

Hurdle rates in practice

Today's outline

- Cost of equity private firms
- Cost of equity for listed firms
- Cost of debt
 - Bank debt
 - Bonds
 - Debt with add-ons
- Restructuring and WACC

The cost of equity of private firms

Estimating discount rates when market prices unobservable

1. Use sector averages

$$\text{Unlevered Beta for sector} = \frac{\text{Average Regression Beta for publicly traded firms}}{(1 + (1 - \text{Tax Rate}) \text{ Average Market D/E Ratio for sector})}$$

2. Use ROA

$$\text{WACC} = R_A = (E/V)R_E + (D/V)R_D$$

– Rearranging the above gives

$$R_E = R_A + (R_A - R_D)(D/E)$$

Unlevered vs levered beta

- Step1: Pick firm in similar industry that is listed.
- Step2: Compute unleveraged industry beta of listed firm chosen.
- Step3: Compute levered beta, using the client's firm debt/equity ratio.
- Here's the formula:

$$\beta_L = \beta_U (1 + (1 - t)(D / E))$$



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Example 1: Computing beta of non-listed firm

- Company A and B are in the same business. The first is listed, the second is not. Com A has a beta of 1.40 and market value of average debt to equity of 14%. Com B has debt to equity ratio of 25%. Compute the appropriate beta for Com B. Assume tax = 36%.

Step1: Compute unlevered beta of A from,
Unlevered beta = Current beta/[1+(1-tax rate)(debt/equity)]
= 1.4/[1+(1-0.36)(0.14)] = 1.289

Step 2: Compute levered beta of B from,
Levered beta = 1.289*[1+(1-0.36)(0.25)] = 1.49



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Using ROA

- Finding comparable betas of listed firms can be difficult if nature of firm is unique.
- Here is an alternative: But this equation assumes that firms are investing optimally to the point that marginal cost = marginal return.

$$WACC = R_A = (E/V)R_E + (D/V)(1-t)R_D$$

Rearranging the above gives

$$R_E = R_A + (R_A - R_D)(D/E)$$



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Example 2: Using ROA

- The firm had return on assets of 12.82 %, a pre-tax interest rate of 7.7%, a debt-equity ratio of 36.59% and a retention ratio of 91% in 1992 (The tax rate was 36%). Assume the firm is operating at optimal capital budget constraint.
- $R_E = R_A + (R_A - R_D)(D/E)(1-T)$
- $R_E = 12.82\% + (12.82\% - 7.7\%)(36.59\%)(1-0.36)$



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THE COST OF EQUITY FOR LISTED FIRMS



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Estimation of cost of equity when prices are observable

- Dividend discount model
- CAPM



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Dividend Growth Model

$$r_e = D_1 / P_0 + g = D_0 (1 + g) / P_0 + g$$

- Dividends grow at expected rate g in perpetuity
- We will discuss ways to determine growth later on.



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Choosing the risk-free rate

- Characteristics of a risk-free asset
 - No default risk
 - No reinvestment risk
 - Thus, the key is to use government security with maturity that matches life of project.
- Picking the right risk free means you already have an adjustment for macro (sovereign risk).
- What to use when R_f asset not available (Sovereign bankruptcy)
 - Look at rate of largest and safest firm and use their rate of borrowing adjusted by default spread



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How long or short the estimation period

- Researchers prefer 60 months estimation window.
- In emerging markets, structural breaks occur so often that using shorter and more recent data is likely to be a better basis.



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What if market risk premium is negative?

- Pick a longer history such that risk premium reflects long run market expectation.

	Rm-Rf
Last year avg	-5%
Last 3 year average	8%

- Pick a period in history that matches your expectation of near future. Ex. If you expect a bullish year next year, then pick period in history that resembles your expectations for next year.
- Needs risk free instrument that is liquid.



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The Bloomberg adjustment

- Adjusted beta = Regression beta * 0.67 + 1.0 * 0.33
- Why adjust betas towards one? The rationale can be traced to studies that indicate that, over time, there is a tendency on the part of betas of all companies to move towards one. Intuitively, this should not be surprising. Firms that survive in the market tend to increase in size over time, become more diversified and have more assets in place



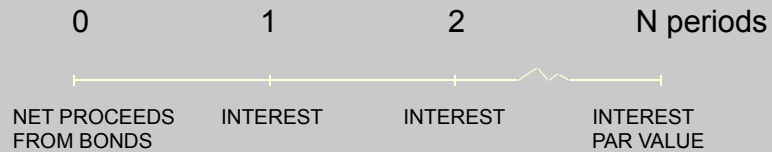
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COST OF DEBT



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Cost Of Debt



- Pretax Cost of Debt
(Adjusted for Flotation Costs)

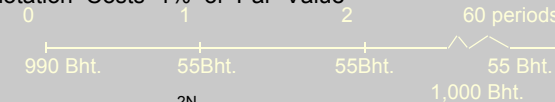
- After Tax

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Ex : ABC Co. Issued 30 year Straight Bond

- 1) Sell at Par 1,000 Baht
- 2) Coupon Rate 11%
(Semi-Annual Payments)
- 3) Flotation Costs 1% of Par Value



$$\begin{aligned} \text{Net Proceeds} &= \sum_{t=1}^{2N} \frac{\text{Interest}}{(1+kd/2)^t} + \frac{\text{Par}}{(1+kd/2)^N} \\ 990 &= \sum_{t=1}^{60} \frac{55}{(1+kd/2)^t} + \frac{1,000}{(1+kd/2)^{60}} \\ kd/2 &= 5.56\% \\ kd &= 11.12\% \end{aligned}$$

$$\begin{aligned} \text{After-Tax} &= 11.12(1 - .3) \\ &= 6.72\% \end{aligned}$$

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Cost Of Bonds With Warrants

Ex : XYZ issued Debt with Warrants

- 1) XYZ received 1,000 Bht. for each Bond
- 2) Coupon is 8% / Yr for 20 years
- 3) Required rate of return on straight bonds = 10%
- 4) Each bond has 20 warrants attached entitles holder to buy 1 share @ 22 Bht.
- 5) Current stock price = 20 Bht.
- 6) Expected growth rate = 10% / Yr
- 7) Warrants expiration = 10 years

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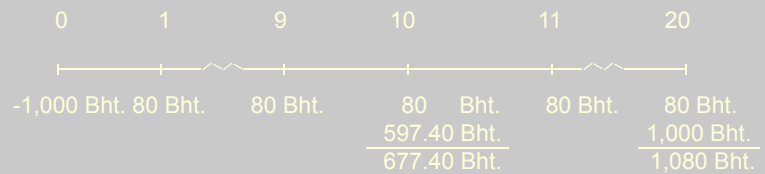


Note : If straight bond were issued, Investors (Requiring 10%) will pay 829.73 Bht. (Instead of Par 1,000 Bht.) So firm adds warrants as "sweetener" so that it sells for Bt 1,000.

$$\begin{aligned} \text{Estimated stock price year 10} &= 20 (1.10)^{10} \\ &= 51.87 \text{ Bht.} \\ \text{Profit when exercised} &= 51.87 - 22 \text{ Bht.} \\ &= 29.87 \text{ Bht.} \\ \text{For 20 warrants} &= 20 (29.87) \\ &= 597.40 \text{ Bht.} \end{aligned}$$

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Find IRR = 10.66%
= Cost of Bonds + Warrants

Factors Effecting Costs

- Coupon
- Required Rate of Return on Straight Bond
- Exercise Price
- Number of Warrants
- Estimated Stock Price

The impact of restructuring and divestiture on WACC

Example 1: Cost of equity for firms with multiple division

- You are analyzing the beta for Hewlett Packard and have broken down the company into four broad business groups, with market values and betas for each group.

Business Group	Market Value of Firm	Beta
Mainframes	\$ 2.0 billion	1.10
Personal Computers	\$ 2.0 billion	1.50
Software	\$ 1.0 billion	2.00
Printers	\$ 3.0 billion	1.00

Example 1: Q1

- Estimate the beta for Hewlett Packard as a company. Is this beta going to be equal to the beta estimated by regressing past returns on HP stock against a market index. Why or Why not?

Example 1: A1

- The firm beta can be estimated from the market value weighted beta of its business groups. Thus, the beta for Hewlett Packard is,
- $1.1(2/8) + 1.5(2/8) + 2(1/8) + 1(3/8) = 1.275$
- This beta is unlikely to equal to the beta estimated by regressing past excess returns against past market risk premium because of estimation error.



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Example 1: Q2

- If the treasury bond rate is 7.5% and the market risk premium is 5.5%, estimate the cost of equity for Hewlett Packard. Estimate the cost of equity for each division. Which cost of equity would you use to value the printer division?



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Example 1: A2

- Cost of equity for HP = $7.5\% + 1.275(5.5\%) = 14.51\%$
- Cost of equity (Main frames) = $7.5\% + 1.1(5.5\%) = 13.55\%$
- Cost of equity (PC) = $7.5\% + (1.5)(5.5\%) = 15.75\%$
- Cost of equity (Software) = 18.50%
- Cost of equity (Printer) = 13.00%



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Example 1: Q3

- Assume that HP divests itself of the mainframe business and pays the cash out as a dividend. Estimate the beta for HP after the divestiture. (HP had \$ 1 billion in debt outstanding. Each division has debt allocated proportionately to its market value weight, ie. Mainframe debt = $(2/8)*1$ bn = 0.25 bn and so on.) Let tax rate = 36%.



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Example 1: A3

Division	Beta	Unlevered beta	Value of division (D+E)	Debt
Mainframes	1.1	1.01	2	0.25
PCs	1.5	1.37	2	0.25
Software	2	1.83	1	0.125
Printers	1	0.92	3	0.375
Total	-	-	8	1

Value of firm without mainframes = $8 - 2 = 6.0$

Unlevered beta without mainframes

= $1.37(2/6.0) + 1.83(1.0/6.0) + 0.92(3.0/6.0) = 1.22$

New debt to equity ratio =

Old debt – Mainframe debt/Value of firm without mainframe

= $(1 - 0.25)/6.0 = 0.125$

New levered beta = $1.22(1+(1-0.36)(0.125)) = 1.32$



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Example 2: Beta of firms after divesting

- You have collected returns on AnaDone Corporation (AD Corp.), a large diversified manufacturing firm, and the NYSE index for five years:

Year	AD Corp Excess return (Ri-Rf)	NYSE Market Risk Premium
2001	10% - 6% = 4%	5% - 6% = -1%
2002	5% - 6% = -1%	15% - 6% = 9%
2003	-5% - 6% = -11%	8% - 6% = 2%
2004	20% - 6% = 14%	12% - 6% = 6%
2005	-5% - 6% = -11%	-5% - 6% = -11%



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Example 2: Q1

- Estimate the slope (beta) of the regression. Assume now that you are an undiversified investor and that you have all of your money invested in AD Corporation. What would be a good measure of the risk that you are taking on?

	r(i)	r(m)
2001	0.04	-0.01
2002	-0.01	0.09
2003	-0.11	0.02
2004	0.14	0.06
2005	-0.11	-0.11

cov(r _i ,r _m)	0.0035
var(r _m)	0.0060
beta	0.5882
std (r _i)	0.1061

- The firm beta is approx 0.59 The risk of an undiversified investor is best captured by the standard deviation.



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Example 2: Q2

- AD is planning to sell off one of its divisions. The division under consideration has assets which comprise half of the book value of AD Corporation, and 20% of the market value. Its beta is twice the average beta for AD Corp (before divestment). What will the beta of AD Corporation be after divesting this division?



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Example 2: A2

- Beta for divested division is $2(0.59) = 1.18$
- Let new beta after divestiture = X , then it must be that,
- $1.18(0.2) + X(0.8) = 0.59$
- $X = 0.45$



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Example 3: Cost of equity after divesting and acquisition

- You run a regression of monthly excess returns of Mapco Inc, an oil and gas producing firm, on the S&P 500 index market premium and come up with the following output for the period 1991 to 1995.
- Intercept of the regression = 0.06%
- X-coefficient of the regression = 0.46
- Standard error of X-coefficient = 0.20
- R squared = 5%
- There are 20 million shares outstanding, and the current market price is \$ 2. The firm has \$ 20 million in debt outstanding. (The firm has a tax rate of 36%)



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Example 3: Q1

- What would an investor in Mapco's stock require as a return, if the T.Bond rate is 6% and market premium is 5.5%? What proportion of this firm's risk is diversifiable?
- Expected return = $6\% + 0.46(5.5\%) = 8.53\%$
- Proportion of risk that is diversifiable is
- $1 - R_{sq} = 1 - .05 = 95\%$



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Example 3: Q2

- Assume now that Mapco has three divisions, of equal size (in market value terms). It plans to divest itself of one of the divisions for \$ 20 million in cash and acquire another for \$ 50 million (It will borrow \$ 30 million to complete this acquisition). The division it is divesting is in a business line where the average unlevered beta is 0.20, and the division it is acquiring is in a business line where the average unlevered beta is 0.80. What will the beta of Mapco be after this acquisition?



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Example 3: A2

- Existing debt/equity = $20/(20*2) = 0.50$
- Unlevered firm beta = $0.46/(1+(1-0.36)(0.5)) = 0.35$
- Let X = beta of remaining non-divested divisions
- Unlevered beta without divested division
- = $0.2(20/60) + X(40/60) = 0.35$
- X = 0.42
- Unlevered beta with NEW division
- = $0.42(40/90) + 0.8(50/90) = 0.63$
- New debt/equity = $(20+30)/40 = 1.25$
- New levered beta = $0.63+(1+(1-0.36)(1.25)) = 1.13$



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Computer exercise

Use **euronxt100.xls** data file to compute security beta for the following stocks:

Compute individual stock beta of Lafarge, BNP Paribas, Michelin, and Carrefour using monthly data between 2007-2012.

Use the historical data 2007-2012 as an estimate of expected market premium for 2012.

Obtain the cost of equity for 2012 based on your beta estimates



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Homework

- Use **property.xls** data file to compute security beta for the following stocks:
- Compute individual stock beta of LH, MBK, NOBLE, QH, SIRI, and SPALI using **weekly** data between 2002-2004.
- Use the historical data 2002-2004 as an estimate of expected market premium for 2005.
- Obtain the cost of equity for 2005 based on your beta estimates
- Analyze your results. Do you see anything interesting?



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