Extensions to the APV Example

3. **Subsidized (or below-market-rate) financing**

   Now take a look at an example that incorporates the value of subsidized financing.

   Suppose a municipal government decides that the investment is socially (and politically) desirable and agrees to raise the $4,969,630 debt financing as a municipal bond, or 'muni.' PPM Inc. can now effectively borrow $4,969,630 at the municipality's borrowing rate, $r_{muni} = 7\%$. (Since interest income on a muni is exempt from Federal taxes, investors demand a lower rate on the muni than the rate on a corporate bond of comparable risk.)

   The good news is that the firm is able to borrow at a below market rate, i.e., 7% vs 10%. The bad news is that this lower interest rate reduces the value of the interest tax shield on debt financing.

   The annual interest expense through the municipal government is only $4,969,630*.07 = $347,874. The opportunity cost (and therefore, the appropriate discount rate) is 10%, PPM's cost of debt. Hence, the present value of the interest tax shield is $347,874*.21/.10 = $730,536. Note that the tax subsidy, i.e., the interest tax shield, is smaller than the amount in the original scenario of $1,043,622 because the annual interest expense through the municipal government is lower.

   The second component of the subsidy is the below market-rate funds provided through the municipal government. The value of the municipal bond is $347,874 /.10 = $3,478,741. If PPM Inc. obtains the funds at their normal borrowing rate, the amount of debt would be $4,969,630. The saving through the municipal government is $1,490,889 (i.e. $4,969,630 - $3,478,741). In other words, PPM receives proceeds from the loan of $4,969,630, but the interest payments have a present value of $3,478,741 only. This is a good deal. In summary, the interest rate subsidy associated with borrowing below the market rate has a value of $1,490,889.

   The total NPVF(Municipal Loan) = PV(tax subsidy) + PV(interest rate subsidy) = $730,536 + $1,490,889 = $2,221,425.

   Next we will look at an approach that combines the two subsidies to get the value of the financing effects. As you will see, the result is the same.

   Value of Subsidized Financing - Alternate Calculation

= Amount borrowed - PV(after-tax interest payments) - PV(loan repayments)
= $4,969,630 - (1-.21)*.07*$4,969,630/.10 - $0
= $4,969,630 - $2,748,205 - $0 = $2,221,425

Note that loan repayments are zero because we have assumed that the loan has no maturity date. The only reason for this assumption is to simplify calculations. Assuming no maturity date allows us to discount the interest payments using the perpetuity formula.
Here, think about what you raise is the full loan proceeds of $4,969,630 versus the value of $2,748,205 that you pay for the after-tax interest obligations, i.e., the present value of the interests you will pay on the loan less the interest tax shield. Intuitively, this value calculation should make sense.

Given the subsidized financing, the APV of the project is:

APV = NPV_U + NPVF
= $0 + $2,221,425
= $2,221,425

The project is now very attractive. This is more attractive than the original scenario due to the second side effect associated with being able to obtain the loan at a below market interest rate, i.e., the interest rate subsidy.

4. **Flotation Costs**

Now we will return to our original scenario.

When a company raises funds through external debt or equity, it must incur flotation costs. Assume that the municipal government no longer sponsored the project and PPM Inc. must obtain $4,969,630 of new debt at the market interest rate of 10%. Flotation costs are 12.5% of gross proceeds.

Since the company must have $4,969,630 in net proceeds from its debt financing, it must raise $4,969,630/(1-0.125) = $5,679,577. The $709,947 (i.e. $5,679,577 - $4,969,630) flotation cost is a cash expense today. The U.S. tax code allows this expense to be amortized over five years, resulting in a $709,947/5 = $141,989 deduction per year. Annual tax shields from amortization of the flotation costs are .21*$141,989 = $29,818. The net present value of the after tax flotation cost is:

NPV(flotation cost) = -$709,947 + $29,818*[1-(1/1.10)^5]/.10 = -$709,947 + $113,034 = - $596,913

The APV of the project is now:

APV = NPV + NPVF(tax subsidy) + NPVF(issue costs) = $0 + $1,043,622 - $596,913 = $446,709

The project, compared to the original scenario, becomes less attractive, i.e., a smaller positive APV. The flotation costs effectively increase the initial investment that cuts into the APV of the project.

5. **Costs of Financial Distress**

   Firms should continue to exploit tax shields on interest until the benefits are offset by the marginal costs of financial distress. This means that financial distress costs are likely to be non trivial for an optimally financed firm. Unfortunately, we don't have a good handle on estimating financial distress costs.

Please closely study and work through another set of numerical illustrations on the comprehensive APV analysis presented in the posted "APV Illustrations" PPT file.