Valuation Methods

He knows the price of everything and the value of nothing

FBE532 Spring 2000   1

Valuation Approaches

- Methods Use Different Definition of Cash Flows
- Methods Use Different Discount Rates
- Properly Used, all Lead to the Same Value

2   FBE 532 Spring, 2000

Discounted Cash Flow Methods

- Compare and contrast four competing valuation approaches
  - Capital Cash Flow
  - WACC
  - Adjusted Present Value
  - Flow to Equity
    Note that in reading on *Valuation in Entrepreurial Ventures,* what Gompers calls CCF is what we call Adjusted Present Value
- Go over some points concerning application of these methods

3   FBE 532 Spring, 2000

Scenario

- Assume that you are given some financial statements containing projections of I/S, B/S, etc. for a period of years.
- From these you will derive a statement of cash flows that will lead, for each year, to the cash flow concept that you will use
- You will then discount the cash flows at an estimate of the cost-of-capital that is appropriate for the cash flow concept you are using
- You then add the present value of some terminal value.

4   FBE 532 Spring, 2000

Cash Flow Determination: Items From the Financial Statements

- Revenues (R)
- Cash Expenses (W)
- Non-Cash Expenses (Dep)
- Capital Expenditures (Capex)
- Cost of Goods Sold (CGS)
- Interest Expense (Int)
- Taxes (T)
- Tax Rate (τ)
- Repayment of Principal (P)
- Changes in Net Working Capital (ΔNWC)

5   FBE 532 Spring, 2000

Definitions of Earnings Components

- Earnings Before Interest & Taxes [EBIT]
  $$R-(W+Dep+CGS)$$
- Earnings Before Interest, Taxes, Depreciation (and Amortization) EBITD(A)
  $$EBIT+Dep$$
- Net Income [NI] (often Pre-tax Income)
  $$[EBIT-Int]$$
- Tax Bill [T]
  $$\tau \times (NI)$$
- Net Income After Tax [NIAT] (often Net Income)
  $$NI - T$$

6   FBE 532 Spring, 2000

Cash Flow Definitions

- Levered Cash Flow [to equity] {LCF or FTE}
  Money that goes to stockholders "account"
  $[R-(W+Dep+CGS+Int)](1-\tau)+Dep-Capex-\Delta NWC$
- Unlevered Cash Flow {UCF}
  Cash flow that would occur if there was no debt
  $(1-\tau)EBIT+Dep-Capex-\Delta NWC$
- Free Cash Flow
  – UCF
- Capital Cash Flow {CCF}
  $LCF+Int = UCF + \tau(Int)$

7　　　　FBE 532 Spring, 2000

Potential Discount Rates

- Unlevered Cost of Equity $[r_0]$
  – What the cost of capital would be if the firm had no leverage. Depends on asset risk, but not not capital structure.
- Levered Cost of Equity $[r_s]$
  – Cost of equity capital at a given leverage. Clearly depends on asset risk and also on leverage.

8　　　　FBE 532 Spring, 2000

Potential Discount Rates

- WACC
- Pre-Tax WACC
  – Just like the WACC, except that the pre-tax cost of debt capital is used
  – Ruback shows (p. 4) that Pre-Tax WACC is the same as the unlevered cost of equity

9　　　　FBE 532 Spring, 2000

On Levered and Unlevered β's

- You have to keep the difference between the asset β and the equity β straight
- You have to know how leverage affects the equity β
- See my note, "A Note on β's, Leverage and Taxes" on the website for this class

10   FBE 532 Spring, 2000

Asset and Equity Betas

- There are a few different β's running around and we need to keep them straight

- How does the risk of the assets get translated into the risk of the equity?
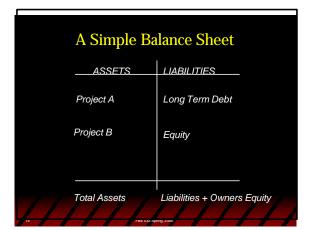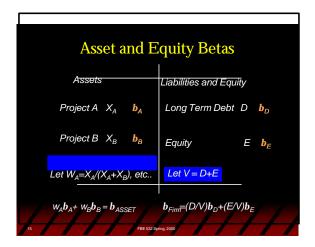
11   FBE 532 Spring, 2000

What is a β?

- For any asset [or liability] its β is simply the ratio of the covariance of the asset (or liabilty) return with that of the market portfolio, that is,

$$b_i = \frac{COV(R_i, R_M)}{VAR(R_{\ })}$$

12   FBE 532 Spring, 2000

A Property of β

- Betas add up. That is, the beta of a combination of assets is the weighted combination of the asset betas, where the weights are the relative values of the investments.

- If two assets, or portfolios, **always** have the same value, their betas must be the same.

13   FBE 532 Spring, 2000

A Simple Balance Sheet

ASSETS	LIABILITIES
Project A	Long Term Debt
Project B	Equity
Total Assets	Liabilities + Owners Equity

14   FBE 532 Spring, 2000

Asset and Equity Betas

Assets			Liabilities and Equity		
Project A	X_A	b_A	Long Term Debt	D	b_D
Project B	X_B	b_B	Equity	E	b_E

Let $W_A = X_A/(X_A+X_B)$, etc..   Let $V = D+E$

$$w_A b_A + w_B b_B = b_{ASSET}$$ $$b_{Firm} = (D/V)b_D + (E/V)b_E$$

15   FBE 532 Spring, 2000

Asset and Equity Betas

- Thus there are three β's running around, the Asset, Debt and Equity βs.

- Knowing any two of the three, and the leverage, we can get the other one.

- Common assumption, β_{Debt}=0. Actually debt β's are positive, but this really only a problem for high leverage firms.

16   FBE 532 Spring, 2000

Asset and Equity Betas

- From our simple balance sheet we see that
$$b_{Asset}=(D/V)b_D+(E/V)b_E$$
- The asset β is often called the "unlevered β" because it is the β that the equity would have if the firm had no debt. That is, $\beta_U = \beta_A$.
- This allows to derive this relation between leverage and equity β (when the debt β is 0):

$$\beta_E = \left[\frac{V}{E}\right]\beta_U = \left[1+\left(\frac{D}{E}\right)\right]\beta_U$$

17   FBE 532 Spring, 2000

Relation to M&M

If we assume that CAPM holds for all assets we are saying that:

$$k_u = E(\tilde{R}_u) = R_F + b_u\left[E(\tilde{R}_M - R_F)\right]$$
$$k_E = E(\tilde{R}_E) = R_F + b_E\left[E(\tilde{R}_M - R_F)\right]$$

A little bit of algebra can get us to this:

$$k_E = k_u + \left(\frac{D}{E}\right)(k_u - R_F)$$

Which is just the M&M proposition

18   FBE 532 Spring, 2000

Conclusion

- In a CAPM world, with no taxes, the M&M propositions hold.

- Not a surprise, M&M holds under very general models of asset pricing

Financial and Business Risk

Can we make sense of the relation between Asset and Equity Betas?

Yes, if look at the equation as

$$b_E = b_A \left[\frac{V}{E}\right] = b_A \left[1 + \left[\frac{D}{E}\right]\right]$$

We see that risk of the stock, and hence the cost of equity capital depends on the asset risk (b_A) and the financial risk from leverage.

Leverage, β, Tax Shields

Assets			Liabilities and Equity		
Project A	X_A	b_A	Long Term Debt	D	b_D
Project B	X_B	b_B	Equity	E	b_E
Tax Shield	$t\,D$	b_D			

Let $W_A = X_A/(X_A + X_B + tD)$, etc.. | Let $V = D + E$

$$w_A b_A + w_B b_B = b_{ASSET} \qquad b_{Firm} = (D/V)\,b_D + (E/V)\,b_E$$

Note: $b_{TAX} = 0$

What does this do to the relation between the betas?

- Depends on what you think the risk (β) of the tax shield (τD) is.

- First consider the normal story, that the beta of the tax shied is zero if the beta of debt is zero
  - If the debt is risk free we know *exactly* how much the tax shield is over time, thus it is risk free
  - The result is the standard one given in the book
  - Holds when the firm has a constant $ amount of debt

22   FBE 532 Spring, 2000

Asset and Equity Betas

$$b_E = b_A\left[1+\left(\frac{D}{E}\right)(1-t)\right]$$

This Relation is are only true when the Debt Beta is 0.

23   FBE 532 Spring, 2000

Another View

- What if the firm sets is debt level as a constant percentage of the value of the firm?
  - Then, even though the debt is free of default, the value of the *tax shield* will change in line with the value of the firm because the face value of debt will change with the value of the firm. Then we get, Lo and Behold, the no-tax relation:

$$b_E = b_A\left[1+\left(\frac{D}{E}\right)\right]$$

24   FBE 532 Spring, 2000

Prof... Mark Weinstein, FBE532

Asset Betas

- Could we work from the Asset side of the Balance Sheet?

Yes, firms with similar assets should have similar asset betas. They may not have the same Equity Betas (Why, or why not?) That is essentially what the Mariott Case is all about. Don't forget the "adding up" property!

25   FBE 532 Spring, 2000

Some other issues after you get the asset β

- What do you do about the term structure of interest rates?
  - How does the maturity of the assets affect your choice of interest rate?
- Where do you get the market risk premium and risk free rate to plug into the CAPM equation when you estimate the cost of equity capital?

26   FBE 532 Spring, 2000

Risk Free Rate

- Look at the evidence presented in RWJ, on average returns on long term treasuries are about 1.8% above those of T-Bills
- Maybe take current T-Bill Rate
- Maybe take long term treasury rate
- No real good theory here to guide you

27   FBE 532 Spring, 2000

Market Risk Premium

- Over last 75 years or so, this averages about 8%
- But, there are those who feel that this is too high
  - Equity Premium Puzzle
    - Theoretical models are unable to generate premia this high without resort to risk aversion that is far beyond anything we think is correct
  - Past may be biased
    - Over the last century or so the US economy has significantly outperformed any economy in the world. Maybe we were just lucky and in the future we will look more like other countries
  - Big Market Move
    - Maybe this is the result of the ERP premium falling
    - It looks like you can explain the current level of the DJIA by

28   FBE 532 Spring, 2000

Valuation Approaches

- Four different approaches
  - APV
  - Flow to Equity
  - WACC
  - Capital Cash Flow
- Properly Used All Methods Lead to the Same Value
  - But, be careful about cost of debt capital

29   FBE 532 Spring, 2000

APV

- Used to Value the Entire Firm
- Simple Idea: Value the firm as if it were unlevered, then add any value that comes from leverage.
- Use Unlevered Cash Flow, discount at r_0 then add value of tax shield (only corporate taxes, and perpetual debt at this level - τB) and any other finance related costs and benefits.

30   FBE 532 Spring, 2000

APV

- Nice theory behind it
- Forces separation of operating and financing flows
- If debt is not constant (same $) gets very tricky to figure value of tax shield, but it can be done

31   FBE 532 Spring, 2000

APV

- Allows for easy addition of other financing related cash flows
- Allows for easy addition of option values
- Makes one think about component of cash flows

32   FBE 532 Spring, 2000

Flow to Equity

- Sometimes called the Residual-Cash-flow Approach
- Used to Value the common stock only
- Must add value of debt to get value of entire firm
- Discount FTE at r_s
- Must add value of debt to get value of firm

33   FBE 532 Spring, 2000

Flow to Equity

- Requires either
  - that discount rate on equity stays constant
  - change discount rate every period
- Thus, even if constant asset risk need
  - constant leverage ratio
  - adjustment of equity β each period
- Since debt tax shield is taken into account in determining the flow to equity, value of equity reflects tax shield

34   FBE 532 Spring, 2000

Flow to Equity

- This may not be a bad assumption if managers have target leverage ratios
  - But becomes problematical in the case of a highly leveraged transaction where, often, any excess cash flow is swept to pay down the debt
  - In principle, could vary r_s with leverage as debt is paid down

35   FBE 532 Spring, 2000

WACC

- Sometimes called the "Free Cash Flow" Approach
- Used to value entire firm
- Discount UCF at WACC
- Note that neither interest expense nor debt repayment is taken out of cash flows

36   FBE 532 Spring, 2000

WACC

- Assumes constant leverage ratio(or you must adjust for changes in leverage each period)
- Constant leverage ratio may be better than constant $ assumption in simple APV
- Since debt shield is taken into account in determining WACC, this method reflects value of tax shield.
- Compare to APV:
  - Both use UCF
  - APV adds tax shield explicitly
  - WACC adds tax shield by discounting at a lower rate than the APV method
  - I.e. due to tax shield on debt,
    WACC<Pre-tax WACC

37   FBE 532 Spring, 2000

Capital Cash Flow

- Method not in the book, in Ruback reading
- Use CCF
- Discount at the *PRE*-tax WACC
  - which turns out to be the same thing as the unlevered cost of equity
- No assumption about leverage is made in discount rate
  - pro forma cash flows must take any changes in leverage into account

38   FBE 532 Spring, 2000

Capital Cash Flow

- Used to value entire firm
- Since effect of tax shield is to increase flows to equity, value of tax shield is taken into account

39   FBE 532 Spring, 2000

Where do You Adjust for Interest Tax Shield?

	Tax Adjustment in the Cash Flows	No Tax Adjustment in Cash Flows
Tax Adjustment in the Discount Rate		WACC
No Tax Adjustment in the Discount Rate	CCF for Firm FTE for Equity	APV for Firm (Tax Shield Valued as a Separate Item)

40   FBE 532 Spring, 2000

Terminal Value

In valuation it is common to make explicit assumptions about the cash flows for the first few years and then apply some terminal value. This is done because often the valuation is in the context of an acquisition in which the first years are unusual because of changes in the operating or financing plan (LBO debt gets paid off). But, at some point the terminal value is used reflecting the fact that the firm is assumed to be normal beyond that point.

41   FBE 532 Spring, 2000

Methods of Estimating Terminal Values

- Book Value
  – obvious how this is done
- Salvage Value
  – also obvious
- Multiples
  – see next slide
- Perpetuity
  – see slide after

42   FBE 532 Spring, 2000

Multiple Based Terminal Values

- Multiples of the final year's numbers are used. These multiples are usually based on averages for the industry. Some common multiples are:
  - Earnings
  - EBIT
  - EBITD
  - Cash Flow
- Often the final year's numbers are "normalized" to take out anything unusual.

43   FBE 532 Spring, 2000

Perpetuity Based Terminal Values

- The final year's cash flows are valued as a perpetuity. Usually, though not always, a growing perpetuity is used.
- What should the growth rate be?
- Much possibility for manipulation by changing growth rate.

44   FBE 532 Spring, 2000

How Important is the Terminal Value?

It depends. In an LBO, e.g., the banks are secured and have fairly quick payoffs so they are less concerned about the out years. But if, as is often the case, all the early cash flows go to paying down debt, the out years are the only thing left for the equity.

45   FBE 532 Spring, 2000

Consistency of Valuation Methods

- In principal all four methods will lead to the same value for the firm, however there are a few caveats that you must be careful about.
  - Problems associated with the properly measuring the cost of debt capital
  - Problems associated with terminal growth rates

46   FBE 532 Spring, 2000

The Cost of Debt

- When computing the WACC in the usual way there is an inconsistency between the way the cost of equity capital is estimated and the way the cost of debt is estimated
  - For equity we get the *expected return* that an investor anticipates receiving from CAPM
  - For debt, we use the yield-to-maturity
    - Unless the debt is risk free, the yield-to-maturity overstates the cost of debt capital, as investors must expect to received less than the yield to maturity
    - When we compute the equity beta, we usually assume that the debt beta is zero. If this is true, how can the cost of debt capital differ from the risk free rate?

47   FBE 532 Spring, 2000

Growth Rates

- When computing the terminal growth rate using different methods you have to be sure that the assumed growth rate in the underlying cash flows is consistent. For example, a constant growth rate of 5% in Free Cash Flow is not the same thing as a constant growth rate of 5% in the Flow to Equity because of Leverage.

48   FBE 532 Spring, 2000

16

Some Mistakes I Have Seen

- Where does the cost of equity come from?
  - The cost of equity should be an *ex ante* rate. I prefer to get it from some asset pricing model (like CAPM)
  - In one case I have seen, an expert got the cost of equity by looking at the *realized* return on the common stock of companies in that industry
    - What does this imply for the cost of equity capital for an internet company today? What would the DCF value of a project in this industry be? What about a steel company?

49 — FBE 532 Spring, 2000

More Mistakes

- It is not uncommon for people to get confused and use the wrong cash flow with the wrong discount rate
  - I have seen experts discount the UCF at the levered cost of equity capital and claim that they are doing a WACC analysis. Do you think that they were employed by the side that wanted a high or a low value?
  - Also, I have seen experts discount *real* cash flows at a *nominal* discount rate. In one case, the expert could have cost his client close to $15 Million.

50 — FBE 532 Spring, 2000

What Risk Free Rate

- The valuation of a post-production house caused these errors. The company was located in LA, but was a subsidiary of a UK company. The company kept its books in £. One expert used the US Treasury Bond rate for the risk free rate in getting the discount rate.
  - What is the relation between UK and US interest rates?
  - What is the role of differential expected inflation in the two countries on the interest rates?

51 — FBE 532 Spring, 2000

Growth Rates

- The same case leads to the problem, what is the forecasted growth rate? If the growth rate is based on historical £ growth, is that relevant to a company doing business in the US, which is to be valued in US$

52   FBE 532 Spring, 2000

Other Funny Things

- "Small Firm" Premiums in the discount rate
  – What if all comparable firms are "small"
- Discounts for "Key Man"
  – In one case, the only identified "Key Man" was staying with the parent firm
- Marketabilty Discount
- Minority Discount

53   FBE 532 Spring, 2000