/P_0.
   c) Required return, k_s.
   d) Expected rate of return, k_s.
   e) All of the above are equally difficult to estimate.

2. Wak Brothers uses the CAPM to calculate the cost of equity capital. The company's capital structure consists of common stock, preferred stock, and debt. Which of the following events will *reduce* the company's WACC?

   a) A reduction in the market risk premium.
   b) An increase in the risk-free rate.
   c) An increase in the company's beta.
   d) An increase in expected inflation.
   e) An increase in the floatation costs associated with issuing preferred stock.

3. Which of the following statements is most correct?

   a) Since stockholders do not generally pay corporate taxes, corporations should focus on before-tax cash flows when calculating the weighted average cost of capital (WACC).
   b) When calculating the WACC. Firms should include the costs of accounts payable.
   c) When calculating the WACC, firms should rely on historical costs rather than marginal cost of capital.
   d) Answers a and b are correct.
   e) None of the answers above is correct.

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4. Assume a project has normal cash flows (i.e., the initial cash flow is negative, and all other cash flows are positive). Which of the following statements is most correct?

   a) All else equal, a project's IRR increases as the cost of capital declines.
   b) All else equal, a project's NPV increases as the cost of capital declines.
   c) All else equal, a project's MIRR is unaffected by changes in the cost of capital.
   d) Answers a and b are correct.
   e) Answers b and c are correct.

5. Project A has an internal rate of return (IRR) of 15 %. Project B has an IRR of 14 %. Both projects have a cost of capital of 12 %. Which of the following statements is most correct?

   a) Both projects have a positive net present value (NPV).
   b) Project A must have a higher NPV than Project B.
   c) If the cost of capital were less than 12 %, Project B would have a higher IRR than Project A.
   d) Statements a and c are correct.
   e) Statements a, b, and c are correct.

6. Two mutually exclusive projects each have a cost of RM10,000. The total undiscounted cash flows from Project L are RM15,000, while the undiscounted cash flows from project S total RM13,000. Their NPV profiles cross at a discount rate of 10%. Which of the following statements best describes this situation?

   a) The NPV and IRR methods will select the same project if the cost of capital is *greater than* 10%.
   b) The NPV and IRR methods will select the same project if the cost of capital is *less than* 10%.
   c) To determine if a ranking conflict will occur between the two projects the cost of capital is needed as well as an additional piece of information.
   d) Project L should be selected at any cost of capital because it has a higher IRR.
   e) Project S should be selected at any cost of capital, because it has a higher IRR.

7. When evaluating a *new* project, the firm should consider all of the following factors *except:*

   a) Changes in working capital attributable to the project.
   b) Previous expenditures associated with a market test to determine the feasibility of the project, if the expenditures have been expensed for tax purposes.
   c) The current market value of any document to be replaced.
   d) The resulting difference in depreciation expense if the project involves replacement.
   e) All of the statements above should be considered.

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8. Which of the following statements is correct?

a) Capital budgeting analysis for expansion and replacement projects is essentially the same because the types of cash flows involved are the same.
b) The replacement decision involves an analysis of two independent projects where the relevant cash flows include the initial investment, additional depreciation, and the terminal value.
c) The change in working capital for a project is the difference between the required increase in current assets and the spontaneous increase in current liabilities and is always positive.
d) Net cash flow for capital budgeting includes return on capital, which is net income, and return of capital, which is depreciation.
e) When a firm implements a project which requires an increase in working capital, both the increase in current assets and current liabilities must be financed.

9. Regarding the net present value of a replacement decision, which of the following statements is *false*?

a) The present value of the after-tax cost reduction benefits resulting from the new investment is treated as an inflow.
b) The after-tax market value of the old equipment is treated as an inflow at $t = 0$.
c) The present value of depreciation expenses on the new equipment multiplied by the tax rate, is treated as an inflow.
d) Any loss on the sale of the old equipment is multiplied by the tax rate and is treated as an outflow at $t = 0$.
e) An increase in net working capital is treated as an outflow when the project begins and is an inflow when the project ends.

10. A firm is considering the purchase of an asset whose risk is greater than the current risk of the firm, based on any method for assessing risk. In evaluating this asset, the decision maker should:

a) Increase the IRR of the asset to reflect the greater risk.
b) Increase the NPV of the asset to reflect the greater risk.
c) Reject the asset, since its acceptance would increase the risk of the firm.
d) Ignore the risk differential if the asset to be accepted would comprise only a small fraction of the total assets of the firm.
e) Increase the cost of capital used to evaluate the project to reflect the higher risk of the project.

11. A company estimates that an average-risk project has a WACC of 10%, a below average risk project has a WACC of 8%, and an above average risk project has a WACC of 12%. Which of the following independent projects should the company accept?

a) Project A has average risk and an IRR = 9%.
b) Project B has below average risk and an IRR = 8.5%
c) Project C has above average risk and an IRR = 11%.
d) All of the projects above should be accepted.
a. None of the projects above should be accepted.

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12. Which of the following methods involves calculating an average beta for firms in a similar business and then applying that beta to determine the beta of its own project?
    a) Risk premium method.
    b) Pure play method.
    c) Accounting beta method.
    d) CAPM method.
    e) Answers b and c are correct.

13. Which of the following statements is most correct?

    a) One of the key steps in the development of pro forma financial statements is to identify those assets and liabilities which increase spontaneously with net income.
    b) The first, and most critical step in constructing a set of pro forma financial statements is establishing the sales forecast.
    c) Pro forma financial statements are primarily used to assess a firm's historical performance.
    d) The capital intensity ratio reflects how rapidly a firm turns over its assets and is the reciprocal of the fixed assets turnover ratio.
    e) The percentage of sales method produces accurate results when fixed assets are lumpy and when economies of scale are present.

14. The percentage of sales method produces accurate results unless which of the following conditions is/are present?

    a) Fixed assets are "lumpy"
    b) Strong economies of scale are present.
    c) Excess capacity exists because of a temporary recession.
    d) Answers a,b, and c all make the percentage of sales method inaccurate.
    e) Answers a and c make the percentage of sales method inaccurate, but the assumption of the economies of scale is built into the percentage of sales method.

15. Ridgefield Enterprises has total assets of RM300 million. The company currently has no debt in its capital structure. The company's basic earning power is 15%. The company is contemplating a recapitalization where it will issue debt at 10% and use the proceed to buy back shares of the company's common stock. If the company proceeds with the recapitalization, its operating income, total assets, and tax rate will remain the same. Which of the following will occur as a result of the recapitalization?

    a) The company's ROA will decline.
    b) The company's ROE will increase.
    c) The company's basic earning power will decline.
    d) Answers a and b are correct.
    e) All of the above answers are correct.

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16. If debt financing is used, which of the following is *true*?

a) The percentage change in net operating income is greater than a given percentage change in net income.
b) The percentage change in net operating income is equal to a given percentage change in net income.
c) The percentage change in net income relative to the percentage change in net operating income depends on the interest rate charged on debt.
d) The percentage change in net operating income is less than the percentage change in net income.
e) The degree of operating leverage is greater than 1.

17. Which of the following statements is most correct?

a) Since debt financing raises the firm's financial risk, raising a company's debt ratio will always increase the company's WACC.
b) Since debt financing is cheaper than equity financing, raising a company's debt ratio will always reduce the company's WACC.
c) Increasing a company's debt ratio will typically reduce the marginal cost of both debt and equity financing; however, it still may raise the company's WACC.
d) Statements a and c are correct.
e) None of the statements above is correct.

18. The trade-off theory provides several insights to financial managers concerning optimal capital structure. Which of the following insights is false?

a) Other things equal, firms with large amounts of marketable fixed assets should use more debt financing than firms whose value comes mostly from intangible assets.
b) Other things equal, firms with high corporate tax rates should use less debt financing than firms with low tax rates.
c) Other things equal, firms with high business risk should use less debt financing than firms with low business risk.

19. As a general rule, the capital structure that

a) maximizes expected EPS also maximizes the price per share of common stock.
b) minimizes the interest rate on debt also maximizes the expected EPS.
c) minimizes the required rate on equity also maximizes the stock price.
d) maximizes the price per share of common stock also minimizes the WACC at any given volume of financing.
e) none of the above is a true statements.

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20. Which of the following statements concerning capital structure theory is false?

a) The major contribution of Miller's theory is that it demonstrates that personal taxes decrease the value of corporate debt.
b) Under MM with zero taxes, financial leverage has no effect on firm value.
c) Under MM with corporate taxes, the value of the levered firm exceeds the value of the unlevered firm by the product of the tax rate times the market value dollar amount of debt.
d) Under MM with corporate taxes, k_s increases with leverage, and this increase is just sufficient to offset the tax benefits of debt financing.
e) Under MM with corporate taxes, the effect of business risk is automatically incorporated because k_{sL} is a function of k_{sU}.

(25 marks)

Section B

Answer any **THREE (3)** of the following questions.

1. (a) Sidek Copy Company is contemplating the replacement of its old printing machine with a new model costing RM60,000. The old machine which originally cost RM40,000, has 6 years of expected life remaining and a current book value of RM30,000 versus a current market value of RM24,000. The Company's corporate tax rate is 40%. It sells the old machine at market value, what is the initial after-tax outlay for the new printing machine?

(8 marks)

(b) Raksasa Steel is forecasting the following numbers:

EBIT	RM1,000,000
Interest Expense	300,000
ROE	20 %

The company is in the 40% tax bracket. After putting together the forecast the company is considering a proposal from its CFO (Chief Financial Officer) which calls for an increase in the company's debt ratio. If the CFO's policy is adopted, the company will reduce the number of common shares by 25 % and increase its interest expense by 20 %. What will be the company's forecasted ROE if the company adopts the CFO's recommendation? (Assume that the change in financing has no impact on EBIT)

(12 marks)

(c) Explain some of the contributing factors that hinders the development of the Malaysian bond market.

(5 marks)

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2. (a) A company is analyzing two mutually exclusive projects, S and L, whose cash flows are shown below:

Years	0 k = 12%	1	2	3
S	(RM1,000)	1,000	350	50
L	(RM1,100)	0	300	1,500

The company's cost of capital is 12%, and it can get an unlimited amount of capital at that cost. What is the regular IRR (not MIRR) of the *better* project, that is, the project which the company should choose if it wants to maximize stock price?

(8 marks)

(b) Club Auto Parts' last dividend, D_0 was RM0.50, and the company expects to experience no growth for the next 2 years. However, the company will grow at an annual rate of 5 % in the third and fourth years, and beginning with the firth year, it should attain a 10 % growth rate which it will sustain thereafter. The company has a required rate of return of 12 %. What should be the price per share of the company's stock at the end of the second year, P_2?

(12 marks)

(c) Explain the difference between interest rate price risk and coupon reinvestment rate risk of bonds.

(5 marks)

3. (a) Stock X and the market have had the following rates of returns over the past four years.

Year	Stock X	Market
1995	12 %	14 %
1996	5	2
1997	11	14
1998	-7	-3

60% of your portfolio is invested in Stock X, and the remaining 40 % is invested in Stock Y. The risk-free rate is 6 % and the market risk premium is also 6 %. You estimate that 14 % is the required rate of return on your portfolio. What is the beta of Stock Y?

(8 marks)

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(b) Given the following information, what is the required cash outflow associated with the acquisition of a new machine; that is, in a project analysis, what is the cash outflow at t = 0?

Purchase price of new machine	RM8,000
Installation charge	2,000
Market value of old machine	2,000
Book value of old machine	1,000
Inventory decrease if new machine is installed	1,000
Accounts payable increase if new machine is installed	500
Tax rate	35 %
Cost of capital	15 %

(12 marks)

(c) What impact does the efficient market hypothesis (EMH) have on the decisions concerning the investment in securities? What impact does the EMH have on corporate financing decisions?

(5 marks)

4. (a) Lakna Enterprises, an all-equity firm, is considering a new capital investment. Analysis has indicated that the proposed investment has a beta of 0.5 and will generate an expected return of 7 %. The firm currently has a required return of 10.75 % and a beta of 1.25. The investment, if undertaken, will double the firm's total assets. If k_{RF} = 7 % and the market return is 10 %, should the firm undertake the investment?

(8 marks)

(b) Colour Bricks Bhd.(CBB) has a total market value of RM200 million, consisting of 2 million shares of common stock selling for RM50 per share and RM100 million of 10% perpertual bonds currently selling at par. CBB pays out all earnings as dividends, and its marginal tax rate is 40%. The firm's earnings before interest and taxes (EBIT) are R30 million. Management is considering increasing CBB's debt to RM140 million by calling in all the old bonds and issuing new debt with a 12% coupon which sells at par. The additional funds will be used to repurchase stock at the new equilibrium price. If CBB's financial leverage is increased as described, the required rate of return on common equity will increase to 15%.
What is CBB's *current* required rate of return on equity? What would be the value of the firm if the capital structure change were made?

(12 marks)

(c) Discuss some of the factors that managers consider when setting the firm's target capital structure.

(5 marks)

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Table A-1 Present Value of $1 Due at the End of n Periods:

$$PVIF_{k,n} = \frac{1}{(1+k)^n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091	.8929	.8772	.8696	.8621	.8475	.8333	.8065	.7813	.7576	.7353
2	.9803	.9612	.9426	.9246	.9070	.8900	.8734	.8573	.8417	.8264	.7972	.7695	.7561	.7432	.7182	.6944	.6504	.6104	.5739	.5407
3	.9706	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7722	.7513	.7118	.6750	.6575	.6407	.6086	.5787	.5245	.4768	.4348	.3975
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	.6830	.6355	.5921	.5718	.5523	.5158	.4823	.4230	.3725	.3294	.2923
5	.9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209	.5674	.5194	.4972	.4761	.4371	.4019	.3411	.2910	.2495	.2149
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323	.4104	.3704	.3349	.2751	.2274	.1890	.1580
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759	.3538	.3139	.2791	.2218	.1776	.1432	.1162
8	.9235	.8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269	.3050	.2660	.2326	.1789	.1388	.1085	.0854
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	.3075	.2843	.2630	.2255	.1938	.1443	.1084	.0822	.0628
10	.9053	.8203	.7441	.6756	.6139	.5584	.5083	.4632	.4224	.3855	.3220	.2697	.2472	.2267	.1911	.1615	.1164	.0847	.0623	.0462
11	.8963	.8043	.7224	.6496	.5847	.5268	.4751	.4289	.3875	.3505	.2875	.2366	.2149	.1954	.1619	.1346	.0938	.0662	.0472	.0340
12	.8874	.7885	.7014	.6246	.5568	.4970	.4440	.3971	.3555	.3186	.2567	.2076	.1869	.1685	.1372	.1122	.0757	.0517	.0357	.0250
13	.8787	.7730	.6810	.6006	.5303	.4688	.4150	.3677	.3262	.2897	.2292	.1821	.1625	.1452	.1163	.0935	.0610	.0404	.0271	.0184
14	.8700	.7579	.6611	.5775	.5051	.4423	.3878	.3405	.2992	.2633	.2046	.1597	.1413	.1252	.0985	.0779	.0492	.0316	.0205	.0135
15	.8613	.7430	.6419	.5553	.4810	.4173	.3624	.3152	.2745	.2394	.1827	.1401	.1229	.1079	.0835	.0649	.0397	.0247	.0155	.0099
16	.8528	.7284	.6232	.5339	.4581	.3936	.3387	.2919	.2519	.2176	.1631	.1229	.1069	.0980	.0708	.0541	.0320	.0193	.0118	.0073
17	.8444	.7142	.6050	.5134	.4363	.3714	.3166	.2703	.2311	.1978	.1456	.1078	.0929	.0802	.0600	.0451	.0258	.0150	.0089	.0054
18	.8360	.7002	.5874	.4936	.4155	.3503	.2959	.2502	.2120	.1799	.1300	.0946	.0808	.0691	.0508	.0376	.0208	.0118	.0068	.0039
19	.8277	.6864	.5703	.4746	.3957	.3305	.2765	.2317	.1945	.1635	.1161	.0829	.0703	.0596	.0431	.0313	.0168	.0092	.0051	.0029
20	.8195	.6730	.5537	.4564	.3769	.3118	.2584	.2145	.1784	.1486	.1037	.0728	.0611	.0514	.0365	.0261	.0135	.0072	.0039	.0021
21	.8114	.6598	.5375	.4388	.3589	.2942	.2415	.1987	.1637	.1351	.0926	.0638	.0531	.0443	.0309	.0217	.0109	.0056	.0029	.0016
22	.8034	.6468	.5219	.4220	.3418	.2775	.2257	.1839	.1502	.1228	.0826	.0560	.0462	.0382	.0262	.0181	.0088	.0044	.0022	.0012
23	.7954	.6342	.5067	.4057	.3256	.2618	.2109	.1703	.1378	.1117	.0738	.0491	.0402	.0329	.0222	.0151	.0071	.0034	.0017	.0008
24	.7876	.6217	.4919	.3901	.3101	.2470	.1971	.1577	.1264	.1015	.0659	.0431	.0349	.0284	.0188	.0126	.0057	.0027	.0013	.0006
25	.7798	.6095	.4776	.3751	.2953	.2330	.1842	.1460	.1160	.0923	.0588	.0378	.0304	.0245	.0160	.0105	.0046	.0021	.0010	.0005
26	.7720	.5976	.4637	.3604	.2812	.2198	.1722	.1352	.1064	.0839	.0525	.0331	.0264	.0211	.0135	.0087	.0037	.0016	.0007	.0003
27	.7644	.5859	.4502	.3468	.2678	.2074	.1609	.1252	.0976	.0763	.0469	.0291	.0230	.0182	.0115	.0073	.0030	.0013	.0006	.0002
28	.7568	.5744	.4371	.3335	.2551	.1956	.1504	.1159	.0895	.0693	.0419	.0255	.0200	.0157	.0097	.0061	.0024	.0010	.0004	.0002
29	.7493	.5631	.4243	.3207	.2429	.1846	.1406	.1073	.0822	.0630	.0374	.0224	.0174	.0135	.0082	.0051	.0020	.0008	.0003	.0001
30	.7419	.5521	.4120	.3083	.2314	.1741	.1314	.0994	.0754	.0573	.0334	.0196	.0151	.0116	.0070	.0042	.0016	.0006	.0002	.0001
35	.7059	.5000	.3554	.2534	.1813	.1301	.0937	.0676	.0490	.0356	.0189	.0102	.0075	.0055	.0030	.0017	.0005	.0002	.0001	*
40	.6717	.4529	.3066	.2083	.1420	.0972	.0668	.0460	.0318	.0221	.0107	.0053	.0037	.0026	.0013	.0007	.0002	.0001	*	*
45	.6391	.4102	.2644	.1712	.1113	.0727	.0476	.0313	.0207	.0137	.0061	.0027	.0019	.0013	.0006	.0003	.0001	*	*	*
50	.6080	.3715	.2281	.1407	.0872	.0543	.0339	.0213	.0134	.0085	.0035	.0014	.0009	.0006	.0003	.0001	*	*	*	*
55	.5785	.3365	.1968	.1157	.0683	.0406	.0242	.0145	.0087	.0053	.0020	.0007	.0005	.0003	.0001	*	*	*	*	*

*The factor is zero to four decimal places.

Table A-2 Present Value of an Annuity of $1 per Period for n Periods:

$$PVIFA_{k,n} = \sum_{i=1}^{n} \frac{1}{(1+k)^i} = \frac{1 - \frac{1}{(1+k)^n}}{k} = \frac{1}{k} - \frac{1}{k(1+k)^n}$$

Number of Periods	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
21	18.8570	17.0112	15.4150	14.0292	12.8212	11.7641	10.8355	10.0168	9.2922	8.6487	7.5620	6.6870	6.3125	5.9731	5.3837	4.8913	4.1212	3.5514	3.1158
22	19.6604	17.6580	15.9369	14.4511	13.1630	12.0416	11.0612	10.2007	9.4424	8.7715	7.6446	6.7429	6.3587	6.0113	5.4099	4.9094	4.1300	3.5558	3.1180
23	20.4558	18.2922	16.4436	14.8568	13.4886	12.3034	11.2722	10.3711	9.5802	8.8832	7.7184	6.7921	6.3988	6.0442	5.4321	4.9245	4.1371	3.5592	3.1197
24	21.2434	18.9139	16.9355	15.2470	13.7986	12.5504	11.4693	10.5288	9.7066	8.9847	7.7843	6.8351	6.4338	6.0726	5.4509	4.9371	4.1428	3.5619	3.1210
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
26	22.7952	20.1210	17.8768	15.9828	14.3752	13.0032	11.8258	10.8100	9.9290	9.1609	7.8957	6.9061	6.4906	6.1182	5.4804	4.9563	4.1511	3.5656	3.1227
27	23.5596	20.7069	18.3270	16.3296	14.6430	13.2105	11.9867	10.9352	10.0266	9.2372	7.9426	6.9352	6.5135	6.1364	5.4919	4.9636	4.1542	3.5669	3.1233
28	24.3164	21.2813	18.7641	16.6631	14.8981	13.4062	12.1371	11.0511	10.1161	9.3066	7.9844	6.9607	6.5335	6.1520	5.5016	4.9697	4.1566	3.5679	3.1237
29	25.0658	21.8444	19.1885	16.9837	15.1411	13.5907	12.2777	11.1584	10.1983	9.3696	8.0218	6.9830	6.5509	6.1656	5.5098	4.9747	4.1585	3.5687	3.1240
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
35	29.4086	24.9986	21.4872	18.6646	16.3742	14.4982	12.9477	11.6546	10.5668	9.6442	8.1755	7.0700	6.6166	6.2153	5.5386	4.9915	4.1644	3.5708	3.1248
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
45	36.0945	29.4902	24.5187	20.7200	17.7741	15.4558	13.6055	12.1084	10.8812	9.8628	8.2825	7.1232	6.6543	6.2421	5.5523	4.9986	4.1664	3.5714	3.1250
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	8.3045	7.1327	6.6605	6.2463	5.5541	4.9995	4.1666	3.5714	3.1250
55	42.1472	33.1748	26.7744	22.1086	18.6335	15.9905	13.9399	12.3186	11.0140	9.9471	8.3170	7.1376	6.6636	6.2482	5.5549	4.9998	4.1666	3.5714	3.1250

Table A-3 Future Value of $1 at the End of n Periods:

$$FVIF_{k,n} = (1 + k)^n$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	1.0100	1.0200	1.0300	1.0400	1.0500	1.0600	1.0700	1.0800	1.0900	1.1000	1.1200	1.1400	1.1500	1.1600	1.1800	1.2000	1.2400	1.2800	1.3200	1.3600
2	1.0201	1.0404	1.0609	1.0816	1.1025	1.1236	1.1449	1.1664	1.1881	1.2100	1.2544	1.2996	1.3225	1.3456	1.3924	1.4400	1.5376	1.6384	1.7424	1.8496
3	1.0303	1.0612	1.0927	1.1249	1.1576	1.1910	1.2250	1.2597	1.2950	1.3310	1.4049	1.4815	1.5209	1.5609	1.6430	1.7280	1.9066	2.0972	2.3000	2.5155
4	1.0406	1.0824	1.1255	1.1699	1.2155	1.2625	1.3108	1.3605	1.4116	1.4641	1.5735	1.6890	1.7490	1.8106	1.9388	2.0736	2.3642	2.6844	3.0360	3.4210
5	1.0510	1.1041	1.1593	1.2167	1.2763	1.3382	1.4026	1.4693	1.5386	1.6105	1.7623	1.9254	2.0114	2.1003	2.2878	2.4883	2.9316	3.4360	4.0075	4.6526
6	1.0615	1.1262	1.1941	1.2653	1.3401	1.4185	1.5007	1.5869	1.6771	1.7716	1.9738	2.1950	2.3131	2.4364	2.6996	2.9860	3.6352	4.3980	5.2899	6.3275
7	1.0721	1.1487	1.2299	1.3159	1.4071	1.5036	1.6058	1.7138	1.8280	1.9487	2.2107	2.5023	2.6600	2.8262	3.1855	3.5832	4.5077	5.6295	6.9826	8.6054
8	1.0829	1.1717	1.2668	1.3686	1.4775	1.5938	1.7182	1.8509	1.9926	2.1436	2.4760	2.8526	3.0590	3.2784	3.7589	4.2998	5.5895	7.2058	9.2170	11.703
9	1.0937	1.1951	1.3048	1.4233	1.5513	1.6895	1.8385	1.9990	2.1719	2.3579	2.7731	3.2519	3.5179	3.8030	4.4355	5.1598	6.9310	9.2234	12.166	15.917
10	1.1046	1.2190	1.3439	1.4802	1.6289	1.7908	1.9672	2.1589	2.3674	2.5937	3.1058	3.7072	4.0456	4.4114	5.2338	6.1917	8.5944	11.806	16.060	21.647
11	1.1157	1.2434	1.3842	1.5395	1.7103	1.8983	2.1049	2.3316	2.5804	2.8531	3.4785	4.2262	4.6524	5.1173	6.1759	7.4301	10.657	15.112	21.199	29.439
12	1.1268	1.2682	1.4258	1.6010	1.7959	2.0122	2.2522	2.5182	2.8127	3.1384	3.8960	4.8179	5.3503	5.9360	7.2876	8.9161	13.215	19.343	27.983	40.037
13	1.1381	1.2936	1.4685	1.6651	1.8856	2.1329	2.4098	2.7196	3.0658	3.4523	4.3635	5.4924	6.1528	6.8858	8.5994	10.699	16.386	24.759	36.937	54.451
14	1.1495	1.3195	1.5126	1.7317	1.9799	2.2609	2.5785	2.9372	3.3417	3.7975	4.8871	6.2613	7.0757	7.9875	10.147	12.839	20.319	31.691	48.757	74.053
15	1.1610	1.3459	1.5580	1.8009	2.0789	2.3966	2.7590	3.1722	3.6425	4.1772	5.4736	7.1379	8.1371	9.2655	11.974	15.407	25.196	40.565	64.359	100.71
16	1.1726	1.3728	1.6047	1.8730	2.1829	2.5404	2.9522	3.4259	3.9703	4.5950	6.1304	8.1372	9.3576	10.748	14.129	18.488	31.243	51.923	84.954	136.97
17	1.1843	1.4002	1.6528	1.9479	2.2920	2.6928	3.1588	3.7000	4.3276	5.0545	6.8660	9.2765	10.761	12.468	16.672	22.186	38.741	66.461	112.14	186.28
18	1.1961	1.4282	1.7024	2.0258	2.4066	2.8543	3.3799	3.9960	4.7171	5.5599	7.6900	10.575	12.375	14.463	19.673	26.623	48.039	85.071	148.02	253.34
19	1.2081	1.4568	1.7535	2.1068	2.5270	3.0256	3.6165	4.3157	5.1417	6.1159	8.6128	12.056	14.232	16.777	23.214	31.948	59.568	108.89	195.39	344.54
20	1.2202	1.4859	1.8061	2.1911	2.6533	3.2071	3.8697	4.6610	5.6044	6.7275	9.6463	13.743	16.367	19.461	27.393	38.338	73.864	139.38	257.92	468.57
21	1.2324	1.5157	1.8603	2.2788	2.7860	3.3996	4.1406	5.0338	6.1088	7.4002	10.804	15.668	18.822	22.574	32.324	46.005	91.592	178.41	340.45	637.26
22	1.2447	1.5460	1.9161	2.3699	2.9253	3.6035	4.4304	5.4365	6.6586	8.1403	12.100	17.861	21.645	26.186	38.142	55.206	113.57	228.36	449.39	866.67
23	1.2572	1.5769	1.9736	2.4647	3.0715	3.8197	4.7405	5.8715	7.2579	8.9543	13.552	20.362	24.891	30.376	45.008	66.247	140.83	292.30	593.20	1178.7
24	1.2697	1.6084	2.0328	2.5633	3.2251	4.0489	5.0724	6.3412	7.9111	9.8497	15.179	23.212	28.625	35.236	53.109	79.497	174.63	374.14	783.02	1603.0
25	1.2824	1.6406	2.0938	2.6658	3.3864	4.2919	5.4274	6.8485	8.6231	10.835	17.000	26.462	32.919	40.874	62.669	95.396	216.54	478.90	1033.6	2180.1
26	1.2953	1.6734	2.1566	2.7725	3.5557	4.5494	5.8074	7.3964	9.3992	11.918	19.040	30.167	37.857	47.414	73.949	114.48	268.51	613.00	1364.3	2964.9
27	1.3082	1.7069	2.2213	2.8834	3.7335	4.8223	6.2139	7.9881	10.245	13.110	21.325	34.390	43.535	55.000	87.260	137.37	332.95	784.64	1800.9	4032.3
28	1.3213	1.7410	2.2879	2.9987	3.9201	5.1117	6.6488	8.6271	11.167	14.421	23.884	39.204	50.066	63.800	102.97	164.84	412.86	1004.3	2377.2	5483.9
29	1.3345	1.7758	2.3566	3.1187	4.1161	5.4184	7.1143	9.3173	12.172	15.863	26.750	44.693	57.575	74.009	121.50	197.81	511.95	1285.6	3137.9	7458.1
30	1.3478	1.8114	2.4273	3.2434	4.3219	5.7435	7.6123	10.063	13.268	17.449	29.960	50.950	66.212	85.850	143.37	237.38	634.82	1645.5	4142.1	10143.
40	1.4889	2.2080	3.2620	4.8010	7.0400	10.286	14.974	21.725	31.409	45.259	93.051	188.88	267.86	378.72	750.38	1469.8	5455.9	19427.	66521.	*
50	1.6446	2.6916	4.3839	7.1067	11.467	18.420	29.457	46.902	74.358	117.39	289.00	700.23	1083.7	1670.7	3927.4	9100.4	46890.	*	*	*
60	1.8167	3.2810	5.8916	10.520	18.679	32.988	57.946	101.26	176.03	304.48	897.60	2595.9	4384.0	7370.2	20555.	56348.	*	*	*	*

*FVIF > 99,999.

Table A-4 Sum of an Annuity of $1 per Period for n Periods:

$$FVIFA_{k,n} = \sum_{i=1}^{n}(1 + k)^{n-i} = \frac{(1 + k)^n - 1}{k}$$

Number of Periods	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	2.1000	2.1200	2.1400	2.1500	2.1600	2.1800	2.2000	2.2400	2.2800	2.3200	2.3600
3	3.0301	3.0604	3.0909	3.1216	3.1525	3.1836	3.2149	3.2464	3.2781	3.3100	3.3744	3.4396	3.4725	3.5056	3.5724	3.6400	3.7776	3.9184	4.0624	4.2096
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746	4.4399	4.5061	4.5731	4.6410	4.7793	4.9211	4.9934	5.0665	5.2154	5.3680	5.6842	6.0156	6.3624	6.7251
5	5.1010	5.2040	5.3091	5.4163	5.5256	5.6371	5.7507	5.8666	5.9847	6.1051	6.3528	6.6101	6.7424	6.8771	7.1542	7.4416	8.0484	8.6999	9.3983	10.146
6	6.1520	6.3081	6.4684	6.6330	6.8019	6.9753	7.1533	7.3359	7.5233	7.7156	8.1152	8.5355	8.7537	8.9775	9.4420	9.9299	10.980	12.136	13.406	14.799
7	7.2135	7.4343	7.6625	7.8983	8.1420	8.3938	8.6540	8.9228	9.2004	9.4872	10.089	10.730	11.067	11.414	12.142	12.916	14.615	16.534	18.696	21.126
8	8.2857	8.5830	8.8923	9.2142	9.5491	9.8975	10.260	10.637	11.028	11.436	12.300	13.233	13.727	14.240	15.327	16.499	19.123	22.163	25.678	29.732
9	9.3685	9.7546	10.159	10.583	11.027	11.491	11.978	12.488	13.021	13.579	14.776	16.085	16.786	17.519	19.086	20.799	24.712	29.369	34.895	41.435
10	10.462	10.950	11.464	12.006	12.578	13.181	13.816	14.487	15.193	15.937	17.549	19.337	20.304	21.321	23.521	25.959	31.643	38.593	47.062	57.352
11	11.567	12.169	12.808	13.486	14.207	14.972	15.784	16.645	17.560	18.531	20.655	23.045	24.349	25.733	28.755	32.150	40.238	50.398	63.122	78.998
12	12.683	13.412	14.192	15.026	15.917	16.870	17.888	18.977	20.141	21.384	24.133	27.271	29.002	30.850	34.931	39.581	50.895	65.510	84.320	108.44
13	13.809	14.680	15.618	16.627	17.713	18.882	20.141	21.495	22.953	24.523	28.029	32.089	34.352	36.786	42.219	48.497	64.110	84.853	112.30	148.47
14	14.947	15.974	17.086	18.292	19.599	21.015	22.550	24.215	26.019	27.975	32.393	37.581	40.505	43.672	50.818	59.196	80.496	109.61	149.24	202.93
15	16.097	17.293	18.599	20.024	21.579	23.276	25.129	27.152	29.361	31.772	37.280	43.842	47.580	51.660	60.965	72.035	100.82	141.30	198.00	276.98
16	17.258	18.639	20.157	21.825	23.657	25.673	27.888	30.324	33.003	35.950	42.753	50.980	55.717	60.925	72.939	87.442	126.01	181.87	262.36	377.69
17	18.430	20.012	21.762	23.698	25.840	28.213	30.840	33.750	36.974	40.545	48.884	59.118	65.075	71.673	87.068	105.93	157.25	233.79	347.31	514.66
18	19.615	21.412	23.414	25.645	28.132	30.906	33.999	37.450	41.301	45.599	55.750	68.394	75.836	84.141	103.74	128.12	195.99	300.25	459.45	700.94
19	20.811	22.841	25.117	27.671	30.539	33.760	37.379	41.446	46.018	51.159	63.440	78.969	88.212	98.603	123.41	154.74	244.03	385.32	607.47	954.28
20	22.019	24.297	26.870	29.778	33.006	36.786	40.995	45.762	51.160	57.275	72.052	91.025	102.44	115.38	146.63	186.69	303.60	494.21	802.86	1298.8
21	23.239	25.783	28.676	31.969	35.719	39.993	44.865	50.423	56.765	64.002	81.699	104.77	118.81	134.84	174.02	225.03	377.46	633.59	1060.8	1767.4
22	24.472	27.299	30.537	34.248	38.505	43.392	49.006	55.457	62.873	71.403	92.503	120.44	137.63	157.41	206.34	271.03	469.06	812.00	1401.2	2404.7
23	25.716	28.845	32.453	36.618	41.430	46.996	53.436	60.893	69.532	79.543	104.60	138.30	159.28	183.60	244.49	326.24	582.63	1040.4	1850.6	3271.3
24	26.973	30.422	34.426	39.083	44.502	50.816	58.177	66.765	76.790	88.497	118.16	158.66	184.17	213.98	289.49	392.48	723.46	1332.7	2443.8	4450.0
25	28.243	32.030	36.459	41.646	47.727	54.865	63.249	73.106	84.701	98.347	133.33	181.87	212.79	249.21	342.60	471.98	898.09	1706.8	3226.8	6053.0
26	29.526	33.671	38.553	44.312	51.113	59.156	68.676	79.954	93.324	109.18	150.33	208.33	245.71	290.09	405.27	567.38	1114.6	2185.7	4260.4	823.13
27	30.821	35.344	40.710	47.084	54.669	63.706	74.484	87.351	102.72	121.10	169.37	238.50	283.57	337.50	479.22	681.85	1383.1	2798.7	5624.8	11198.0
28	32.129	37.051	42.931	49.968	58.403	68.528	80.698	95.339	112.97	134.21	190.70	272.89	327.10	392.50	566.48	819.22	1716.1	3583.3	7425.7	15230.3
29	33.450	38.792	45.219	52.966	62.323	73.640	87.347	103.97	124.14	148.63	214.58	312.09	377.17	456.30	669.45	984.07	2129.0	4587.7	9802.9	20714.2
30	34.785	40.568	47.575	56.085	66.439	79.058	94.461	113.28	136.31	164.49	241.33	356.79	434.75	530.31	790.95	1181.9	2640.9	5873.2	12941.	28172.3
40	48.886	60.402	75.401	95.026	120.80	154.76	199.64	259.06	337.88	442.59	767.09	1342.0	1779.1	2360.8	4163.2	7343.9	22729.	69377.	*	*
50	64.463	84.579	112.80	152.67	209.35	290.34	406.53	573.77	815.08	1163.9	2400.0	4994.5	7217.7	10436.	21813.	45497.	*	*	*	*
60	81.670	114.05	163.05	237.99	353.58	533.13	813.52	1253.2	1944.8	3034.8	7471.6	18535.	29220.	46058.	*	*	*	*	*	*

*FVIFA > 99,999.