Solutions for HW chap 3. (9th ed)  
  
1.        Using the formula for NWC, we get:  
  
        NWC = CA – CL  
        CA = CL + NWC = $3,720 + 1,370 = $5,090  
  
        So, the current ratio is:  
        Current ratio = CA / CL = $5,090/$3,720 = 1.37 times  
  
        And the quick ratio is:  
        Quick ratio = (CA – Inventory) / CL = ($5,090 – 1,950) / $3,720 = 0.84 times  
  
4.        Inventory turnover = COGS / Inventory  
        Inventory turnover = $4,105,612 / $407,534 = 10.07 times  
  
        Days’ sales in inventory = 365 days / Inventory turnover = 365 / 10.07 = 36.23 days  
  
        On average, a unit of inventory sat on the shelf 36.23 days before it was sold.  
  
5.        Total debt ratio = 0.63 = TD / TA  
  
        Substituting total debt plus total equity for total assets, we get:  
  
        0.63 = TD / (TD + TE)  
  
        Solving this equation yields:  
  
        0.63(TE) = 0.37(TD)  
  
        Debt/equity ratio = TD / TE = 0.63 / 0.37 = 1.70  
  
        Equity multiplier = 1 + D/E = 2.70  
  
12.        The equity multiplier is:  
  
        EM = 1 + D/E  
        EM = 1 + 0.65 = 1.65  
  
        One formula to calculate return on equity is:  
  
        ROE = (ROA)(EM)  
        ROE = .085(1.65) = .1403 or 14.03%  
  
  
        ROE can also be calculated as:  
  
        ROE = NI / TE  
  
        So, net income is:  
  
        NI = ROE(TE)  
        NI = (.1403)($540,000) = $75,735.  
  
  
19.        This is a multi-step problem involving several ratios. It is often easier to look backward to determine where to start. We need receivables turnover to find days’ sales in receivables. To calculate receivables turnover, we need credit sales, and to find credit sales, we need total sales. Since we are given the profit margin and net income, we can use these to calculate total sales as:  
  
        PM = 0.087 = NI / Sales = $218,000 / Sales; Sales = $2,505,747  
  
        Credit sales are 70 percent of total sales, so:  
  
        Credit sales = $2,515,747(0.70) = $1,754,023  
  
        Now we can find receivables turnover by:  
  
        Receivables turnover = Credit sales / Accounts receivable = $1,754,023 / $132,850 = 13.20 times  
  
        Days’ sales in receivables = 365 days / Receivables turnover = 365 / 13.20 = 27.65 days  
  
  
24.        The only ratio given which includes cost of goods sold is the inventory turnover ratio, so it is the last ratio used. Since current liabilities is given, we start with the current ratio:  
  
        Current ratio = 1.40 = CA / CL = CA / $365,000  
        CA = $511,000  
  
        Using the quick ratio, we solve for inventory:  
  
        Quick ratio = 0.85 = (CA – Inventory) / CL = ($511,000 – Inventory) / $365,000  
        Inventory = CA – (Quick ratio × CL)  
        Inventory = $511,000 – (0.85 × $365,000)  
        Inventory = $200,750  
  
        Inventory turnover = 5.82 = COGS / Inventory = COGS / $200,750  
        COGS = $1,164,350  
  
  
  
  
  
  
  
  
  
  
Solutions to HW chap 5( 9th ed )  
1.        The simple interest per year is:  
        $5,000 × .08 = $400  
        So after 10 years you will have:  
        $400 × 10 = $4,000 in interest.  
        The total balance will be $5,000 + 4,000 = $9,000  
        With compound interest we use the future value formula:  
        FV = PV(1 +r)t  
        FV = $5,000(1.08)10 = $10,794.62  
        The difference is:  
        $10,794.62 – 9,000 = $1,794.62  
9.        To answer this question, we can use either the FV or the PV formula. Both will give the same answer since they are the inverse of each other. We will use the FV formula, that is:  
        FV = PV(1 + r)t  
        Solving for t, we get:  
        t = ln(FV / PV) / ln(1 + r)  
        t = ln ($170,000 / $40,000) / ln 1.053 = 28.02 years  
13.        To answer this question, we can use either the FV or the PV formula. Both will give the same answer since they are the inverse of each other. We will use the FV formula, that is:  
        FV = PV(1 + r)t  
        Solving for r, we get:  
        r = (FV / PV)1 / t – 1  
        r = ($1,260,000 / $150)1/112 – 1 = .0840 or 8.40%  
        To find the FV of the first prize, we use:  
        FV = PV(1 + r)t  
        FV = $1,260,000(1.0840)33 = $18,056,409.94  
20.        To answer this question, we can use either the FV or the PV formula. Both will give the same answer since they are the inverse of each other. We will use the FV formula, that is:  
        FV = PV(1 + r)t  
        Solving for t, we get:  
        t = ln(FV / PV) / ln(1 + r)  
        t = ln($75,000 / $10,000) / ln(1.11) = 19.31  
        So, the money must be invested for 19.31 years. However, you will not receive the money for another two years.         From now, you’ll wait:  
        2 years + 19.31 years = 21.31 years  
  
  
  
  
Selected solutions to  HW chap 6  
  
30.        Here we need to convert an EAR into interest rates for different compounding periods. Using the equation for the EAR, we get:  
  
        EAR = [1 + (APR / m)]m – 1  
  
        EAR = .17 = (1 + r)2 – 1;        r = (1.17)1/2 – 1         = .0817 or 8.17% per six months  
  
        EAR = .17 = (1 + r)4 – 1;        r = (1.17)1/4 – 1         = .0400 or 4.00% per quarter  
  
        EAR = .17 = (1 + r)12 – 1;        r = (1.17)1/12 – 1         = .0132 or 1.32% per month  
  
        Notice that the effective six month rate is not twice the effective quarterly rate because of the effect of compounding.  
  
34.        Here we are finding the annuity payment necessary to achieve the same FV. The interest rate given is a 12 percent APR, with monthly deposits. We must make sure to use the number of months in the equation. So, using the FVA equation:  
  
        Starting today:  
        FVA = C[{[1 + (.12/12) ]480 – 1} / (.12/12)]  
        C = $1,000,000 / 11,764.77 = $85.00  
  
        Starting in 10 years:  
        FVA = C[{[1 + (.12/12) ]360 – 1} / (.12/12)]  
        C = $1,000,000 / 3,494.96 = $286.13  
  
        Starting in 20 years:  
        FVA = C[{[1 + (.12/12) ]240 – 1} / (.12/12)]  
        C = $1,000,000 / 989.255 = $1,010.86  
  
Notice that a deposit for half the length of time, i.e. 20 years versus 40 years, does not mean that the annuity payment is doubled. In this example, by reducing the savings period by one-half, the deposit necessary to achieve the same ending value is about twelve times as large.  
  
38.        Since your salary grows at 4 percent per year, your salary next year will be:  
  
        Next year’s salary = $50,000 (1 + .04)  
        Next year’s salary = $52,000  
  
        This means your deposit next year will be:  
  
        Next year’s deposit = $52,000(.05)  
        Next year’s deposit = $2,600  
  
        Since your salary grows at 4 percent, you deposit will also grow at 4 percent. We can use the present value of a growing perpetuity equation to find the value of your deposits today. Doing so, we find:  
  
        PV = C {[1/(r – g)] – [1/(r – g)] × [(1 + g)/(1 + r)]t}  
        PV = $2,600{[1/(.11 – .04)] – [1/(.11 – .04)] × [(1 + .04)/(1 + .11)]40}  
        PV = $34,399.45  
  
        Now, we can find the future value of this lump sum in 40 years. We find:  
  
        FV = PV(1 + r)t  
        FV = $34,366.45(1 + .11)40  
        FV = $2,235,994.31  
  
        This is the value of your savings in 40 years.  
  
  44.        To solve this problem, we simply need to find the PV of each lump sum and add them together. It is important to note that the first cash flow of $1 million occurs today, so we do not need to discount that cash flow. The PV of the lottery winnings is:  
  
        PV = $1,000,000 + $1,500,000/1.09 + $2,000,000/1.092 + $2,500,000/1.093 + $3,000,000/1.094  
                        + $3,500,000/1.095 + $4,000,000/1.096 + $4,500,000/1.097 + $5,000,000/1.098  
                        + $5,500,000/1.099 + $6,000,000/1.0910  
        PV = $22,812,873.40  
  
47.        We want to find the value of the cash flows today, so we will find the PV of the annuity, and then bring the lump sum PV back to today. The annuity has 18 payments, so the PV of the annuity is:  
  
        PVA = $4,000{[1 – (1/1.10)18] / .10} = $32,805.65  
  
        Since this is an ordinary annuity equation, this is the PV one period before the first payment, so it is the PV at t = 7. To find the value today, we find the PV of this lump sum. The value today is:  
  
        PV = $32,805.65 / 1.107 = $16,834.48  
  
52.        The cash flows in this problem are semiannual, so we need the effective semiannual rate. The         interest rate given is the APR, so the monthly interest rate is:  
  
        Monthly rate = .10 / 12 = .00833  
  
To get the semiannual interest rate, we can use the EAR equation, but instead of using 12 months as the exponent, we will use 6 months. The effective semiannual rate is:  
  
        Semiannual rate = (1.00833)6 – 1 = .0511 or 5.11%  
  
We can now use this rate to find the PV of the annuity. The PV of the annuity is:  
  
PVA @ year 8: $7,000{[1 – (1 / 1.0511)10] / .0511} = $53,776.72  
  
Note, this is the value one period (six months) before the first payment, so it is the value at year 8. So, the value at the various times the questions asked for uses this value 8 years from now.  
  
        PV @ year 5: $53,776.72 / 1.05116 = $39,888.33  
  
Note, you can also calculate this present value (as well as the remaining present values) using the number of years. To do this, you need the EAR. The EAR is:  
  
        EAR = (1 + .0083)12 – 1 = .1047 or 10.47%  
  
        So, we can find the PV at year 5 using the following method as well:  
  
        PV @ year 5: $53,776.72 / 1.10473 = $39,888.33  
  
The value of the annuity at the other times in the problem is:  
  
        PV @ year 3: $53,776.72 / 1.051110         = $32,684.88  
        PV @ year 3: $53,776.72 / 1.10475          = $32,684.88  
  
        PV @ year 0: $53,776.72 / 1.051116         = $24,243.67  
        PV @ year 0: $53,776.72 / 1.10478         = $24,243.67  
  
55.         The payment for a loan repaid with equal payments is the annuity payment with the loan value as the PV of the annuity. So, the loan payment will be:  
  
        PVA = $42,000 = C {[1 – 1 / (1 + .08)5] / .08}  
  
        C = $10,519.17  
The interest payment is the beginning balance times the interest rate for the period, and the principal payment is the total payment minus the interest payment. The ending balance is the beginning balance minus the principal payment. The ending balance for a period is the beginning balance for the next period. The amortization table for an equal payment is:  
        Year        Beginning        Balance        Total  
Payment        Interest  
Payment        Principal  
Payment        Ending  
Balance  
        1        $42,000.00        $10,519.17        $3,360.00        $7,159.17        $34,840.83  
        2        34,840.83        10,519.17        2,787.27        7,731.90        27,108.92  
        3        27,108.92        10,519.17        2,168.71        8,350.46        18,758.47  
        4        18,758.47        10,519.17        1,500.68        9,018.49        9,739.97  
        5        9,739.97        10,519.17        779.20        9,739.97        0.00  
  
        In the third year, $2,168.71 of interest is paid.  
  
        Total interest over life of the loan = $3,360 + 2,787.27 + 2,168.71 + 1,500.68 + 779.20  
        Total interest over life of the loan = $10,595.86  
  
64.        First we will find the APR and EAR for the loan with the refundable fee. Remember, we need to use the actual cash flows of the loan to find the interest rate. With the $2,300 application fee, you will need to borrow $242,300 to have $240,000 after deducting the fee. Solving for the payment under these circumstances, we get:  
  
        PVA = $242,300 = C {[1 – 1/(1.005667)360]/.005667} where .005667 = .068/12  
        C = $1,579.61  
  
We can now use this amount in the PVA equation with the original amount we wished to borrow, $240,000. Solving for r, we find:  
  
        PVA = $240,000 = $1,579.61[{1 – [1 / (1 + r)]360}/ r]  
  
        Solving for r with a spreadsheet, on a financial calculator, or by trial and error, gives:  
  
         r = 0.5745% per month  
  
        APR = 12(0.5745%) = 6.89%  
  
        EAR = (1 + .005745)12 – 1 = 7.12%  
  
        With the nonrefundable fee, the APR of the loan is simply the quoted APR since the fee is not         considered part of the loan. So:  
  
        APR = 6.80%  
  
        EAR = [1 + (.068/12)]12 – 1 = 7.02%  
  
65.  Be careful of interest rate quotations. The actual interest rate of a loan is determined by the cash flows. Here, we are told that the PV of the loan is $1,000, and the payments are $41.15 per month for three years, so the interest rate on the loan is:  
  
        PVA = $1,000 = $41.15[{1 – [1 / (1 + r)]36 } / r ]  
  
        Solving for r with a spreadsheet, on a financial calculator, or by trial and error, gives:  
  
         r = 2.30% per month  
  
        APR = 12(2.30%) = 27.61%  
  
        EAR = (1 + .0230)12 – 1 = 31.39%  
  
        It’s called add-on interest because the interest amount of the loan is added to the principal amount of the loan before the loan payments are calculated.  
  
  
69.        The monthly payments with a balloon payment loan are calculated assuming a longer amortization schedule, in this case, 30 years. The payments based on a 30-year repayment schedule would be:  
  
        PVA = $750,000 = C({1 – [1 / (1 + .081/12)]360} / (.081/12))  
        C = $5,555.61  
  
Now, at time = 8, we need to find the PV of the payments which have not been made. The balloon payment will be:  
  
        PVA = $5,555.61({1 – [1 / (1 + .081/12)]12(22)} / (.081/12))  
        PVA = $683,700.32

Solutions to HW chap 7 (9th ed)  
1.        The yield to maturity is the required rate of return on a bond expressed as a nominal annual interest rate. For noncallable bonds, the yield to maturity and required rate of return are interchangeable terms. Unlike YTM and required return, the coupon rate is not a return used as the interest rate in bond cash flow valuation, but is a fixed percentage of par over the life of the bond used to set the coupon payment amount. For the example given, the coupon rate on the bond is still 10 percent, and the YTM is 8 percent.  
6.        To find the price of this bond, we need to realize that the maturity of the bond is 10 years. The bond was issued one year ago, with 11 years to maturity, so there are 10 years left on the bond. Also, the coupons are semiannual, so we need to use the semiannual interest rate and the number of semiannual periods. The price of the bond is:  
        P = $34.50(PVIFA3.7%,20) + $1,000(PVIF3.7%,20) = $965.10  
8.        Here we need to find the coupon rate of the bond. All we need to do is to set up the bond pricing equation and solve for the coupon payment as follows:  
        P = $924 = C(PVIFA3.4%,29) + $1,000(PVIF3.4%,29)  
        Solving for the coupon payment, we get:  
        C = $29.84  
                Since this is the semiannual payment, the annual coupon payment is:  
        2 × $29.84 = $59.68  
        And the coupon rate is the annual coupon payment divided by par value, so:  
        Coupon rate = $59.68 / $1,000  
        Coupon rate = .0597 or 5.97%  
17.        Initially, at a YTM of 8 percent, the prices of the two bonds are:  
                PJ         = $20(PVIFA4%,18) + $1,000(PVIF4%,18)         = $746.81  
                PK         = $60(PVIFA4%,18) + $1,000(PVIF4%,18)         = $1,253.19  
        If the YTM rises from 8 percent to 10 percent:  
                PJ         = $20(PVIFA5%,18) + $1,000(PVIF5%,18)         = $649.31  
                PK         = $60(PVIFA5%,18) + $1,000(PVIF5%,18)         = $1,116.90  
                The percentage change in price is calculated as:  
                Percentage change in price = (New price – Original price) / Original price  
              PJ%         = ($649.31 – 746.81) / $746.81         = – 13.06%Δ    
            PK%        = ($1,116.90 – 1,253.19) / $1,253.19         = – 10.88%Δ      
        If the YTM declines from 8 percent to 6 percent:  
                PJ         = $20(PVIFA3%,18) + $1,000(PVIF3%,18)         = $862.46  
                PK         = $60(PVIFA3%,18) + $1,000(PVIF3%,18)         = $1,412.61  
              PJ%         = ($862.46 – 746.81) / $746.81        = + 15.49%Δ    
              PK%         = ($1,412.61 – 1,253.19) / $1,253.19        = + 12.72%Δ    
        All else the same, the lower the coupon rate on a bond, the greater is its price sensitivity to changes in interest rates.  
18.        The bond price equation for this bond is:  
        P0 = $1,068 = $46(PVIFAR%,18) + $1,000(PVIFR%,18)  
        Using a spreadsheet, financial calculator, or trial and error we find:  
        R = 4.06%  
        This is the semiannual interest rate, so the YTM is:  
 4.06% = 8.12%×        YTM = 2   
        The current yield is:  
        Current yield = Annual coupon payment / Price = $92 / $1,068 = .0861 or 8.61%  
        The effective annual yield is the same as the EAR, so using the EAR equation from the previous chapter:        Effective annual yield = (1 + 0.0406)2 – 1 = .0829 or 8.29%  
24.        a.        The bond price is the present value of the cash flows from a bond. The YTM is the interest rate used in valuing the cash flows from a bond.  
        b.        If the coupon rate is higher than the required return on a bond, the bond will sell at a premium, since it provides periodic income in the form of coupon payments in excess of that required by investors on other similar bonds. If the coupon rate is lower than the required return on a bond, the bond will sell at a discount since it provides insufficient coupon payments compared to that required by investors on other similar bonds. For premium bonds, the coupon rate exceeds the YTM; for discount bonds, the YTM exceeds the coupon rate, and for bonds selling at par, the YTM is equal to the coupon rate.  
c.        Current yield is defined as the annual coupon payment divided by the current bond price. For  
premium bonds, the current yield exceeds the YTM, for discount bonds the current yield is less than the YTM, and for bonds selling at par value, the current yield is equal to the YTM. In all cases, the current yield plus the expected one-period capital gains yield of the bond must be equal to the required return.  
  
26.         a.        The coupon bonds have an 8% coupon which matches the 8% required return, so they will sell at par. The number of bonds that must be sold is the amount needed divided by the bond price, so:  
                Number of coupon bonds to sell = $30,000,000 / $1,000 = 30,000  
                The number of zero coupon bonds to sell would be:  
                Price of zero coupon bonds = $1,000/1.0460 = $95.06  
                Number of zero coupon bonds to sell = $30,000,000 / $95.06 = 315,589  
        b.        The repayment of the coupon bond will be the par value plus the last coupon payment times the number of bonds issued. So:  
                Coupon bonds repayment = 30,000($1,040) = $31,200,000  
                The repayment of the zero coupon bond will be the par value times the number of bonds issued, so: Zeroes: repayment = 315,589($1,000) = $315,588,822  
27.        We found the maturity of a bond in Problem 22. However, in this case, the maturity is indeterminate. A bond selling at par can have any length of maturity. In other words, when we solve the bond pricing equation as we did in Problem 22, the number of periods can be any positive number.  
                Challenge  
29.        To find the capital gains yield and the current yield, we need to find the price of the bond. The current price of Bond P and the price of Bond P in one year is:  
        P:        P0 = $120(PVIFA7%,5) + $1,000(PVIF7%,5) = $1,116.69  
                P1 = $120(PVIFA7%,4) + $1,000(PVIF7%,4) = $1,097.19  
                Current yield = $120 / $1,116.69 = .1075 or 10.75%  
                        The capital gains yield is:  
                        Capital gains yield = (New price – Original price) / Original price  
                Capital gains yield = ($1,097.19 – 1,111.69) / $1,116.69 = –.0175 or –1.75%  
        The current price of Bond D and the price of Bond D in one year is:  
        D:        P0 = $60(PVIFA7%,5) + $1,000(PVIF7%,5) = $883.31  
                P1 = $60(PVIFA7%,4) + $1,000(PVIF7%,4) = $902.81  
                Current yield = $60 / $883.81 = .0679 or 6.79%  
                   Capital gains yield = ($902.81 – 883.31) / $883.31 = +.0221 or +2.21%  
        All else held constant, premium bonds pay high current income while having price depreciation as maturity nears; discount bonds do not pay high current income but have price appreciation as maturity nears. For either bond, the total return is still 9%, but this return is distributed differently between current income and capital gains.  
  
  
  
Solutions to HW chap 8 (9th ed)  
  
2.        We need to find the required return of the stock. Using the constant growth model, we can solve the equation for R. Doing so, we find:  
  
        R = (D1 / P0) + g = ($2.10 / $48.00) + .05 = .0938 or 9.38%  
  
6.        We know the stock has a required return of 11 percent, and the dividend and capital gains yield are equal, so:  
  
        Dividend yield = 1/2(.11) = .055 = Capital gains yield  
  
        Now we know both the dividend yield and capital gains yield. The dividend is simply the stock price times the dividend yield, so:  
  
        D1 = .055($47) = $2.59  
  
        This is the dividend next year. The question asks for the dividend this year. Using the relationship between the dividend this year and the dividend next year:  
  
        D1 = D0(1 + g)  
  
        We can solve for the dividend that was just paid:  
  
        $2.59 = D0(1 + .055)  
  
        D0 = $2.59 / 1.055 = $2.45  
  
11.        Here we have a stock that pays no dividends for 10 years. Once the stock begins paying dividends, it will have a constant growth rate of dividends. We can use the constant growth model at that point. It is important to remember that general constant dividend growth formula is:  
  
        Pt = [Dt × (1 + g)] / (R – g)  
  
        This means that since we will use the dividend in Year 10, we will be finding the stock price in Year 9. The dividend growth model is similar to the PVA and the PV of a perpetuity: The equation gives you the PV one period before the first payment. So, the price of the stock in Year 9 will be:  
  
        P9 = D10 / (R – g) = $10.00 / (.14 – .05) = $111.11  
  
        The price of the stock today is simply the PV of the stock price in the future. We simply discount the future stock price at the required return. The price of the stock today will be:  
  
        P0 = $111.11 / 1.149 = $34.17  
13.        With supernormal dividends, we find the price of the stock when the dividends level off at a constant growth rate, and then find the PV of the future stock price, plus the PV of all dividends during the supernormal growth period. The stock begins constant growth in Year 4, so we can find the price of the stock in Year 4, at the beginning of the constant dividend growth, as:  
  
        P4 = D4 (1 + g) / (R – g) = $2.00(1.05) / (.12 – .05) = $30.00  
  
        The price of the stock today is the PV of the first four dividends, plus the PV of the Year 3 stock price. So, the price of the stock today will be:  
  
        P0 = $11.00 / 1.12 + $8.00 / 1.122 + $5.00 / 1.123 + $2.00 / 1.124 + $30.00 / 1.124 = $40.09  
  
17.        We are given the stock price, the dividend growth rate, and the required return, and are asked to find the dividend. Using the constant dividend growth model, we get:  
  
        P0 = $64 = D0 (1 + g) / (R – g)  
  
        Solving this equation for the dividend gives us:  
  
        D0 = $64(.10 – .045) / (1.045)  
        D0 = $3.37  
  
20.        We can use the two-stage dividend growth model for this problem, which is:  
  
        P0 = [D0(1 + g1)/(R – g1)]{1 – [(1 + g1)/(1 + R)]T}+ [(1 + g1)/(1 + R)]T[D0(1 + g2)/(R – g2)]  
        P0 = [$1.25(1.28)/(.13 – .28)][1 – (1.28/1.13)8] + [(1.28)/(1.13)]8[$1.25(1.06)/(.13 – .06)]  
        P0 = $69.55  
  
  
  
Solutions to HW chap 9 (new ed)  
  
7.        The IRR is the interest rate that makes the NPV of the project equal to zero. So, the equation that defines the IRR for this project is:  
  
        0 = – $34,000 + $16,000/(1+IRR) + $18,000/(1+IRR)2 + $15,000/(1+IRR)3  
  
        Using a spreadsheet, financial calculator, or trial and error to find the root of the equation, we find that:  
  
        IRR = 20.97%  
  
        Since the IRR is greater than the required return we would accept the project.  
  
8.        The NPV of a project is the PV of the outflows minus the PV of the inflows. The equation for the NPV of this project at an 11 percent required return is:  
  
        NPV = – $34,000 + $16,000/1.11 + $18,000/1.112 + $15,000/1.113 = $5,991.49  
  
        At an 11 percent required return, the NPV is positive, so we would accept the project.  
  
        The equation for the NPV of the project at a 30 percent required return is:  
  
        NPV = – $34,000 + $16,000/1.30 + $18,000/1.302 + $15,000/1.303 = –$4,213.93  
  
        At a 30 percent required return, the NPV is negative, so we would reject the project.  
  
        And the NPV at a 30 percent required return is:  
  
        NPV        = –$19,500 + $9,800/1.3 + $10,300/1.32 + $8,600/1.33 = –$1,952.44  
  
        Notice that as the required return increases, the NPV of the project decreases. This will always be true for projects with conventional cash flows. Conventional cash flows are negative at the beginning of the project and positive throughout the rest of the project.  
  
13.        The IRR is the interest rate that makes the NPV of the project equal to zero. The equation to calculate the IRR of Project X is:  
  
        0 = –$15,000 + $8,150/(1+IRR) + $5,050/(1+IRR)2 + $6,800/(1+IRR)3  
  
        Using a spreadsheet, financial calculator, or trial and error to find the root of the equation, we find that:  
  
        IRR = 16.57%  
  
        For Project Y, the equation to find the IRR is:  
  
        0 = –$15,000 + $7,700/(1+IRR) + $5,150/(1+IRR)2 + $7,250/(1+IRR)3  
  
        Using a spreadsheet, financial calculator, or trial and error to find the root of the equation, we find that:  
  
        IRR = 16.45%  
  
        To find the crossover rate, we subtract the cash flows from one project from the cash flows of the other project, and find the IRR of the differential cash flows. We will subtract the cash flows from Project Y from the cash flows from Project X. It is irrelevant which cash flows we subtract from the other. Subtracting the cash flows, the equation to calculate the IRR for these differential cash flows is:  
  
        Crossover rate: 0 = $450/(1+R) – $100/(1+R)2 – $450/(1+R)3  
  
        Using a spreadsheet, financial calculator, or trial and error to find the root of the equation, we find that:  
  
        R = 11.73%  
  
        The table below shows the NPV of each project for different required returns. Notice that Project Y always has a higher NPV for discount rates below 11.73 percent, and always has a lower NPV for discount rates above 11.73 percent.  
  
R        $NPVX                 $NPVY  
0%        $5,000.00                $5,100.00  
5%        $3,216.50                $3,267.36  
10%        $1,691.59                $1,703.23  
15%        $376.59                $356.78  
20%        –$766.20                –$811.34  
25%        –$1,766.40                –$1,832.00  
  
  
16.        a.        The profitability index is the PV of the future cash flows divided by the initial investment. The cash flows for both projects are an annuity, so:  
  
                PII = $27,000(PVIFA10%,3 ) / $53,000 = 1.267  
  
                PIII = $9,100(PVIFA10%,3) / $16,000 = 1.414  
  
                The profitability index decision rule implies that we accept project II, since PIII is greater than the PII.  
  
        b.        The NPV of each project is:  
  
                NPVI = –$53,000 + $27,000(PVIFA10%,3) = $14,145.00  
  
                NPVII = –$16,000 + $9,100(PVIFA10%,3) = $6,630.35  
  
                The NPV decision rule implies accepting Project I, since the NPVI is greater than the NPVII.  
  
        c.        Using the profitability index to compare mutually exclusive projects can be ambiguous when the magnitude of the cash flows for the two projects are of different scale. In this problem, project I is roughly 3 times as large as project II and produces a larger NPV, yet the profitability index criterion implies that project II is more acceptable.  
  
17.        a.        The payback period for each project is:  
  
                A:        3 + ($180,000/$390,000) = 3.46 years  
  
                B:        2 + ($9,000/$18,000) = 2.50 years  
  
                The payback criterion implies accepting project B, because it pays back sooner than project A.  
  
        b.        The discounted payback for each project is:  
  
                A:        $20,000/1.15 + $50,000/1.152 + $50,000/1.153 = $88,074.30  
                        $390,000/1.154 = $222,983.77  
  
                        Discounted payback = 3 + ($390,000 – 88,074.30)/$222,983.77 = 3.95 years  
  
                B:        $19,000/1.15 + $12,000/1.152 + $18,000/1.153 = $37,430.76  
                        $10,500/1.154 = $6,003.41  
  
                        Discounted payback = 3 + ($40,000 – 37,430.76)/$6,003.41 = 3.43 years  
  
                The discounted payback criterion implies accepting project B because it pays back sooner than A.  
  
        c.        The NPV for each project is:  
  
                A:        NPV = –$300,000 + $20,000/1.15 + $50,000/1.152 + $50,000/1.153 + $390,000/1.154  
                        NPV = $11,058.07  
  
                B:        NPV = –$40,000 + $19,000/1.15 + $12,000/1.152 + $18,000/1.153 + $10,500/1.154  
                        NPV = $3,434.16  
  
                NPV criterion implies we accept project A because project A has a higher NPV than project B.  
  
        d.        The IRR for each project is:  
  
                A:        $300,000 = $20,000/(1+IRR) + $50,000/(1+IRR)2 + $50,000/(1+IRR)3 + $390,000/(1+IRR)4  
  
                Using a spreadsheet, financial calculator, or trial and error to find the root of the equation, we find that:  
  
                        IRR = 16.20%  
  
                B:        $40,000 = $19,000/(1+IRR) + $12,000/(1+IRR)2 + $18,000/(1+IRR)3 + $10,500/(1+IRR)4  
  
                Using a spreadsheet, financial calculator, or trial and error to find the root of the equation, we find that:  
  
                        IRR = 19.50%  
  
                IRR decision rule implies we accept project B because IRR for B is greater than IRR for A.  
  
        e.        The profitability index for each project is:  
  
                A:        PI = ($20,000/1.15 + $50,000/1.152 + $50,000/1.153 + $390,000/1.154) / $300,000 = 1.037  
  
                B:        PI = ($19,000/1.15 + $12,000/1.152 + $18,000/1.153 + $10,500/1.154) / $40,000 = 1.086  
  
                Profitability index criterion implies accept project B because its PI is greater than project A’s.  
  
        f.        In this instance, the NPV criteria implies that you should accept project A, while profitability index, payback period, discounted payback, and IRR imply that you should accept project B. The final decision should be based on the NPV since it does not have the ranking problem associated with the other capital budgeting techniques. Therefore, you should accept project A.  
  
18.        At a zero discount rate (and only at a zero discount rate), the cash flows can be added together across time. So, the NPV of the project at a zero percent required return is:  
  
        NPV = –$684,680 + 263,279 + 294,060 + 227,604 + 174,356 = $274,619  
  
        If the required return is infinite, future cash flows have no value. Even if the cash flow in one year is $1 trillion, at an infinite rate of interest, the value of this cash flow today is zero. So, if the future cash flows have no value today, the NPV of the project is simply the cash flow today, so at an infinite interest rate:  
  
        NPV = –$684,680  
  
        The interest rate that makes the NPV of a project equal to zero is the IRR. The equation for the IRR of this project is:  
  
        0 = –$684,680 + $263,279/(1+IRR) + $294,060/(1+IRR)2 + $227,604/(1+IRR)3 + 174,356/(1+IRR)4  
  
        Using a spreadsheet, financial calculator, or trial and error to find the root of the equation, we find that:  
  
        IRR = 16.23%

Solutions to HW chap 10 (9th ed)  
  
  
2.        Sales due solely to the new product line are:  
  
        19,000($13,000) = $247,000,000  
  
        Increased sales of the motor home line occur because of the new product line introduction; thus:  
  
        4,500($53,000) = $238,500,000  
  
        in new sales is relevant. Erosion of luxury motor coach sales is also due to the new mid-size campers; thus:  
  
        900($91,000) = $81,900,000 loss in sales  
  
        is relevant. The net sales figure to use in evaluating the new line is thus:  
  
        $247,000,000 + 238,500,000 – 81,900,000 = $403,600,000  
  
3.        We need to construct a basic income statement. The income statement is:  
  
        Sales        $        830,000  
        Variable costs                498,000  
        Fixed costs                181,000  
        Depreciation                  77,000  
        EBT        $          74,000  
        [Taxes@35](https://imail.aub.edu.lb/imp/message.php?mailbox=INBOX&index=1127)%                  25,900  
        Net income        $          48,100  
  
4.        To find the OCF, we need to complete the income statement as follows:  
  
        Sales        $        824,500  
        Costs                538,900  
        Depreciation                126,500  
        EBT        $        159,100  
        [Taxes@34](https://imail.aub.edu.lb/imp/message.php?mailbox=INBOX&index=1127)%                  54,094  
        Net income        $        105,006  
  
The OCF for the company is:  
  
OCF = EBIT + Depreciation – Taxes  
OCF = $159,100 + 126,500 – 54,094  
OCF = $231,506  
  
The depreciation tax shield is the depreciation times the tax rate, so:  
  
Depreciation tax shield = tcDepreciation  
Depreciation tax shield = .34($126,500)  
Depreciation tax shield = $43,010  
  
The depreciation tax shield shows us the increase in OCF by being able to expense depreciation.  
  
5.        To calculate the OCF, we first need to calculate net income. The income statement is:  
  
                Sales        $         108,000  
        Variable costs                51,000  
        Depreciation                  6,800  
        EBT        $        50,200  
        [Taxes@35](https://imail.aub.edu.lb/imp/message.php?mailbox=INBOX&index=1127)%                17,570  
        Net income        $        32,630  
  
                Using the most common financial calculation for OCF, we get:  
  
                OCF = EBIT + Depreciation – Taxes  
                OCF = $50,200 + 6,800 – 17,570  
                OCF = $39,430  
  
8.        To find the BV at the end of four years, we need to find the accumulated depreciation for the first four years. We could calculate a table as in Problem 6, but an easier way is to add the MACRS depreciation amounts for each of the first four years and multiply this percentage times the cost of the asset. We can then subtract this from the asset cost. Doing so, we get:  
  
        BV4 = $7,900,000 – 7,900,000(0.2000 + 0.3200 + 0.1920 + 0.1152)  
        BV4 = $1,365,120  
  
        The asset is sold at a gain to book value, so this gain is taxable.  
  
        Aftertax salvage value = $1,400,000 + ($1,365,120 – 1,400,000)(.35)  
        Aftertax salvage value = $1,387,792  
  
9.        Using the tax shield approach to calculating OCF (Remember the approach is irrelevant; the final answer will be the same no matter which of the four methods you use.), we get:  
  
                OCF = (Sales – Costs)(1 – tC) + tCDepreciation  
        OCF = ($2,650,000 – 840,000)(1 – 0.35) + 0.35($3,900,000/3)  
        OCF = $1,631,500  
  
10.        Since we have the OCF, we can find the NPV as the initial cash outlay plus the PV of the OCFs, which are an annuity, so the NPV is:  
  
        NPV = –$3,900,000 + $1,631,500(PVIFA12%,3)  
        NPV = $18,587.71  
  
11.        The cash outflow at the beginning of the project will increase because of the spending on NWC. At the end of the project, the company will recover the NWC, so it will be a cash inflow. The sale of the equipment will result in a cash inflow, but we also must account for the taxes which will be paid on this sale. So, the cash flows for each year of the project will be:  
  
        Year        Cash Flow  
        0        –$4,200,000                 = –$3,900,000 – 300,000  
        1        1,631,500  
        2        1,631,500  
        3        2,068,000                 = $1,631,500 + 300,000 + 210,000 + (0 – 210,000)(.35)  
  
        And the NPV of the project is:  
  
        NPV = –$4,200,000 + $1,631,500(PVIFA12%,2) + ($2,068,000 / 1.123)  
        NPV = $29,279.79  
  
12.        First we will calculate the annual depreciation for the equipment necessary for the project. The depreciation amount each year will be:  
  
        Year 1 depreciation = $3,900,000(0.3333) = $1,299,870  
        Year 2 depreciation = $3,900,000(0.4445) = $1,733,550  
        Year 3 depreciation = $3,900,000(0.1481) = $577,590  
  
        So, the book value of the equipment at the end of three years, which will be the initial investment minus the accumulated depreciation, is:  
  
        Book value in 3 years = $3,900,000 – ($1,299,870 + 1,733,550 + 577,590)  
        Book value in 3 years = $288,990  
  
        The asset is sold at a loss to book value, so this loss is taxable deductible.  
  
        Aftertax salvage value = $210,000 + ($288,990 – 210,000)(0.35)  
        Aftertax salvage value = $237,647  
  
        To calculate the OCF, we will use the tax shield approach, so the cash flow each year is:  
  
                OCF = (Sales – Costs)(1 – tC) + tCDepreciation  
  
        Year        Cash Flow  
        0        –$4,200,000                 = –$3,900,000 – 300,000  
        1        1,631,454.50                 = ($1,810,000)(.65) + 0.35($1,299,870)  
        2        1,783,242.50                 = ($1,810,000)(.65) + 0.35($1,733,550)  
        3        1,916,303.00                 = ($1,810,000)(.65) + 0.35($577,590) + $237,647 + 300,000  
  
        Remember to include the NWC cost in Year 0, and the recovery of the NWC at the end of the project. The NPV of the project with these assumptions is:  
  
        NPV = –$4,200,000 + ($1,631,454.50/1.12) + ($1,783,242.50/1.122) + ($1,916,303.00/1.123)  
        NPV = $42,232.43  
  
  
  
  
33.        To find the initial pretax cost savings necessary to buy the new machine, we should use the tax shield approach to find the OCF. We begin by calculating the depreciation each year using the MACRS depreciation schedule. The depreciation each year is:  
  
        D1 = $610,000(0.3333) = $203,313  
        D2 = $610,000(0.4444) = $271,145  
        D3 = $610,000(0.1482) = $90,341  
        D4 = $610,000(0.0741) = $45,201  
        Using the tax shield approach, the OCF each year is:  
  
        OCF1 = (S – C)(1 – 0.35) + 0.35($203,313)  
        OCF2 = (S – C)(1 – 0.35) + 0.35($271,145)  
        OCF3 = (S – C)(1 – 0.35) + 0.35($90,341)  
        OCF4 = (S – C)(1 – 0.35) + 0.35($45,201)  
        OCF5 = (S – C)(1 – 0.35)  
  
        Now we need the aftertax salvage value of the equipment. The aftertax salvage value is:  
  
        After-tax salvage value = $40,000(1 – 0.35) = $26,000  
  
        To find the necessary cost reduction, we must realize that we can split the cash flows each year. The OCF in any given year is the cost reduction (S – C) times one minus the tax rate, which is an annuity for the project life, and the depreciation tax shield. To calculate the necessary cost reduction, we would require a zero NPV. The equation for the NPV of the project is:  
  
        NPV = 0 = –$610,000 – 55,000 + (S – C)(0.65)(PVIFA12%,5) + 0.35($203,313/1.12  
                       + $271,145/1.122 + $90,341/1.123 + $45,201/1.124) + ($55,000 + 26,000)/1.125  
  
        Solving this equation for the sales minus costs, we get:  
  
        (S – C)(0.65)(PVIFA12%,5) = $447,288.67  
        (S – C) = $190,895.74  
  
  
  
Solutions to HW chap13 (9th edition)  
  
2.        The expected return of a portfolio is the sum of the weight of each asset times the expected return of each asset. The total value of the portfolio is:  
  
        Total value = $2,950 + 3,700 = $6,650  
  
        So, the expected return of this portfolio is:  
  
        E(Rp) = ($2,950/$6,650)(0.11) + ($3,700/$6,650)(0.15) = .1323 or 13.23%  
  
4.        Here we are given the expected return of the portfolio and the expected return of each asset in the portfolio, and are asked to find the weight of each asset. We can use the equation for the expected return of a portfolio to solve this problem. Since the total weight of a portfolio must equal 1 (100%), the weight of Stock Y must be one minus the weight of Stock X. Mathematically speaking, this means:  
  
        E(Rp) = .124 = .14wX + .105(1 – wX)  
  
        We can now solve this equation for the weight of Stock X as:  
  
        .124 = .14wX  + .105 – .105wX  
        .019 = .035wX  
        wX = 0.542857  
  
        So, the dollar amount invested in Stock X is the weight of Stock X times the total portfolio value, or:  
  
        Investment in X = 0.542857($10,000) = $5,428.57  
  
        And the dollar amount invested in Stock Y is:  
        Investment in Y = (1 – 0.542857)($10,000) = $4,574.43  
  
6.        The expected return of an asset is the sum of the probability of each return occurring times the probability of that return occurring. So, the expected return of the asset is:        E(R) = .20(–.05) + .50(.12) + .30(.25) = .1250 or 12.50%  
  
8.        The expected return of a portfolio is the sum of the weight of each asset times the expected return of each asset. So, the expected return of the portfolio is:  
  
        E(Rp) = .25(.08) + .55(.15) + .20(.24) = .1505 or 15.05%  
  
        If we own this portfolio, we would expect to get a return of 15.05 percent.  
  
10\*\*.        a.        This portfolio does not have an equal weight in each asset. We first need to find the return of the portfolio in each state of the economy. To do this, we will multiply the return of each asset by its portfolio weight and then sum the products to get the portfolio return in each state of the economy. Doing so, we get:  
                Boom:        E(Rp) = .30(.3) + .40(.45) + .30(.33) = .3690 or 36.90%  
                Good:    E(Rp) = .30(.12) + .40(.10) + .30(.15) = .1210 or 12.10%  
                Poor:        E(Rp) = .30(.01) + .40(–.15) + .30(–.05) = –.0720 or –7.20%  
                Bust:        E(Rp) = .30(–.06) + .40(–.30) + .30(–.09) = –.1650 or –16.50%  
  
                And the expected return of the portfolio is:  
  
                E(Rp) = .15(.3690) + .45(.1210) + .35(–.0720) + .05(–.1650) = .0764 or 7.64%  
  
        b.        To calculate the standard deviation, we first need to calculate the variance. To find the variance, we find the squared deviations from the expected return. We then multiply each possible squared deviation by its probability, than add all of these up. The result is the variance. So, the variance and standard deviation of the portfolio is:  
  
p2σ                = .15(.3690 – .0764)2 + .45(.1210 – .0764)2 + .35(–.0720 – .0764)2 + .05(–.1650 – .0764)2  
p2 = .02436σ                  
p = (.02436)1/2 =σ                .1561 or 15.61%  
  
12.        The beta of a portfolio is the sum of the weight of each asset times the beta of each asset. If the portfolio is as risky as the market it must have the same beta as the market. Since the beta of the market is one, we know the beta of our portfolio is one. We also need to remember that the beta of the risk-free asset is zero. It has to be zero since the asset has no risk. Setting up the equation for the beta of our portfolio, we get:  
  
X)βp = 1.0 = 1/3(0) + 1/3(1.38) + 1/3(β          
  
        X = 1.62βSolving for the beta of Stock X, we get:          
  
13.        CAPM states the relationship between the risk of an asset and its expected return. CAPM is:  
  
iβ        E(Ri) = Rf + [E(RM) – Rf] ×   
  
        Substituting the values we are given, we find:  
  
        E(Ri) = .052 + (.11 – .052)(1.05) = .1129 or 11.29%  
  
  
16.        Here we need to find the risk-free rate using the CAPM. Substituting the values given, and solving for the risk-free rate, we find:  
  
        E(Ri) = .14 = Rf + (.115 – Rf)(1.45)  
  
        .14 = Rf + .16675 – 1.45Rf  
  
        Rf = .0594 or 5.94%  
  
17\*\*.        a.        Again we have a special case where the portfolio is equally weighted, so we can sum the returns of each asset and divide by the number of assets. The expected return of the portfolio is:  
  
                E(Rp) = (.16 + .048)/2 = .1040 or 10.40%  
  
        b.        We need to find the portfolio weights that result in a portfolio of the risk-free asset is zero. We also know theβ of 0.95. We know the βwith a weight of the risk-free asset is one minus the weight of the stock since the portfolio weights must sum to one, or 100 percent. So:  
  
pβ                = 0.95 = wS(1.35) + (1 – wS)(0)  
                0.95 = 1.35wS + 0 – 0wS  
                wS = 0.95/1.35  
                wS = .7037  
  
                And, the weight of the risk-free asset is:  
  
                wRf = 1 – .7037 = .2963  
  
        c.        We need to find the portfolio weights that result in a portfolio with an expected return of 8 percent. We also know the weight of the risk-free asset is one minus the weight of the stock since the portfolio weights must sum to one, or 100 percent. So:  
  
                E(Rp) = .08 = .16wS + .048(1 – wS)  
                .08 = .16wS + .048 – .048wS  
                .032 = .112wS  
                wS = .2857  
  
    of the portfolio will be:β            So, the   
  
p =β                .2857(1.35) + (1 – .2857)(0) = 0.386  
  
β        d.        Solving for the of the portfolio as we did in part a, we find:  
  
p = 2.70β                = wS(1.35) + (1 – wS)(0)  
  
                wS = 2.70/1.35 = 2  
  
                wRf = 1 – 2 = –1  
  
                The portfolio is invested 200% in the stock and –100% in the risk-free asset. This represents borrowing at the risk-free rate to buy more of the stock.  
  
24\*\*.        Since the portfolio of the portfolio must be equal to one. We alsoβis as risky as the market, the ofβ of the risk-free asset is zero. We can use the equation for the βknow the a portfolio to find the weight of the third stock. Doing so, we find:  
  
    p = 1.0 = wA(.85) + wB(1.20) + wC(1.35) + wRf(0)β      
  
        Solving for the weight of Stock C, we find:  
  
        wC = .324074  
  
        So, the dollar investment in Stock C must be:  
  
        Invest in Stock C = .324074($1,000,000) = $324,074.07  
  
        We know the total portfolio value and the investment of two stocks in the portfolio, so we can find the weight of these two stocks. The weights of Stock A and Stock B are:  
  
        wA = $210,000 / $1,000,000 = .210  
  
        wB = $320,000/$1,000,000 = .320  
  
        We also know the total portfolio weight must be one, so the weight of the risk-free asset must be one minus the asset weight we know, or:  
  
        1 = wA + wB + wC + wRf = 1 – .210 – .320 – .324074 – wRf  
  
        wRf = .145926  
  
        So, the dollar investment in the risk-free asset must be:  
  
        Invest in risk-free asset = .145926($1,000,000) = $145,925.93  
  
Solutions to HW chap 14 (9th ed)  
  
8.        The book value of debt is the total par value of all outstanding debt, so:  
  
        BVD = $80,000,000 + 35,000,000 = $115,000,000  
  
        To find the market value of debt, we find the price of the bonds and multiply by the number of bonds. Alternatively, we can multiply the price quote of the bond times the par value of the bonds. Doing so, we find:  
  
        MVD = .95($80,000,000) + .61($35,000,000)  
        MVD = $76,000,000 + 21,350,000  
        MVD = $97,350,000  
  
        The YTM of the zero coupon bonds is:  
  
        PZ = $610 = $1,000(PVIFR%,14)  
        R = 3.594%  
        YTM = 2 × 3.594% = 7.19%  
  
        So, the aftertax cost of the zero coupon bonds is:  
  
        RZ = .0719(1 – .35) = .0467 or 4.67%  
  
        The aftertax cost of debt for the company is the weighted average of the aftertax cost of debt for all outstanding bond issues. We need to use the market value weights of the bonds. The total aftertax cost of debt for the company is:  
  
        RD = .0552($76/$97.35) + .0467($21.35/$97.35) = .0534 or 5.34%  
  
  
11.        Here we have the WACC and need to find the debt-equity ratio of the company. Setting up the WACC equation, we find:  
  
        WACC = .0890 = .12(E/V) + .079(D/V)(1 – .35)  
  
        Rearranging the equation, we find:  
  
        .0890(V/E) = .12 + .079(.65)(D/E)  
  
        Now we must realize that the V/E is just the equity multiplier, which is equal to:  
  
        V/E = 1 + D/E  
  
        .0890(D/E + 1) = .12 + .05135(D/E)  
  
        Now we can solve for D/E as:  
  
        .06765(D/E) = .031  
        D/E = .8234  
  
12.        a.        The book value of equity is the book value per share times the number of shares, and the book value of debt is the face value of the company’s debt, so:  
  
                BVE = 11,000,000($6) = $66,000,000  
  
                BVD = $70,000,000 + 55,000,000 = $125,000,000  
  
                So, the total value of the company is:  
  
                V = $66,000,000 + 125,000,000 = $191,000,000  
  
                And the book value weights of equity and debt are:  
  
                E/V = $66,000,000/$191,000,000 = .3455  
  
                D/V = 1 – E/V = .6545  
  
        b.        The market value of equity is the share price times the number of shares, so:  
  
                MVE = 11,000,000($68) = $748,000,000  
  
                Using the relationship that the total market value of debt is the price quote times the par value of the bond, we find the market value of debt is:  
  
                MVD = .93($70,000,000) + 1.04($55,000,000) = $122,300,000  
  
                This makes the total market value of the company:  
  
                V = $748,000,000 + 122,300,000 = $870,300,000  
  
                And the market value weights of equity and debt are:  
  
                E/V = $748,000,000/$870,300,000 = .8595  
  
                D/V = 1 – E/V = .1405  
  
        c.        The market value weights are more relevant.  
  
13.        First, we will find the cost of equity for the company. The information provided allows us to solve for the cost of equity using the dividend growth model, so:  
  
        RE = [$4.10(1.06)/$68] + .06 = .1239 or 12.39%  
  
        Next, we need to find the YTM on both bond issues. Doing so, we find:  
  
        P1 = $930 = $35(PVIFAR%,42) + $1,000(PVIFR%,42)  
        R = 3.838%  
        YTM = 3.838% × 2 = 7.68%  
  
        P2 = $1,040 = $40(PVIFAR%,12) + $1,000(PVIFR%,12)  
        R = 3.584%  
        YTM = 3.584% × 2 = 7.17%  
  
        To find the weighted average aftertax cost of debt, we need the weight of each bond as a percentage of the total debt. We find:  
  
        wD1 = .93($70,000,000)/$122,300,000 = .5323  
  
        wD2 = 1.04($55,000,000)/$122,300,000 = .4677  
  
        Now we can multiply the weighted average cost of debt times one minus the tax rate to find the weighted average aftertax cost of debt. This gives us:  
  
        RD = (1 – .35)[(.5323)(.0768) + (.4677)(.0717)] = .0484 or 4.84%  
  
        Using these costs we have found and the weight of debt we calculated earlier, the WACC is:  
  
        WACC = .8595(.1239) + .1405(.0484) = .1133 or 11.33%  
  
14.        a.        Using the equation to calculate WACC, we find:  
  
                WACC = .094 = (1/2.05)(.14) + (1.05/2.05)(1 – .35)RD  
                RD = .0772 or 7.72%  
  
        b.        Using the equation to calculate WACC, we find:  
  
                WACC = .094 = (1/2.05)RE + (1.05/2.05)(.068)  
                RE = .1213 or 12.13%  
16.        a.        We will begin by finding the market value of each type of financing. We find:  
  
                MVD = 105,000($1,000)(0.93) = $97,650,000  
                MVE = 9,000,000($34) = $306,000,000  
                MVP = 250,000($91) = $22,750,000  
  
                And the total market value of the firm is:  
  
                V = $97,650,000 + 306,000,000 + 22,750,000 = $426,400,000  
  
                So, the market value weights of the company’s financing is:  
  
                D/V = $97,650,000/$426,400,000 = .2290  
                P/V = $22,750,000/$426,400,000 = .0534  
                E/V = $306,000,000/$426,400,000 = .7176  
  
        b.        For projects equally as risky as the firm itself, the WACC should be used as the discount rate.  
  
                First we can find the cost of equity using the CAPM. The cost of equity is:  
  
                RE = .05 + 1.25(.085) = .1563 or 15.63%  
  
                The cost of debt is the YTM of the bonds, so:  
  
                P0 = $930 = $37.5(PVIFAR%,30) + $1,000(PVIFR%,30)  
                R = 4.163%  
                YTM = 4.163% × 2 = 8.33%  
  
                And the aftertax cost of debt is:  
  
                RD = (1 – .35)(.0833) = .0541 or 5.41%  
  
                The cost of preferred stock is:  
  
                RP = $6/$91 = .0659 or 6.59%  
  
                Now we can calculate the WACC as:  
  
                WACC = .0541(.2290) + .1563(.7176) + .0659(.0534) = .1280 or 12.80%  
  
  
Solutions to selected problems of chap 16  
  
  
  
1.        a.        A table outlining the income statement for the three possible states of the economy is shown below. The EPS is the net income divided by the 5,000 shares outstanding. The last row shows the percentage change in EPS the company will experience in a recession or an expansion economy.  
  
                        Recession        Normal        Expansion  
                EBIT        $14,000        $28,000        $36,400  
                Interest                 0                 0                 0  
                NI        $14,000        $28,000        $36,400  
                EPS        $  2.80        $  5.60        $  7.28  
EPS        –50        –––       Δ                % +30  
  
        b.        If the company undergoes the proposed recapitalization, it will repurchase:  
  
                Share price = Equity / Shares outstanding  
                Share price = $250,000/5,000  
                Share price = $50  
  
                Shares repurchased = Debt issued / Share price  
                Shares repurchased =$90,000/$50  
                Shares repurchased = 1,800  
  
  
                The interest payment each year under all three scenarios will be:  
  
                Interest payment = $90,000(.07) = $6,300  
  
                The last row shows the percentage change in EPS the company will experience in a recession or an expansion economy under the proposed recapitalization.  
  
                        Recession        Normal        Expansion  
                EBIT        $14,000        $28,000        $36,400  
                Interest          6,300          6,300          6,300  
                NI        $7,700        $21,700        $30,100  
                EPS        $2.41        $  6.78        $9.41  
EPS        –64.52        –––        +38.71Δ                %  
  
4.        a.        Under Plan I, the unlevered company, net income is the same as EBIT with no corporate tax. The EPS under this capitalization will be:  
  
                EPS = $350,000/160,000 shares  
                EPS = $2.19  
  
                Under Plan II, the levered company, EBIT will be reduced by the interest payment. The interest payment is the amount of debt times the interest rate, so:  
  
                NI = $500,000 – .08($2,800,000)  
                NI = $126,000  
  
                And the EPS will be:  
                EPS = $126,000/80,000 shares  
                EPS = $1.58  
  
                Plan I has the higher EPS when EBIT is $350,000.  
  
        b.        Under Plan I, the net income is $500,000 and the EPS is:  
  
                EPS = $500,000/160,000 shares  
                EPS = $3.13  
  
                Under Plan II, the net income is:  
  
                NI = $500,000 – .08($2,800,000)  
                NI = $276,000  
  
                And the EPS is:  
  
                EPS = $276,000/80,000 shares  
                EPS = $3.45  
  
                Plan II has the higher EPS when EBIT is $500,000.  
  
        c.        To find the breakeven EBIT for two different capital structures, we simply set the equations for EPS equal to each other and solve for EBIT. The breakeven EBIT is:  
  
                EBIT/160,000 = [EBIT – .08($2,800,000)]/80,000  
                EBIT = $448,000  
  
  
5.        We can find the price per share by dividing the amount of debt used to repurchase shares by the number of shares repurchased. Doing so, we find the share price is:  
  
        Share price = $2,800,000/(160,000 – 80,000)  
        Share price = $35.00 per share  
  
        The value of the company under the all-equity plan is:  
  
        V = $35.00(160,000 shares) = $5,600,000  
  
        And the value of the company under the levered plan is:  
  
        V = $35.00(80,000 shares) + $2,800,000 debt = $5,600,000  
  
6.        a.        The income statement for each capitalization plan is:  
  
                        I        II        All-equity  
                EBIT        $39,000        $39,000        $39,000  
                Interest          16,000         24,000                    0  
                NI        $23,000        $15,000        $39,000  
                EPS        $    3.29        $   3.00        $  3.55  
  
                The all-equity plan; Plan II has the lowest EPS.  
  
        b.        The breakeven level of EBIT occurs when the capitalization plans result in the same EPS. The EPS is calculated as:  
  
                EPS = (EBIT – RDD)/Shares outstanding  
  
                This equation calculates the interest payment (RDD) and subtracts it from the EBIT, which results in the net income. Dividing by the shares outstanding gives us the EPS. For the all-equity capital structure, the interest term is zero. To find the breakeven EBIT for two different capital structures, we simply set the equations equal to each other and solve for EBIT. The breakeven EBIT between the all-equity capital structure and Plan I is:  
  
                EBIT/11,000 = [EBIT – .10($160,000)]/7,000  
                EBIT = $44,000  
  
                And the breakeven EBIT between the all-equity capital structure and Plan II is:  
  
                EBIT/11,000 = [EBIT – .10($240,000)]/5,000  
                EBIT = $44,000  
  
                The break-even levels of EBIT are the same because of M&M Proposition I.  
  
        c.        Setting the equations for EPS from Plan I and Plan II equal to each other and solving for EBIT, we get:  
  
                [EBIT – .10($160,000)]/7,000 = [EBIT – .10($240,000)]/5,000  
                EBIT = $44,000  
  
                This break-even level of EBIT is the same as in part b again because of M&M Proposition I.  
  
7.        To find the value per share of the stock under each capitalization plan, we can calculate the price as the value of shares repurchased divided by the number of shares repurchased. So, under Plan I, the value per share is:  
  
        P = $160,000/(11,000 – 7,000 shares)  
        P = $40 per share  
  
        And under Plan II, the value per share is:  
  
        P = $240,000/(11,000 – 5,000 shares)  
        P = $40 per share  
  
        This shows that when there are no corporate taxes, the stockholder does not care about the capital structure decision of the firm. This is M&M Proposition I without taxes.  
  
        d.        The income statement for each capitalization plan with corporate income taxes is:  
  
                        I        II        All-equity  
                EBIT        $39,000        $39,000        $39,000  
                Interest        16,000        24,000        0  
                Taxes            9,200           6,000          15,600  
                NI         $ 13,800        $  9,000        $ 23,400  
                EPS        $    1.97        $    1.80        $    2.13  
  
                The all-equity plan still has the highest EPS; Plan II still has the lowest EPS.  
  
                We can calculate the EPS as:  
  
                EPS = [(EBIT – RDD)(1 – tC)]/Shares outstanding  
  
                This is similar to the equation we used before, except now we need to account for taxes. Again, the interest expense term is zero in the all-equity capital structure. So, the breakeven EBIT between the all-equity plan and Plan I is:  
  
                EBIT(1 – .40)/11,000 = [EBIT – .10($160,000)](1 – .40)/7,000  
                EBIT = $44,000  
  
                The breakeven EBIT between the all-equity plan and Plan II is:  
  
                EBIT(1 – .40)/11,000 = [EBIT – .10($240,000)](1 – .40)/5,000  
                EBIT = $44,000  
  
                And the breakeven between Plan I and Plan II is:  
  
                [EBIT – .10($160,000)](1 – .40)/7,000 = [EBIT – .10($240,000)](1 – .40)/5,000  
                EBIT = $44,000  
  
                The break-even levels of EBIT do not change because the addition of taxes reduces the income of all three plans by the same percentage; therefore, they do not change relative to one another.