DCF Valuation methods: the equivalence

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DCF VALUATION METHODS

There are at least four DCF methods which give identical values:

1. Free cash flow
2. Cash flow to equity (the residual method)
3. Capital cash flow
4. Adjusted Present Value (APV)

Since all of them use the cash flow to estimate the company fair value, the measure of cash flow differs.

The key is establishing the risk of each cash flow, the tax effects and the right, risk-adjusted cost of capital.

EXAMPLE

XX is a company that achieved a steady state; it will not grow anymore. Therefore, it does not need to invest in working capital and depreciation equals capex. All net income is distributed as a dividend.

Using the data of income statement, you have to calculate the: a) cash flow to equity b) free cash flow and c) capital cash flow.

EBIT	20
Interest	5
EBT	15
Income taxes (40%)	6
Net income	9

D=100 and kd=5%

Since XX does not grow, we are going to value the business assuming perpetuities.

EQUIVALENCE DCF METHODS

Each cash flow has different risk and tax effects. Therefore, both circumstances have to be considered in the cost of capital calculation.

The market data to estimate the cost of equity using the CAPM are:

Rf=5%; Rm=10%; MRP= Rm-Rf=5% β_L=1.0

Therefore, ke=5%+5% x 1.0=10%

The cost of debt, kd=5%

Notice that kd=rf, so debt is risk free and its beta, β_D=0 (this will be important later when we estimate the company fair value using the APV method)

CASH FLOW TO EQUITY METHOD

The equity fair value E is equal to the cash flow to equity CFE discounted using ke as the discount rate:

$E=CFE/ke$
$E=9/0.10=90$

Since the debt is D=100, the company fair value is:

$V=E+D$
$V=90+100=190$

FREE CASH FLOW (OR WACC) METHOD

Since the free cash flow does not count the tax saving, we need to use a cost of capital that counts for it. Therefore, the WACC must be used as the discount rate:

$$WACC = kd(1-t)\frac{D}{E+D} + ke\frac{E}{E+D}$$

$$WACC = 5\%(1-0.40)\times 100/190 + 10\% \times 90/190 = 6.32\%$$

The fair value of the business (or company fair value, or the value of operations) is equal to the FCF discounted at the WACC:

V=FCF/WACC=12/0.0632=190

CAPITAL CASH FLOW (OR WACC) METHOD

Since the CCF considers the tax savings, we must not consider them in the cost of capital, to avoid duplications. Therefore, we have to calculate the "WACC before taxes":

$$WACC_{bt} = kd\frac{D}{E+D} + ke\frac{E}{E+D}$$

$$WACC_{bt} = 5\% \times 100/190 + 10\% \times 90/190 = 7.37\%$$

The fair value of the business is equal to the CCF (the cash flow available for the total company's capital providers) discounted by the WACC before taxes

V=FCF/WACC=14/0.0737=190

ADJUSTED PRESENT VALUE METHOD

The APV calculates the company fair value as the sum of two parts: the value of an unlevered business plus the present value of the tax shield:

$$V=V_U+Dt$$

The value of an unlevered business is equal to the free cash flow discounted by ku, the cost of capital for an unlevered company.

$$V_U=FCF/ku$$

Because XX is a levered firm and its beta reflects its financial risk, to estimate ku (the cost of capital that XX would have if it was an unlevered firm) first we have to calculate the unlevered beta.

ADJUSTED PRESENT VALUE METHOD

Robert Hamada combined the CAPM model and MM propositions with taxes to obtain the formulas for unlevered and relevered betas. Assuming that the beta of the business is the weighted average of the equity beta and debt beta:

$$\beta u = \frac{\beta_L E + \beta_D D(1-t)}{E + D(1-t)}$$

As kd=rf, D is risk free, so its beta BD=0, we can simplify and rearrange:

$$\beta_L = \beta u \left[1 + \frac{D(1-t)}{E} \right]$$

To unlever a levered beta:

$$\beta u = \frac{\beta_L}{\left[1 + \frac{D1-t)}{E} \right]}$$

To relever an unlevered beta:

$$\beta_L = \beta u \left[1 + \frac{D\,(1-t)}{E} \right]$$

ADJUSTED PRESENT VALUE METHOD

Unlevering the beta of XX: $$\beta u = \frac{1.0}{\left[1+\frac{100\ (1-0.40)}{90}\right]} = 0.60$$

Then we can calculate the unlevered cost of capital, ku, with the CAPM:

Ku=5%+5% x 0,6=8%

And the value of an unlevered firm is

V_U=FCF/ku=12/0.08=150

And the value of the operations, V, is

V=V_U+Dt=150+100x40%=190

THE EQUIVALENCE

All four DCF methods give identical values. Although this conclusion was expected, the exercise to demonstrate the equivalence has certain benefits:

1. It forces our thinking about the different risk of each cash flow measure and tax effects.

2. It helps us to think about the relations between the different cash flow measures.

3. While the four methods yield identical values (*), only the APV tells us how much value is produced by the business (the assets) and how much value is generated by the capital structure decision.

(*) It can be thought as a question of common sense: since all methods use the same resource to obtain the company value (the cash flow), the change of method shouldn't change the value.

QUESTIONS

1. Taking into account that the cash flow to equity of XX is of $ 9 million, calculate the free cash flow knowing that interest payments are $ 5 million and the tax rate is t=40%

2. If the Capital Cash Flow is of $14, what is the Free Cash Flow, since D=100, kd=5% and t=40%

3. If the Free Cash Flow is of $12, D=100, kd=5%, and t=40%, what is the cash flow to equity?

EXERCISE 1

Using the data of income statement, you have to calculate the: a) cash flow to equity b) free cash flow and c) capital cash flow.

EBIT	40
Interest	5
EBT	35
Income taxes (40%)	14
Net income	31

D=100 and kd=5%

Rf=5%; MRP=6% β_L=1.2

EXERCISE 2

Redo excercise 1 but now assuming kd=7%. Since kd>rf=5%, we must change the formulas for unlevered and relevered betas.

Remember that for the model to work, it must be consistent with the assumptions previously stated. Here we asume that D is not risk free and therefore its beta is not zero…