

# **FINANCE FOR NON-FINANCE PROFESSIONALS**

## Week 4: The Cost of Capital

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# RISK, RETURN, AND THE COST OF CAPITAL

- ▶ Debt vs. Equity
- ▶ Cost of equity
- ▶ Cost of debt
- ▶ Weighted average cost of capital
- ▶ Putting it all together

# RISK, RETURN, AND THE COST OF CAPITAL

## Debt vs. Equity Financing

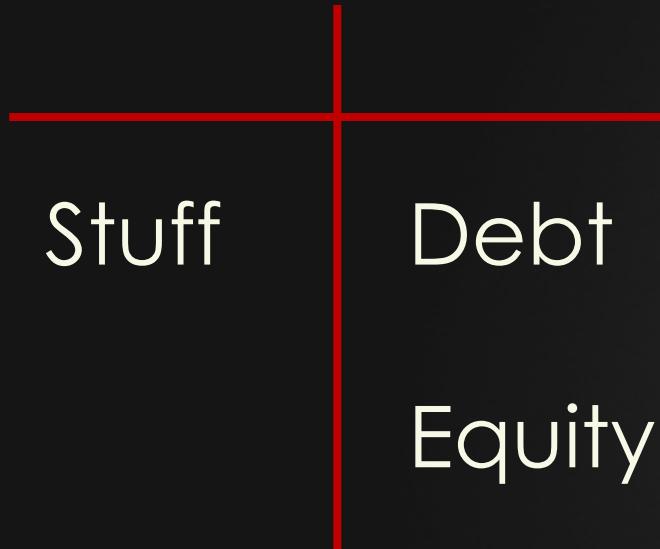
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# DEBT VS EQUITY

Simple Balance Sheet



# DEBT FINANCING

- ▶ Non-contingent claim
- ▶ Repay principle and interest
- ▶ Collateral
- ▶ Priority in bankruptcy
- ▶ Monitoring / restrictions
- ▶ Many different forms

# DEBT FINANCING

- Banks
  - Straight loan
  - Line of credit
  - Mortgages
  - Commercial/industrial loans
- Bonds

# DEBT FINANCING AND TAXES

- ▶ Interest payments are pre-tax
- ▶ Creates a tax shield
- ▶ This is an important cash flow
- ▶ Subsidizes debt
- ▶ Lowers the effective interest rate

# EQUITY FINANCING

- ▶ Ownership and control
- ▶ Contingent claim
- ▶ All residual cash
- ▶ All the upside
- ▶ Wiped out in bankruptcy

# MIX OF DEBT AND EQUITY

- ▶ Capital structure
- ▶ Does not change risk!
- ▶ Moves risk between investors
  - ▶ Debt: no upside / protected downside
  - ▶ Equity: all upside / can get wiped out

# SUMMARY

- ▶ Equity has ownership and control
- ▶ Debt is safer than equity
  - ▶ Lower cost
- ▶ Mix is called “capital structure”
- ▶ Slices up the risk of the firm

# RISK, RETURN, AND THE COST OF CAPITAL

## Risk-Free Rate

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# RATE OF RETURN

- Safest possible investment?



# US TREASURY BONDS

- ▶ US will not default (soon)
- ▶ Treasury can print money
- ▶ Backed by future taxes
- ▶ Treasury rate is safest

# RISK FREE RATE

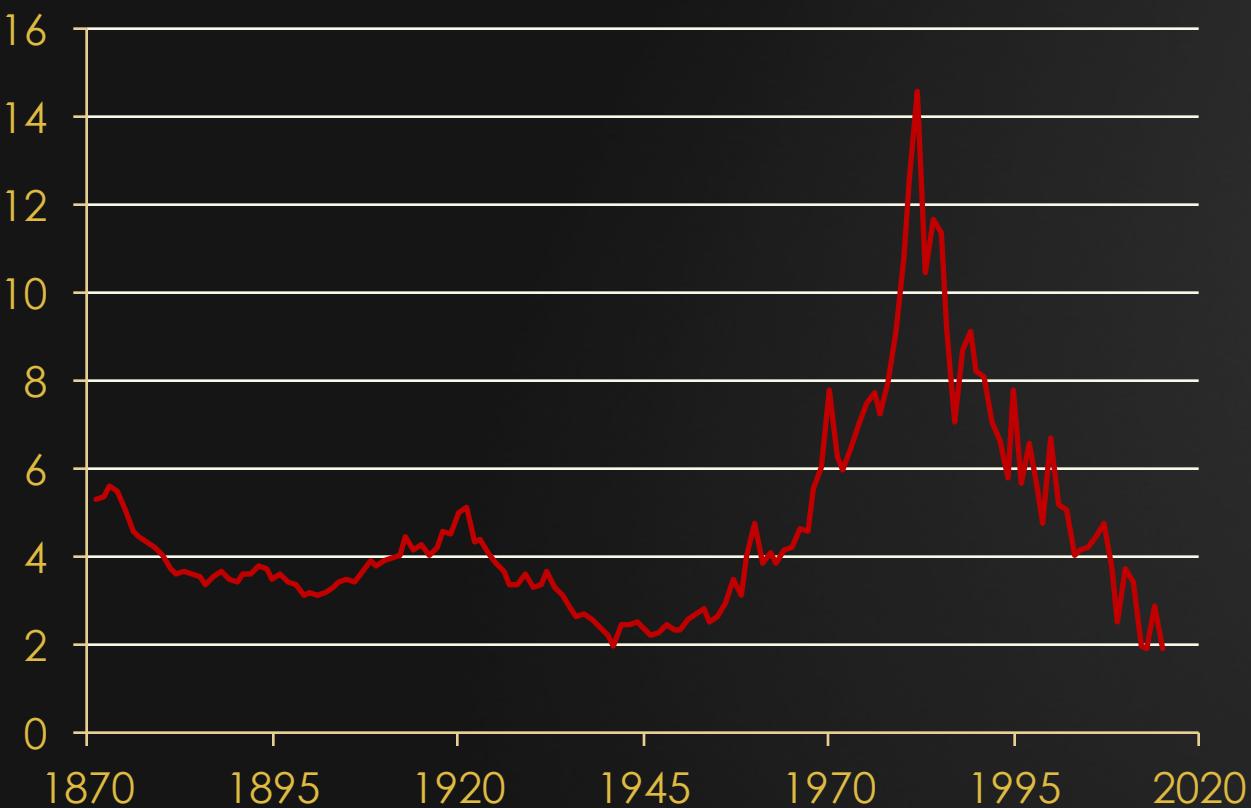
Rate of return

= risk free rate

+ risk premium

# HISTORICAL RATES

Long-term Treasury Rate (%)



# RISK FREE RATES: MATURITY

- ▶ Yield curve
- ▶ Longer maturity = higher rates
- ▶ Rates may rise
- ▶ Greater liquidity risk

# SUMMARY

- ▶ Risk free rates set the floor
- ▶ Risky returns earn a premium
- ▶ Benchmark is U.S. Treasury
- ▶ Rates rise with maturity

# RISK, RETURN, AND THE COST OF CAPITAL

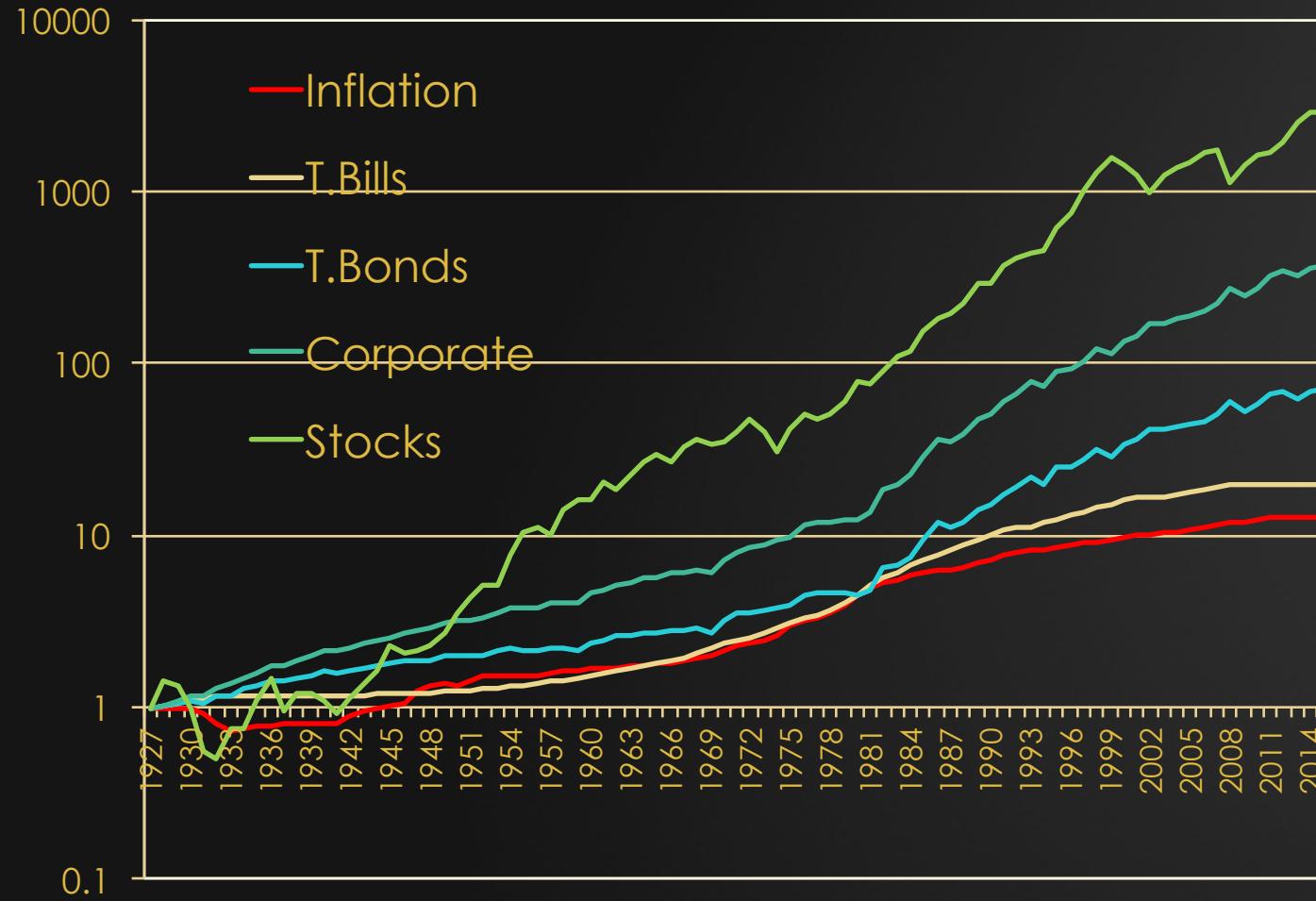
## Historical Risk and Return

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# ONE PICTURE SAYS IT ALL



# HISTORICAL RATES OF RETURN

	Inflation	T.Bills	T.Bonds	C.Bonds	Stocks
Mean	3.0%	3.5%	5.2%	7.2%	11.4%
Standard Dev.	4.2%	3.1%	7.8%	7.8%	19.8%
Minimum	-10.1%	0.0%	-11.1%	-8.9%	-43.8%
25th percentile	1.2%	1.0%	1.2%	2.9%	-1.2%
Median	2.7%	3.1%	3.5%	5.2%	13.9%
75th percentile	4.2%	5.2%	8.5%	10.8%	25.3%
Maximum	18.1%	14.3%	32.8%	35.5%	52.6%

# RISK FREE RATE

Rate of return

= risk free rate

+ risk premium

# HISTORICAL RATES

Long-term Treasury Rate (%)



# RISK FREE RATES: MATURITY

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# RISK, RETURN, AND THE COST OF CAPITAL

## The Equity Risk Premium

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# EQUITY RISK PREMIUM

- ▶ Stocks do better in the long run
- ▶ Might need 50 years!
- ▶ Huge volatility
- ▶ Higher discount rates!

# STOCK MARKET PERFORMANCE

- The stock market returns 10-12%
- Interest rates are typically 5-6%

$$\begin{aligned}\text{Equity premium} &= R_m - r.f. \\ &= 11\% - 5.5\% \\ &= 5.5\%\end{aligned}$$

# EQUITY RISK PREMIUM

- 5.5% is based on historical average
- Does this seem reasonable?
- Surveys of market professionals differ
- Different methods give 4%-8%!

# EQUITY PREMIUM

- ▶ 4.5% – 6.5% is a good range
- ▶ Why might this change over time?
  - ▶ Systemic risk
  - ▶ Attitudes toward risk
- ▶ These change the price of risk!

# SUMMARY

- ▶ Stock market as a whole is well diversified
- ▶ Equity premium is around 4.5-6.5%
- ▶ Compensates for equity risk
- ▶ 5.5% ballpark “price” of market risk

# RISK, RETURN, AND THE COST OF CAPITAL

## Beta and the Cost of Equity

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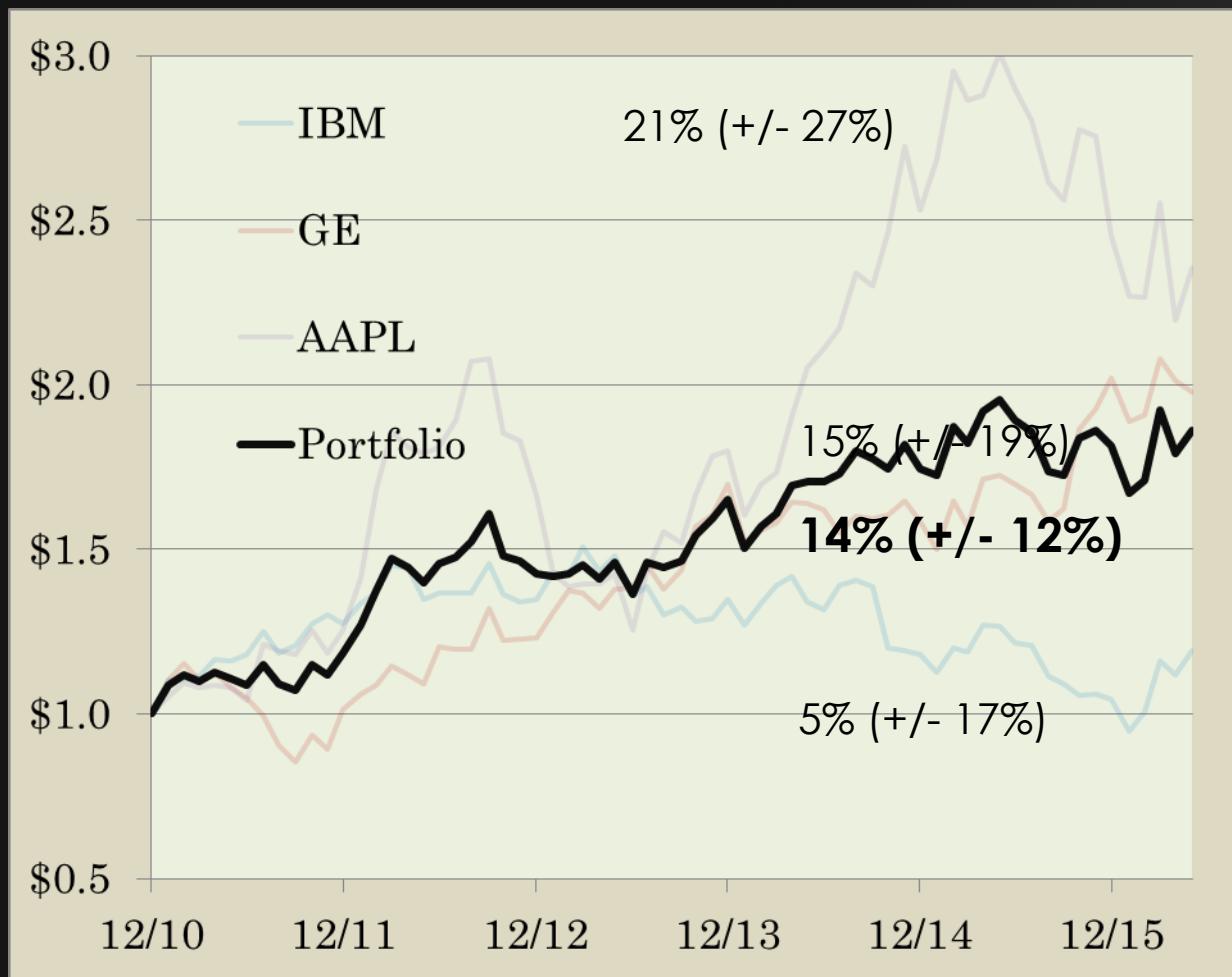
# EQUITY RISK ON STOCKS

- Equity market premium is 5.5%
- Premium for a single stock?
- How to measure stock risk?

# MEASURING STOCK RISK

- ▶ What makes a single stock risky?
  - ▶ Wiggles a lot?
  - ▶ “Jumps” around too much?
  - ▶ Has gone down in the past?
- ▶ These are all stock specific risks....
- ▶ Diversification reduces these risks!

# HOLD MULTIPLE STOCKS!



# DIVERSIFICATION

- ▶ Holding multiple stocks reduces risk!
- ▶ Why not hold lots of stocks?
- ▶ Why not hold the market?

# HOW TO MEASURE RISK

- ▶ Wiggles and jumps might be good!
- ▶ How does a stock change my portfolio?
- ▶ Does a stock make me wiggle more or less?

# BETA: ONE MEASURE OF RISK

- ▶ How much wiggle with the market?
- ▶ Variance (wiggle)
- ▶ Covariance (wiggle together)

# MARKET BETA

- ▶ Average beta around 1
- ▶ Most betas between 0.25 and 2.5
- ▶ Beta = 2 : Stock return up/down twice the market return
  - ▶ Two servings of market risk
  - ▶ Should have higher returns

# COST OF EQUITY

Rate of return = risk free rate  
+ risk premium

Risk Premium = Beta \* (Equity Premium)

# CAPITAL ASSET PRICING MODEL (CAPM)

Return = risk free rate  
+ Beta \* (Equity Premium)

# COST OF EQUITY USING CAPM

Stock has a beta of 1.8.

Equity premium is 5.5%.

Risk-free rate is 3%.

What is the cost of equity?

$$R_e = r.f. + \text{Beta} * (\text{equity premium})$$

$$= 3\% + 1.8 * (5.5\%)$$

$$= 12.9\%$$

# COST OF EQUITY ( $R_e$ )

Simple Balance Sheet

Stuff	Debt	Equity ( $R_e$ )
		✓

# SUMMARY

- Diversification changes risk
- Market risk can't be diversified
- Beta is sensitivity to market risk
- $R_e = r.f. + \text{Beta} * (\text{Equity Premium})$

# RISK, RETURN, AND THE COST OF CAPITAL

## Credit Rating and Quality Spreads

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# WHAT MAKES DEBT RISKY?

Rate of return = risk free rate

+ risk premium

- ▶ Default



- ▶ Recovery in default

# MEASURING RISK FOR DEBT

- Will the debt default?
  - Maturity
  - Cash on hand/ Capital cushion
  - Debt level
  - Profitability
  - Economic conditions
  - Ability to raise capital

# MEASURING RISK FOR DEBT

- ▶ Can I recover my money in default?
- ▶ Physical capital / Tangibility
- ▶ Marketability
- ▶ Transportability

# CREDIT RATING AGENCIES

- ▶ Banks and credit rating agencies
- ▶ Estimate default/recovery
- ▶ Assign a classification (credit score)
- ▶ This gives a risk premium!

# AVERAGE YIELDS ON DEBT ( $R_d$ )

Example from October 2015  
Average US Corporate Bond Yields

Rating	1 yr	5 yr	10 yr	20 yr
US Treasury	0.2%	1.4%	2.0%	2.5%
AAA	0.4%	1.9%	2.8%	3.7%
AA	0.5%	2.0%	3.3%	4.0%
A	0.7%	2.2%	3.5%	4.2%
BBB	1.2%	2.9%	4.6%	5.2%
BB	2.0%	4.8%	5.7%	6.1%

# SUMMARY

- ▶ Risky debt earns a premium
- ▶ Default and recovery are the source of risk
- ▶ Credit scores and rating help determine how risky debt is

# RISK, RETURN, AND THE COST OF CAPITAL

## Estimating the Cost of Debt

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# COST OF DEBT CAPITAL

Rate of return = risk free rate

+ risk premium

3 methods:

Historical cost

Current yield to maturity

Ratings adjusted yield

# COST OF DEBT CAPITAL

- ▶ Historical cost
  - ▶ What did the company pay last time?
  - ▶ Look at interest expense over debt
  - ▶ What is the coupon rate on bonds?
- ▶ OK, but not great
  - ▶ May not reflect current market
  - ▶ Rates may have changed

# COST OF DEBT CAPITAL

- ▶ Current yield to maturity
- ▶ Best method
  - ▶ If you have market prices
- ▶ Mainly large public companies

# COST OF DEBT CAPITAL

- ▶ Ratings adjusted yield
- ▶ Debt rating/credit score
- ▶ Current treasury rate
- ▶ Adjust the treasury rate by the “credit spread”

# COST OF DEBT CAPITAL

Example of ratings adjusted yield:

What is  $R_d$  for a 10-year A-rated firm?

Basis point spreads based on market prices				
Rating	1 yr	5 yr	10 yr	20 yr
US Treasury	0.2%	1.4%	2.0%	2.5%
AAA	21	53	76	122
AA	30	65	121	153
A	43	88	147	175
BBB	96	153	253	269
BB	172	343	361	364

$$R_d = 2.0\% + 147 \text{ b.p.} = 3.47\%$$

# IMPORTANCE OF TAXES

- Interest payments are deductible
- The effective cost of debt is less than what you pay

$$R_d = R (1 - t_c)$$

# IMPORTANCE OF TAXES

Example: You pay 5% on debt and have a 20% tax rate.

\$5 goes to the bank

Your taxes go down by  $20\% * \$5 = \$1$

So you only really paid \$4

Effective cost of debt is 4%

# COST OF DEBT: SUMMARY

- ▶  $R_d$  reflects default and recovery
- ▶ Historical cost of debt
- ▶ Current yield on debt
- ▶ Ratings adjusted yield
- ▶ Interest is tax deductible

# RISK, RETURN, AND THE COST OF CAPITAL

Putting It All Together  
as the WACC

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# COST OF CAPITAL

Simple Balance Sheet

Stuff (WACC)	Debt ( $R_d$ )	✓
	Equity ( $R_e$ )	✓

# COST OF CAPITAL

$$WACC = \frac{\text{Equity}}{\text{Equity} + \text{Debt}} R_e + \frac{\text{Debt}}{\text{Equity} + \text{Debt}} (1 - t) R_d$$

- ▶ Cost of capital for the firm
- ▶ Balances debt and equity

# WACC: AN EXAMPLE

Example:

The equity value of Target is about \$40B.

They have roughly 15B in long-term debt.

They pay a 35% corporate tax rate.

Their beta is 0.6.

Assume treasury rates are 2.5% and the equity premium is 5.5%.

They are A-rated with a quality spread of 120bps.

Estimate Target's cost of capital.

# WACC: SUMMARY

- Firm's cost of capital → WACC
- Weighted average of debt and equity
- Debt receives tax shield