



Cost of Capital for valuation, funding, and decision making

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Overview



1. Context setting



2. Technical overview



3. Group exercise



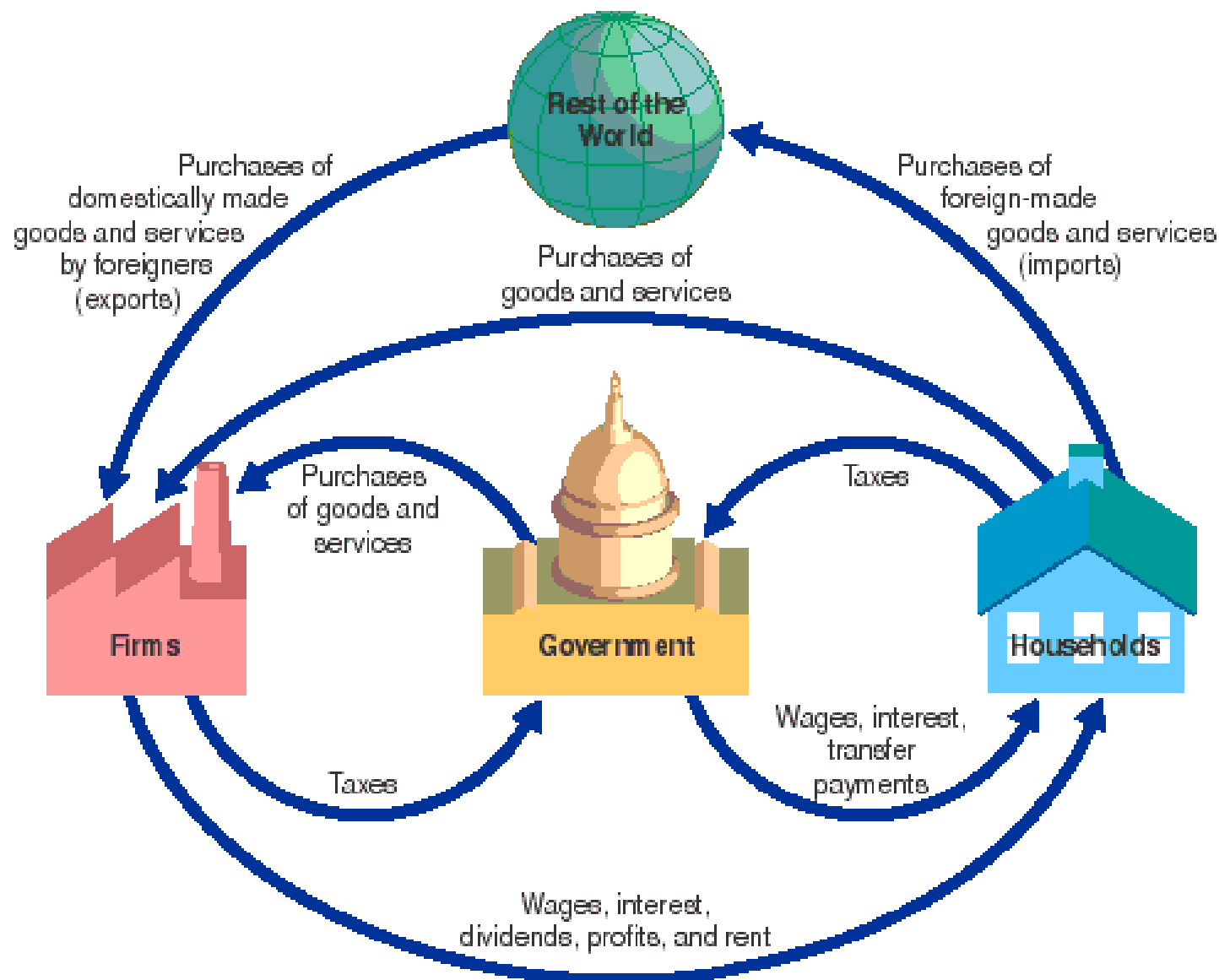
4. CoC feedback



5. Summary conclusion



Valuation & Managerial Decision Making





Overview

1. Context of capital budgeting decision making
2. Establishing a 'motivational' foundation
3. Examining technical derivation methods
4. Collaborative discussion on central factors
5. Issues & trends in practitioner terms

This presentation provides a comprehensive practitioner-based overview of the Cost of Capital as related to corporate financial management, in particular: capital budgeting, risk management, valuation, and innovation in financing.



Learning Objectives

To get a multi-faceted sense of:

- **Cost of Capital (CoC)**
 - Definition of...
 - Variations on...
 - Types of...
 - Methods to determine...
 - Proper use of...
- **CoC's use as:**
 - A decision making tool...
 - within a valuation process...
 - applying risk analysis techniques...
 - to optimize and deliver on firm strategy...
 - in a project risk and...
 - opportunity portfolio context.
- **Understanding context related to project specific CoC**



Summary Orientation

- **Cost of Capital**

- “*Opportunity cost* of all capital invested in a firm”

- **Definition**

- “**Opportunity cost**” =
what is given up in decision to commit resource to use
- “**all capital invested**” =
total amount of cash invested in business.
- “**in a firm**” =
opportunity cost of all funding sources (debt + equity)

- **Uses**

- Establishing threshold for profitability
- Project valuation/evaluation
- Setting corporate capital structure
- Benchmark for corporate value analysis



1. Context setting



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Historical Perspective

Birth of modern capital markets

- Dutch East India Co. (VOC)
(1602)
 - Corporation
 - Globalization
 - Stock exchange
 - Derivatives:
futures & options
 - Perpetuities



<http://blog.sunan-ampel.ac.id/aulyaridwan/>



Historical Perspective

Instruments to share risk

- Corporation as a 'legal entity'
- Capital markets as 'assessors of risk'
- Vehicles to fund ambitious undertakings
- Wisdom of crowds vs. speculation

Raised notion of risk quantification





Historical Perspective

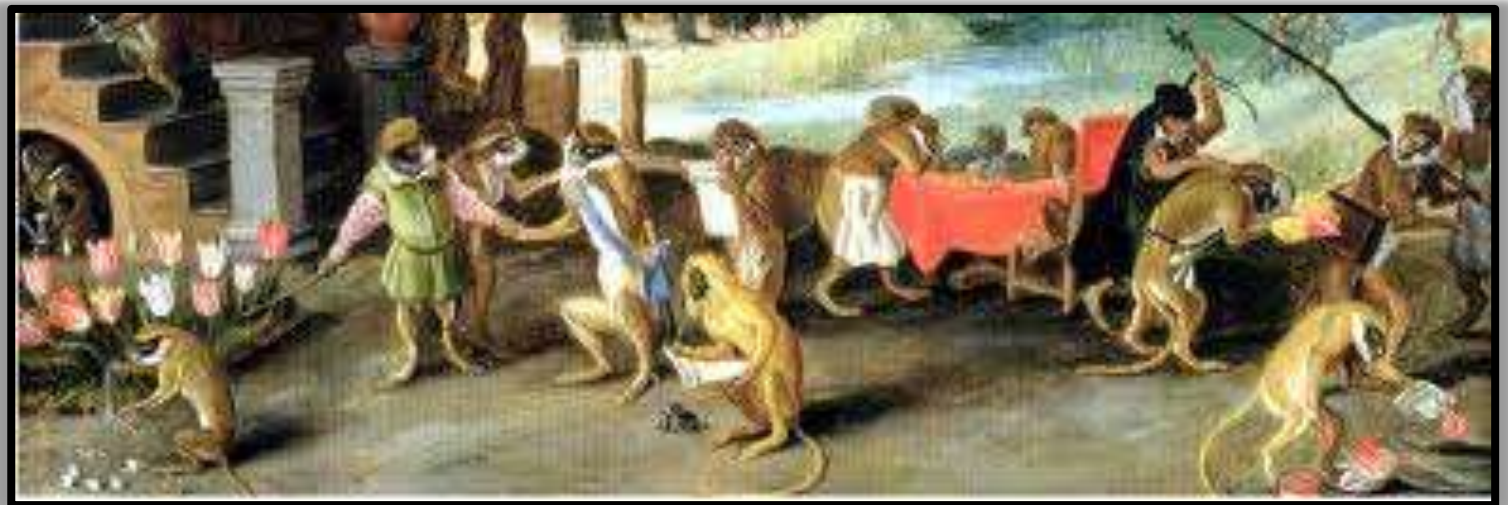
- Market ‘irrationality’
- Dutch Tulip mania
 - First well-recorded bubble
 - Lessons in valuation
 - Lessons in folly and delusion
 - Markets are not always right, not always efficient



“Flora's Mallewagen” (Hendrik Pot, 1640): Allegory of Tulip Mania.

en.wikipedia.org/wiki/File:Flora%27s_Mallewagen_van_Hendrik_Pot_1640.jpg

Jan Breughel the Younger's *Allegory upon the Tulip Mania*
<http://ellishollow.remarc.com/?p=1336>





Risk in the Brave New World

• Energy security

- Depletion of oil
- Growing demand
- Global warming
- Sustainability



Sean Gallup/Getty Images
<http://www.topnews.in/law/region/tripoli>



<http://tinyurl.com/6hbuyrg>

• Changing global demographics

- Emergence of Asia
- 'Greying' of NA & Europe
- 'Latinization' & emerging
- 'Surprising Africa'



studentenwerk.nl



Risk in the Brave New World

• Shifting economics

- Slowing growth in developed nations
- Deficits & currency instability
- Trade wars, outsourcing, labor migration



<http://www.re-define.org/blogs/sonykapoor?page=5>



• Technology & mobility

- Moore's Law:
processor, storage,
bandwidth
- Interfaces & persistent
computing
- Virtual & real transportation



Risk and Decision Making



New perspectives on risk

- **Paradigm shift**

- Insurance underwriting => *Entrepreneurial venturing*
- Mandarin: 'crisis' or 'risk' => 'dangerous opportunity'

- **Probabilistic perspective**

- Risk & opportunity are sides of same coin
- Max potential gain + lowest possibility loss
- Investment management: 'efficient frontier'

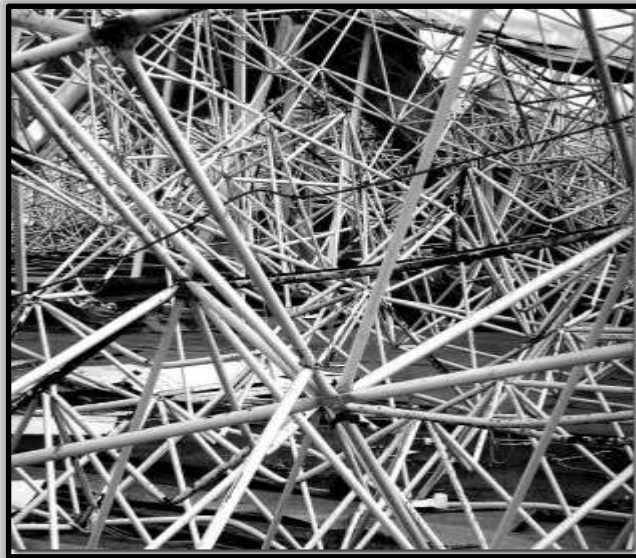




Risk and Decision Making

Increasing complexity...

- Driven by emergent factors...
 - Globalization
 - Computational & methodological power
 - Socioeconomic / political shifts
 - Competitive pressure / market liberalization



• New 'playing field' for firms...

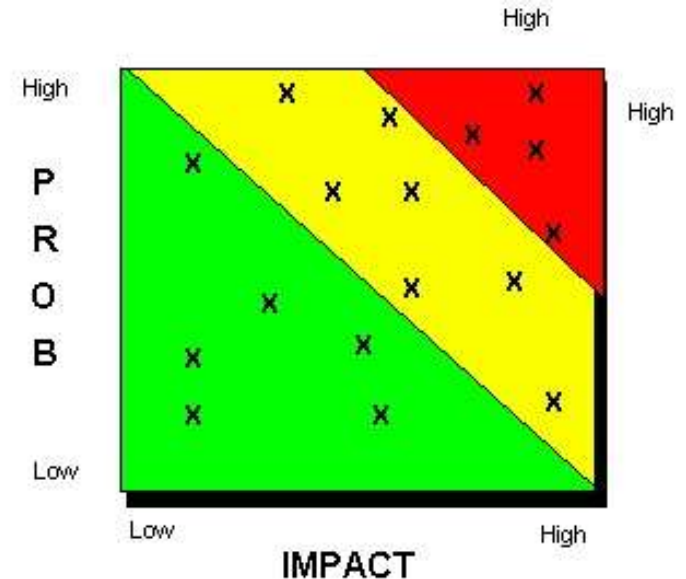
- 'Systems of systems'
- Globally distributed
- Multi-stakeholder
- Multi-systemic
- Organizational scale
- Technical & market complexity



Risk and Decision Making

- **Reactions to complexity**

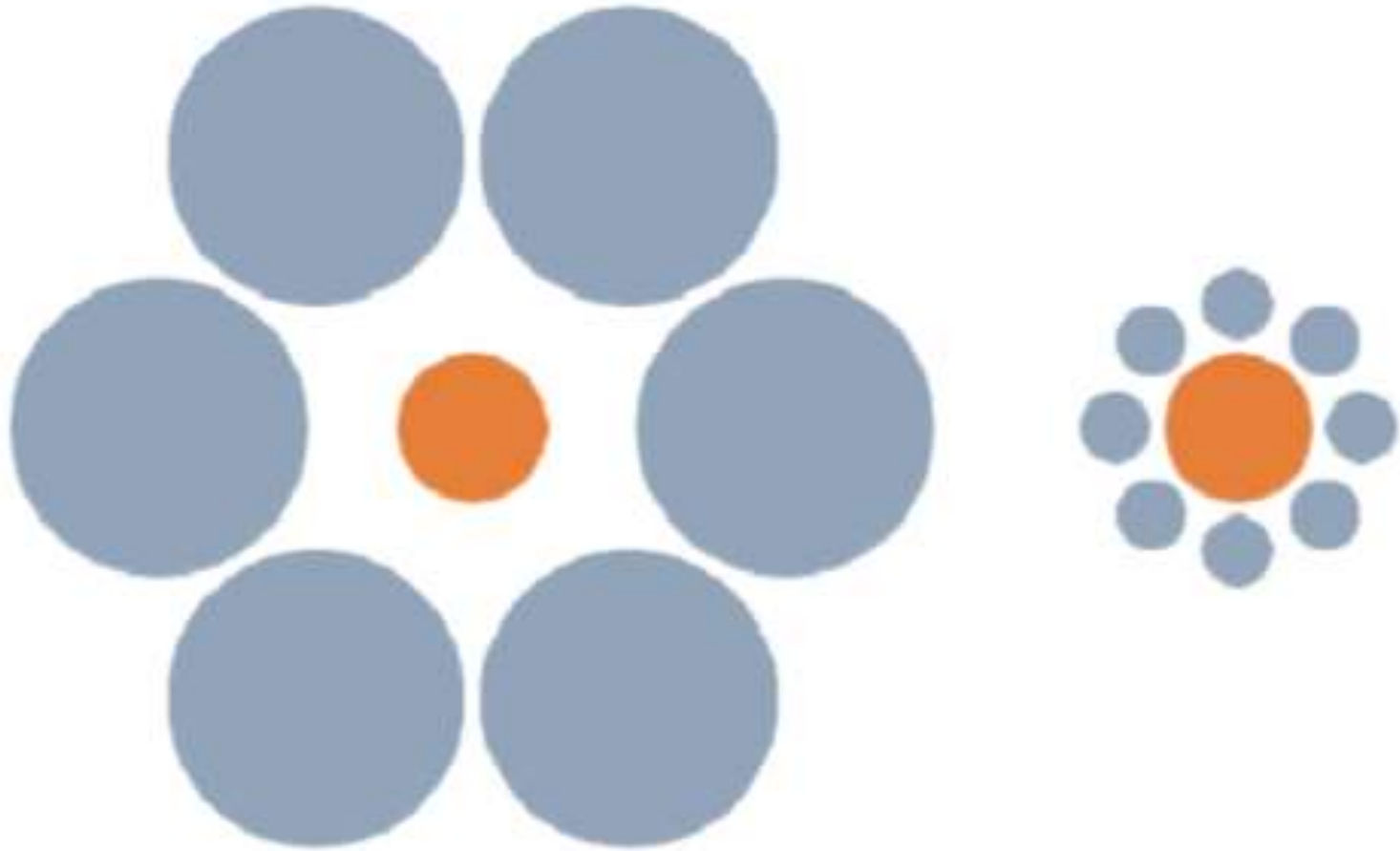
- Formal framing methods: i.e. PESTLE, RACI, SWOT
- Enterprise risk management
- Management science
- ‘Evidence-based management’



- **New views on the ‘nature of markets’**
 - ‘Boundedly Rational’
 - Behavioral biases
 - Opportunity portfolio management

Perception & Decision Making

Which orange circle is largest?




Perception & Decision Making

- Bat & ball together cost €1,10
- Bat costs €1 more than the ball
- How much does the ball cost?



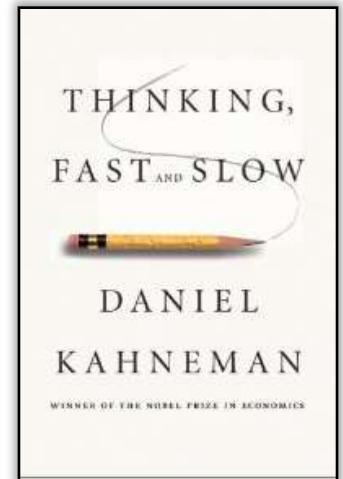
Perception & Decision Making

- Instinct: ~~€0,10~~ 
- Asked of many university students:
 - 50% Harvard, MIT & Princeton students wrong
 - 80% students at other universities wrong
- Bat & ball together cost €1,10
 - *Bat = €1,05 (€1 more than the ball)*
 - *Therefore, Ball = €0,05 ✓*
 - $1,05 - 0,05 = 1,00$ or $1,00 = 1,05 - 0,05$
- Counteracting instinct exerts effort
(actual sugar consumption in brain)



Behavioral Decision Biases

- **Bounded rationality**
 - Incomplete information
 - Information is ‘expensive’
 - There is more & more of it
 - We face limits: time, skills
 - Susceptible to self-interest
- **Prone to ‘cognitive biases’**
 - System 1: efficient short-cuts
 - System 2: ‘expensive’ concentration





Behavioral Decision Biases

Decision making systems:

- **System 1**

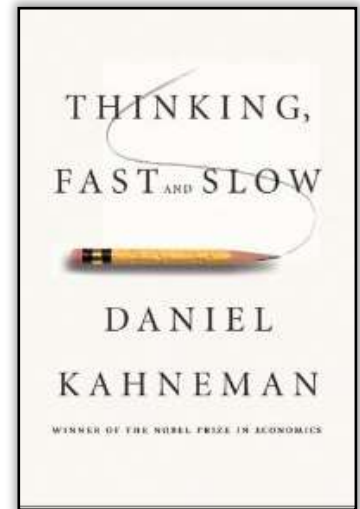
- Fast & emotion/impression driven
- Often priming us unconsciously
- Often effective, but can mislead
- Prone to easy ‘stories’:

“The bitter butler stole the money!”

- **System 2:**

- Slow & deliberate
- Checks, but susceptible to System 1 biases
- Fact assessing:

“There has been a cash shortfall”





Behavioral Decision Biases

- Inherent ‘cognitive biases’

- Framing
- Anchoring
- Bandwagon
- Loss aversion
- Overconfidence
- Expectation
- Attribution
- Illusion of control

http://en.wikipedia.org/wiki/List_of_cognitive_biases



- We evolved to win (not to be right)

- Beyond individuals...

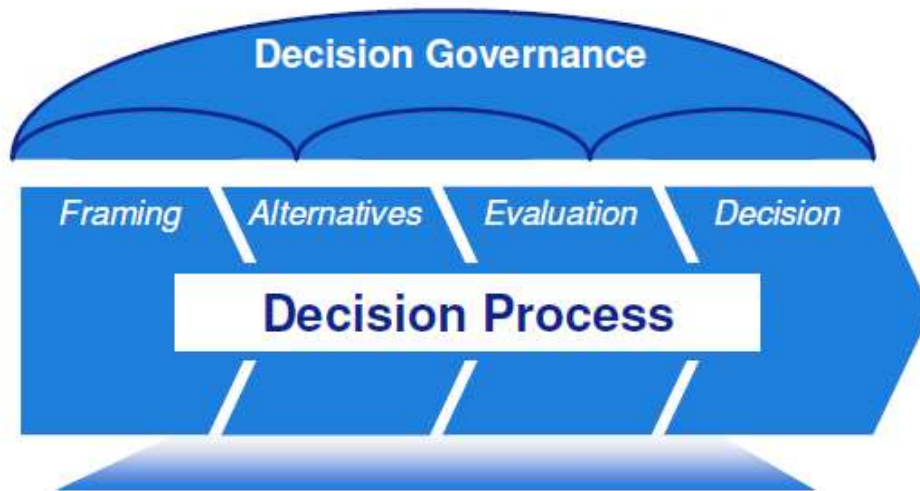
- Organizational decisions also ‘expensive’
- Firms, as collective networks of individuals, also have ‘System 1 & 2’
- Unintended consequences of ‘perverse incentives’ (trading, mortgage crisis)

CoC as Decision Making Process

- Method to enhance *rational* decision making
- Establishment of an external, 'objective' measure
- Reference to compare alternate valuation contexts
 - Market-based (price-oriented)
 - Internal (value based) valuation
- Focal point for *informed debate within the firm*

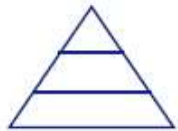


Decision Best Practices & Tools

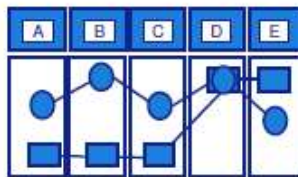


Tools and Methods

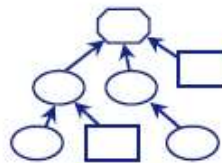
Illustrative Samples



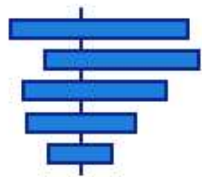
Decision Hierarchy



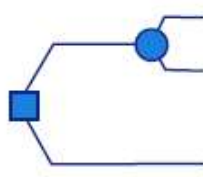
Strategy Table



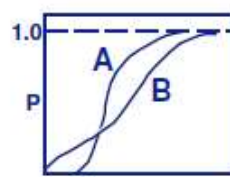
Value & Risk Map



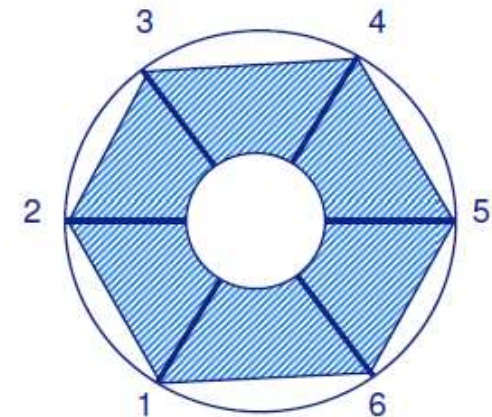
Tornado Diagram



Decision Tree



Value Distributions



Decision Quality

1. Right Frame
2. Good Alternatives
3. Reliable Information
4. Clear Values & Trade-offs
5. Sound Logic
6. Commitment to Action



1. Context setting



2. Technical overview



3. Group exercise



4. CoC feedback

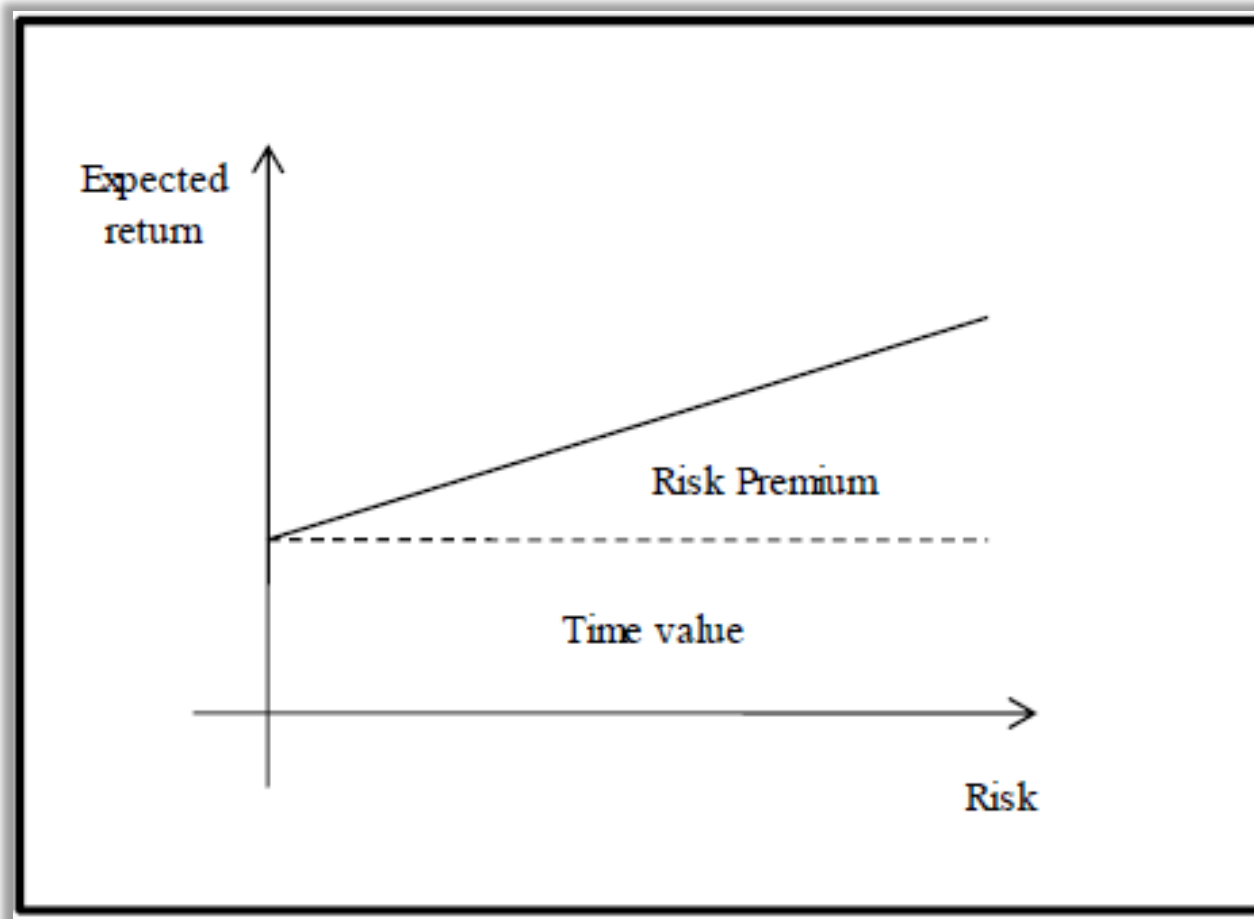


5. Summary conclusion



Opportunity Cost: Time Horizon & Risk

- Expected return increases proportional to time



- ‘Investors’ demand higher returns for higher risks
 $r = \text{expected rate of return (typically annual)}$



Discount Factor: Time Value

Discount Factor = DF = PV of 1 unit (i.e. €1)

$$DF = \frac{1}{(1+r)^t}$$

Discount Factor: multiplier to compute *present value* of any proposed cash flow

Where: r = expected rate of return

t = time

Time Effect and Discount Factor

- Time effect is highly impactful
- Two discount factors $Y1 = 20\%$ and $Y2 = 9\%$:
 $r_1 = 20\%$ & $r_2 = 9\%$
- *9% expected return 1 year horizon nearly equivalent to 20% 2 year horizon*

$$DF_1 = \frac{1.00}{(1+.20)^1} = .83$$

$$DF_2 = \frac{1.00}{(1+.09)^2} = .84$$



Present Value

$$PV = DF \times C_t = \frac{C_t}{(1 + r)^t}$$

PV can thus be computed directly given:

C = cash flow

r = expected rate of return

t = time



Net Present Value

Present Values can be aggregated (all are equal, being in PV form) to evaluate multiple cash flows => Net Present Value

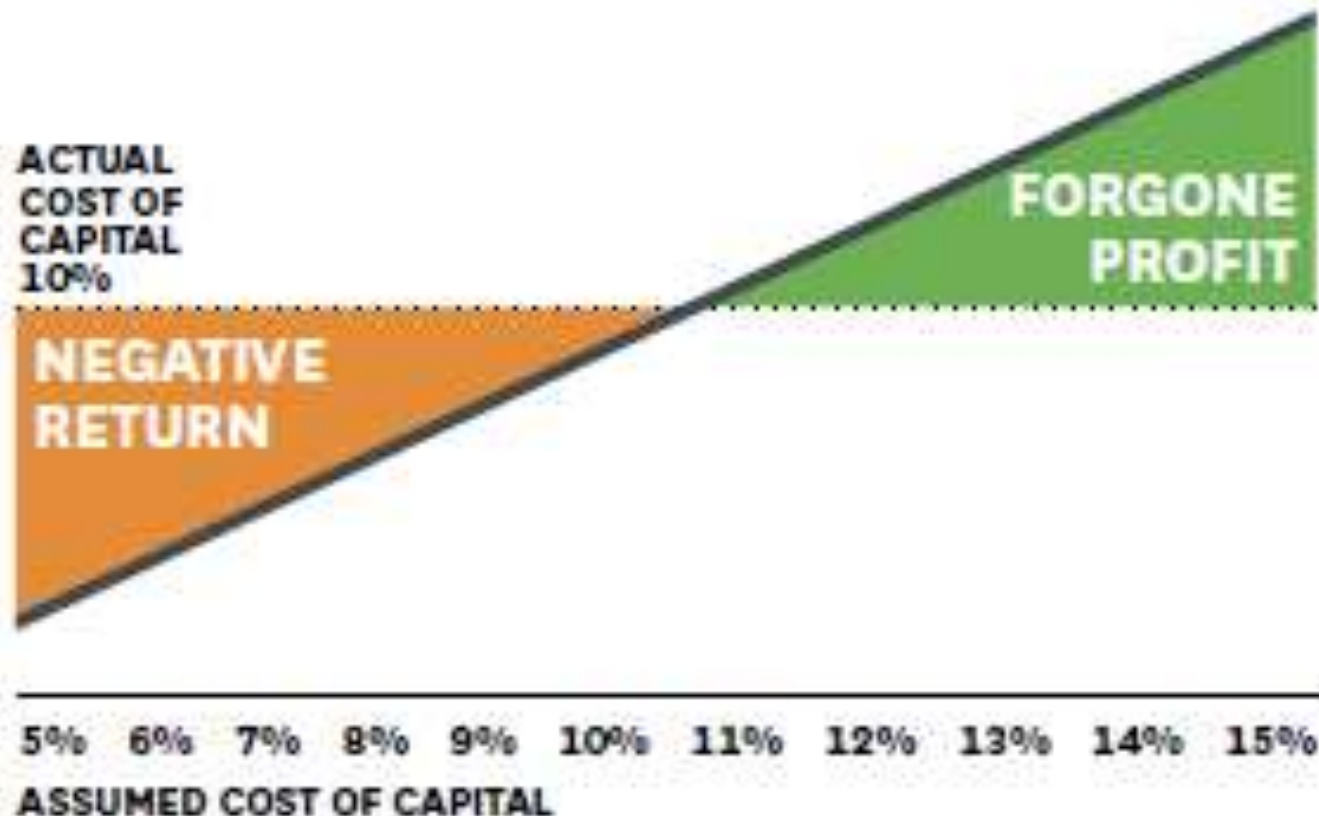
$$NPV = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \dots$$

Simple rule: > 0 = profitable opportunity



Why is CoC so important?

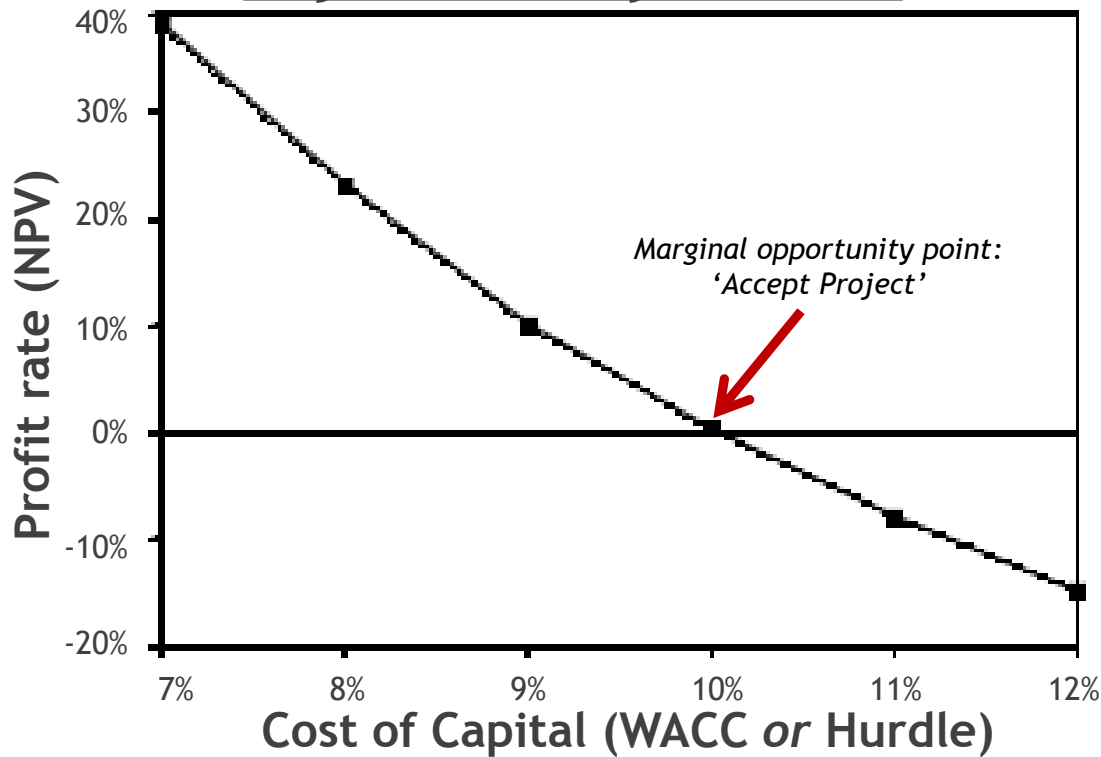
- Overestimating cost of capital can lead to lost profits
- Underestimating can yield negative returns





Why is CoC so important?

Project NPV Analysis via DCF



- Graph shows different NPV results (using DCF)
- Depending on CoC used
 - Lower CoC measure leads to higher NPV result
 - Higher CoC leads to lower NPV results
- This is result of time value of money discounting effect
- Higher CoC represents higher *opportunity cost* over time

- Benchmark reference for cash generating initiatives
- Either over or under-values firm opportunities:
- **Too low: firm takes on projects with too much risk**
- **Too high: firm rejects value-generating, growth projects**



CoC Core Concepts



INVESTMENT FINANCE

- Price vs. Value
- Market value vs. book value
- Required Rate of Return vs. Opportunity Cost of Capital
- Uncertainty vs. risk
- Opportunity & risk

CORPORATE FINANCE

- Required Rate of Return (RROR)
- Internal Rate of Return (IRR)
- Capital Asset Pricing Model (CAPM)
- Discounted Cash Flow (DCF) Analysis
- Net Present Value (NPV)
- Discount Rate(s)
 - Weighted Average Cost of Capital (WACC)
 - Internal Opportunity Cost of Capital (Hurdle Rate)





Behavioral Bias Aspects of Investment Markets

Keynes: stock market similar to a beauty contest...

- Choose "most beautiful" based on *most votes* to win prize
- *Naïve*: choose six faces that are most beautiful *to you*
- *Sophisticated* : choose based on an understanding of what the *majority 'perception of beauty' is*
- *Crafty*: choose based on understanding that others are also attempting to analyze majority perception of beauty



The Greater Fool Theory

- You see dilapidated house
- Asking price is €500k
- You know house not worth it
- You would be a fool to buy it
- However, you know there are *greater fools* who will pay more
- You believe you can buy and re-sell for a profit





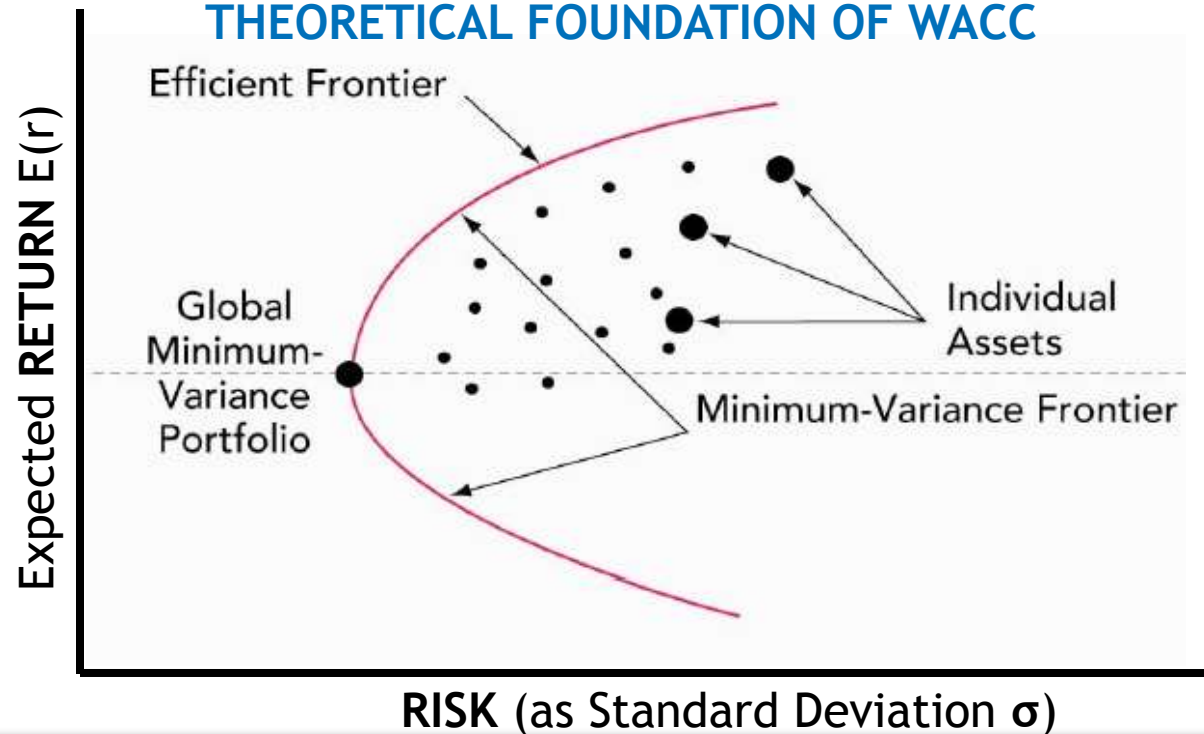
Capital Asset Pricing Model (CAPM)

Assumptions of the underlying Efficient Market Hypothesis

1. Investors are risk adverse
2. Rational investors seek to hold efficient portfolios (i.e. fully diversified portfolios)
3. Investors have identical time horizons (i.e. expected holding periods)
4. All investors have identical assumptions about variables such as expected rate of return
5. There are no transaction costs
6. There are no investment-related taxes
7. Rate received from lending is same as cost of borrowing
8. Market has perfect divisibility and liquidity

Capital Asset Pricing Model (CAPM)

THEORETICAL FOUNDATION OF WACC



STOCKS (EQUITY) HAS TWO ASPECTS

- | STOCKS (EQUITY) HAS TWO ASPECTS | |
|--|---|
| <ul style="list-style-type: none">• Unsystematic Risk<ul style="list-style-type: none">- Real Options- Firm specific- Can be <i>diversified away</i> via investment portfolio | <ul style="list-style-type: none">• Systematic Risk<ul style="list-style-type: none">- Cost of Capital- Market risk- Cannot be diversified away- This is what investors seek- Central component to CoC |



Corporate Funding Sources

DIRECT INSTRUMENTS*

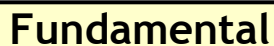
- **Equity**
 - Share release
 - Preferred shares
 - Convertible
- **Debt**
 - Bonds
 - Loans / bank debt

** Mix for optimal capital structure*

INDIRECT METHODS

- **Capital Leasing**
 - Operational lease
 - Capital lease
- **Structured Finance**
 - Special Purpose Vehicles / Entities (SPVs/SPEs)
 - Project Finance
 - Infrastructure initiatives
 - Public, Private Partnerships (PPP)
 - Private equity
 - Sovereign funds
- **Grants, Collaboration, etc.**



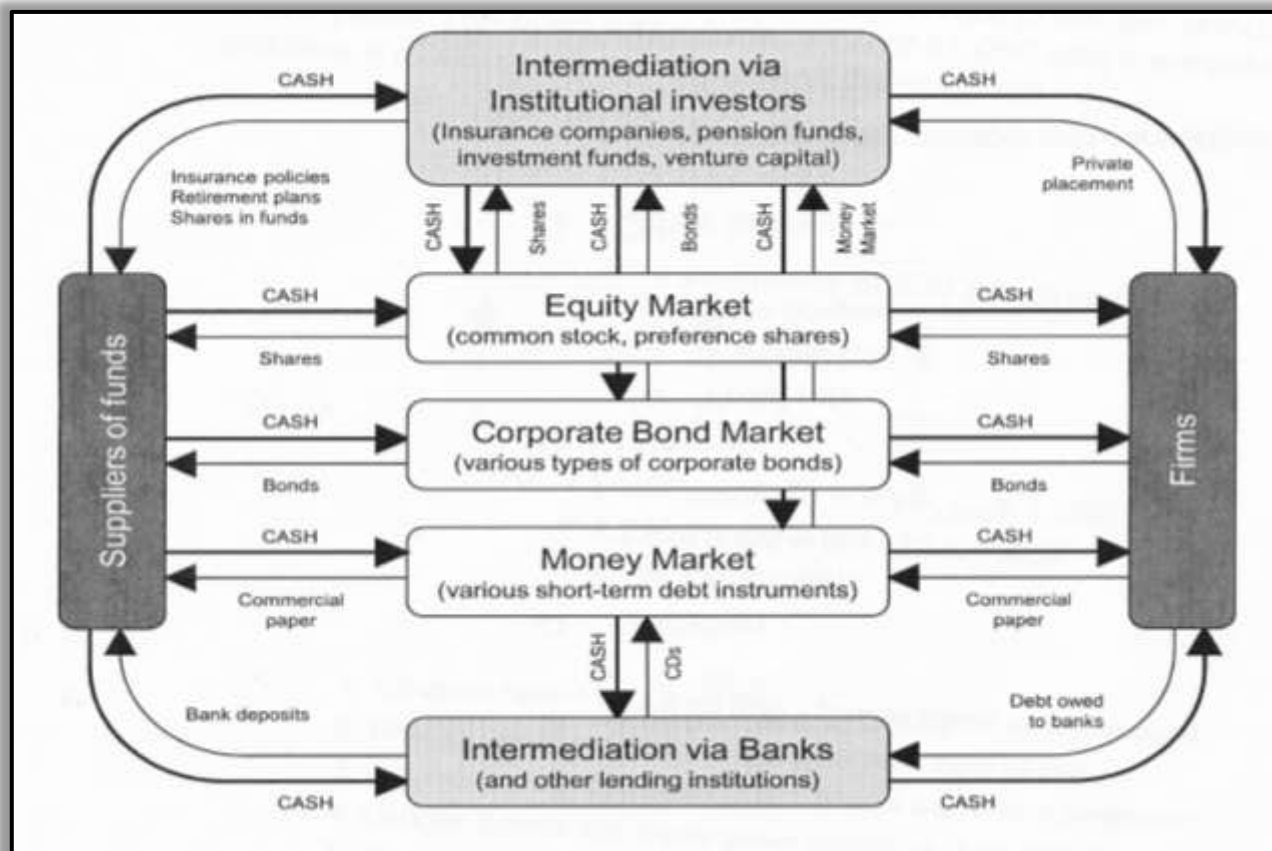


- ## Speculative

- Slide



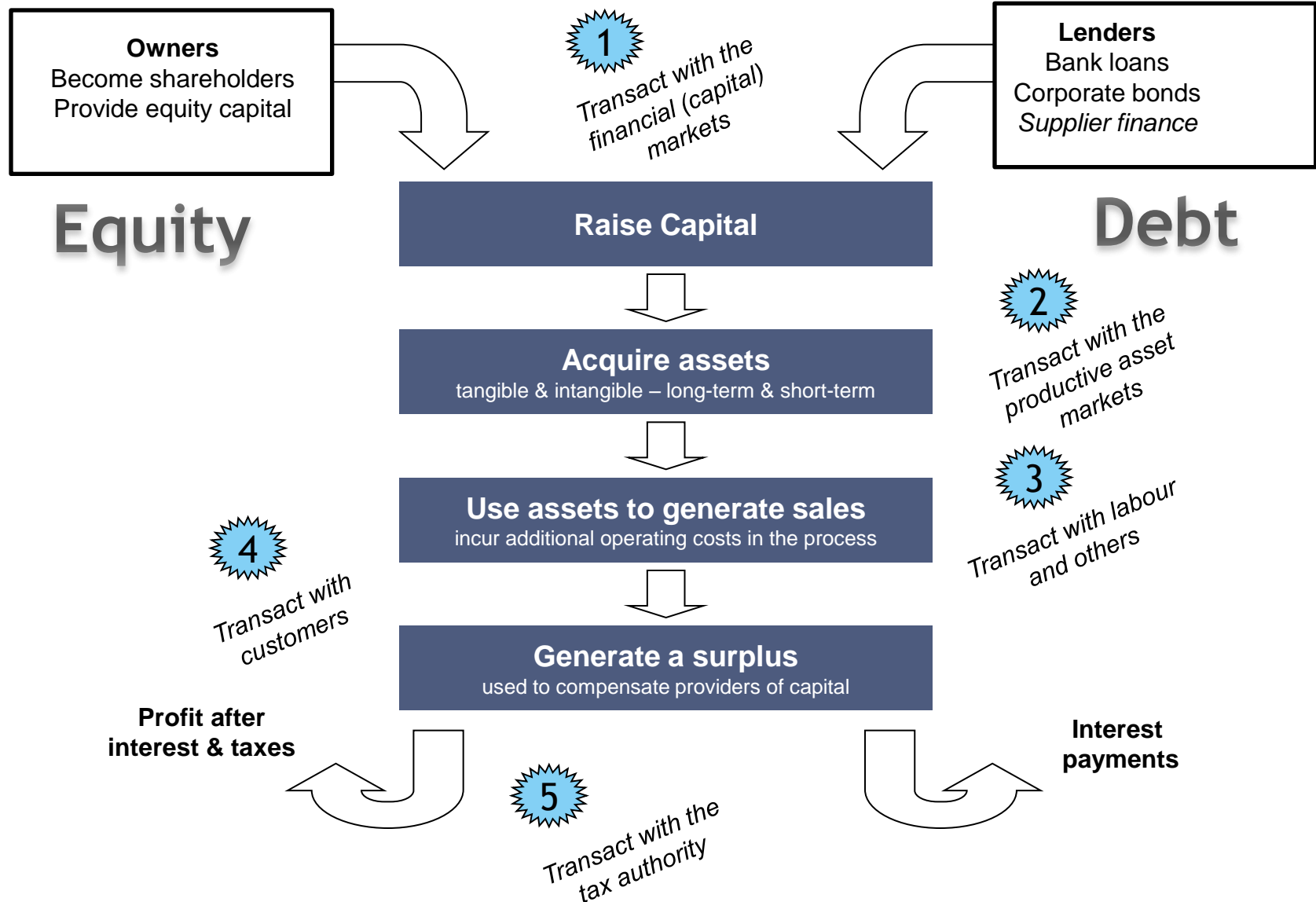
Context of Capital Markets



- Short versus long term funding
- Cash cycles and liquidity
- Context of government
- Context of currency and banking

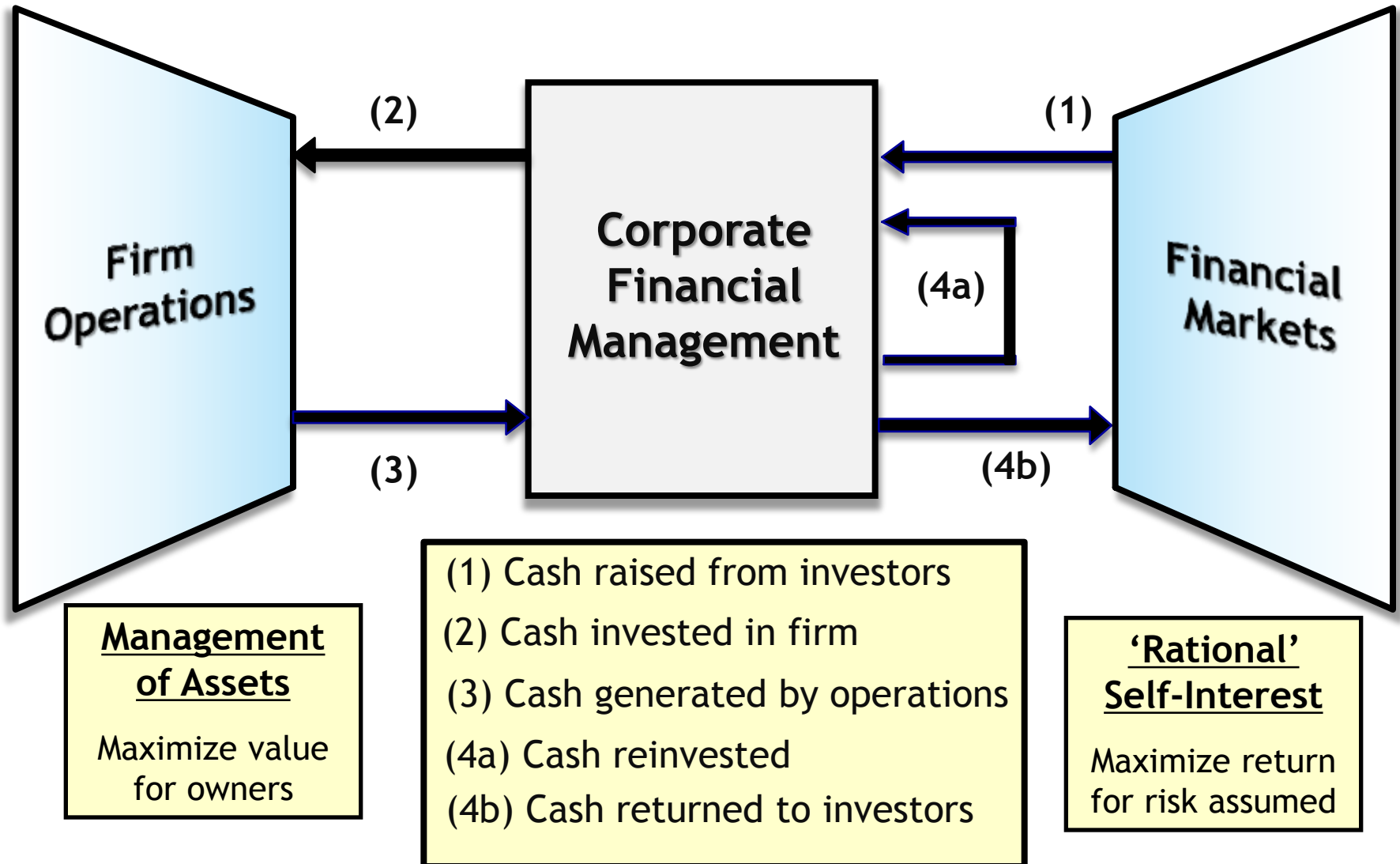


Equity and Debt Cycle





Corporate Financial Management





Balance Sheet: Linking Assets to Liabilities

ASSETS

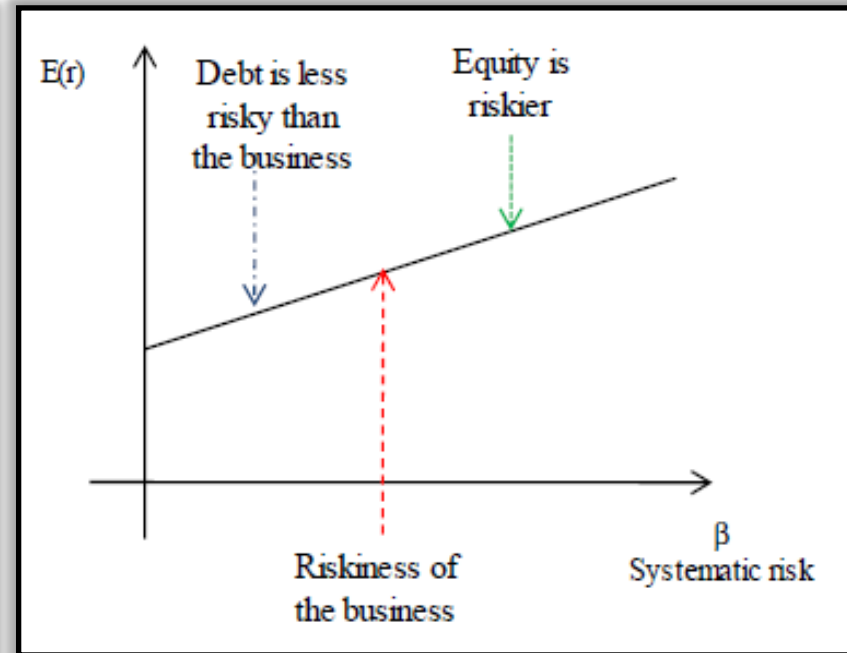
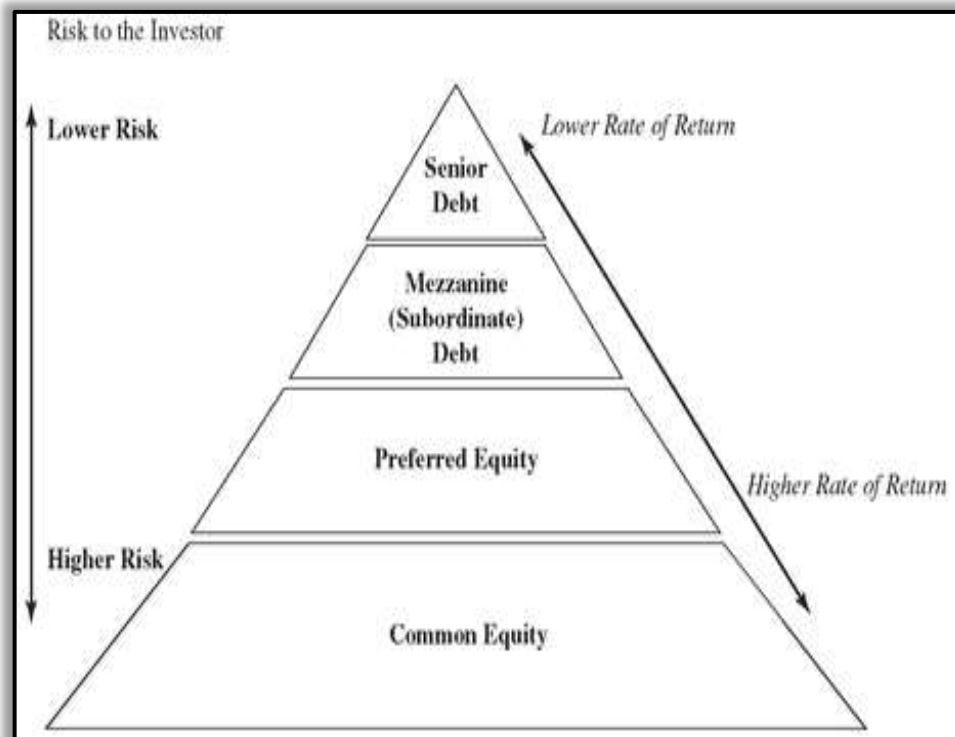
- Property, plant & equipment
- Land
- IP
- Intangibles
- Investments
- Subsidiaries
- etc.

<i>Cash is generated here</i>	<i>Cash is distributed here</i>
Business operations	Debt Equity
Value = D + E	
Debt and Equity claimants collectively bear all business risk.	

LIABILITIES & EQUITY

- Debt holders expect regular distributions of principle + interest
- Equity holders expect return on investment (economic growth, dividends, share value)

For Investors, Holding Debt is “Less Risky”



Where $E(r)$ = expected return and B is Systemic (non-diversifiable) risk of investment

- In event of financial distress, debt holders have primary claim
- Equity holders stand to lose investment (and therefore expect higher return)
- Systematic risk only
 - Investors can diversify away unsystematic / ‘non-diversifiable’ risk



WACC: Weighted Average Cost of Capital

- **Debt providers** require a return that from the corporate perspective is tax deductible as interest is tax deductible. The return required by debt providers equals the yield on a government bond plus a credit spread.
- **Equity providers** require a return for investing in shares (dividends and capital gains) and depends on the risk of the operating assets and the level of debt financing. The returns are not tax deductible and equals the yield on a government bond and an equity risk premium

The Weighted Average Cost of Capital, reflects the average return required by the investors and can be calculated as follows:

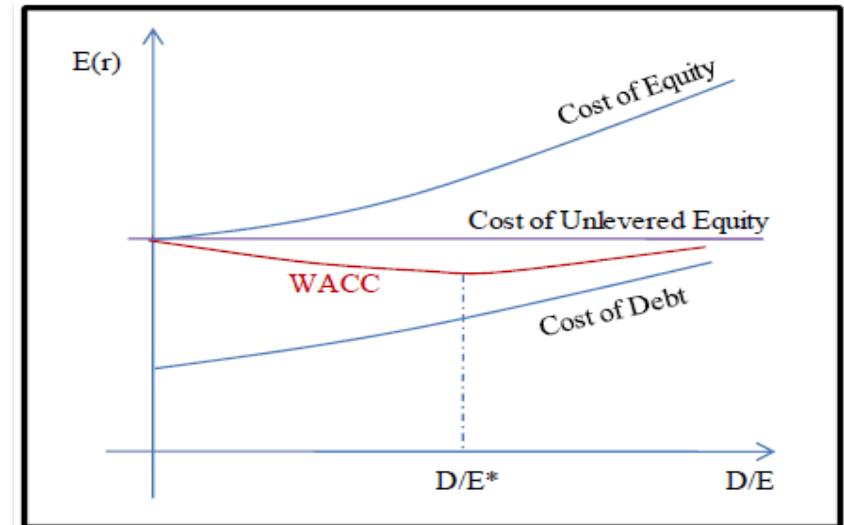
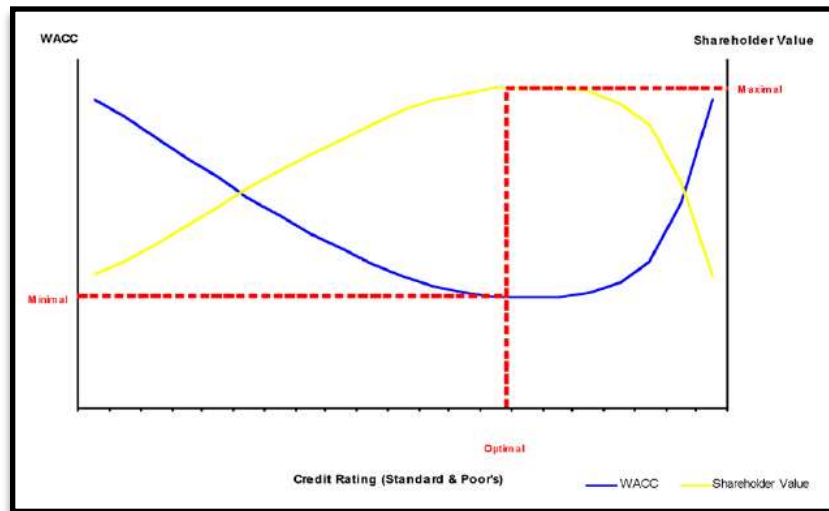
$$WACC = k_e \frac{E}{D+E} + k_d (1 - T_c) \frac{D}{D+E}$$

Where WACC =

- K_e = expected market rate of return (RoR) on equity
- E = equity (market value)
- D = debt (market value)
- K_d = expected RoR on debt
- T_c = tax rate



WACC: Optimal Capital Structure



- Optimal capital structure & credit rating achieved when **WACC CoC** is minimized
- Best practice: define a target capital structure which provides for sufficient financial flexibility to cope with adverse scenarios & turbulent markets
- Unlevered Equity = 100% equity financed firm
- Cost of Equity (equity risk) raises as debt level raises
- But, interest payments on debt provide a 'tax shield' effect
- Therefore, there is a marginal benefit to some amount of debt



Price versus Value



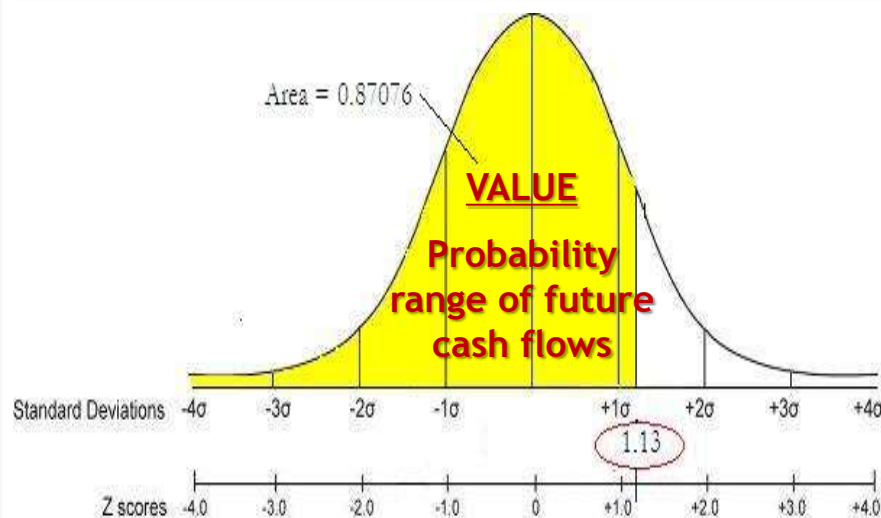
PRICE Today's Market Value of Firm

VALUE: INTERNAL ANALYSIS

- There **will** be a final, future value!
- In the present, that value can be:
 - Estimated...
 - but not determined with 100% confidence
 - Best: probabilistic risk understanding
 - Categorization of unknowns
- Measured by future Free Cash Flows (FCF)
 - Holistic risk analysis
 - Discounted *through time* at CoC
 - Producing DCF which sum to NPV
 - Both WACC & Hurdle Rate (OCOC)

PRICE: MARKET-BASED

- Proxy for asset value in market
- Speculative aspect: perceptions of comparative current value
- Cyclical market factors
- Influence of macro- context
- Susceptible to
 - Fungibility, liquidity
 - Transaction costs
 - Storage, physical risks (commodities)
 - Etc...



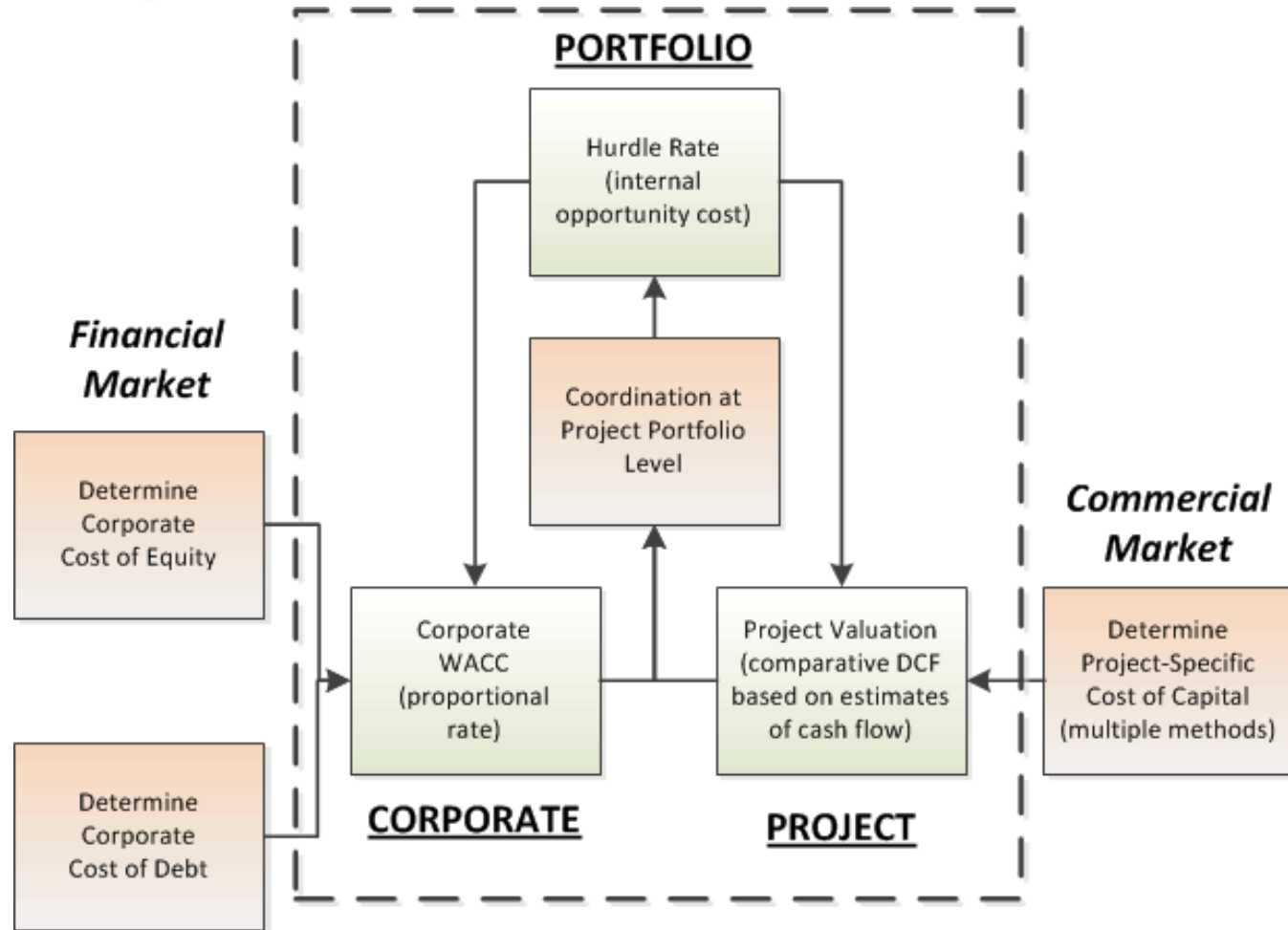


Hurdle Rate: Risk Analysis



- **OPTIONAL: Internal Cost of Capital**
 - Higher than WACC (market's base expectation)
= $WACC + \text{Adjustments for Specific Risk (industry, market, legal, etc.)}$
 - Principle: highest reward for lowest risk
- **Potential tool for risk/opportunity ranking**
 - **Project level**: individual project risk assessment
 - **Division level**: risk ranking of divisional portfolio opportunities
 - **Corporate level**: project portfolio roll-up
- **Project Portfolio**
 - Targeted Hurdle Rates can assist ranking of portfolio projects
 - Portfolio can be used to aggregate Hurdle Rates at different levels
- **Real Options**
 - Alternative method to project-specific hurdle valuation approach

Perspective: CoC as a *Process*



CoC as a *decision making process* resolving financial markets with evolving market opportunities via structured metrics



Review: Technical Concepts Raised

FOUNDATION...

- **What & why?**
 - Decision making process & tool
- **CoC: Cost of Capital**
 - **WACC: Weighted Average Cost of Capital**
 - Market basis: Efficient Market & CAPM
 - Equity vs. Debt (in terms of risk)
 - Tax shield
 - Optimal capital structure
 - **Internal Hurdle(s) CoC:**
 - Internal expected return on capital
 - 'Opportunity Cost' (division specific risk measures possible)
- **Use of CoC**
 - **PROCESS:** Decision making / risk analysis
 - **TOOL:** Discount analysis - time value of money



Review: Context of Cost of Capital

Depends upon who is asking & why

- **INVESTOR**: Market investment opportunity cost
 - Opportunity cost - sacrifice for investing in company
 - Represents comparative risks taken on by investing
- **FIRM**: Weighted Average Cost of Capital (WACC)
 - Proportional mix Equity & Debt (market measure)
 - Sets measure for 'lowest possible return expectation'
- **FIRM**: Hurdle Rate (Internal Opportunity Cost)
 - Possible higher internal CoC benchmark
 - Rate to meet or surpass in terms of 'opportunity cost' for not investing in *other available firm opportunities*
 - Utilize in risk mapping exercises



Context of Technical Cost of Capital

- Value is destroyed unless projects & companies meet or beat CoC measures
 - **Too high:** value creating projects are rejected
 - **Too low:** value destroying projects are accepted
- Measurement
 - Estimate *WACC* CoC via market measures
 - Estimate *Hurdle* CoC via project portfolio (risk) analysis
 - Use in DCF / NPV analysis for present value of projects
 - Monitor & benchmark results over time



Key Technical Concepts

- **WACC** => as combination of...
 - **RFR**: Risk Free Rate
 - **Re**: Expected Return/Cost of- Equity
 - Market Return
 - Beta
 - **Rd**: Expected Return on/Cost of- Deb
- **Hurdle Rate**: Internal Opportunity Cost of Capital
- **Use of CoC (WACC & Hurdle)**
- **Cash Flow Analysis**
 - **DCF**: Discounted Cash Flow analysis
 - **FCF**: Free Cash Flow
 - **NPV**: Net Present Value



Capital Structure Components

1. Cost of Equity =

Market Risk Free Rate

+

(Equity Beta * Equity Risk Premium)

2. Cost of Debt with Tax Shield =

(Market Risk Free Rate + Debt Risk Premium)

X

(1 - Corporate Tax Rate)



WACC: Cost of Equity & Debt

WACC =

Proportionally* weighted Cost of Debt + Cost of Equity**

** Use target capital structure or market values*

*** Debt less effect of tax rebate on interest*

$$\text{WACC} = ((\text{Debt}\%) * (\text{Rd} * (1 - \text{Tax Rate}))) + ((\text{Equity}\%) * \text{Re})$$

- **Rd = Cost of Debt**

- Rd = Market Risk Free Rate + Credit Spread

- **Re = Cost of Equity**

- Equity Cost from Asset Cost

- Re = (Asset Beta * Market Return) + Market Risk Free Rate



Deriving WACC

$$\text{WACC} = ((\text{Debt}\%) * (\text{Rd} * (1 - \text{Tax Rate}))) + ((\text{Equity}\%) * \text{Re})$$

- Rf = Market Risk Free Rate
- Be = Equity Beta
- MRP = Market Risk Premium
- Re = Expected Return on Equity
- Rd = Expected Return on Debt
- Tax Rate
- Debt %
- Equity %
- Leverage = debt ratio

Rf	<input type="text" value="Risk Free Interest Rate %"/>	%
Be	<input type="text" value="Equity Beta"/>	
MRP	<input type="text" value="Market Risk Premium %"/>	%
Re	<input type="text" value="5"/>	%
Rd	<input type="text" value="4"/>	%
Tax Rate	<input type="text" value="35"/>	%
Debt	<input type="text" value="30"/>	
Equity	<input type="text" value="70"/>	
Leverage	<input type="text" value="Debt/Equity in %"/>	%
<input type="button" value="WACC"/>		
WACC= 4.28%		

WACC: Market Risk Free Rate (RFR)

- **Defined as:**
 - Rate of return for investment with zero risk
 - Probability of X% return over T period is 100%
- **Traditionally: government debt**
 - i.e. U.S. Treasury Rates (10 year zero coupon), Netherlands Gov't
- **Use current market quote**
- **Timeframe: matching principle**
- **Restrict using own 'theories'**
 - Assign owner for monitoring macroeconomic outlook / risk
 - Spikes possible (i.e. 1980's)
 - Principle of '*reversion to mean*'*
 - 1930 to present = 5.1%
 - 1960 to present = 6.5%
 - 1980 to present = 6.7%
 - 2002 to present = 3.7%
 - 2008 to present = 2.8%

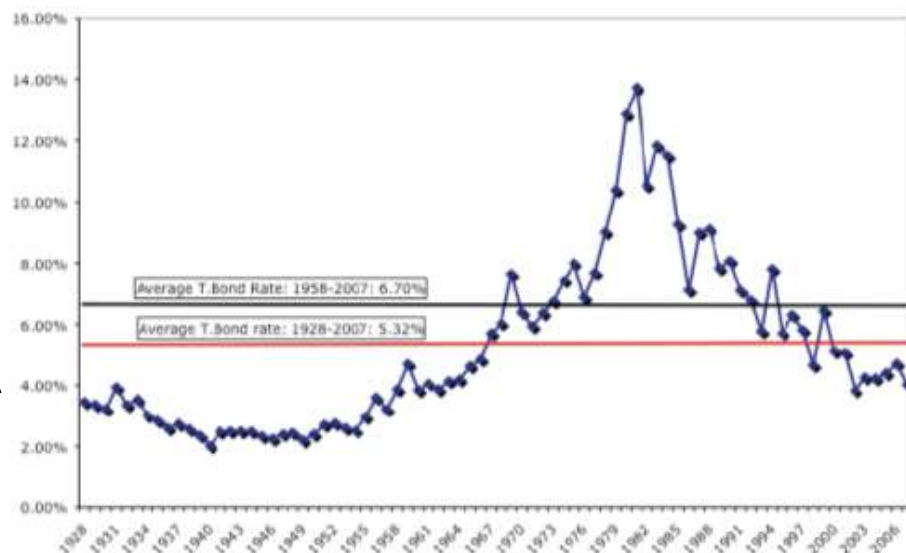
Rd = Cost of Debt

= Risk Free Rate + Credit Spread

Re = Cost of Equity

= Re = Risk Free Rate + (Asset Beta * Mrkt Return)

US Treasury Bond Rates 1928 - 2007



* <http://people.stern.nyu.edu/adamodar/>



WACC: Netherlands Market Risk Free Rate

- Match currency & project time line
10 year Netherlands Euro denominated project =
10 year Netherlands government bond
- 2011 Netherlands Market RFR: 2.3 - 3.8% (default to 3.2%)

Netherlands 10 year Sovereign Bonds



<http://www.nma.nl/images/Second%20opinion%20cost%20of%20capital22-193267.pdf>



WACC: Cost of Equity Capital

$$Re = \text{Cost of Equity} = RFR + (\text{Equity Premium} \times \text{Equity Beta})$$

1. RFR: Market Risk Free Rate

+

2. Equity Risk Premium:

For investing in equities

X

3. Equity Beta:

Relative risk of company to 'The Market'

WACC: Equity Risk (Market) Premium

- What an equity investor can expect from ‘*the market*’
 - Generally: dominant equity index applicable to firm
- Equities
 - Higher aggregate return over time, but higher variability
- Long-Term (LT) timeframe
 - *Remember: remove long-term Risk Free Rate if using aggregate equity returns!*
 - Equity Risk Premium = LT Equity Return - LT Risk Free Rate (RFR)

1926 - 2002 (%)	mean return p.a.	variability
common stocks	12.2	20.5
small stocks	16.9	33.2
LT corp.bonds	6.2	8.7
LT govt bonds	5.8	9.4
T-Bills	3.8	3.2
inflation	3.1	4.4

US EXAMPLE (at left)

$$12.2\% - 5.8\% = 6.4\%$$

Netherlands (1900 - 2010)

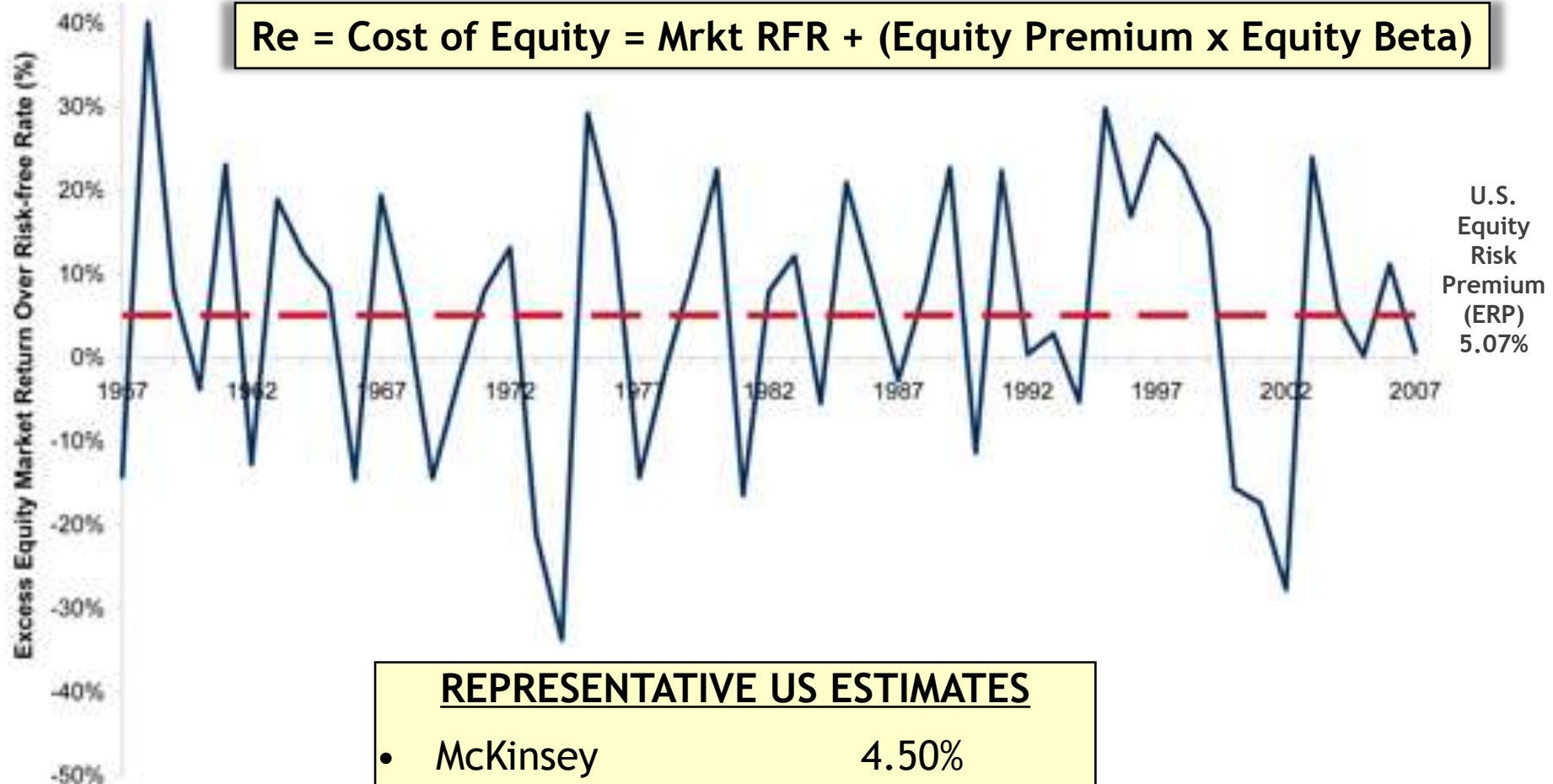
$$9.4\% - 4.6\% = 4.8\%$$

<http://www.iese.edu/research/pdfs/DI-0920-E.pdf>
<http://faculty.london.edu/edimson/assets/documents/Jacf1.pdf>



WACC: Equity Risk (Market) Premium

$$Re = \text{Cost of Equity} = \text{Mrkt RFR} + (\text{Equity Premium} \times \text{Equity Beta})$$



REPRESENTATIVE US ESTIMATES

- McKinsey 4.50%
- Goldman Sachs Low 3.5%
- Goldman Sachs High 5.5%
- Brealey and Meyers 6% to 8.5%
- Gordon's model 2.9%



WACC: Equity Beta

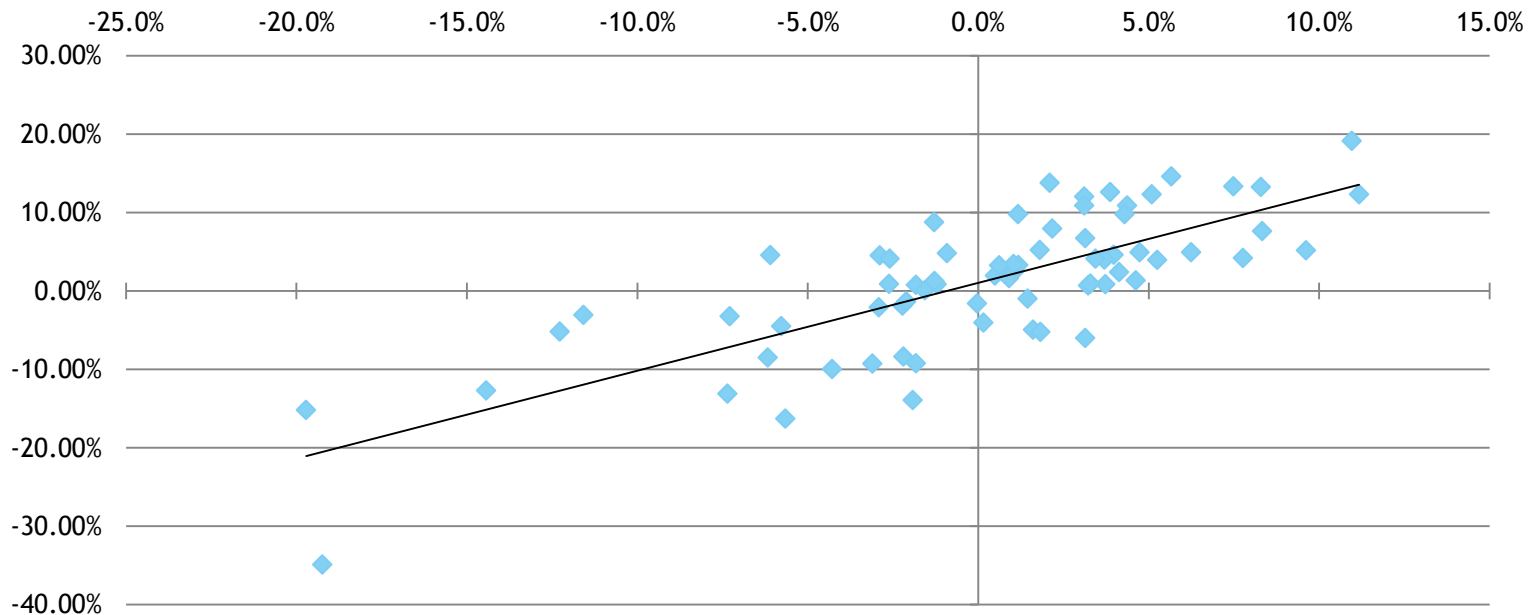
- **Beta = stock movements compared to index**
- **Two methods for measurement**
 1. **Historical (top-down)**
‘Regression’ of historical stock returns on index (market) returns
 2. **Basket (bottom-up)**
Measuring average beta for firms in same industry (debt adjusted)
- **Indicates ‘relative risk’ of equity for company *as compared to ‘the market’***
 - 1 = perfect correlation with index
 - > 1 = higher proportional volatility to market
 - < 1 = lower proportional volatility to market *
 - * *Beta lower than 1 will lower CoC*



WACC: Equity Beta - Example Co. Historical (Top-Down)

- Beta measures stock movements compared to index
- **1 = perfect market correlation**
 - No upper or lower bound
 - Betas as large as 3 or 4 = highly volatile stocks
 - Beta can be zero = no correlation with market
 - Negative beta = inverse correlation with the market
- **Example Beta = 1.12**
 - Indicates slightly more volatility than Index

Regression (slope): Example Co. versus Euronext Amsterdam (AEX) (1/05 - 12/10)

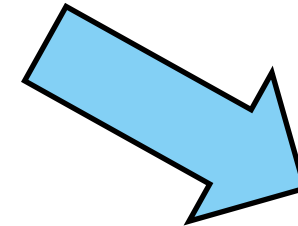




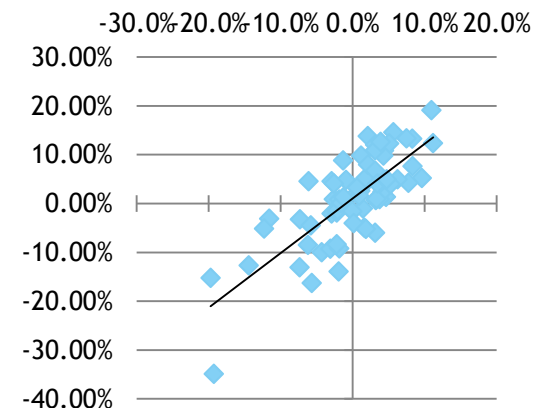
WACC: Example Co. Historical Beta Source Data (Top-Down)

- Example Co. Beta: Example Co. 1/05 - 12/10 versus Euronext Amsterdam
- Monthly % change: Example Co. & Euronext

Date	Close Co.	% chg Co.	% chg EurAms	Close Euronxt
12/1/2010	42.6	13.2%	8.3%	354.57
11/1/2010	37.62	-2.1%	-2.9%	327.41
10/1/2010	38.42	2.2%	0.8%	337.23
9/1/2010	37.58	14.6%	5.7%	334.39
8/2/2010	32.79	-10.0%	-4.3%	316.47
7/1/2010	36.42	10.9%	4.4%	330.64
6/1/2010	32.85	0.9%	-1.2%	316.81
5/3/2010	32.57	-3.2%	-7.3%	320.7
4/1/2010	33.66	2.0%	0.5%	345.91
3/1/2010	33.01	7.6%	8.3%	344.22
2/1/2010	30.67	-9.3%	-3.1%	317.74
1/4/2010	33.81	-1.9%	-2.2%	327.9
12/1/2009	34.46	5.2%	9.6%	335.33
11/2/2009	32.76	9.8%	1.2%	305.9
10/1/2009	29.84	4.5%	-2.9%	302.36
9/1/2009	28.55	12.3%	5.1%	311.35
8/3/2009	25.42	1.4%	4.6%	296.27
7/1/2009	25.08	12.3%	11.2%	283.17
6/1/2009	22.33	-9.2%	-1.8%	254.71
5/4/2009	24.6	4.2%	7.8%	259.45



EXCEL slope function



Example Co.
Beta = **1.12**



WACC: Industry Betas - Basket (Bottom-Up)

Industry Name	# of Firms	Average Beta	Market D/E Ratio	Tax Rate	Unlevered Beta	Cash/ Firm Value	Unlev Beta Less Cash
Beverage	34	0.92	13.09%	19.08%	0.83	3.69%	0.86
Biotechnology	120	1.13	13.24%	5.74%	1.01	16.31%	1.20
Chemical (Basic)	17	1.28	18.75%	22.39%	1.12	5.41%	1.19
Chemical (Diversified)	31	1.51	21.07%	23.87%	1.30	6.22%	1.39
Chemical (Specialty)	83	1.37	23.06%	14.85%	1.14	4.22%	1.20
Coal	25	1.59	16.16%	13.17%	1.39	3.74%	1.45
Computer SW/Svcs	247	1.06	4.68%	13.88%	1.02	9.48%	1.12
Diversified Co.	111	1.22	99.77%	17.14%	0.67	11.99%	0.76
Drug	301	1.11	14.10%	6.72%	0.98	8.96%	1.08
E-Commerce	52	1.14	4.58%	17.19%	1.10	8.09%	1.19
Educational Services	37	0.79	8.89%	27.32%	0.75	11.26%	0.84
Engineering & Const	17	1.65	7.93%	28.52%	1.56	15.56%	1.85
Environmental	69	0.85	41.13%	11.02%	0.62	2.50%	0.64
Financial Svcs. (Div.)	230	1.37	135.83%	18.63%	0.65	13.43%	0.75
Food Processing	109	0.87	28.98%	21.80%	0.71	3.91%	0.74
Heavy Equip Makers	8	1.94	46.41%	19.97%	1.42	8.90%	1.55
Household Products	22	1.17	18.38%	27.46%	1.03	2.14%	1.05
Industrial Services	137	0.96	26.26%	20.50%	0.79	7.97%	0.86
Information Services	26	1.10	20.21%	22.44%	0.95	3.28%	0.98
Internet	180	1.11	1.57%	7.89%	1.09	9.48%	1.21
Machinery	114	1.22	28.52%	19.61%	0.99	5.82%	1.05
Metals & Mining (Div.)	69	1.33	11.01%	7.07%	1.21	3.32%	1.25
Petroleum (Integrated)	23	1.21	18.37%	27.13%	1.07	4.84%	1.12
Power	68	1.34	98.86%	7.58%	0.70	10.14%	0.78
Utility (Foreign)	5	0.99	58.68%	20.30%	0.67	4.45%	0.70
TOTAL MARKET	5928	1.15	36.04%	15.32%	0.88	8.51%	0.96

Aswath Damodaran (Jan 2011) <http://people.stern.nyu.edu/adamodar/>



WACC: Example Co. Basket Approach (Bottom-Up)

- Bottom-Up: Weighted basket of industry Betas
- Proportionally weight by division/segment *
- Use when:
 - Poor 'fit' to index (regression error)
 - Historical Beta markedly different from average in industry
 - Reorganization, strategic realignment, etc. (as comparison)

SEGMENT	% REVENUE *	BETA	Weighted
Nutrition	34%	0.95	0.32
Pharmaceuticals	9%	1.08	0.10
Performance materials	27%	1.20	0.32
Polymer intermediates	16%	1.19	0.19
Base chem. & materials	9%	1.39	0.13
Other (microorganisms)	5%	1.20	0.06
SUMMARY	100%	1.17	1.12

* Multiple used for simplicity, typically relative debt/equity



WACC: Beta Tips and Advice

- **INDEX: where is equity traded?**
 - Local index may be biased: particular industries/regions
 - Local index may be biased to particular investors
 - If multiple, consider weighting by market value of equity
- **HORIZON: which timeframe?**
 - Common: 2 years weekly data *or* 5 years monthly
 - At least 60 data points
 - Recent times have been unusual: consider longer frame!
- **INDUSTRY: which industry?**
 - Some sectors counter-cyclical: consumer staples vs. tech
 - If diversified, compare top-down & bottom-up results



WACC: Cost of Equity Capital DMS Example

$$Re = \text{Cost of Equity} = RFR + (\text{Equity Premium} \times \text{Equity Beta})$$

1. RFR: 3.2% NL market government rate

+

2. [Equity Risk Premium: 4.8% (long term)

X

3. Equity Beta: 1.12 (Example Co.)]

=

4. Cost of Equity: 3.2% + (4.8% x 1.12)

= 8.6% Example Co. CoE



WACC: Cost of Debt Capital

$$R_d = \text{Cost of Debt} = \text{Mrkt RFR} + \text{Debt Risk Premium}$$

1. RFR: Market Risk Free Rate

+

2. Debt Risk Premium

- Reflects industry & company business risk
- As determined by rating agency or market data (i.e. bond yield)
- Use CURRENT RATE on existing debt



WACC: Cost of Debt Capital Example Co. Example

$$R_d = \text{Cost of Debt} = \text{Mrkt RFR} + \text{Debt Risk Premium}$$

1. RFR: 3.2% NL market government rate

+

2. Debt Risk Premium: 2.5% A-Rated company

=

3. Cost of Debt: 3.2% + 2.5%

= 5.7% Example Co. CoD



WACC: Tax Shield of Debt

- **‘Tax shield’ of debt**

- Debt is adjusted for tax deductibility
- Reduces overall cost of debt

$$\text{Cost of Debt} * (1 - \text{Corporate Tax Rate})$$

- **However...**

- Amount of debt raises Cost of Equity
- Though there is a marginal benefit
- Therefore there is an ‘optimal’ capital ratio



WACC: Tax Shield of Debt Example Co. Example

$$\text{Cost of Debt} * (1 - \text{Corporate Tax Rate})$$

1. Example Co. Cost of Debt = 5.7%
2. Example Co. Tax Rate* = 25%
3. Cost of Debt with Tax Shield:

=

$$5.7\% \times (1 - 0.25)$$

$$= 4.2\% \text{ Example Co. AT CoD}$$



WACC: Summary of Derivation

$$\text{WACC} = ((\text{Debt}\%) * (\text{Rd} * (1 - \text{Tax Rate}))) + ((\text{Equity}\%) * \text{Re})$$

- **Rd = Cost of Debt**
 - Rd = Market Risk Free Rate
+ Credit Spread
- **Re = Cost of Equity**
 - Equity Cost from Asset Cost
 - Re = (Asset Beta * Market Return)
+ Risk Free Rate



WACC: Debt to Equity - Example

$$\text{WACC} = ((\text{Debt}\%) * (\text{Rd} * (1 - \text{Tax Rate}))) + ((\text{Equity}\%) * \text{Re})$$

Example Co. PROPORTION OF DEBT TO EQUITY

1. Book Value Debt = €2.097 B
2. Market Value Equity = €6.578 B
 - ☐ Share Price Ex.Co. (2011 avg) = €40.1
 - ☐ Shares outstanding = 164.047 M
3. Combined Value = €8.675 B = 100%
4. Debt 24% / Equity 76%



WACC: Final WACC - Example

$$\text{WACC} = ((\text{Debt}\%) * (\text{Rd} * (1 - \text{Tax Rate}))) + ((\text{Equity}\%) * \text{Re})$$

Example WACC DERIVATION

1. **AT Cost of Debt =**
 $(24\% * 4.2\%) = 1.0\%$
2. **Cost of Equity =**
 $(76\% * 8.6\%) = 6.5\%$
3. **Example Co. WACC = 7.5%**

WACC CHECK: Composite of Divisions

- **Composite assembled from proportion of active segments**
 - i.e. Material Sciences & Life Sciences
 - For composite, should be proportional to capital structure
- **Aspects**
 - Useful as internal 'baseline'
 - **Investors still expect market-derived single return**
 - Allows potential for division-specific WACC for project assessment
 - Divisions capital structure should be considered

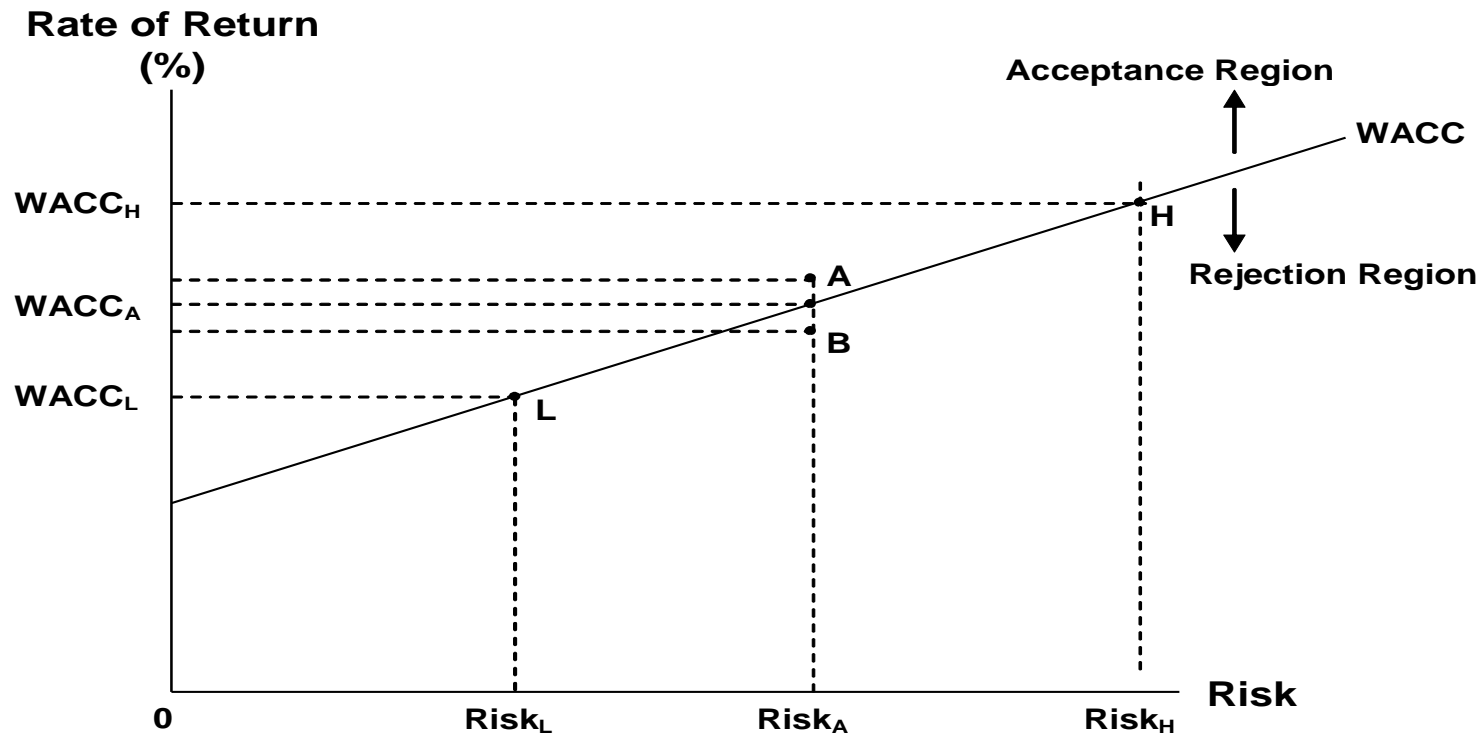
INDUSTRY *	WACC	Cost of Debt	Cost of Equity	D/E
Materials	9%	7%	11%	26%
Industrial	9%	7%	10%	26%
Technology	10%	7%	10%	6%
Energy	8%	7%	9%	22%

Example only! <http://www.wikiwealth.com/wacc>



WACC: Divisional WACC Projects

- Estimate CoC division would have as stand-alone firm
 - Estimate Beta, Cost Debt, Cost Equity, Capital Structure, etc.
- Use 'Segment / Divisional WACC' for project assessment/
'*risk mapping*' exercises
 - i.e. If Division WACC = 12.5%, typical projects in division expected to return 12.5% or above





WACC: Comparative across Industries *

Industry Name	# Co's	Beta	Cost of Equity	% Equity	SD (Beta)	Cost of Debt	Tax Rate	AT Cost Debt	Debt %	WACC
Beverage	34	0.92	7.87%	88.43%	73.62%	5.29%	19.08%	4.28%	11.57%	7.45%
Biotechnology	120	1.13	8.96%	88.31%	98.40%	6.29%	5.74%	5.93%	11.69%	8.61%
Chemical (Basic)	17	1.28	9.71%	84.21%	53.72%	4.79%	22.39%	3.72%	15.79%	8.77%
Chemical (Diversified)	31	1.51	10.85%	82.60%	72.83%	5.29%	23.87%	4.03%	17.40%	9.66%
Chemical (Specialty)	83	1.37	10.14%	81.26%	78.35%	5.29%	14.85%	4.50%	18.74%	9.08%
Coal	25	1.59	11.24%	86.09%	68.06%	5.29%	13.17%	4.59%	13.91%	10.31%
Computer Software/Svcs	247	1.06	8.58%	95.53%	82.47%	5.79%	13.88%	4.99%	4.47%	8.42%
Computers/Peripherals	101	1.27	9.66%	91.63%	104.65%	7.29%	8.94%	6.64%	8.37%	9.41%
Diversified Co.	111	1.22	9.38%	50.06%	69.50%	5.29%	17.14%	4.38%	49.94%	6.89%
Drug	301	1.11	8.84%	87.64%	103.61%	7.29%	6.72%	6.80%	12.36%	8.59%
E-Commerce	52	1.14	8.98%	95.62%	65.85%	5.29%	17.19%	4.38%	4.38%	8.78%
Educational Services	37	0.79	7.26%	91.84%	72.23%	5.29%	27.32%	3.84%	8.16%	6.98%
Engineering & Const	17	1.65	11.55%	92.65%	75.32%	5.29%	28.52%	3.78%	7.35%	10.98%
Environmental	69	0.85	7.54%	70.86%	95.81%	6.29%	11.02%	5.60%	29.14%	6.97%
Financial Svcs. (Div.)	230	1.37	10.15%	42.40%	81.52%	5.79%	18.63%	4.71%	57.60%	7.02%
Food Processing	109	0.87	7.63%	77.53%	58.43%	4.79%	21.80%	3.75%	22.47%	6.76%
Heavy Equip Makers	8	1.94	13.00%	68.30%	86.20%	5.79%	19.97%	4.63%	31.70%	10.35%
Household Products	22	1.17	9.13%	84.47%	50.80%	4.79%	27.46%	3.47%	15.53%	8.25%
Human Resources	24	1.44	10.51%	91.62%	72.08%	5.29%	23.73%	4.03%	8.38%	9.96%
Industrial Services	137	0.96	8.08%	79.20%	68.67%	5.29%	20.50%	4.21%	20.80%	7.28%
Information Services	26	1.10	8.78%	83.19%	49.65%	4.29%	22.44%	3.33%	16.81%	7.86%
Internet	180	1.11	8.82%	98.46%	111.24%	7.29%	7.89%	6.71%	1.54%	8.79%
Machinery	114	1.22	9.37%	77.81%	68.30%	5.29%	19.61%	4.25%	22.19%	8.23%
Metals & Mining (Div.)	69	1.33	9.93%	90.08%	107.77%	7.29%	7.07%	6.77%	9.92%	9.62%
Petroleum (Integrated)	23	1.21	9.34%	84.48%	45.93%	4.29%	27.13%	3.13%	15.52%	8.38%
Utility (Foreign)	5	0.99	8.23%	63.02%	34.61%	4.29%	20.30%	3.42%	36.98%	6.45%
Total Market	5928	1.15	9.02%	73.51%	75.65%	5.29%	15.32%	4.48%	26.49%	7.82%

* Aswath Damodaran (Jan 2011) <http://people.stern.nyu.edu/adamodar/>



WACC: Division Specific => Composite

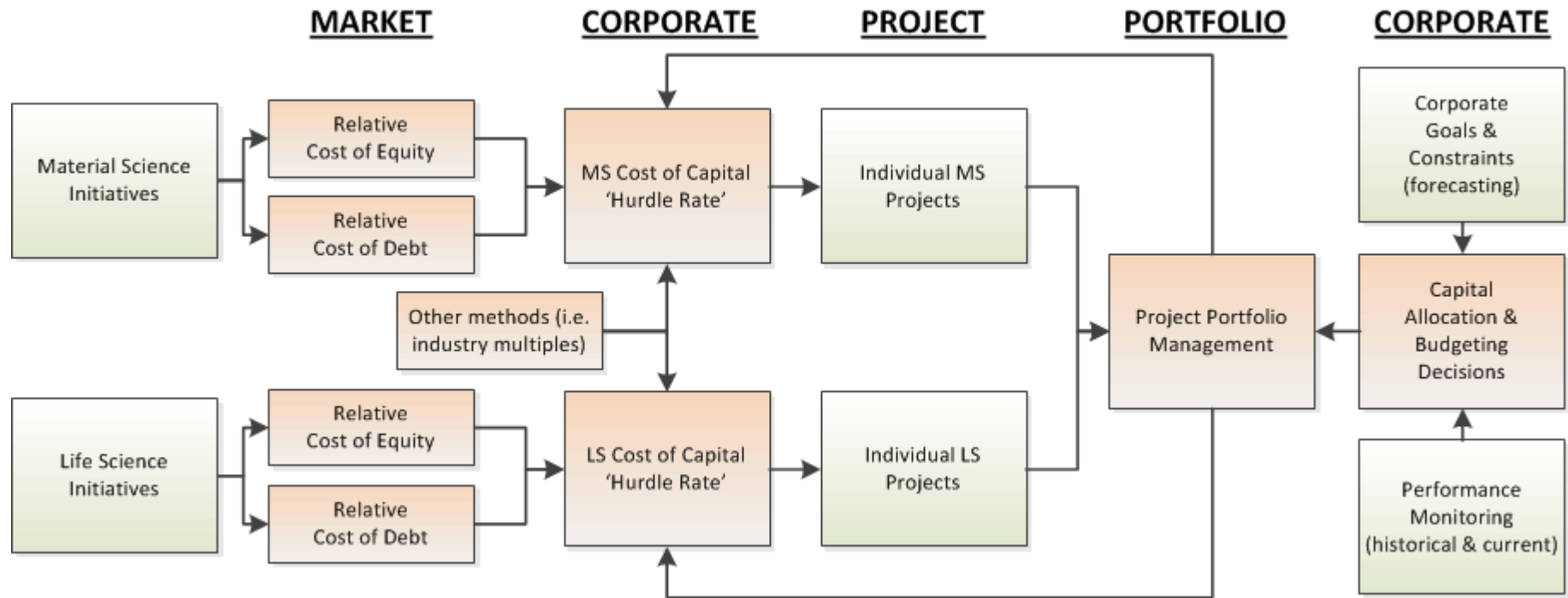
- Alternate measure of Opportunity is per business unit
- This gives alternate measure of risks/rewards
- For instance, strategic Material Sci/Life Sci split

SEGMENT	% REVENUE	WACC*	Weighted
Nutrition	34%	~ 6.5%	2.2
Pharmaceuticals	9%	~ 8.6%	.7
Performance materials	27%	~ 9%	2.43
Polymer intermediates	16%	~ 9.5%	1.4
Base chem. & materials	9%	~ 8.7%	.7
Other (microorganisms)	5%	~ 8.6%	.4
SUMMARY			7.8%

* Aswath Damodaran (Jan 2011) <http://people.stern.nyu.edu/adamodar/>



Hurdle Rate: Internal Opportunity CoC

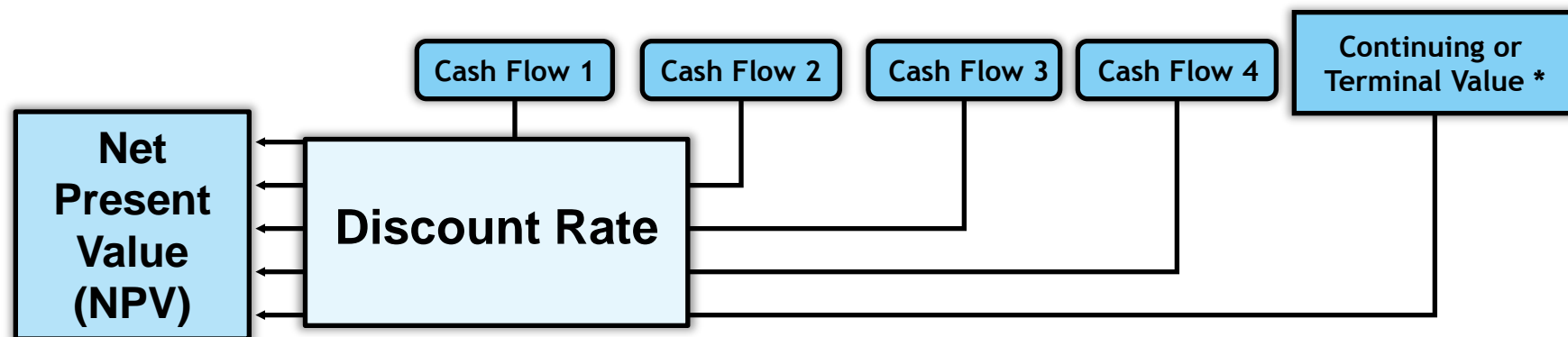


- Hurdle Rate is internal opportunity cost of capital measure
- Establishes 'baseline' profitability threshold within firm
- **Can potentially be established as:**
 - Divisional WACCs adjusted for project risks
 - Collection of NPVs for project gating (based on NPV/DCF analysis)
 - Benchmark via other valuation measures: i.e. Real Options, Multiples, etc.



Bringing it Together: DCF => NPV Analysis

- CoC is used to discount cash flows...
- in Discounted Cash Flow (DCF) analysis process...
- to determine Net Present Value (NPV) result
- This provides a threshold/benchmark against the *'opportunity cost of capital'*



- Which CoC?
 - Cross-compare in structured *assessment process*
 - Use each for its specific context



Conclusion: Use of Cost of Capital

- Derivation of WACC via market measures
 - Single firm CoC
 - Proportional combination of divisions
- Internal Hurdle Rate option for portfolio analysis
- **Resulting Cost of Capital used in crucial ways:**
 - Project approval/denial (*'gating'*)
 - Discounted Cash Flow (DCF) analysis
 - Net Present Value (NPV)
 - Can be used to find optimal capital structure
 - Establishing metric for value creation
 - Valuing company as a whole



1. Context setting



2. Technical overview



3. Group exercise



4. CoC feedback



5. Summary conclusion



Group 1: Forecast Horizon

- 1) Your company is considering *acquiring a consulting services firm*. The firm provides expert advice to companies on improving manufacturing processes. What investment *forecast time horizon* should be applied in valuing the acquisition prospect?
- 2) Your company is considering pursuing *investment in an innovative pharmaceutical product*. What investment forecast *time horizon* should be applied?
- 3) What special considerations are applicable in the *time horizon* associated with an investment to *build a new manufacturing plant*?
- 4) What special methods might be used to ‘*stress test*’ and gain deeper insight into *forecasts*?



Group 2: Cost of Debt & Tax Rate

- 1) What *cost of borrowing rate* should be applied when calculating CoC? (i.e. current average of existing bond yields, comparable industry rate, etc.)
- 2) An anticipated *acquisition might lower the firm's credit rating*. Should this effect the estimated *cost of capital in valuing the acquisition*?
- 3) Tax rates for the corporation are expected to rise next year. How should this *affect the cost of capital calculation* in assessing a new project opportunity?



Exercise 3: Risk Free Rate

1. This year many *10-year government bond rates in developed world* have been at historic lows (i.e. U.S. 1.8%). Assume you are valuing a potential U.S. opportunity in US dollars. *How should you determine the risk free rate?*
2. What *timeframe* should you apply in estimating the risk free rate?
3. How should you *determine the risk free rate* (i.e. current rate, average, a forecast, etc.)?



Exercise 4: Equity-Market Risk Premium

1. Should the *market turmoil* of the past 10 years effect consideration of the expected equity return rate?
2. What *timeframe* should be applied in analyzing expected equity returns?
3. How *often* should the equity premium be *updated*?



Exercise 5: Beta Period

1. What *timeframe* should be used in the calculation of beta?
2. Where should *data be obtained* to calculate company beta?
3. Should a *major acquisition* effect the beta estimation in DCF analysis?



1. Content setting



2. Technical overview



3. Group exercise



4. CoC feedback



5. Summary conclusion



Historic Views on Cost of Capital

PERIOD	CONCEPT/FRAME	VALUATION
1950's	Payback period	Company-per-company basis
1960's	Present value	Discounted time value of money
1980's	<ul style="list-style-type: none">• Internal Rate of Return (IRR)• Net Present Value (NPV)	Valuation specific initiative / project according to a risk-balanced threshold
1990's	<ul style="list-style-type: none">• High stock returns• Theory that stock prices are 'rational'	'Rational Market' dominant principle: Capital Asset Pricing Model
2000's	Dot-Com, Housing Bubbles and Global Financial Crisis	Notion of 'new age of high growth': excess risk-taking followed by collapse and severe breakdowns in trust networks
Present	Assault on 'rational market' principles & RFR	Increased caution & cross-comparisons via several CoC methods - new focus on 'contextual' risk assessments & 'decision process'



WACC Survey

SURVEY*: 27 Major Corporations, 10 Investment Banks, major textbooks

- DCF dominant valuation technique & WACC as discount rate
- Weights based on *market* rather than book values
- After-tax cost of debt based on marginal pretax costs and marginal (statutory) tax rates
- CAPM (reference to equity markets) dominant for estimating cost of equity
- Risk Free Rate:
 - Most use Treasury Bonds as long-term Treasury Rate (RFR)
 - Arithmetic mean dominant, though some make a case for geometric mean (generally lower)
- Equity premium
 - Majority less than 6%
 - 11% use lower than 4.5%
 - 10% use 5%
 - 50% use 7.0% to 7.4%
- WACC is viewed as indicating *average* risk investments and departures of typical line of business investments require risk modifications (only 26% regularly modify, however)

* http://www.pageout.net/user/www/j/o/jostokes/BRUNEREst_Cost_of_Capital.pdf



Common Problems in Applying CoC to Cash Flow

- **Generally companies use too high a rate (McKinsey)**
 - 2001 Survey - managers use 12.2%
 - Actual market equity premium is much less
 - Companies pick rate & do not update
- **Reasons for over-estimation**
 - As compensation for inflated cash flow projections
 - A way to challenge staff to aspire to greater profitability
 - Inadequate sensitivity / risk analysis
- **Hurdle rate should reflect specific project risk**
 - Industry
 - Technology
 - Market factors
 - Contracts / counterparties



HBR: CoC Practitioner Survey

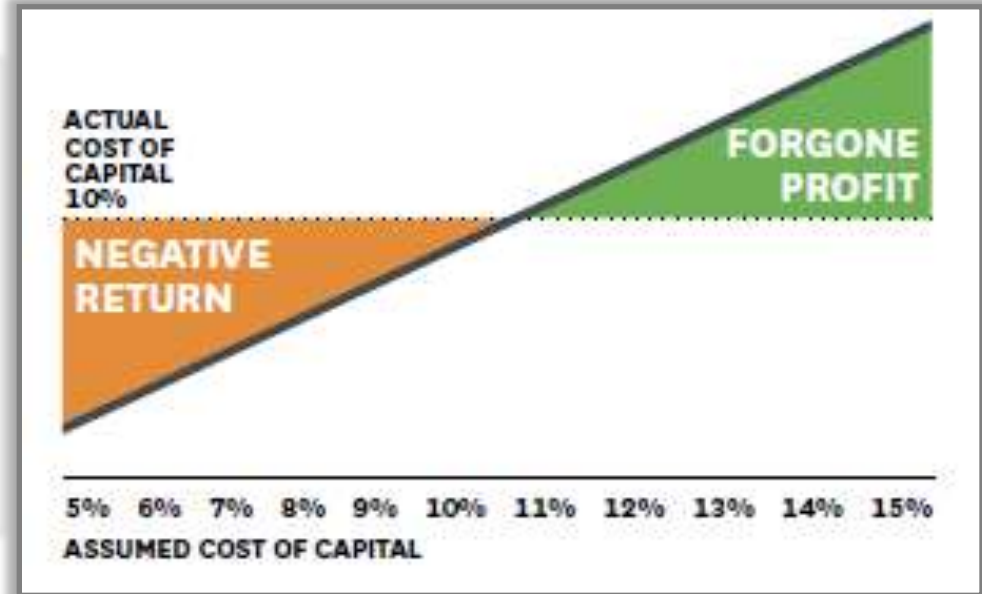
*Jacobs, M., Shivdasani, A. Do you know your cost of capital?
Harvard Business Review. July-August 2012.*

- Survey of 300 CFO-level finance professionals via Association for Financial Professionals (AFP)
- *+1B rev.*: 90% use DCF in project gating
- 90% use Capital Asset Pricing Model (CAPM) to estimate cost of equity
- Similarities end here... broad range of practices!



HBR: CoC Practitioner Survey

- Historic levels (trillions €) on balance sheets
- Investors: Growing pressure to invest...
- Managers: Fear of future, fear of failure...



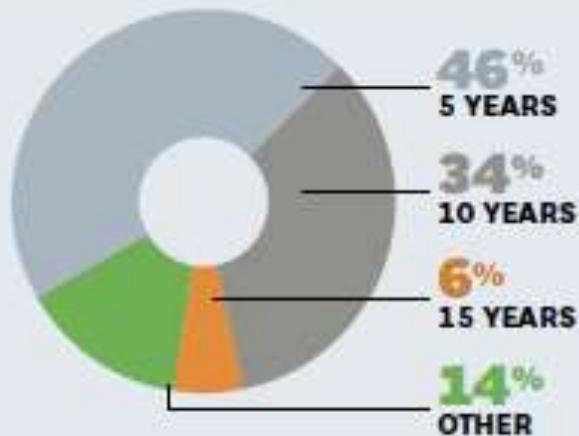
- ~50% of AFP survey respondents admitted WACC may be +/- 1% (or more) above or below actual rate...
- **Sizable error margin!**
- Given €20M investment for project with 10 year span & annual cash flow of € 3.25M...
- 10% CoC: break-even
- 9% CoC: + € 1 M
- 11% CoC: - € 1 M



HBR: CoC Practitioner Survey

*Jacobs, M., Shivdasani, A. Do you know your cost of capital?
Harvard Business Review. July-August 2012.*

What's Your Forecast Horizon?



1. Investment Time Horizon
 - *Forecast period should vary according to type of project*
 - Companies tend to use standard timeframes...
 - Horizons can be extended via proper Terminal Value
 - Terminal Value highly impactful!



HBR: CoC Practitioner Survey

Terminal Value Guidelines

- Acquisitions & on-going initiatives generate cash flows in perpetuity
- However, difficult to project cash flows into long-term time horizon
- Terminal value: value of cash flows beyond predictive threshold
- Perpetuity formula (47% survey respondents use)

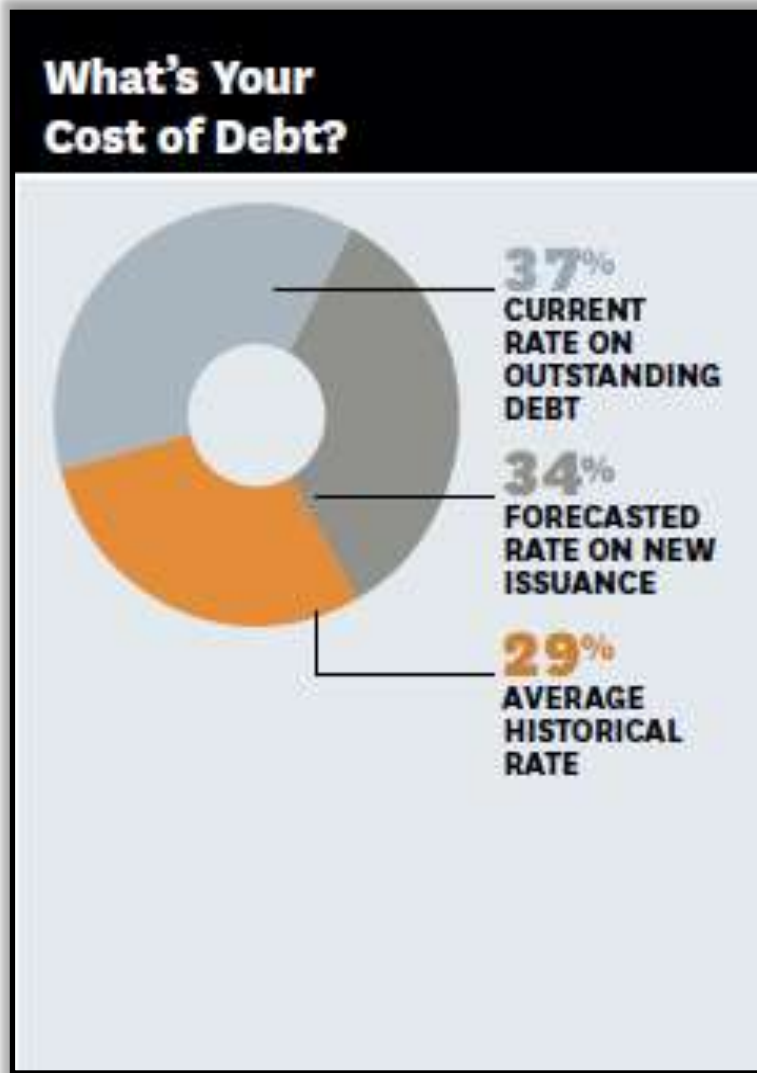
First, estimate the cash flow that you can reasonably expect—stripping out extraordinary items such as one-off purchases or sales of fixed assets—in the final year for which forecasts are possible. Assume a growth rate for those cash flows in subsequent years. Then simply divide the final-year cash flow by the weighted-average cost of capital minus the assumed growth

$$TV = \frac{\text{Normalized Final Year Cash Flow}}{(WACC - \text{Growth Rate})}$$

It's critical to use a growth rate that you can expect will increase forever—typically 1% to 4%, roughly the long-term growth rate of the overall economy. A higher rate would be likely to cause the terminal value to overwhelm the valuation for the whole project. For example, over 50 years a \$10 million cash flow growing at 10% becomes a \$1 billion annual cash flow. In some cases, particularly industries in sustained secular decline, a zero or negative rate may be appropriate.



HBR: CoC Practitioner Survey

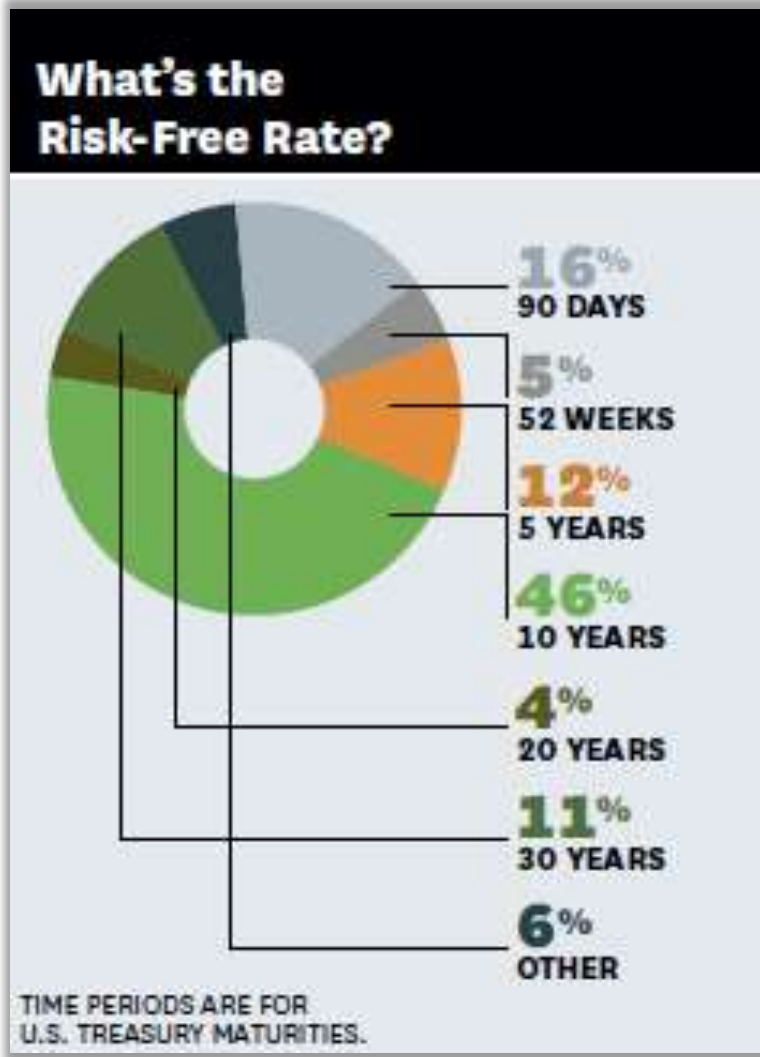


2. Cost of Debt

- *Forecasted rate on new debt issuance recommended*
- Suggests acquisition modifying rating should use modified CoD
- Tax rate most serious!
- Fewer than 30% use recommended marginal tax rate (most misapply effective or average rate)
- 35% typical (as opposed to 22% median effective for S&P)



HBR: CoC Practitioner Survey



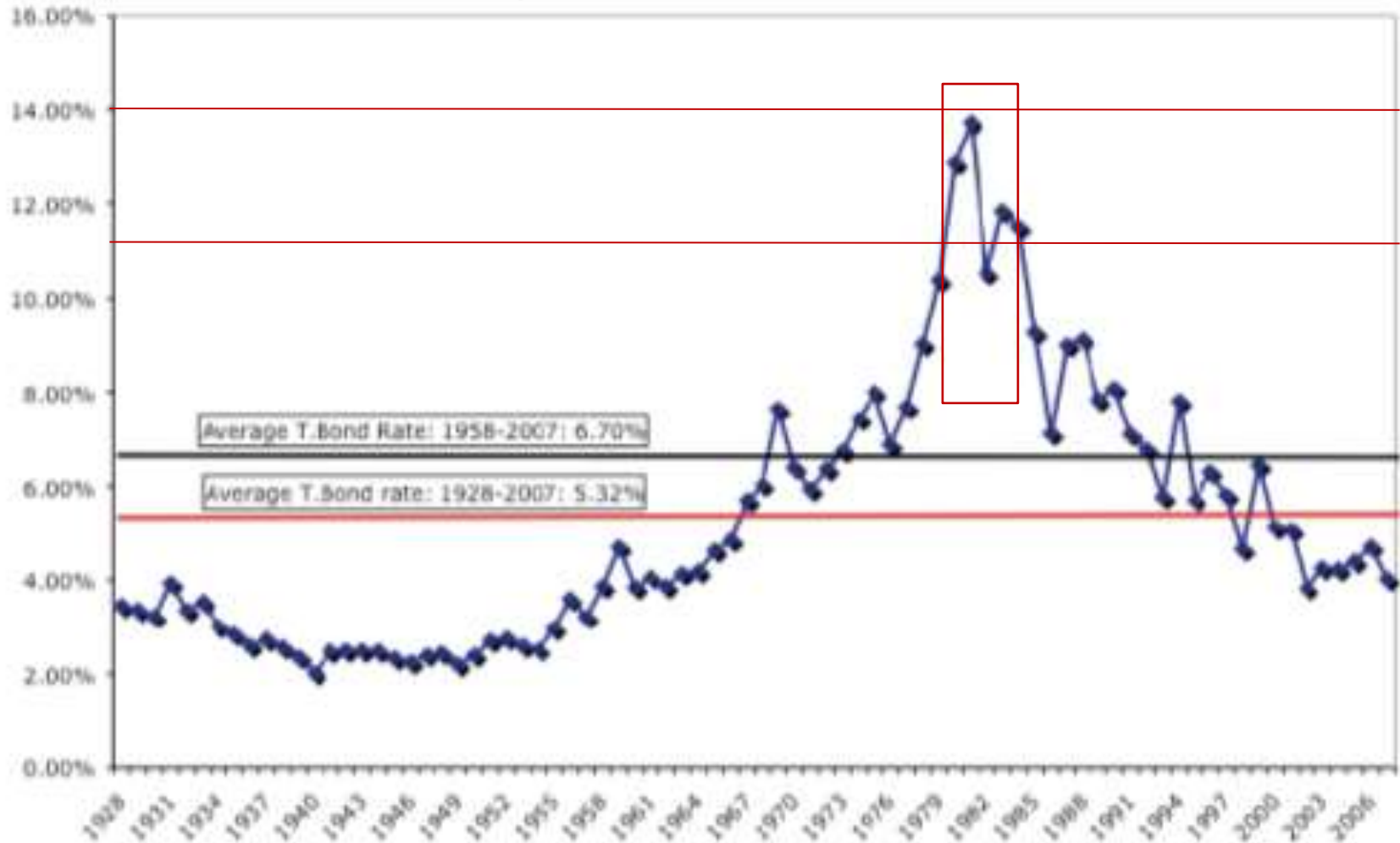
3. Risk Free Rate

- *Start with government securities (U.S. Treasury)*
- From 90-day to 30-year rates there is currently +/- 3% difference
- Apply 'matching principle': match duration to timeframe for project
- Can also consider industry (services highly cyclical, infrastructure long-term)
- Current rate suggested
- ...but, beware unusual markets



Risk Free Rate Context

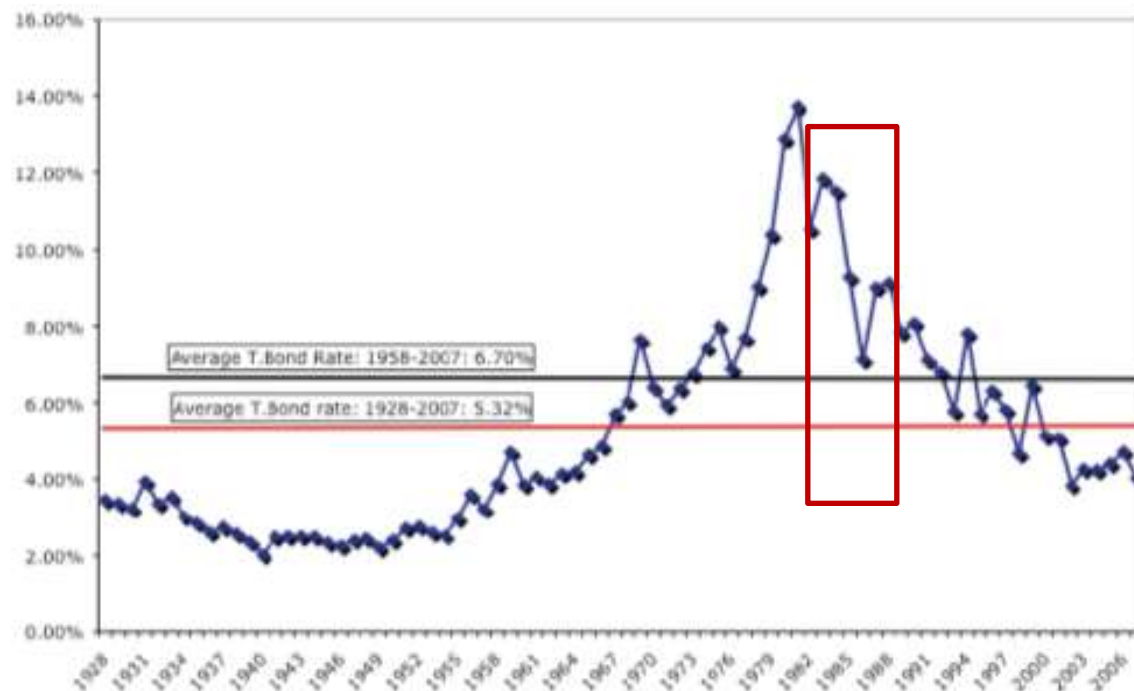
US Treasury Bond Rates 1928 - 2007





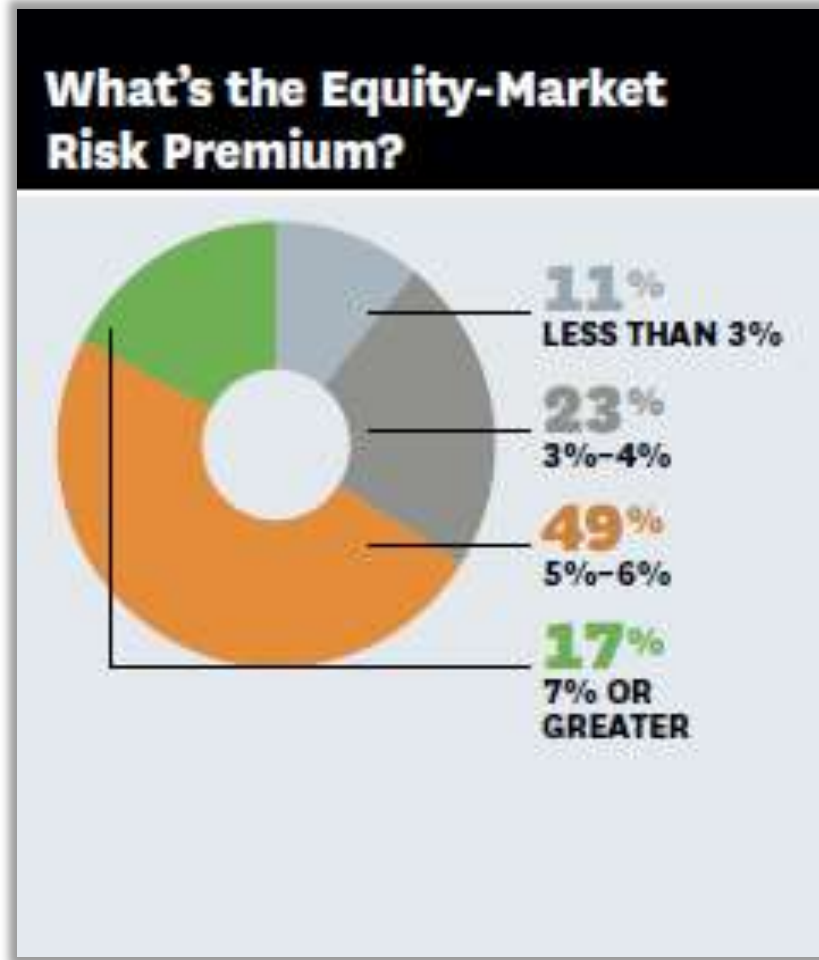
1980's: What happened?

- Many firms initially did very well with expansions
 - Began to develop many new initiatives
- Risk Free Rate collapsed
 - Interest rates began to fall rapidly (from historical highs)
 - Key government investment tax credits withdrawn
 - Long-term projects on books funded at high rate expected return
 - Illiquid inventory/assets (i.e. goods, developed properties)





HBR: CoC Practitioner Survey

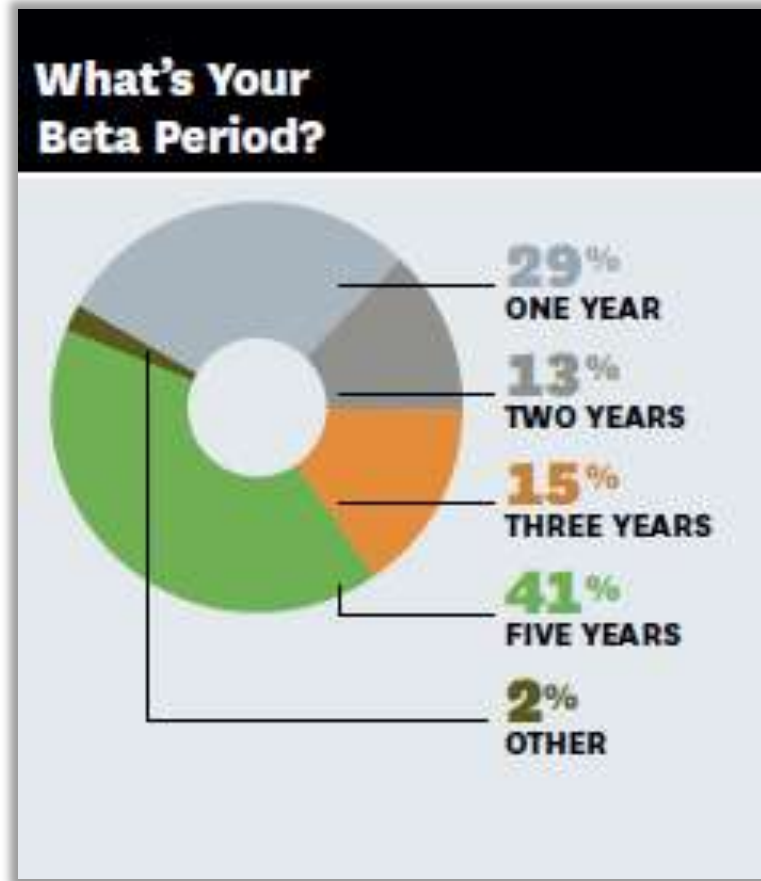


4. Equity Market Premium

- Remember: above Risk Free Rate! (subtract-out & add in)
- Wide range: 3 - 7%
- Generally long-term...
- Should be updated frequently (most do not)
- Market turmoil: *investors expect a higher premium!*



HBR: CoC Practitioner Survey

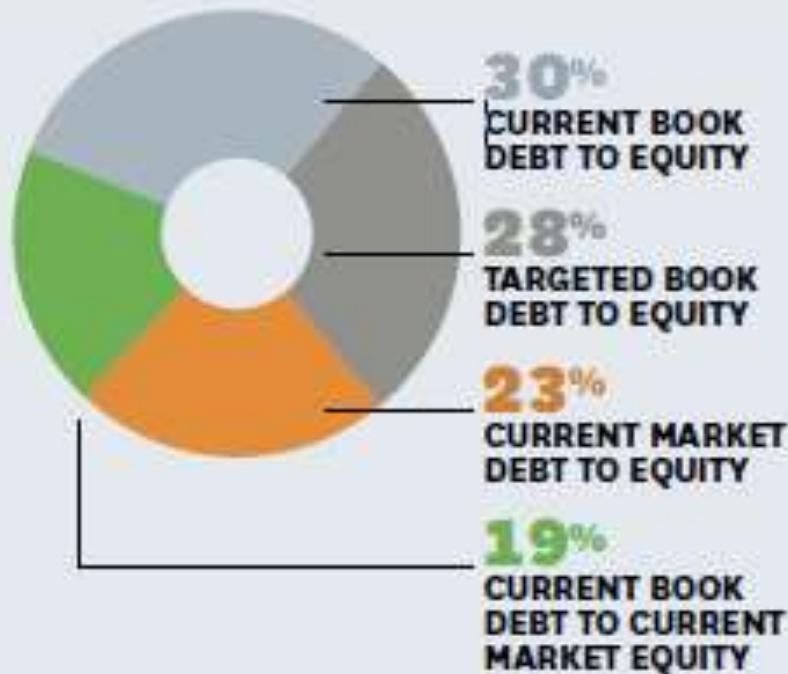


- ## 5. Beta: Company Risk
- Backwards estimate...
 - Bear in mind change to company profile for substantial ventures (i.e. acquisitions)
 - Timeframe: longer-term (5 years +)
 - Bear in mind investor profile (value investors vs. growth investors?)



HBR: CoC Practitioner Survey

What's Your Debt-to-Equity Ratio?



6. Debt-to-Equity Ratio

- Book value should be avoided...
- Market values of debt & equity preferable
- For market value of debt, consider *current issuance* level
- Acquisition or debt issuance news might change rating



7. Project Risk Adjustment

- Recommendation in article is to adjust CoC on a project-by-project basis
- 70% of companies follow this practice



Cost of Capital Tips

- Industry Beta gives accurate divisional equity risk
- Matching principle:
 - Short-term projects financed with short-term funds
 - Long-term projects with long-term funds
- Use matching timeframes for WACC determination
- Example:
 - Long-term debt costs applied to infrastructure projects
 - Shorter-duration securities matched to services divisions



Recommendations

- Actively seek ways to ‘de-bias’ CoC via:
 - Rigorous, ongoing Cost of Capital assessment processes
 - Organizational culture of ‘opportunity assessment’
 - Belief in *validity of CoC as decision process*
- Use comparative CoC *ranges* for valuation
- Consider simulation & Real Options
- Use several methods & triangulate (cross-compare)
 - Compare ‘market-view’ (WACC) with internal benchmarking of projects (Hurdle Rate)



Recommendations

- If high risk / high impact, consider comparative cross-analysis of project as a stand-alone business (reduces abstraction of reliance on shared corporate resources)
- Cross-coordinate with Investor Relations stance:
 - What industry do your investors & analysts believe you are in versus where you are going?



1. Context setting



2. Technical overview



3. Group exercise



4. CoC feedback



5. Summary conclusion



Balancing Present and Future

Running tactics vs. emerging strategy

- Shifting industry focus
- Changing risk profiles
- Shifting target investor expectations...
- Shifting capital profile / structure
- ‘Living in interesting (fiscal) times!’
- Need for careful! “*Was vs. is vs. to be*”?



Practical Use of Cost of Capital

- **Cost of Capital used in crucial ways...**
 - ‘Rational’ decision making metric
 - Project approval/denial benchmark
 - Context for value creation
 - Identification of optimal capital structure
 - Valuing company as a whole
 - ‘Focus’ to manage attention & ‘story’ of firm!
- **Monitor & benchmark results over time**
 - Examine key value measures over time (i.e. ROIC, EVA)
 - Lagging & negative measures means firm losing value
 - Indicates project ‘gate keeping mismatches’
 - **Too low: firm takes on projects with too much risk**
 - **Too high: firm rejects value-generating, growth projects**



Cost of Capital for valuation, funding, and decision making

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Thank you!