Valuation

Valuation of single cash flows

A single cash flow will be discounted by the appropriate rate and time, using Table A2.1. Read across for the discount rate and down for the number of periods. Multiply the cash flow by the present value interest factor ($PVIF_{i,n}$) to get the present value of the cash flow.

Valuation of multiple cash flows

Valuation of a series of equal cash flows is the valuation of an annuity stream. If the discount rate is the same and all cash flows are the same, then you have an annuity (if the cash flows go on indefinitely, it is a perpetuity). The annuity can be valued by using Table A2.2. You will have the cash flow, the discount rate and the number of periods of the same cash flow, so read across for the interest rate and down for the number of periods. Multiply the cash flow by the present value annuity interest factor ($PVAIF_{i,n}$) to get the present value of the annuity stream.

With the valuation of the annuity, it is assumed that the first cash flow occurs at the end of year 1. If the cash flow starts immediately there is an adjustment that needs to be made. Multiply the $PVAIF_{i,n}$ by (1+interest rate). This reflects the fact that the first cash flow is one year earlier. All the present and future value tables assume that the cash flow is at the end of the year.

With valuation you are bringing future cash flows back to a present value.

Valuation of bonds

Bonds will usually have a fixed life, eg, five years, ten years, fifteen years, etc. A very small number of bonds are irredeemable, which means they are perpetuities, the bond will keep paying cash flows indefinitely.

A bond will have a face value at which it is issued and redeemed. This face value is £100 in the UK and $1,000 in the US. There are other terms that are used for this value; nominal value, redemption value. So the bond will be issued at £100 and at the end of the bond's life, at maturity it will be redeemed for £100. The bondholder has lent the company a £100 and at the end of the period, the bondholder is repaid the £100. In the intervening years the bondholder is paid a coupon (cash). This is the income the bondholder gets for lending the company the £100. The level of the coupon depends on the creditworthiness of the company. The more creditworthy the company, the lower the coupon, because there is low risk of the bondholder not being repaid at the maturity of the bond.

So the bond has a face value (£100), it has a coupon (say 5%) and it has a fixed term (say 5 years left to maturity). With that information we can lay out the cash flows to the bond and value the bond. The value of the bond will be the

discounted value of all its future cash flows. The cash flows of the bond will be discounted at the appropriate interest rate for the timing of each cash flow. For example, assume the bond is a UK Government bond, this will be a risk free bond, there is no risk of non-payment, so the cash flows will be discounted by the risk free rate of interest for each time period.

$$\text{Price} = \frac{5}{} + \frac{5}{} + \frac{5}{} + \frac{5}{} + \frac{105}{}$$

The first cash flow will be discounted by the one year spot rate $(1+{}_0s_1)$, the second cash flow will be discounted by the two year spot rate $(1+{}_0s_2)^2$ and so on through to the end of year 5.

The interest rates will be the set of spot rates from the term structure of interest rates. This is a set of interest rates that are not fixed but can fluctuate on a daily basis according to the economic conditions in a country. There is an example of a term structure with this link; http://markets.ft.com/markets/bonds.asp

The cash flows are discounted and the discounted cash flows added up to give the bond price. Once you have the bond price, the yield to maturity (YTM) can be worked out. This is the average return on the bond, given today's price if held through to maturity.

Valuation of Equity

We have seen how to value simple cash flows, annuity cash flows and bond cash flows. We now move on to valuing the equity of a company. This is different from valuing the bond. With the bond we were valuing certain cash flows (the coupon payments), with equity we are valuing uncertain cash flows. Equity is risky, shareholders only get the residual cash flow that a company generates. Before the shareholders get their return the bondholders have to be paid their interest (the coupon payments).

The cash return to the shareholder is the dividend. The total return to the shareholder is the dividend plus the capital gain. The dividend is the only cash that is paid out by the company, so the valuation is based on that cash flow.

Bonds have fixed lifetimes of 5 years, 10 years, etc. Equities have an indefinite lifetime. When shares are floated on to the stock market, the assumption is that the company will keep on going indefinitely. A company does not sell shares on to the stock market for 5 or 10 years like the bond. So a company on the stock market is perpetuity. A company on the stock market will want to increase its dividend each year to reward investors. So the company's shares can be valued like a growing perpetuity.

The formula for a perpetuity is; cash flow/ interest rate

The formula for a growing perpetuity is; cash flow/(interest rate – growth rate)

Adapted for share valuation, this becomes;

$P0 = D_1/(r - g)$

Where, P0 is the price of the shares today, D1 is the next period's dividend (the value of the shares is the discounted value of all FUTURE dividends), r is the cost of equity and g is the compound growth rate of dividends.

r is really *re*, which is from the WACC and can be calculated by the CAPM, or if given all the other components of the formula above, from it.

g is the growth rate of dividends. If you have the dividend that has just been paid and, say, the dividend from 3 years ago, then you can work out the growth rate of the dividend over the three year period. This will be the dividend that has just been paid, divided by the dividend from three years ago and the result taken to the power of one divided by the number of periods. Eg, dividend of 10p has just been paid, the dividend three years ago was 8p, the growth rate is $(10/8)^{(1/3)}$ which is $1.25^{(1/3)} = 1.0772$, subtract 1 to get the growth rate, = 7.72%.

When a dividend is paid, the share price falls by that amount. The shareholder has a cash dividend, and the shares, but the shares are worth less (by the amount of the dividend), but the shareholder's total wealth is unchanged. If you add the new price of the shares plus the dividend, this would equal the price before the dividend was paid.

In the example above, if the cost of equity were 15%, then the value of the shares should be;

$P0 = D_1/(r-g)$

$D_1 = D_0*(1+g) = 10 * 1.077217 = 10.77217$

$P0 = 10.77217/(0.15 – 0.077217) = 148.00$

What has been done is to value the growing dividend stream, assuming it will grow forever at 7.7217%. If that were the case, then the shares should be 148p. If the growth rate falls in the future, then the share price will have to fall, as you are capitalising the dividend with a higher discount rate (r-g).

If a company doesn't pay a dividend, they will be valued on the cash flows the company is generating and the growth rate of those cash flows.

In the financial markets, analysts pay very close attention to these growth rates. If an analyst thinks that the growth rate at a company is likely to slow down but that is not reflected in the share price yet, then they will look to sell the shares as they would believe them to be overvalued. If the growth rate does slow down then the share price will fall.

Valuing Projects

Valuing projects is similar to the valuations that have been outlined already. You have to lay out the relevant cash flows and they have to be discounted by an appropriate rate that reflects the risk of the project. With the share valuation, if you value the share at more than the current market price, then if you are correct, the purchase of the shares would be a positive NPV investment.

With projects you want to obtain the ungeared free cash flows (FCF*) and discount these with the risk rate for the project. Whether a WACC/NPV or APV valuation is being attempted, the cash flows used will remain the same (with the APV, you discount with the ungeared equity rate and separately present value the tax shield).

The complexity with the project is correctly identifying the relevant after tax cash flows. Once you have netted off the FCF* they are discounted in the same way as with the bond or share. With the project you will use the one discount rate (WACC as opposed to the set of spot rates with a bond). Add up the present value of the project cash flows. If they are greater than the initial investment, then it is a good project with a positive NPV.

If the project needs to be valued at the end of a period of time, eg, you evaluate a five year project, it has a positive NPV, but you want to sell it at the end of five years, how would you go about valuing the project?

Well, all you are interested in are the cash flows after the end of year 5, so from the end of year 6 onwards. The cash flows to the project will be growing at a certain rate. This growth rate will be used to project forward for year 6 onwards.

The present value of the project from year 6 onwards can be valued using the growing perpetuity formula. With the dividends it was $P0 = D_1/(r-g)$, note that using the next period's dividend will give you a valuation one period back from the dividend (ie, use year 1 dividend to produce year 0 value).

With the project, the next cash flow is year 6, so the valuation we will obtain will be $P5 = CF6/(r-g)$. We use the cash flow in year 6, valuing that will give us a valuation at the end of year 5. This is what we could sell the project for at that time. If we want to know what that value is in today's terms, we would need to discount the P5 value by $(1+r)^5$.

Remember, in valuation you are discounting all FUTURE cash flows. Dividends or cash flows that have already been paid out by the company are gone, they are out of the valuation.