1. Estimate the WACC that is appropriate for discounting the Collinsville plant’s incremental cash flows. You should estimate and present each component of the WACC separately, explaining briefly but clearly what assumptions you are making for each of them. In the same spirit, estimate the appropriate all-equity cost of capital for the APV-based valuation.  
     
   WACC calculation.  
   WACC = RD\*(1-t)\*D/(D+E)+RE\* E/(D+E)  
   Cost of equity  
   We assume that risk free rate (Rf) equals rate of long-term Treasury Bonds (as the project’s life is 10 years), so Rf = 9.5%.  
     
   According to Aswath Damodaran equity risk premium in the US in 1979 was 6.45%, thus Rm – Rf = 6.45%.  
     
   We will estimate beta equity using data of comparable firms, focusing on production only sodium chlorate: Brunswick Chemical and Sothern Chemicals. To calculate beta asset we’ll use information about beta equity and equity-to-value ratio. As well we assume that debt beta equals zero:  
     
   To adjust beta in accordance with project we assume that in the long-run Dixon will maintain its target debt-to-capital ratio in proportion of 35%. Thus, we get the following beta asset of the project that accounts for Dixon’s capital structure: Betaproject = 0.94/(1-0.35) = 1.45  
     
   RE = Rf + Bproject\*(Rm-Rf) = 9.5% + 1.45\*6.45% = 18.85%  
   Cost of debt  
   We assume that cost of debt equals 11.25% as Dixon issue bonds at this rate for the purpose of this project financing. Marginal tax rate = 3,818/(3,818+4,024) = 48,68%  
   RD\*(1-t) = 11.25%\*(1-48.68%) = 5.77%  
   WACC  
   WACC = RD\*(1-t)\*D/(D+E)+RE\* E/(D+E)  
   = 5.77%\*0.35 + 18.85%\*0.65 = 14.27%.  
   APV-based evaluation

The rate we’re looking for APV evaluation is return on equity if this project is 100% equity financed. So we use unlevered average beta for evaluation as equity-to value ratio equals 1. Betaequity = Betaasset = 0.94  
  
RE = Rf + Bequity\*(Rm-Rf) = 9.5% + 0.94\*6.45% = 15.56%  
  
 2) Project the incremental cash flows associated with the acquisition of the Collinsville plant without the laminate technology. Use projections from Exhibit 8 through 1984. After 1984 assume: EBIT is flat; capital expenditures are $600,000 per year; and that net working capital increases 8% per year. Assume that the plant is shut down at the end of 1989 and that its salvage value is zero.  
  
Depreciation would increase as the value of plant in the amount of $10.6 mln should be written off. We estimated average depreciation growth in 1980-1984 is 4.6%. So after 1984 we assume that depreciation would increase by 4.6% each year. Thus some assets (recent years’ CAPEX) will remain on the balance. Under these assumptions we get the following forecast of incremental cash flow without the laminate technology:  
  
3) Estimate the value of the Collinsville plant without the laminate technology using the simple WACC method.  
  
Using the calculated WACC of 14.27% and the free cash flows calculated in question 2 above; we calculated the value of the Collinsville plant without laminate technology to be $ 9.536million. The calculation is shown below.  
  
  | 1979| 1980| 1981| 1982| 1983| 1984| 1985| 1986| 1987| 1988| 1989| FCF|  | 1,206 | 1,407 | 1,892 | 2,074 | 2,073 | 2,116 | 2,163 | 2,213 | 2,264 | 2,318 | WACC|  | 0.1427| 0.1427| 0.1427| 0.1427| 0.1427| 0.1427| 0.1427| 0.1427| 0.1427| 0.1427| Disc. Rate|  | 1.1427| 1.1427| 1.1427| 1.1427| 1.1427| 1.1427| 1.1427| 1.1427| 1.1427| 1.1427| no of periods| 0| 1| 2| 3| 4| 5| 6| 7| 8| 9| 10| time factor|  | 1.14| 1.31| 1.49| 1.71 2.91| 3.32| 3.80| discount factor|  | 0.88| 0.77| 0.67| 0.59| 0.51| 0.45| 0.39| 0.34| 0.30| 0.26| P.V. @ t=o|  | 1,055.83 | 1,077.74 | 1,267.72 | 1,216.63 | 1,063.96 | 950.26 | 850.40 | 761.26 | 681.66 | 610.56 | Total=| 9,536.02 |  |  |  |  |  |  |  |  |  |  |  
  
4) Project the incremental cash flows associated with the 1980 investment in laminate technology. Using the simple WACC method, estimate the investment’s net present value.  
  
We assumed that the cost of graphite which according to exhibit 8 has been growing slower year on year would grow steadily at 4% and that power costs would grow at 12% per year up to 1989. We also assumed that the benefits of laminate technology will only be felt starting in 1981. With 1980 as the base year, the NPV calculation was done as at December, 1980 and we assumed that the cash injection of $2.5million dollars would occur instantaneously in December 1980. Using a median assumption of power cost savings of 17.5%, we arrive at an NPV of $12.865million for the laminate investment. The applicable range and full calculations are presented below.  
  
 Savings| 1980| 1981| 1982| 1983| 1984| 1985| 1986| 1987| 1988| 1989|

Total| Graphite costs| 645| 791| 875| 940| 992| 1031.68| 1072.95| 1115.87| 1160.50| 1206.92|  |

savings| 0| 791| 875| 940| 992| 1031.68| 1072.95| 1115.87| 1160.50| 1206.92|

 | Power Costs| 6304| 7735| 9366| 10526| 11780| 13193.6| 14776.83| 16550.05| 18536.06| 20760.39|

| savings (15%)| | 1160.25| 1404.9| 1578.9| 1767| 1979.04| 2216.52| 2482.51| 2780.409| 3114.058|

| savings (20%)| | 1547| 1873.2| 2105.2| 2356| 2638.72| 2955.37| 3310.01| 3707.21| 4152.08|

| Total Savings (15%)| | 1951.25| 2279.9| 2518.9| 2759| 3010.72| 3289.47| 3598.37| 3940.90| 4320.97|

| Total Savings (20%)| | 2338| 2748.2| 3045.2| 3348| 3670.4| 4028.31| 4425.88| 4867.71| 5358.99|

| Discount Factor| | 0.87512| 0.76584| 0.6702| 0.5865| 0.51326| 0.44917| 0.39307| 0.34398| 0.30103|

 | PV of Savings ( 15%)| | 1707.58| 1746.03| 1688.2| 1618.2| 1545.29| 1477.52| 1414.43| 1355.62| 1300.74| 13854

| PV of savings (20%)| | 2046.03| 2104.67| 2040.9| 1963.6| 1883.88| 1809.38| 1739.7| 1674.43| 1613.21| 16876|

PV(17.5%)| | | | | | | | | | | 15365|  
  
Cash Outflow in 1980| -2500| | | | | | | | | | | NPV (15%)| 11354| | | | | | | | | | |  
NPV(20%)| 14376| | | | | | | | | | |  
NPV(17.5%)| 12865| | | | | | | | | | |  
  
5) Compare the WACC-based valuation to the APV-based valuation. Do they differ and how much? If the difference is important, explain why. If the difference is small or zero, explain why.  
  
To use the APV model we need to calculate the value of the project as if it were 100% equity financed (for this we use the return on equity obtained in question 1 – 15.56%) and the value of the tax shield of debt. For the first we arrive at an NPV of $9.023 million. The calculations are shown below:  
  
  | 1979| 1980| 1981| 1982| 1983| 1984| 1985| 1986| 1987| 1988| 1989| FCF| | 1,206| 1,407| 1,892| 2,074| 2,073| 2,116| 2,163| 2,213| 2,264| 2,318| WACC| | 15.56%| 15.56%| 15.56%| 15.56%| 15.56%| 15.56%| 15.56%| 15.56%| 15.56%| 15.56%| Disc. Rate| | 1.1556| 1.1556| 1.1556| 1.1556| 1.1556| 1.1556| 1.1556| 1.1556| 1.1556| 1.1556| no of periods| 0| 1| 2| 3| 4| 5| 6| 7| 8| 9| 10| time factor| | 1.16| 1.34| 1.54| 1.78| 2.06| 2.38| 2.75| 3.18| 3.68| 4.25| discount factor| | 0.87| 0.75| 0.65| 0.56| 0.49| 0.42| 0.36| 0.31| 0.27| 0.24| P.V. @ t=o| | 1,044.02| 1,053.76| 1,225.64| 1,163.08| 1,005.76| 888.22| 785.99| 695.73| 616.01| 545.59| Total=| 9,023.80| | | | | | | | | | |  
  
For the second part, cash flows are tRdD and discount rate is between Rd and Re. So we calculated the NPV for both options to define the range for this part. Using Rd we consider that Debt remains stable and using Re we assume that D/V is stable. With these assumptions we arrive at a range for the NPV of $1.461million up to $1.570million. So, the total NPV for this plant using the APV methodology is between $10.485million and $10.594million. The calculations for the second part are in the following table:  | 1979| 1980| 1981| 1982| 1983| 1984| 1985| 1986| 1987| 1988| 1989| Debt| 8,000 | 7,000 | 6,000 | 5,000 | 4,000 | 3,000 | 2,000 | 1,000 | - | - | - | t| 0.4868| 48.68%| 48.68%| 48.68%| 48.68%| 48.68%| 48.68%| 48.68%| 48.68%| 48.68%| 48.68%| Rd| 0.1125| 11.25%| 11.25%| 11.25%| 11.25%| 11.25%| 11.25%| 11.25%| 11.25%| 11.25%| 11.25%| CF| 438 | 383 | 329 | 274 | 219 | 164 | 110 | 55 | - | - | - | R=Rd| 0.1125| 11.25%| 11.25%| 11.25%| 11.25%| 11.25%| 11.25%| 11.25%| 11.25%| 11.25%| 11.25%| P.V. @ t=o| 438.12| 344.59 | 265.49 | 198.87 | 143.01 | 96.41 | 57.77 | 25.97 | - | - | - | Total=| 1,570.23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | R=Re| 0.1556| 15.56%| 15.56%| 15.56%| 15.56%| 15.56%| 15.56%| 15.56%| 15.56%| 15.56%| 15.56%| P.V. @ t=o| 438.12| 331.73 | 246.05 | 177.43 | 122.83 | 79.71 | 45.99 | 19.90 | - | - | - | Total=| 1,461.74 |  |  |  |  |  |  |  |  |  |  |  | Rd| Re| | | | | | | | | |  
  
Total NPV| 10,594.03 | 10,485.53| | | | | | | | | |  
  
Using APV method we obtain a higher value for the plant. Since the debt varies drastically during the operation of the plant the APV method presents a better value for it than the WACC model that does not take this issue into account. The difference between the values are the result for this assumption in both models.  
  
6) As CEO of Dixon Corporation, would you approve the acquisition of the Collinsville plant at the price and on the terms proposed? Why, or why not? If we held the responsibility of the CEO of Dixon Corporation, we would approve the acquisition of the Collinsville plant at the price of $12 million and terms proposed. Our recommendation is based on the premise that a firm operates in the interests of its shareholders and therefore should accept all projects that increase the wealth of the shareholders. Looking at the results already mentioned in the previous questions, we used NPV to back our recommendation. The project is clearly negative without the laminate technology (NPV= $-2,464mln). However, it gets promising due to the potential cost savings that this technology can provide (NPV=$865 if 17.5% cost saving and NPV=$2,376 if 20% cost saving). Given the possibility of an unsuccessful technology, we would recommend Dixon to have a contractual clause with American Chemical in case the technology are not to succeed. In this case, American should at least pay back the $2.25mln investment. Finally, we recommend that Dixon invest in Collinsville because it will not only increase the wealth of the shareholders, but also complement its strategy of supplying chemicals products to the paper and pulp industry.