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### Future Value and Present Value Formulas

#### Formulas and Calculator Strokes

(TEXAS INSTRUMENTS BA II PLUS SOLAR)

#### Future Value of a Sum

<table>
<thead>
<tr>
<th>Function</th>
<th>Key Stroke</th>
</tr>
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<tbody>
<tr>
<td>Interest Rate Per Period</td>
<td>I/Y</td>
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<tr>
<td>Time Periods</td>
<td>N</td>
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<tr>
<td>Initial Investment</td>
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</tr>
<tr>
<td>Future Value</td>
<td>CPT--FV</td>
</tr>
</tbody>
</table>

#### Present Value of a Sum

<table>
<thead>
<tr>
<th>Function</th>
<th>Key Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest Rate Per Period</td>
<td>I/Y</td>
</tr>
<tr>
<td>Time Periods</td>
<td>N</td>
</tr>
<tr>
<td>Future Value</td>
<td>FV</td>
</tr>
<tr>
<td>Present Value</td>
<td>CPT--PV</td>
</tr>
</tbody>
</table>

#### Future Value of an Annuity

<table>
<thead>
<tr>
<th>Function</th>
<th>Key Stroke</th>
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</thead>
<tbody>
<tr>
<td>Present Value</td>
<td>ZERO</td>
</tr>
<tr>
<td>Interest Rate Per Period</td>
<td>I/Y</td>
</tr>
<tr>
<td>Time Periods</td>
<td>N</td>
</tr>
<tr>
<td>Payment</td>
<td>PMT</td>
</tr>
<tr>
<td>Future Value</td>
<td>CPT--FV</td>
</tr>
</tbody>
</table>

#### Present Value of an Annuity

<table>
<thead>
<tr>
<th>Function</th>
<th>Key Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future Value</td>
<td>ZERO</td>
</tr>
<tr>
<td>Interest Rate Per Period</td>
<td>I/Y</td>
</tr>
<tr>
<td>Time Periods</td>
<td>N</td>
</tr>
<tr>
<td>Payment</td>
<td>PMT</td>
</tr>
<tr>
<td>Present Value</td>
<td>CPT--PV</td>
</tr>
</tbody>
</table>
FIND PAYMENT FOR LOAN

\[ PV = \text{Payment} \times \left[ \frac{1}{K} - \frac{1}{(1+K)^n} \right] \]

FUNCTION
- Key Stroke
  - Interest Rate Per Period: I/Y
  - Time Periods: N
  - Future Value: FV (FV is zero)
  - Loan Amount: PV (PV Number is negative)
  - Payment: CPT—PMT

FIND INTEREST RATE ON LOAN

FUNCTION
- Key Stroke
  - Time Periods: N
  - Future Value: FV (FV is zero)
  - Loan Amount: PV (PV Number is negative)
  - Payment: PMT
  - Interest Rate Per Period: CPT-I/Y

FIND TIME PERIOD ON LOAN

FUNCTION
- Key Stroke
  - Future Value: FV (FV is zero)
  - Loan Amount: PV (PV Number is negative)
  - Payment: PMT
  - Interest Rate Per Period: I/Y
  - Time Periods: CPT—N

FIND AMOUNT OF ON LOAN

FUNCTION
- Key Stroke
  - Future Value: FV (FV is zero)
  - Payment: PMT
  - Interest Rate Per Period: I/Y
  - Time Periods: N
  - Loan Amount: CPT—PV (PV Number will be negative)

Effective annual rate

\[ [1 + (K/m)]^m - 1 \]

WHERE
- \( K \) = Nominal Yearly Rate of Interest
- \( m \) = Portion of the Year
- \( n \) = Number of Years
1. A rich aunt promises you $35,000 exactly 5 years after you graduate from college. What is the value of the promised $35,000 if you could negotiate payment upon graduation? Assume an interest rate of 11.25 percent. [$20,538.46]

2. Suppose you own a valuable Persian rug. A local art gallery offers you $600/year payable at the end of the year if you will loan the rug to the gallery permanently instead of selling it. If you require a 16.7% return, what is the value of the rug to you if you are willing to accept the offer? [$3,592.81]

3. According to the Upper Crust department store, the store charges its customers 2% per month on the outstanding balances of their charge accounts. What is the effective annual rate on such customer credit? Assume the store recalculate your account balance at the end of each month. [26.82%]

4. You plan on working for 10 years and then leaving for the Alaskan 'back country.' You figure you can save $1,000 a year for the first 5 years and $2,000 a year for the last 5 years. In addition, your family has given you a $5,000 graduation gift. If you put the gift and your future savings in an account paying 8.4% compounded annually, what will your 'stake' be when you leave for the wilderness 10 years hence? [$31,879.38]

5. Hill Distributors is financing a new truck with a loan of $25,000 with monthly payments over 5 years. If the yearly interest rate is 6.75% what are the monthly payments? [$492.09]

6. Betty Sue has decided to deposit her scholarship money ($1,000) in a savings account paying 7.25% interest, compounded quarterly. Twenty-one months later, she decides to go to the mountains rather than school and closes out her account. How much money will she receive? [$1,133.99]

7. Tammy wants to set up a trust fund. If she makes a payment at the end of each year for twenty years and earns 8.75% per year, how large must her annual payments be so that the trust is worth $100,000 at the end of the twentieth year? [$2,010.18]
8. Your $10,000 student loan requires you to pay interest on the declining balance so the entire loan and interest will be paid off in equal annual installments over 3 years beginning at the end of the first year. Approximately what will be your payment if the interest rate is 10.35% \[4045.95\]

9. Find the present value for the following income stream of the Storm Project if the interest rate is 12.75 percent and the payments occur at the end of each year. \[4766.72\]

<table>
<thead>
<tr>
<th>YEARS</th>
<th>CASH FLOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>$ 500</td>
</tr>
<tr>
<td>5-10</td>
<td>$ 800</td>
</tr>
<tr>
<td>11-15</td>
<td>$1,200</td>
</tr>
</tbody>
</table>

10. You place $5,000 in your credit union at an annual interest rate of 11.25 percent compounded monthly. How much will you have in 2 years if all interest remains in the accounts? \[6,255.05\]

11. Find the present value of the following cash flows of the Ram Project using a discount rate of 9.25 percent. Assume that each payment occurs at the end of the year. \[1,073.31\]

<table>
<thead>
<tr>
<th>YEAR</th>
<th>CASH FLOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>$100/yr.</td>
</tr>
<tr>
<td>5</td>
<td>200</td>
</tr>
<tr>
<td>6</td>
<td>300</td>
</tr>
<tr>
<td>7-15</td>
<td>100/yr.</td>
</tr>
<tr>
<td>16</td>
<td>400</td>
</tr>
</tbody>
</table>

12. John Roberts is retiring one year from today. How much should John currently have in a retirement account earning 10.75 percent interest to guarantee withdrawals of $25,000 per year for 10 years? \[148,787.04\]
13. On January 1, 1985, a graduate student developed a financial plan which would provide enough money at the end of his graduate work (January 1, 1990) to open a business of his own. His plan was to deposit $8,000 per year, starting immediately, into an account paying 10.6% compounded annually. His activities proceeded according to plan except that at the end of his third year he withdrew $5,000 to take a Caribbean cruise, at the end of the fourth year he withdrew $5,000 to buy a used Camaro, and at the end of the fifth year he had to withdraw $5,000 to pay to have his dissertation typed. His account, at the end of the fifth year, will be less than the amount he had originally planned on by how much? ($8,000 is put in every year)  \[16,646.18\]

14. The present value (t = 0) of the following cash flow stream is $6,000 when discounted at 10.75% annually. What is the value of the MISSING (t = 2) cash flow?  \[2,815.39\]

\[
\begin{array}{cccc}
0 & 1 & 2 & 3 & 4 \\
\hline \\
0 & $1,000 & $? & $2,000 & $2,000 \\
\end{array}
\]

15. Your 69-year old Aunt Wilma has savings of $35,000. She has made arrangements to enter a home for the aged upon reaching the age of 80. She wants to decrease the account balance by a constant amount each year for ten years, with a zero balance remaining. How much can she withdraw each year if she earns 7.5 percent annually on her savings? Her first withdrawal would be one year from today.  \[5,099.01\]

16. Jill Ann has agreed to pay a creditor $5,000 one year hence, $4,000 two years hence, $3,000 three years hence, $2,000 four years hence, and a final payment of $1,000 five years from now. Due to budget considerations she would like to make five equal annual payments to satisfy her contract. If the agreed upon interest is 6.25% effective per year, what should the equal annual payments be?  \[3,121.06\]

17. Herman is 35 years old and wishes to provide for his old age. Suppose he invests $12,000 per year at an effective rate of 6.25 percent per year for the next 25 years, with the first deposit beginning one year hence. Beginning at age 60 he starts withdrawing $X per year for the next 20 years. How large must $X be in order to use up all of his funds?  \[60,674.64\]
18. Your grandmother is thrilled that you are going to college and plans to reward you at graduation with a Porsche Turbo automobile. She would like to set aside an equal amount at the completion of each of your college years from her pension. If her account earns 11.5 percent and a new Porsche will cost $50,000, how much must she deposit each year? Assume her first deposit is in exactly one year and that you graduate in four years. [$10,538.69]

19. Robert Smith’s son Joseph is ten years old today. Joseph is already making plans to go to college on his eighteenth birthday and his father wants to start putting away money now for that purpose. Smith estimates that Joseph will need $16,000, $17,000, $18,000, and $19,000 for his freshman, sophomore, junior, and senior years. He plans on making these amounts available to Joseph at the beginning of each of these years. Smith would like to make eight deposits (the first of which would be made on Joseph’s eleventh birthday, 1 year from now) in an account earning 11.5 percent. He wants the account to eventually be worth enough to pay for Joseph’s college expenses. Any balances remaining in the account will continue to earn 11.5 percent. How much will Smith have to deposit in this planning account each year to provide for Joseph’s education? [$4,920.89]

20. John Brennen wishes to retire in 18 years. He figures that he needs an annual income of $29,750 per year when he retires. In addition, he wishes to leave his children $350,000 in a lump sum when he dies although he has no idea when that might be. Assume that he lives beyond the 18 years and that the interest rate will be constant. What interest rate must exist and what yearly annuity must he invest at that interest rate to insure the outcome stated above and leave no extra in his account? [interest rate = .085    annuity = $8,900.64]

21. In 1975, its first year of operations, The Coffee Mill had earnings per share (EPS) of $0.261. Four years later, in 1978, EPS was $0.33, and 7 years later, in 1985, EPS was up to $0.566. It appears that the first 4 years represented an unusual growth situation and that since then a more normal growth rate has been sustained. What are the two growth rates? [6% and 8%]
22. The Sawyer Corporation wishes to determine the present value of a cash flow that is of unequal periods. One payment of $20,000 is received on March 1 and the other payment of $18,000 is received on July 31. Thus, there are five months between the first and second payments of the year. The cash flows will continue in this pattern for six years. It is now January 1 and your job is to determine the present value of this flow for the next six years. The appropriate interest rate is determined to be 10.5 percent. The rate per month is determined as a market rate, not a financial institution rate. [$173,832.90]

23. The Sackley Corporation will receive a cash flow that is believed to become more risky as time goes on. It will receive a cash flow of $52,000 for the next five years. The market interest rate is 7.5 percent. It has been suggested that the interest rate be increased over time to compensate for the increased risk. An increase of .003 per year is determined to be the appropriate increase. Note that the rate will not change until after the first year. Determine the difference between the present value of the cash flow discounted at the 7.5 percent rate and the increasing rate. [$4,176.01]

24. E. Seymour is 35 years old and wishes to provide for his old age. Suppose he invested $1,000 per year at an effective rate of 6.5 percent per year for the next 25 years, with the first deposit beginning one year hence. Beginning at age 60 he will start withdrawing $X per year for the next 20 years. How large must $X be in order to use up all of his funds? [$5,344.43]

25. You have just had your thirtieth birthday. You have two children. One will go to college 10 years from now and require four beginning-of-year payments for college expenses of $10,000, $11,000, $12,000, and $13,000. The second child will go to college 15 years from now and require four beginning-of-year payments of $15,000, $16,000, $17,000, and $18,000. In addition, you plan to retire in 30 years. You want to be able to withdraw $50,000 per year (at the end of each year) from an account throughout your retirement. You expect to live 20 years beyond retirement. The first withdrawal will occur on your sixty-first birthday. What equal, annual, end-of-year amount must you save for each of the next 30 years to meet these goals, if all savings earn a 15 percent annual rate of return? [$3,123.10]
26. George Shaw can buy an annuity that adjusts for an increasing interest rate. The interest rate for this year is 7%. George will put the money in now and the rate will adjust each year for the next 6 years. George expects the rate to increase 1 percentage point per year. If he puts $10,000 per year into the annuity, how much will he have at the end of six years? [$85,536.95]

27. On December 1, 1991, Otto VanAuto borrowed $25,000 for his new car. The loan terms were: 48 month loan, payments beginning January 1, 1992, 8.6% interest. However, as a marketing promotion, a monthly payment will not be required on the month of his birthday, May. What will be the monthly payment for the loan? How much larger is this payment than a standard 48 month loan? [Monthly Payment = $674.16: Difference = $56.77]

28. Digger O'Dell is the local friendly undertaker. His business has improved since he adopted his new motto, "I will be the last man to ever let you down." Given his expanded business, he wishes to build a new establishment financed with a short-term mortgage. He can borrow for eight years at 9 percent. He will pay monthly payments on the $50,000 he will borrow. Determine his monthly payment and develop an amortization schedule for the first four months. [Monthly Payment = $732.51]

29. How much should Joe James be willing to pay for a security that will have a value of $12,000 in 8 years under continuous compounding if the nominal rate is 8.75%? [$5,959.02]

30. What is the rate of return on project Jumbo that costs $12,932.62 and returns net cash flows of $3,000, $4,000, $5,000 and $6,000 at the end of years 1-4 respectively? [13%]

31. You purchased some Eagle stock 5 years ago. You paid $30.00 per share and the stock paid dividends the first year of $2.00, the second year $2.25, the third year $2.35, the fourth year $2.50 and the fifth year $2.55. On the day that you receive the fifth year dividend, you can sell the stock for $49.75 per share. What rate of interest have you earned? [17%]
BOND FORMULAS

ANNUAL BOND PRICE = \( C \left[ 1 - \frac{1}{(1+K)^n} \right] + \left[ \frac{M}{(1+K)^n} \right] \)

SEMIAANNUAL BOND PRICE = \( \frac{C}{2} \left[ \frac{1}{(1+(1 + K)^n)} \right] + \left[ \frac{M}{(1+K)^n} \right] \)

WHERE

\( K \) = Yearly Rate Of Interest  
\( n \) = Number Of Years  
\( C \) = Coupon Payment \((\text{COUPON RATE} \times \text{MATURITY VALUE})\)  
\( M \) = Maturity Value

FORMULAS AND CALCULATOR STROKES  
\( \text{TEXAS INSTRUMENTS BA II PLUS SOLAR} \)

BOND PRICE ANNUAL BOND
FUNCTION KEY STROKE
Interest Rate Per Period I/Y  
Time Periods N  
Coupon Payment PMT  
Maturity Value FV  
Bond Price CPT--PV

BOND YIELD ANNUAL BOND
FUNCTION KEY STROKE
Time Periods N  
Coupon Payment PMT  
Maturity Value FV  
Bond Price PV (change to negative number)  
Interest Rate Per Period CPT--I/Y
BOND FORMULAS

BOND PRICE SEMIANNUAL BOND

FUNCTION Key Stroke

(1) Convert Yearly Rate To Semiannual Rate
   (A) Change rate from percentage to decimal (% rate/100)
   (B) Add one (1) and take square root \( \sqrt{X} \)
   (C) Subtract one
   (D) Change rate from decimal to percentage (decimal rate*100)

(2) Multiply number of years by two
(3) Divide coupon payment by two

Interest Rate Per Period [number from step (1D)] I/Y
Time Periods (number from step 2) N
Coupon Payment (number from step 3) PMT
Maturity Value FV
Bond Price CPT--PV

BOND RATE SEMIANNUAL BOND

FUNCTION Key Stroke

(1) Multiply number of years by two
(2) Divide coupon payment by two

Time Periods (number from step 1) N
Coupon Payment (number from step 2) PMT
Maturity Value FV
Bond Price (change to negative number) PV
Semiannual Rate CPT—I/Y

Convert Semiannual Rate To Yearly Rate
   (A) Change semiannual rate from percentage to decimal (% rate/100)
   (B) Add one (1) and square \( X^2 \)
   (C) Subtract one
   (D) Change rate from decimal to percentage (decimal rate*100)
BOND FORMULAS

DURATION FOR ANNUAL BOND
\[ D = N - \frac{(C/P)}{(N - (1+y)AN)} \]
- **N** = years to maturity
- **C** = yearly coupon payment
- **P** = market price of the bond
- **y** = yield to maturity in annual terms
- **AN** = present value of an annuity yielding \( y \) for \( N \) years.

DURATION FOR SEMIANNUAL BOND
\[ D = N - \frac{(C'/P'y')}{(N - (1+y')AN'/2)} \]
- **C'** = \( \frac{C}{2} \)
- **y'** = \( \frac{(1+y)/2 - 1} \)
- **AN'** = present value of an annuity yielding \( (1+y)/2 - 1 \) for \( 2N \) years.

ELASTICITY OF A BOND
\[ (-1.0)IEit = MDi \frac{YTM}{(1 + YTM)} \]
where,
- **IEit** = ELASTICITY
- **MDi** = DURATION
- **YTM** = YIELD TO MATURITY
32. USM bonds pay an annual coupon rate of 10%. They have 8 years before maturity. The maturity value is $1,000. The yield to maturity (market interest rate) on these class of bonds is 12%. Determine the price of these bonds. [$900.65]

33. Liddy Corporation has bonds that pay a coupon rate of 8% and a maturity value of $1,000. The yield on comparable new bonds is 9.5%. The bonds have 7 years before they mature. Determine the value of one of Liddy’s bonds. [$925.76]

34. Hamblin Inc. has bonds that pay a coupon rate of 11% and a maturity value of $1,000. The yield in the market for this risk class of bonds is 10.5%. The bonds have 18 years before maturity. How much would one Hamblin bond be worth on the market? [$1,039.73]

35. An issue of Treasury bonds has an annual coupon rate of 10%. They have 8 years before maturity. The maturity value is $1,000. The price of one of these bonds is $951.02. Determine the yield on this bond. [10.95 %]

36. Joe Don Brigham has a choice of buying bonds that pay a coupon rate of 8% per year or ones that pay a coupon rate of 8% per year with semiannual payments. Both bonds have 10 years remaining and have a face value of $1,000. The market rate for this class of bonds is 14%. Joe Don is trying to decide which to do. He picks up a finance book that uses the following formula for annual bonds and semiannual bonds. Joe Don calculates the prices of the two bonds and finds that the bond that pays interest less frequently costs more. What is the difference in price between the bond paying coupon payments once a year and the bond paying coupon payments twice a year Joe Don calculates the prices of the two bonds and finds that the bond that pays interest less frequently costs more. What is the difference in price between the bond paying coupon payments once a year and the bond paying coupon payments twice a year. Does this difference seem reasonable? Would you pay more for the yearly bond? [$4.85]

\[
\text{ANNUAL BOND PRICE = } C \left[ \frac{1 - \frac{1}{(1+K)^n}}{K} \right] + \left[ \frac{M}{(1+K)^n} \right]
\]

\[
\text{TEXT BOOK FORMULA FOR SEMIANNUAL BONDS}
\]

\[
\text{SEMIANNUAL BOND PRICE = } C/2 \left[ \frac{1 - \frac{1}{(1+K/2)^{2n}}}{K/2} \right] + \left[ \frac{M}{(1+K/2)^{2n}} \right]
\]
37. Assume that you own 100 bonds, $1,000 par value, with a total face value of $100,000. These bonds have a 9% coupon, pay interest semiannually, and have 5 years remaining until they mature. New bonds with the same risk and maturity provide yields to maturity of 15%. You are considering selling your bonds and depositing the proceeds in a savings account which pays interest at a rate of 8%, compounded annually. If you do make the transaction, you will liquidate the savings account by making 5 equal withdrawals, the first coming 1 year from now. How large will each annual withdrawal be? [$20,281.69]

38. Mary Parker was left some bonds (face value $1,000,000) by her late husband Norman. She has recently become engaged to Slick Jones, who wants her to cash in the bonds and use the money to 'live like royalty' for a couple of years in Monte Carlo. The 8% bonds mature on January 1, 2019, and it is now January 1, 1999. Interest on these bonds is paid annually on December 31 each year and new bonds issued by the same company with the same maturity are currently showing a 7% coupon rate. If Mary sells her bonds now and puts the proceeds in an account paying 6% compounded annually, what would be the largest equal annual amounts they could withdraw for two years beginning January 1, 2000? [$603,220.56]

39. Commonwealth Company has 100 bonds outstanding (maturity value = $1,000). The required rate of return on these bonds is currently 10%, and interest is paid semiannually. The bonds mature in 5 years, and their current market value is $892.75 per bond. What is the annual coupon interest rate? [7%]

40. Robert Baron is considering two 5-year bonds. One pays a coupon rate of 10% and is tax-exempt and the other pays a coupon rate of 13% and is fully taxable for Bob at a 34% tax rate. If the tax-exempt bond sells for $1000, at what maximum price must the taxable bond sell for in order to induce Robert to purchase it instead of the tax-exempt (par value is $1000)? NOTE: There is capital gain at end. [$ 931.77]

41. You are the owner of 100 bonds issued by Georgia Corporation. These bonds have 8 years remaining to maturity, an annual coupon payment of $80, and a par value of $1,000. Unfortunately, Georgia Corp. is on the brink of bankruptcy, and the creditors, including yourself, have agreed to a postponement of the next 4 interest payments. The remaining interest payments will be made as scheduled. The postponed payments will accrue interest at an annual rate of 5% and will be paid as a lump sum at maturity 8 years hence. The required rate of return on these bonds, considering their substantial risk, is now 27%. What is the present value of each bond? [$279.81]

42. Easton, Inc., has two bond issues outstanding, both selling for $761.10. The first issue has a coupon rate of 8% and 20 years to maturity. The second has an identical yield to maturity as the first but only 5 years until maturity. Both issues are payable annually. What is the interest payment on the second issue? [$45.36]
43. RFK, Inc., plans to issue bonds with a par value of $1,000 and 10 years to maturity. These bonds will pay $45 every 6 months. Current market conditions are such that the bonds will be sold to net $923.63. If RFK is in the 34% tax bracket, what is its AFTER-TAX cost of debt? (The after-tax cost of debt is equal to the interest rate times (1 - tax rate), and it recognizes the tax deductibility of interest.) [6.93%]

44. The Athletic Association has decided to build new bleachers for the baseball field. Total costs are estimated to be $1 million, and financing will be through a bond issue of the same amount. The bond will have a coupon rate of 8%, and the Association must set up a reserve to pay off the loan by making equal annual payments in an account paying 8% annually. The interest-accumulated amount in the reserve will be used to retire the entire issue at its maturity date (20 years). The Association plans to meet the payment requirements by selling season tickets at $10 net profit per ticket. Approximately how many tickets must be sold each year to meet the interest and principal retirement requirements? [10,185 Tickets]

45. Recently, JFK, Inc., filed bankruptcy papers. The firm was reorganized as PQ, Inc., and the court permitted a new indenture on an outstanding bond issue to be put into effect. The issue has 10 years to maturity and a coupon rate of 10%, paid annually. The new agreement allows the firm to pay no interest for 5 years and then at maturity to repay principal and any unpaid interest (no interest on the unpaid interest). If the required return is 20%, what should such bonds sell for in the market today? [$362.44]

46. Golden bonds pay a semi-annual coupon rate of 10%. They have 8 years before maturity. The maturity value is $1,000. The yield to maturity (market interest rate) on these class of bonds is 10%. Determine the price of these bonds. [$1,013.02]

47. Calculate the price change in a semiannual municipal bond with a coupon rate of 9% and 10 years to maturity when the market rate of interest increases from 8.25% to 10.75% [$151.96]

48. What is the value of a government bond that pays semiannual payments of $50 (coupon rate of 10%) and has a maturity value of $1,000 if the annual market interest rate is 10% and the bond has 20 years until maturity? [$1,020.78]

49. What is the coupon payment on a corporate bond that has semiannual payments if the price of the bond is $1,141.57, the interest rate is 7.75%, and there are 8 years left until the bond matures. (Assume a maturity value of $1,000). [$50]
50. The Banzai Auto Company has experienced a market re-evaluation lately due to a number of lawsuits. The firm has a bond issue outstanding with 15 years to maturity and a coupon rate of 8% (paid semiannually). The required rate has now risen to 12.25%. At what price can these securities be purchased on the market? [$ 730.35]

51. River Corporation has bonds that pay a coupon rate of 8% semiannually and a maturity value of $1,000. The bonds are selling for $925.73 and have 7 years before they mature. Determine the return on one of River Corporations’ bonds. [9.7%]

52. Syringa Inc. bonds pay a coupon rate of 11% semiannually and a maturity value of $1,000. The bonds have 18 years before maturity. The bonds are selling for $1,054.01. What is the current yield to maturity of these bonds? [10.6%]

53. The current market price of a Johnson Company bond is $1,305.28. A 10% coupon interest rate is paid semi-annually, and the par value is equal to $1,000. What is the YTM (on an annual basis) if the bonds mature 10 years from today? [6%]

54. Ford and GM have similar bond issues outstanding. The Ford bond has interest payments of $80 paid annually and matures 20 years from today. The GM bond has interest payments of $80 paid semiannually and also matures twenty years from today. If the required rate of return is 12%, what is the difference in the current selling price of the two bonds? [$17.42]

55. Adeline Corporation just issued a zero coupon bond with a life of 15 years. The face value of these bonds is $100,000 and the market rate is 9.6%. What would be the price of these bonds? [25,283.76]

56. Calculate the yield to maturity (on an annual basis) of an 8% coupon, 10 year bond that pays interest semiannually if its price is now $787.17. [12%]

57. A major auto manufacturer has experienced a market re-evaluation lately due to a number of lawsuits. The firm has a bond issue outstanding with 15 years to maturity and a coupon rate of 8% (paid semiannually). The required rate has now risen to 16%. At what price can these securities be purchased on the market? [$571.14]

58. Larry Penny is considering buying some zero coupon bonds that mature in 5 years and pay $10,000 upon maturity. The bonds are selling for $5,802.64. However, the IRS requires that taxes be paid on the implicit interest earned on these bonds. What will be the effective rate earned on these bonds? Larry’s marginal tax rate is 28%. Calculate the yearly tax payment for each of the five years and the after-tax yield.

   [YR1 = $186.86; YR2 =$208.36; YR3 = $232.32; YR4 = $259.04; YR5 = $288.83]

   [YIELD = .0828]
59. McDougal Corporation has a 15 year bond with a coupon rate of 15 percent paid annually and yields 12% (par value= $1000). What is the duration elasticity of the bond? [Duration = 7.35 IE = -.79]

60. King Incorporated has a twenty year bond with a coupon rate of 12 percent paid semiannually. The market rate of interest is 10.5 percent and the bond has a maturity value of $1,000. Determine the duration of the bond. [Duration = 8.647]

61. Determine the price elasticity of Bolin Corporation’s semiannual bond with twelve years to maturity and a maturity value of $1,000. The coupon rate is 10% and the market rate of interest is 11.5 percent. [Duration = 7.04 IE = -.73]
MEAN, VARIANCE, COVARIANCE AND PORTFOLIO

**Mean**

\[
\bar{X} = \frac{1}{n} \sum_{i=1}^{n} (X_i P_i)
\]

Where \( P_i \) is the probability of \( X_i \) occurring

**Variance**

\[
\sigma^2 = \sum_{i=1}^{n} (X_i - \bar{X})^2 P_i
\]

**Standard Deviation**

\[
\sigma = \left( \sum_{i=1}^{n} (X_i - \bar{X})^2 P_i \right)^{1/2}
\]

**Covariance**

\[
COV_{X,Y} = \sum_{i=1}^{n} (X_i - \bar{X})(Y_i - \bar{Y}) P_i
\]

**Beta**

\[
\beta = \frac{COV_{M,S}}{\sigma^2_M}
\]

**Correlation**

\[
\rho = \frac{COV_{X,Y}}{\sigma_X \sigma_Y}
\]

**Coefficient of Variation**

\[
\frac{\sigma}{\bar{X}}
\]

**Mean of Portfolio**

\[
\left( W_X \right) \bar{X} + \left( W_Y \right) \bar{Y}
\]

**Standard Deviation of a Portfolio**

\[
\sigma_p = \left[ (w_X)^2 \left( \sigma_X^2 \right) + (w_Y)^2 \left( \sigma_Y^2 \right) + 2 (w_X)(w_Y)(COV_{X,Y}) \right]^{1/2}
\]

\[
\sigma_p = \left[ (w_X)^2 \left( \sigma_X^2 \right) + (w_Y)^2 \left( \sigma_Y^2 \right) + 2 (w_X)(w_Y)(\rho \sigma_X \sigma_Y) \right]^{1/2}
\]

\[
\sigma_p = \left[ (w_X)^2 \left( \sigma_X^2 \right) + (w_Y)^2 \left( \sigma_Y^2 \right) + (w_Z)^2 \left( \sigma_Z^2 \right) + 2 (w_X)(w_Y)(COV_{X,Y}) + 2 (w_X)(w_Z)(COV_{X,Z}) + 2 (w_Y)(w_Z)(COV_{Y,Z}) \right]^{1/2}
\]
62. Two stocks, Ruffco and Weems have the following returns. Determine the mean returns, variances, and standard deviations of the two, and the covariance between them. Put them into a portfolio with Ruffco weighted at 40% and Weems weighted at 60% and determine the portfolio mean return and the portfolio standard deviation.

\[
\begin{array}{c|c|c}
\text{Ruffco} & \text{Weems} \\
19\% & 14\% \\
13\% & 16\% \\
14\% & 17\% \\
15\% & 13\% \\
16\% & 17\% \\
\end{array}
\]

<table>
<thead>
<tr>
<th></th>
<th>Ruffco</th>
<th>Weems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>15.4%</td>
<td>15.4%</td>
</tr>
<tr>
<td>Variance</td>
<td>4.24%</td>
<td>2.64%</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>2.06%</td>
<td>1.62%</td>
</tr>
<tr>
<td>Covariance</td>
<td>-1.36%</td>
<td></td>
</tr>
<tr>
<td>Portfolio Mean</td>
<td>15.4%</td>
<td></td>
</tr>
<tr>
<td>Portfolio Standard Deviation</td>
<td>.987%</td>
<td></td>
</tr>
</tbody>
</table>

63. Stocks A and B have returns and probability distributions as given below. Calculate the expected returns and the standard deviations of expected returns for Stocks A and B. Also compute the covariance and the correlation coefficient between Stocks A and B. Suppose you want to hold a portfolio composed of 60% of Stock A and 40% of Stock B. What will be the expected return (mean) and risk (standard deviation) of your portfolio?

\[
\begin{array}{c|c|c|c}
\text{Stock A} & \text{Stock B} \\
.07 & .11 \\
.08 & .12 \\
.07 & .13 \\
.11 & .05 \\
\end{array}
\]

<table>
<thead>
<tr>
<th></th>
<th>Stock A</th>
<th>Stock B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>8.25%</td>
<td>10.25%</td>
</tr>
<tr>
<td>STD DEV</td>
<td>1.64%</td>
<td>3.11%</td>
</tr>
<tr>
<td>COV</td>
<td>-4.81%</td>
<td></td>
</tr>
<tr>
<td>CORR COEF</td>
<td>-.94</td>
<td></td>
</tr>
<tr>
<td>PORTFOLIO Mean</td>
<td>9.05%</td>
<td>Std. Dev. = 0.4555</td>
</tr>
</tbody>
</table>
64. You have the opportunity to purchase three stocks at a price which you consider a bargain. You have a history of the returns on the stocks over the past six quarters. As one can see from observation, the stocks do not yield equal rates of return. Your friend suggests that you should purchase only the stock with the highest return. Since you have had finance and know the value of a portfolio, demonstrate why buying all three in equal proportions is a wiser investment.

<table>
<thead>
<tr>
<th>STOCK A</th>
<th>STOCK B</th>
<th>STOCK C</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.0%</td>
<td>10.0%</td>
<td>13.0%</td>
</tr>
<tr>
<td>12.5%</td>
<td>11.0%</td>
<td>14.0%</td>
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<tr>
<td>12.0%</td>
<td>12.0%</td>
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</tr>
<tr>
<td>11.0%</td>
<td>13.0%</td>
<td>12.0%</td>
</tr>
<tr>
<td>10.0%</td>
<td>14.0%</td>
<td>11.0%</td>
</tr>
</tbody>
</table>

PORTFOLIO MEAN = 12.23% PORTFOLIO STD DEVIATION = .4668
STOCK VALUE FORMULAS

GORDON DIVIDEND MODEL (PRICE)

\[ P_0 = \frac{D_1}{R^e - g} \]

GORDON DIVIDEND MODEL (RETURN)

\[ R^e = \frac{D_1}{P_0} + g \]

WHERE

\( R^e \) = Yearly Rate Of Return
\( P_0 \) = Price Of Stock At Time Zero
\( D_1 \) = Expected Dividend = \( D_0 \) \((1 + g)\)
\( g \) = Growth Rate of Stock

CAPITAL ASSET PRICING MODEL (CAPM)

\[ R^e = R_f + \beta (R_m - R_f) \]

WHERE

\( R^e \) = Yearly Rate Of Return
\( R_f \) = Risk Free Rate
\( \beta \) = Beta
\( R_m \) = Return On Market

\[ \beta = \frac{\text{COV}_{M,S}}{\sigma^2_M} \]

\( \beta \) = Beta = \( \frac{\text{COV}_{M,S}}{\text{VAR}_M} \)

Where \( M \) = Market Returns, \( S \) = Returns on Stock
65. In your analysis of MBI Corporation you find that the current earnings per share are $5.00 per share and most analysts are projecting the earnings per share to grow at a 10.75 percent rate annually. What can you expect the earnings per share of this firm to be in 7 years?  [$10.22]

66. Crockett, Inc is facing a rather difficult financial future in which it expects to experience an indefinite period of contraction with earnings (and dividends) decreasing at an annual rate of 5%. If the last dividend was $1.00 and the stock price is $12 per share, what is the return expected by investors who buy this stock?  [2.9%]

67. The Crapola Company has decided to make a major investment. The investment will require a substantial early cash out-flow, and inflows will be relatively late. As a result, it is expected that the impact on the firm’s earnings for the first 2 years will be a negative growth of 5% annually. Further, it is anticipated that the firm will then experience 2 years of zero growth after which it will begin a positive annual sustainable growth of 6%. If the firm's cost of capital is 11% and its current dividend (D0) is $2 per share, what should be the current price per share?  [$30.89]

68. SOS, Inc., has experienced a recent resurgence in business as it has gained new national identity. Management is forecasting rapid growth over the next 4 years (annual rate of 15%). After that, it is expected that the firm will revert to its historical growth rate of 2% annually. The last dividend paid was $1.50 per share, and the required return is 11%. What is the current price per share, assuming equilibrium?  [$26.15]

69. AT&E, Inc., a large conglomerate, has decided to acquire another firm. Analysts are forecasting that there will be a period (2 years) of extraordinary growth (20%) followed by another 2 years of unusual growth (10%), and that finally the previous growth pattern of 6% annually will resume. If the last dividend was $1 per share and the required return is 10%, what should the market price be today?  [$36.20]

70. The ACE Auto Parts Company has just recently been organized. It is expected to experience no growth for the next 2 years as it identifies its market and acquires its inventory. However, ACE will grow at an annual rate of 5% in the third and fourth years and, beginning with the fifth year, should attain a 10% growth rate which it will sustain thereafter. The last dividend paid was $0.50 per share. ACE has a cost of capital of 14%. What should be the present price per share of ACE common stock?  [$10.48]

71. A share of JTL, Inc., stock paid a dividend of $1.50 last year, and the dividend is expected to grow at a constant rate of 4% in the future. The appropriate rate of return on this stock is believed to be 11%. What should the stock sell for today?  [$22.29]
SOS, Inc., has experienced a recent resurgence in business as it has gained new national identity. Management is forecasting rapid growth over the next 4 years (annual rate of 15%). After that, it is expected that the firm will revert to its historical growth rate of 2% annually. The last dividend paid was $1.50 per share, and the required return is 11%. What will be the equilibrium price of SOS stock at the end of the second year (P2)?

A share of JTL, Inc., stock paid a dividend of $1.50 last year, and the dividend is expected to grow at a constant rate of 4% in the future. The appropriate rate of return on this stock is believed to be 11%. What would be the price of one share of JTL stock 1 year from today?  

Cuomo Corporation has had dividends grow from $2 to $4.25 over the last five years. This growth is expected to continue well into the foreseeable future. If the current market price is $38 per share, what annual rate of return do investors expect to receive from buying Cuomo stock?  

The BB Company has fallen on hard times. Its management expects to pay no dividends for the next 2 years. However, the dividend for Year 3 (D3) will be $1.00 per share, and it is expected to grow at a rate of 3% in Year 4, 6% in Year 5, and 10% in Year 6 and thereafter. If the required return for BB Co. is 18.25%, what is the current equilibrium price of the stock?  

The Pet Company has recently discovered a type of rock which, when crushed, is extremely absorbent. It is expected that the firm will experience (beginning now) an unusually high growth rate (20%) during the period (3 years) when it has exclusive rights to the property where this rock can be found. However, beginning with the fourth year the firm's competition will have access to the material, and from that time on the firm will assume a normal growth rate of 8% annually. During the rapid growth period, the firm's dividend payout ratio will be relatively low (20%), to conserve funds for reinvestment. However, the decrease in growth will be accompanied by an increase in dividend payout to 50%. Last year's earnings were $2.00 per share (E0) and the firm's cost of equity is 13%. What should be the current price of the common stock?  

The Teetertotter Company is expecting both earnings and dividends to grow by -5% in Year 1, 0% in Year 2, 5% in Year 3, and 10% in Year 4 and thereafter. The required return on Teetertotter is 14%, and the equilibrium price (P0) is $50. What is the expected value of the next dividend (D1)?  

ICBM is currently selling at $65 per share. Next year's dividend is expected to be $2.60. If investors on this particular day expect a return of 13.25% on their investment, what do they think ICBM's growth rate will be?
79. USA Paper's stock is currently in equilibrium selling at $30 per share. The firm has been experiencing a 6% annual growth rate. Earnings per share (E0) were $4.00 and the dividend payout ratio is 40%. The risk-free rate is 8% and the market risk premium is 5%. If systematic risk increases by 50%, all other factors remaining constant, the stock price will increase/decrease by how much? [-$7.33]

80. Assume that AA Co. has been growing at a 12% annual rate and is expected to continue to do so for 3 more years. At that time, growth is expected to slow to a constant 4% rate. The firm maintains a 30% payout ratio, and this year's retained earnings were $1.4 million. The firm's beta is 1.25, the risk-free rate is 8%, and the market risk premium is 5%. If the market is in equilibrium, what is the market value of the firm's common equity (1 million shares outstanding)? [$7,465,200]

81. EMBA, Inc., has a beta coefficient of 0.9 and a required rate of return of 15%. The market risk premium is currently 6%. If we expect the inflation premium to increase 2 percentage points and EMBA to add assets to his firm that will increase the beta by 50%, what will be EMBA's new required rate of return? [Answer 19.7%]

82. Thomas, Inc., has just paid a dividend of $2.00. Its stock is now selling for $48 per share. The firm is half as volatile as the market. The expected return on the market is 15% and the yield on U.S. Treasury bills is 11%. If the market is in equilibrium, what rate of growth is expected? [8.48%]

83. Overflow Oil Company is currently selling at its equilibrium price of $100 per share. The beta coefficient currently is 2. The risk-free rate is 9%. The following events will soon occur: (1) top management will lower Overflow's beta to 1.2 by investing in several low risk projects; (2) the Federal Reserve Board will reduce the money supply causing the inflation premium to be reduced by 3 percentage points; and (3) decreased world stability due to global politics will cause the market risk premium to increase 2 percentage points to 5%. The company has a constant growth rate of 6%. What will be the new equilibrium price for a share of Overflow Oil common stock after the above events have taken place? (Assume the expected dividend will not change.) [$150]

84. GWK Corp. stock is currently paying a dividend of $3.00 per share (D0 = $3) and is in equilibrium. The company has a growth rate of 5% and beta equal to 1.5. The required rate of return on the market is 16%, and the risk-free rate is 7%. GWK is considering a change in policy which will increase its beta coefficient to 1.75. If market conditions remain unchanged, what new growth rate will cause the common stock price of GWK to remain unchanged? [6.96%]
CAPITAL BUDGETING FORMULAS

**PAYBACK** = THE NUMBER OF YEARS TO RECOVER THE INVESTMENT DOLLARS

**NPV** = NET PRESENT VALUE = PRESENT VALE OF INFLOW - PRESENT VALUE OF OUTFLOW

\[ NPV = \sum_{t=0}^{n} \frac{CF_t}{(1+K)^t} \]

WHERE

- \( n \) = number of periods
- \( t \) = an index number indexing from 0 to \( n \)
- \( CF \) = the amount of each \( t \) numbered cashflow
- \( K \) = the rate of interest in each time period \( t \)

**IRR** = INTERNAL RATE OF RETURN

\( IRR = NPV = 0 \)
CALCULATOR STROKES
(TEXAS INSTRUMENTS BA II PLUS SOLAR)
NET PRESENT VALUE (NPV)

INITIAL CASH OUTFLOW CF (You should see CF0 and zeros. If other numbers appear, push 2nd and CE/C). Next type in the initial outflow as a negative number and push ENTER. The negative number will appear on the display. Push ↓ and C01 will appear. This represents the first cash inflow.

FIRST CASH INFLOW (C01): Type in value of first cash inflow and push ENTER and then ↓. F01 will appear. If there were multiple cash flows of the same amount (say 4 identical cash flows for four periods) you would type in 4. Our example here assumes each cash inflow is unique so type in 1 and push enter. Push ↓ and C02 will appear.

REMAINING CASH INFLOWS (C02 TO CN): Type in value of the next Cash inflow, push ENTER and then push ↓ for the corresponsing (F02 to FN). Each F02 to FN is entered and then push ↓. When all cash inflows have been entered, PUSH NPV and it will ask for the interest rate by displaying I. Type in rate in percentage and push ENTER. Next push ↓, The display will show NPV = 0.0. Push CPT and the answer will appear.

INTERNAL RATE OF RETURN (IRR)

INITIAL CASH OUTFLOW CF (You should see CF0 and zeros. If other numbers appear, push 2nd and CE/C). Next type in the initial outflow as a negative number and push ENTER. The negative number will appear on the display. Push ↓ and C01 will appear. This represents the first cash inflow.

FIRST CASH INFLOW (C01): Type in value of first cash inflow and push ENTER and then ↓. F01 will appear. If there were multiple cash flows of the same amount (say 4 identical cash flows for four periods) you would type in 4. Our example here assumes each cash inflow is unique so type in 1 and push enter. Push ↓ and C02 will appear.

REMAINING CASH INFLOWS (C02 TO CN): Type in value of the next Cash inflow, push ENTER and then push ↓ for the corresponding (F02 to FN). Each F02 to FN is entered and then push ↓. When all cash inflows have been entered, PUSH IRR and push ENTER.
85. MTM Inc., is considering the purchase of a new machine which will reduce manufacturing costs by $16,000 annually. MTM will use the straight-line method to depreciate the machine, and it expects to sell the machine at the end of its 5 year life for $10,000. The firm expects to be able to reduce working capital by $15,000 when the machine is installed. The firm’s marginal tax rate is 34% and it uses a 9.75% cost of capital to value the projects of this nature. If the machine costs $60,000, what is the NPV of the project’s cash flows? [$ 5,119]

86. After a disastrous ski season last year, Valley, Inc., is considering the installation of a snow machine. The machine has an invoice price of $100,000, and it will cost $10,000 to install the machine. It is estimated that the machine will increase revenues by $26,234 annually, although operating expenses other than depreciation will also increase by $5,000. The machine will be depreciated on a straight-line basis over its useful life (10 years) to a zero salvage value. If the tax rate on ordinary income is 40%, what is the project’s IRR (approximately)? [9%]

87. You have been asked by the CEO of Gadsden Co. to evaluate the proposed acquisition of a new machine. The machine’s price is $50,000, and it will cost $10,000 to transport and install. It will be depreciated by the straight-line method over its 5 year useful life to a $7,000 salvage value. The machine will increase revenues by $11,000 per year, and it will decrease operating costs by $20,000 per year. Also, the machine will allow the firm to reduce inventories by $5,000. If the firm’s cost of capital is 12%, and its marginal tax rate is 34%, what is the new machine’s NPV? [$ 32,880]

88. Heel & Sole, Inc., is considering the purchase of a new leather-cutting machine to replace an existing machine that has a book value of $3,000 and can be sold for $1,500. The estimated salvage value of the old machine in 4 years is zero. The new machine will reduce costs (before tax) by $7,000 per year; that is, $7,000 cash savings over the old machine. The new machine has a 4 year life, costs $14,000, and can be sold for an expected $2,000 at the end of the fourth year (it will be depreciated to a book value of $2,000). Assuming straight-line depreciation for both machines, a 34% tax rate, and a cost of capital of 16%, find the NPV. [$4,182.91]

89. Missouri Metals, Inc. is considering the replacement of its existing lathe, which cost $200,000 at the time of purchase five years ago, and which now has a remaining life of five years with no salvage value. It can be sold currently for $100,000. A new, more operationally efficient lathe costs $300,000 and has a useful life of five years with a salvage value of $50,000. It is expected to reduce operating costs by $66,000 annually. The firm’s required rate of return for replacement decisions is 12%. Assume straight-line depreciation and a tax rate of 34 percent. What is the net present value of this capital budgeting decision? [$ 22,164]
90. UT Company is faced with two mutually exclusive investment alternatives, each of which has an initial cost of $100 million. The alternatives have the following net cash flows (in millions). What is the NPV at a 5 percent discount rate and at a 10 percent discount rate?  

<table>
<thead>
<tr>
<th>YEAR</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$50</td>
<td>$10</td>
</tr>
<tr>
<td>2</td>
<td>$40</td>
<td>$30</td>
</tr>
<tr>
<td>3</td>
<td>$30</td>
<td>$40</td>
</tr>
<tr>
<td>4</td>
<td>$10</td>
<td>$60</td>
</tr>
</tbody>
</table>

[5% A = 18.04, B = 20.65: 10% A = 7.88, B = 4.92]

91. At approximately what discount rate will the NPVs of the two mutually exclusive investment alternatives of the UT Company be equal?  

[.0716; NPV of both = 13.45]

92. Davis & Associates is considering the purchase of a new pizza oven. The original cost of the old oven was $30,000. The machine is now 5 years old and has a current market value of $5,000. The oven is being depreciated over a 10-year life toward a zero estimated salvage value on a straight-line basis. Management is contemplating the purchase of a new oven whose cost is $25,000 and whose estimated salvage value is zero. Expected cash savings from the new oven are $7,000 a year (before tax). Depreciation is on a straight line basis over a 5 year life, and the cost of capital is 12%. Assume a 28% tax rate. What is the net present value of the new machine?  

[$2,986.75]

93. Corleone, Inc., is a fast-food establishment which needs to purchase new fryolators. If the machines are purchased, they will replace old machines purchased 10 years ago for $105,000, being depreciated on a straight-line basis to a zero salvage value (20 years depreciable life). The old machines can be sold for $120,000. The new machines will cost $200,000 installed and will be depreciated on a straight-line basis to a zero salvage value in 10 years. It is expected that there will be increased revenues of $28,000 per year and increased cash expenses of $2,500 per year. If the firm’s cost of capital (k) is 11% and the tax rate on ordinary income is 40%, and the tax rate on capital gains 30%, what is the NPV of the machine?  

[$19,352]

94. DC, Inc., has a stamping machine which is 5 years old and which is expected to last another 10 years. It has a book value of $100,000 and is being depreciated by the straight-line method to zero. Allstate Industries has demonstrated a new machine with an expected useful life of 10 years (scrap value $50,000) that should save DC $35,000 a year in labor and maintenance costs. The firm’s tax rate is 40%, and the new machine will cost $200,000. The market value of the old machine is $12,000 and an $11,000 increase in working capital will be needed to support the new machine. If DC’s cost of capital is 9%, should the replacement be made?  

[$9,573]
95. FIDO, Inc., is considering the replacement of its computer with a new generation model. The IBM salesperson has demonstrated a model which would cost FIDO $750,000, should last 10 years, and reduce costs $166,043 per year. IBM estimates that this new computer can be sold for $15,000 at the end of its useful life. The computer FIDO currently uses has a book value of $450,000 (remaining life of 10 years, a salvage value of $10,000, and a current market value of $16,000. If the new machine will permit an $8,000 decrease in working capital when the computer is installed, what is the NPV given that \( k = 13\% \), \( t = 40\% \), and depreciation is straight line? \[ $51,340 \]

96. Stork Company is considering the purchase of a new machine to replace an existing one. The old machine was purchased 5 years ago at a cost of $20,000 and is being depreciated on a straight-line basis to a zero salvage value 5 years from today. The current market value of the old machine is $15,000. The new machine has an estimated life of 5 years, costs $32,000, and has an estimated zero salvage value. It is expected to generate cash savings (before taxes) of $6,000 per year. What is the NPV of the proposed purchase if the tax rate is 34% and the cost of capital is 11%? \[ $1,465 \]

97. Yankee Brick, Inc., has an electric kiln which is 5 years old and is expected to last another 10 years. It has a book value of $100,000, and it is being depreciated by the straight-line method to a zero salvage value. As Director of Capital Budgeting, you are evaluating a new gas kiln that should save YBI $40,000 a year in fuel costs. The new kiln would cost $200,000, and it would be depreciated over its 10-year life using the straight-line method to a $20,000 salvage value. The market value of the old kiln is $10,000. YBI’s marginal tax rate is 40%, and the firm’s cost of capital is 10%. What is the NPV of the replacement project? \[ $20,843 \]

98. Two projects being considered are mutually exclusive and have the following projected cash flows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-$50,000</td>
<td>-$50,000</td>
</tr>
<tr>
<td>1</td>
<td>15,625</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>15,625</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>15,625</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>15,625</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>15,625</td>
<td>99,500</td>
</tr>
</tbody>
</table>

Beyond what level of required return (approximately) would you change your selection? \[ 12\% \]
99. Tyler Products, Inc., requires a new machine to produce a part for a heat generator. Two companies have submitted bids, and you have been assigned the task of choosing one of the machines. Cash flow analysis indicated the following:

<table>
<thead>
<tr>
<th>Year</th>
<th>Machine A</th>
<th>Machine B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-$1,000</td>
<td>-$1,000</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>417</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>417</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>417</td>
</tr>
<tr>
<td>4</td>
<td>2,144</td>
<td>417</td>
</tr>
</tbody>
</table>

What is the internal rate of return for each machine? [IRR A = 21%; IRR B = 24%]

100. Projects C and W are mutually exclusive, and they have the following net cash flows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Project C</th>
<th>Project W</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-$50,000</td>
<td>-$100,000</td>
</tr>
<tr>
<td>1</td>
<td>30,000</td>
<td>60,000</td>
</tr>
<tr>
<td>2</td>
<td>50,000</td>
<td>60,000</td>
</tr>
<tr>
<td>3</td>
<td>60,000</td>
<td>60,000</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>60,000</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>60,000</td>
</tr>
</tbody>
</table>

You are to use the equivalent annual annuity method for comparing these projects since they have unequal lives. If the cost of capital is 10% for Project C and 13% for Project W, which project should be chosen? [C = $256,042 W = $242,834]

101. The Cossack project has the following cash flows.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NET CASH FLOWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-$4,187</td>
</tr>
<tr>
<td>1</td>
<td>$5,000</td>
</tr>
<tr>
<td>2</td>
<td>$6,000</td>
</tr>
<tr>
<td>3</td>
<td>-$7,135</td>
</tr>
</tbody>
</table>

What is the NPV at 12%, at 20%, and 30% cost of capital? What do these results suggest about the IRR of this project? [-$18.10; $17.28; -$38.16]
102. The Lewis Company is considering two mutually exclusive investments that would increase its capacity to make strawberry tarts. The firm uses a 8.75 percent cost of capital to evaluate potential investments. The projects have the following costs and cash flow streams:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$-30,000</td>
<td>$-30,000</td>
</tr>
<tr>
<td>1</td>
<td>10,500</td>
<td>6,500</td>
</tr>
<tr>
<td>2</td>
<td>10,500</td>
<td>6,500</td>
</tr>
<tr>
<td>3</td>
<td>10,500</td>
<td>6,500</td>
</tr>
<tr>
<td>4</td>
<td>10,500</td>
<td>6,500</td>
</tr>
<tr>
<td>5</td>
<td>--</td>
<td>6,500</td>
</tr>
<tr>
<td>6</td>
<td>--</td>
<td>6,500</td>
</tr>
<tr>
<td>7</td>
<td>--</td>
<td>6,500</td>
</tr>
<tr>
<td>8</td>
<td>--</td>
<td>6,500</td>
</tr>
</tbody>
</table>

What are the respective EQUIVALENT ANNUAL ANNUITIES for alternatives A and B? [$1,291 $1,130]

103. EPA Hydronics, Inc. wants to replace one of its larger control devices. A new unit sells for $30,000 (delivered). An additional $3,000 will be needed to install the device. The new device has an estimated 20-year service life, and it will be depreciated on a straight-line basis to its estimated salvage value of $2,000. The existing machine has been in service for 22 years and has been fully depreciated. Its scrap value is estimated to be $1,000. The existing device could be used indefinitely, assuming the firm is willing to pay for its very high maintenance costs. The firm’s marginal tax rate is 40%. The new control device requires lower maintenance costs and frees up personnel who would normally have to monitor the system. Estimated annual cash savings from the new device will be $9,000. The firm’s cost of capital is 10.75 percent. Using this information, evaluate the relative merits of replacing the old control device using the net present value method. [$16,593]

104. Taco, Inc., is evaluating the introduction of a new production process. Two alternatives are available. Production Process A has an initial investment of $25,000, a 4 year life, and a $5,000 salvage value. The use of Process A will increase net income after taxes by $8,000 per year for each of the 4 years that the equipment is in use. Production Process B also requires an initial investment of $25,000, will also last for 4 years, and its expected salvage value is zero. Process B will increase net income after taxes by $9,065 per year. Taco uses straight-line depreciation on all capital assets. Management believes that risk-adjusted discount rate of 10% should be used for Process A. If Taco is to be indifferent between the two processes, what risk-adjusted discount rate must be used to evaluate B? [14%]
Frankenstein Inc. is considering the development of one of two mutually exclusive new models. Each will cost $5,000. The cash flow figures (after-tax profits plus depreciation) for each project are shown below: Model B, which has an energy-saving sod roof, is considered a high-risk project, while Model A is of average risk. The firm adds 2 percentage points to arrive at a risk-adjusted cost of capital when evaluating a high-risk project. The cost of capital used for average risk projects is 9%. Calculate the NPVs for Models A and B. [A $676 B $1,933]

<table>
<thead>
<tr>
<th>Period</th>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$2,000</td>
<td>$3,000</td>
</tr>
<tr>
<td>2</td>
<td>$2,500</td>
<td>$2,600</td>
</tr>
<tr>
<td>3</td>
<td>$2,250</td>
<td>$2,900</td>
</tr>
</tbody>
</table>
LEASING

106. Queens Manufacturing Company has decided to acquire a new pressing machine and is trying to decide between leasing and buying alternatives. The machine can be purchased from the manufacturer for a delivered price of $85,000. The machine will be depreciated over a 6-year period to a zero salvage value although the firm estimates that it could be sold for a minimum of $5,000 at the end of the 6 years. Alternatively, the manufacturer has offered a financial lease at $17,000 per year for the 6 years with all operating, maintenance, and insurance expense to be borne by the lessee. The first lease payment is at $T_0$. The firm will retain the machine at the end of the lease. The firm’s before-tax interest rate on long-term debt is 10 percent, all depreciation is straight-line, and the tax rate is 34 percent. What is the NAL (Net Advantage of Leasing)? [NAL = $1,800]

107. Highlights Illuminating has decided to acquire a lighting display to use at automobile exhibitions during the next 4 years. The display can be purchased or it can be leased for a 4-year period. If purchased, the lighting display will require a $10,000 outlay and Highlights Illuminating anticipates that maintenance will be $800 per year payable at the beginning of the year. The display has an expected $1,000 market value at the end of the 4-year period. The company will use straight-line depreciation to a zero salvage value with a 4-year life for tax purposes. Highlights Illuminating is in the 34 percent marginal tax bracket and has a 16 percent weighted average cost of capital. No investment tax credit is available.

Lumenescence Leasing offers to lease the lighting display to Highlights for $3,785 annually, with payments at the beginning of each of the 4 years. Lease payments include maintenance.

Highlights Illuminating’s financial manager calls the company’s commercial bank and is told by a loan officer that the company can borrow up to $10,000 for 4 years at an effective interest rate of 8 percent annually. What is the NAL (Net Advantage of Leasing) in this case? [NAL = -$953]
108. Gomez Enterprises has decided to renovate an old production facility and equip it with all new machinery. Gomez can borrow the entire $5 million it needs to purchase the machinery at 12 percent from a bank, to be amortized over five years. The machinery will be depreciated to zero value using straight-line over its six-year life. If purchased, maintenance will cost $50,000 per year for six years payable at the beginning of the year. As an alternative to purchasing the machinery, Gomez is considering leasing it. The lease payments are to be $1,000,000 per year for six years, and each payment is to be made in advance. Gomez estimates that it can purchase the equipment at the end of the lease period for $200,000. Gomez has a 34 percent marginal tax rate. Maintenance is included in the lease. What is the NAL (Net Advantage of Leasing)?

\[ \text{NAL} = $375,658.70 \]

109. Noah Boatworks has decided to expand its current production facilities. The expansion will require the purchase or lease of $400,000 of new equipment. To finance the new equipment, Noah can either lease it or purchase it. The following information concerning the two alternative financing methods is to be used to make the lease versus purchase decision. That is, what is the NAL (Net Advantage of Leasing)?

Estimated maintenance cost on the equipment is $25,000 per year payable at the beginning of the year. Noah must pay for maintenance regardless of the financing method selected. If the equipment is purchased, Noah can borrow the necessary funds at 15 percent interest and the loan will be amortized over a five year period. The equipment will be depreciated to zero on a straight-line basis. The lease arrangements call for payment of $95,000 to be paid at the beginning of each of the next five years. The lessor will permit Noah to purchase the equipment at the end of the lease at its fair market value. Noah estimates that value to be $30,000. Noah has a 34 percent marginal tax rate.

\[ \text{NAL} = $8,969.77 \]

110. The Carson Company has an opportunity to purchase a new conveyor line for $250,000. They can borrow $250,000 paying annual payments for five years and an interest rate of 15 percent. They also have an opportunity to lease the line for $62,500 a year. At the end of five years, the estimated salvage value is $40,000. If owned, the cost of maintenance is expected to be $10,000 per year. Assume straight-line depreciation to zero, a 34 percent tax rate, a cost of debt of 15 percent, and a cost of capital of 12 percent. At the end of the lease, the conveyor line will be returned to the leasing company. What is the net advantage of leasing the equipment? \[ \text{NAL} = $16,125.17 \]
BOND REFUNDING

111. The Deadbeat Corporation is considering whether to refund its outstanding $20 million bond obligation. Though the bonds were initially issued at 8 percent, the interest rates on similar issues have declined to 6.75 percent. The bonds were originally issued for 20 years and have 16 years remaining. The new issue would be for 16 years. There is an 8 percent call premium on the old issue. The underwriting cost on the new $20,000,000 issue is $480,000 and the underwriting cost of the old issue was $400,000. The company is in a 40 percent tax bracket. What is the NPV of the refunding decision? [$475,853]

112. The Reagan Corporation is considering whether to refund a $50 million, 11 percent coupon, 20 year bond issue which was sold 5 years ago. It is amortizing $2 million of flotation costs on the 11 percent issue over the life of that issue. Reagan’s investment bankers have indicated that the company could sell a new $50 million, 15 year issue at an interest rate of 9 3/4 percent in today’s market. Neither they nor Reagan’s management sees much chance that interest rates will fall below 9 3/4 percent any time soon, but there is a chance that rates will increase. A call premium of 5 percent would be required to retire the old bonds, and flotation costs on the new issue would amount to $3 million. Reagan’s marginal tax rate is 40 percent. The new bonds would be issued one month before the old bonds were called, with the proceeds of the new issue being invested in short-term government securities with a 5 percent coupon during the interim. Calculate the NPV of the bond refunding. [$20,383]
113. GMAC’s current (target) capital structure has a debt ratio (D/TA) of 50%. The firm can raise up to $10 million in new debt at a before-tax cost of 8%. If more debt is required, the cost will be 11%. Net income (after tax) for the previous year was $10 million and is expected to increase by 10% this year. The firm expects to maintain its dividend payout ratio of 40% on the 1 million shares of common stock outstanding. If it must sell new common stock, it would encounter a 20% flotation cost. The tax rate is 34% and current stock price is $88 per share. What are the breakpoints for GMAC and what is the weighted average cost of capital in each case?

<table>
<thead>
<tr>
<th>BREAKPOINTS</th>
<th>COST OF CAPITAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 TO $13,200,000</td>
<td>.1014</td>
</tr>
<tr>
<td>$13,200,000 TO 20,000,000</td>
<td>.1097</td>
</tr>
<tr>
<td>$20,200,000 AND UP</td>
<td>.1196</td>
</tr>
</tbody>
</table>

114. ZZZ, Inc., has a debt ratio of 0.2. It has concluded that this capital structure is in the target capital structure range. It has analyzed its investment opportunities for the coming year and has identified four possible additions to assets which generate IRRs greater than zero.

<table>
<thead>
<tr>
<th>Investment</th>
<th>Size</th>
<th>IRR</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$ 3M</td>
<td>0.200</td>
</tr>
<tr>
<td>B</td>
<td>$ 6M</td>
<td>0.185</td>
</tr>
<tr>
<td>C</td>
<td>$12M</td>
<td>0.190</td>
</tr>
<tr>
<td>D</td>
<td>$ 9M</td>
<td>0.180</td>
</tr>
</tbody>
</table>

ZZZ is forecasting net income for the coming year of $10 million and expects to pay out 50% in dividends to the 1 million outstanding shares of common stock. The earnings have been growing at a constant rate of 10% over the past few years, and this rate is expected to continue indefinitely. If ZZZ has to sell new common stock, it will be faced with flotation costs of 15% (current market price = $50 per share). Any debt that is raised will require a coupon rate of 8%. However, if the total debt required is greater than $5 million, the coupon rate will have to be 10%. Assume the marginal tax rate is 50%. If the firm does not face capital rationing, how large should the capital budget be?

Answer  $21 Million
115. Miller Mining had net income after interest but before taxes of $40,000 this year. The marginal tax rate is 40%, and the dividend payout ratio is 30%. The company can raise debt at a 12% interest rate for any amount of debt less than $8,000. If the firm raises more than $8,000, a 15% interest rate will apply. The last dividend paid by Miller was $0.90. Miller’s common stock is selling for $8.59 per share, and its growth rate expected in earnings and dividends is 5%. If Miller issues new common stock, the flotation cost incurred will be 10%. Miller plans to finance all capital expenditures with 30% debt and 70% equity. What is the break point due to retained earnings being used up?

Answer $24,000

116. Miller Mining had net income after interest but before taxes of $40,000 this year. The marginal tax rate is 40%, and the dividend payout ratio is 30%. The company can raise debt at a 12% interest rate for any amount of debt less than $8,000. If the firm raises more than $8,000, a 15% interest rate will apply. The last dividend paid by Miller was $0.90. Miller’s common stock is selling for $8.59 per share, and its growth rate expected in earnings and dividends are 5%. If Miller issues new common stock, the flotation cost incurred will be 10%. Miller plans to finance all capital expenditures with 30% debt and 70% equity. What is the cost of new common equity raised by selling stock?

Answer 17.22%

117. Miller Mining had net income after interest but before taxes of $40,000 this year. The marginal tax rate is 40%, and the dividend payout ratio is 30%. The company can raise debt at a 12% interest rate for any amount of debt less than $8,000. If the firm raises more than $8,000, a 15% interest rate will apply. The last dividend paid by Miller was $0.90. Miller’s common stock is selling for $8.59 per share, and its growth rate expected in earnings and dividends is 5%. If Miller issues new common stock, the flotation cost incurred will be 10%. Miller plans to finance all capital expenditures with 30% debt and 70% equity. There are two break points in Miller’s MCC schedule; one when retained earnings have been used up, and one when low-cost debt has been used up. Therefore, there are three intervals in the MCC schedule. What is the marginal cost of capital in each of these intervals?

Answer 13.36%  14.21%  14.75%
118. Adams Corporation’s present capital structure, which is also its target capital structure, is 40% debt and 60% common equity. Next year’s net income is projected to be $21,000, and Adams’ payout ratio is 30%. The company’s earnings and dividends are growing at a constant rate of 5%; the last dividend (D0) was $2.00; and the current equilibrium stock price is $21.88. Adams can raise up to $20,000 of debt at a 12% before-tax cost. All debt after $20,000 will cost 16%. If Adams issues new common stock, a 20% flotation cost will be incurred. The firm’s marginal tax rate is 50%.

(A) What is the maximum amount of new capital that can be raised at the LOWEST component cost of EQUITY? (In other words, what is the retained earnings break point?)

(B) What is the component cost of equity by selling new common stock?

Answer $24,500 17.0%

119. The following information applies to Winston Inc.:

1. Optimal capital structure is 50% debt and 50% equity.
2. Retained earnings are $4 million.
3. Cost of debt is 12 percent.
4. Tax rate is 46 percent.
5. Current dividend is $1.00.
6. Expected growth rate of dividends is 6 percent.
7. Current stock price is $25.00.
8. Floatation costs involved in issuing new stock are 5%.

What is Winston’s marginal weighted average required return (the cost of the last dollar raised), given a planned capital budget of $12 million?

Answer 8.47%

120. Determine the weighted average required return for Venus Corp. given the following data:

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank loan</td>
<td>$ 120,000</td>
<td>Current stock price</td>
<td>$ 62.50</td>
</tr>
<tr>
<td>Long-term debt</td>
<td>$ 175,000</td>
<td>Current dividend</td>
<td>$ 7.32</td>
</tr>
<tr>
<td>Preferred stock</td>
<td>$ 15,000</td>
<td>Return on preferred stock</td>
<td>14%</td>
</tr>
<tr>
<td>Common stock</td>
<td>$ 100,000</td>
<td>Return on long-term debt</td>
<td>12%</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>$ 250,000</td>
<td>Interest on bank loan</td>
<td>16%</td>
</tr>
<tr>
<td>Flotation Costs</td>
<td>8%</td>
<td>Expected growth rate on dividends</td>
<td>11%</td>
</tr>
<tr>
<td>Tax rate</td>
<td>40%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ANSWER = 16.7%
121. Zenon Co. recently issued 10-year 12 3/4 percent coupon bonds at face value. Zenon's beta is .62, its target debt/equity ratio is .60, and the tax rate is 46 percent. If the market risk premium is 8 percent and the risk-free rate is 10 percent, estimate Zenon's weighted average required return.

Answer 11.93%