

# Time Value of Money & WACC

NME Week 4



# Attendance

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# Accounting Review

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- What is the accounting equation?
- What are the 3 financial statements?
- What is each financial statement used for?
- How do the 3 statements link?



# The Holy Trinity: 3 Financial Statements

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## IS: PROFITABILITY.

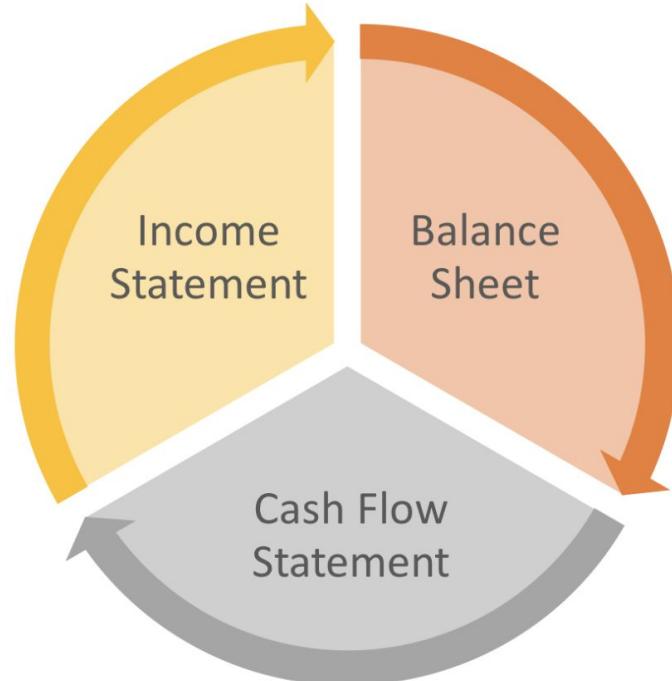
- Shows the company's revenue, expenses, taxes, and net income
- Reported as a period of time (eg: Q1-Q4 of 2018)

## CFS: CASH.

- Shows the real cash generated through operations, and cash inflows/outflows from different activities
- Reported as a period of time (eg: 2017-2018)

## BS: SOLVENCY.

- Shows the company's resources (aka assets), and how it got those resources (liabilities or stockholder's equity)
- Reported as a **point** in time (eg: as of Q4 of 2018)



# The Bread and Butter: Balance Sheet

- Assets, Liabilities, Stockholder's Equity. Creditors and debtors have a claim to assets
- Current vs. Non-current difference
- Why does  $A=L+SE$ ?
- Listed in Order of Liquidity!

Example Company Balance Sheet December 31, 2018		
ASSETS	LIABILITIES	
Current assets		
Cash	\$ 2,100	Notes payable \$ 5,000
Petty cash	100	Accounts payable 35,900
Temporary investments	10,000	Wages payable 8,500
Accounts receivable - net	40,500	Interest payable 2,900
Inventory	31,000	Taxes payable 6,100
Supplies	3,800	Warranty liability 1,100
Prepaid insurance	1,500	Unearned revenues 1,500
Total current assets	<u>89,000</u>	Total current liabilities <u>61,000</u>
Investments	<u>36,000</u>	Long-term liabilities
Property, plant & equipment		Notes payable 20,000
Land	5,500	Bonds payable 400,000
Land improvements	6,500	Total long-term liabilities <u>420,000</u>
Buildings	180,000	
Equipment	201,000	Total liabilities <u>481,000</u>
Less: accum depreciation	(56,000)	
Prop, plant & equip - net	<u>337,000</u>	
Intangible assets		STOCKHOLDERS' EQUITY
Goodwill	105,000	Common stock 110,000
Trade names	200,000	Retained earnings 220,000
Total intangible assets	<u>305,000</u>	Accum other comprehensive income 9,000
Other assets	3,000	Less: Treasury stock (50,000)
Total assets	<u>\$ 770,000</u>	Total stockholders' equity <u>289,000</u>
		Total liabilities & stockholders' equity <u>\$ 770,000</u>

The notes to the sample balance sheet have been omitted.



# Income Statement

- Main stages: Net Sales, Gross Profit, Operating Income, Income before Tax, Net Income
- When is an item on the income statement?  
(2 rules)
  - Has an effect on taxes
  - Corresponds to the period of the IS
- Why isn't capex here?
  - Capital expenditures, commonly known as CapEx, are funds used by a company to acquire, upgrade, and maintain physical assets such as property, buildings, an industrial plant, technology, or equipment.

Innovative Products, Inc. Income Statement For Year Ending December 31, 2012		
<b>Sales</b>		\$50,00,000
Cost of Goods Sold		
Materials	8,00,000	
Labor	11,00,000	
Overhead	6,00,000	25,00,000
<b>Gross Margin</b>		<b>\$25,00,000</b>
<b>Operating Expenses</b>		
Selling Expenses	9,00,000	
Administrative Expenses	6,00,000	
Depreciation and Amortization	5,00,000	2000000
<b>Operating Income</b>		<b>\$5,00,000</b>
<b>Other Income &amp; Expenses</b>		
Interest Revenue	50000	
Interest Expense	-1,00,000	
Extraordinary items	2,00,000	1,50,000
<b>Income Before Tax</b>		\$6,50,000
Income Tax (at 35%)		\$2,27,500
<b>Net Income</b>		<b>\$4,22,500</b>

# Cash Flow Statement

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## Why do we need this?

- Income statement includes non-cash revenues and expenses (A/P, A/R)
- There are real cash outflows that aren't reported on income statement because they fall outside of the reporting period of the IS (eg: prepaid expenses, capex)
- **Because of these reasons**, income statement not good indicator of real cash the company is generating



# CFS: Indirect Method

## Net working capital

- NWC = noncash CA - CL
- Why is an increase in current assets a decrease in cash?
- Why is an increase in current liabilities an increase in cash?

CF from operations: Net Income

modified to show real cash generated from running the business

CF from investing: Capex, equipment sales/purchases, etc

CF from financing: anything the company does related to stock, debt

**XYZ Company**  
**Cash Flow Statement**  
**For the Year Ended December 31, 2015**  
(in millions)

Net Income	\$12.0
Depreciation and Amortization	4.0
<b>Changes in other accounts affecting operations</b>	
(Increase) / Decrease in Accounts Receivable	(0.5)
(Increase) / Decrease in Inventory	(0.4)
(Increase) / Decrease in Prepaid Expenses	0.3
(Increase) / Decrease in Other Current Assets	(0.1)
Increase / (Decrease) in Accounts Payable	(0.3)
Increase / (Decrease) in Deferred Revenue	1.0
<b>→ Cash Flow from Operations</b>	
	\$16.0
Capital Expenditures	(5.0)
Proceeds from sales of equipment	—
Proceeds from sales of investments	—
<b>→ Cash Flow from Investing Activities</b>	
	(\$5.0)
Proceeds from issuance of new debt	10.0
Proceeds from issuance of equity	—
Dividends paid	(2.0)
<b>→ Cash Flow from Financing Activities</b>	
	8.0
Beginning Cash	\$16.0
<b>→ Change in cash</b>	
	19.0
<b>Ending Cash</b>	<b>\$35.0</b>

# 1. Net Income Retained Earnings Link

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- Net Income on **Income Statement** (also **Cash Flow Statement**) affects Retained Earnings on **Balance Sheet** (under Stockholder Equity)

Retained Earnings = Starting RE amount + Net Income - Dividends Paid



## 2. Net Income $\longrightarrow$ Cash Link

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- Net income is the last line item in the *Income Statement*
- Net income is the first line item on the *Cash Flow Statement*
- Change in NWC on *CFS* relates to CA and CL line items on *BS*
- The last line item on the *Cash Flow Statement* is Change in Cash
- This Change in cash line item is the change in cash year to year on the *Balance Sheet*



# Linking Statements Together

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Income Statement

Cash Flows

Balance Sheet

Net Income

Beginning Cash

Net Working Capital

Current Assets &  
Current Liabilities

Net Income

Ending Cash

Retained Earnings



# Best Way to Think Through these Questions

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1. Start with **Income Statement**, **Cash Flow Statement**, and finally **Balance Sheet** effects.
2. DO memorize line item definition. Know what the line item does, how it affects at least 2 other items



# Summary

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	<b>Income Statement</b>	<b>Balance Sheet</b>	<b>Cash Flow</b>
<b>Time</b>	Period of time	A point in time	Period of time
<b>Purpose</b>	Profitability	Financial position	Cash movements
<b>Measures</b>	Revenue, expenses, profitability	Assets, liabilities, shareholders' equity	Increases and decreases in cash
<b>Starting Point</b>	Revenue	Cash balance	Net income
<b>Ending Point</b>	Net income	Retained earnings	Cash balance



# Time Value of Money & WACC



# A dollar today...

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# A dollar today...

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## The Formula for Future Value

$$FV = PV \times (1 + r)^n$$

Future Value  
Present Value  
Number of periods  
Rate of return or discount rate or interest rate or growth *per period*

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PV: how much money you have today

FV: what your money will be worth in the future (answer)



A \$ today is worth more than a \$ tomorrow because of:

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$$FV = PV(1+r)^n$$

Reasons:

- Return
  - Compound Interest
- Risk
  - More risk, more return
  - Inflation (Prices go up)
- Opportunity Cost
  - Bank v. Stocks
  - College v. Work



# Practice

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If I have \$10,000 today, how much money would I have in 20 years, assuming 6% growth?

Hint: Use the Formula  $FV = PV(1+r)^n$



# Answer

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$$FV = PV(1+r)^n$$

$$PV = \$10,000$$

$$r = 6\%$$

$$FV = \$10,000(1.06)^{20}$$

$$n = 20 \text{ years}$$

$$FV = 32071.35472 = \$32,071.35$$



A \$ Today Forever...

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(the cash flow is growing/declining in perpetuity)

$$PV = CF / (r - g)$$

- r=discount rate (interest rate)
- g=growth
- cf=cash flows

So what?



A \$ Today Forever...

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**The intrinsic value of a company is the cash flows of all the money it can generate in perpetuity discounted to the present.**



# So what “r” do you use for a company?

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## Factors:

- Return
- Risk
- Opportunity Cost

Plus another level of complexity....



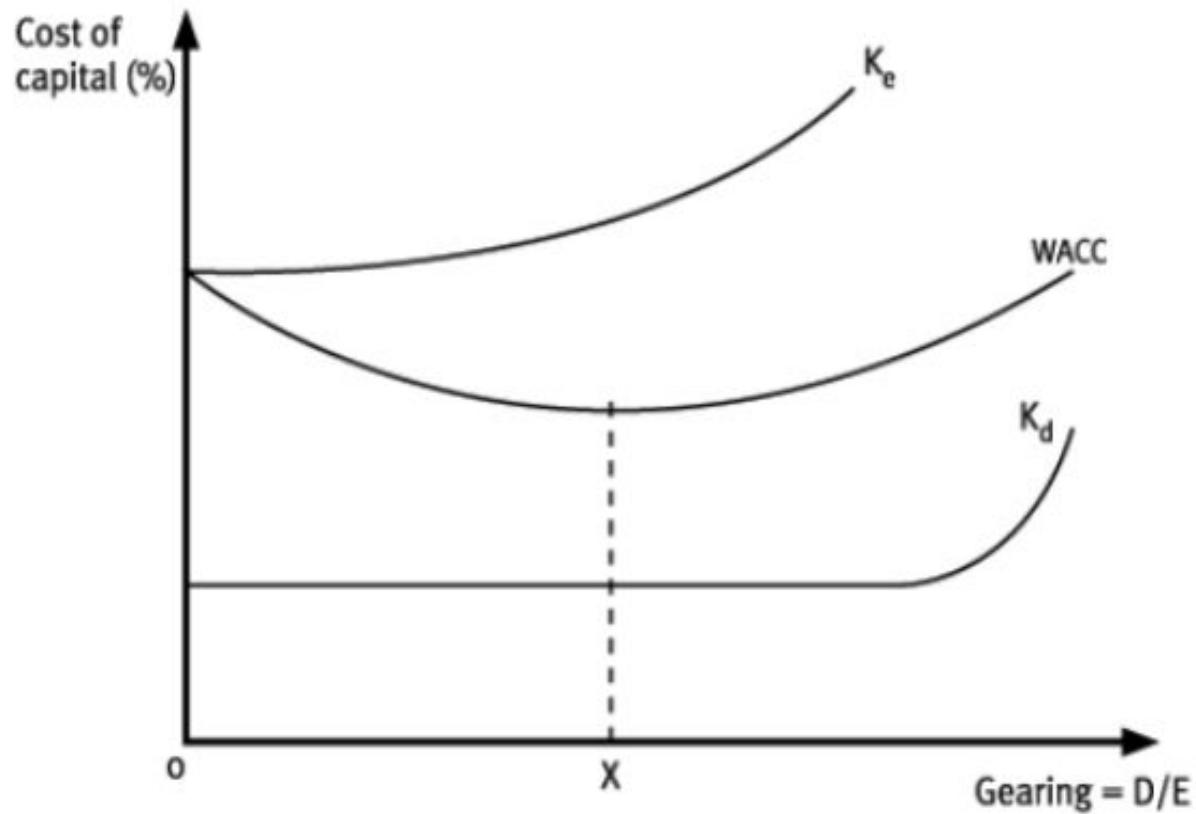
# Debt v. Equity

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- Capital Structure Definition: Sources of capital a company has (D&E)
- Debt and equity demand different costs. Why?
  - Cost = a % return that an investor demands
- What is cheaper? Debt or Equity?
  - Effects of interest tax shield: interest payments on certain debts are a tax-deductible expense, so taking on qualifying debts can act as tax shields (interest paid decreases after-tax income)
  - Governments provide interest tax shields in order to encourage more investments for companies and firms, as well as for individuals
- So how do you combine the two costs into a single “r”?



# A Wacky Concept: Weighted Average Cost of Capital



WACC, Traditional Position:  
the discount rate; the  
blended mix of a company's  
debt and equity and the  
required return based on  
those proportions;  
the rate that a company is  
expected to pay on average to  
all its security holders to  
finance its assets



# WACC

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$$WACC = \frac{E}{D + E} (r_e) + \frac{D}{D + E} (r_d)(1 - t)$$

Where:

E = market value of equity

D = market value of debt

$r_e$  = cost of equity

$r_d$  = cost of debt

t = corporate tax rate

Important notes:

- According to traditional position, there IS an optimal capital structure, different for each company
- Debt is cheaper than equity



# Ke & CAPM & Kd

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**Cost of equity (Ke)** can be found by using the Capital Asset Pricing Model (CAPM):

Formula:

**Risk-free rate + beta \* (market return - risk-free rate)**

- The 10 yr treasury rate can be used as the risk-free rate and the expected market return is generally estimated to be ~7%
- The 10 yr treasury rate is usually 1.5-2%
- The cost of debt (Kd) can be calculated by finding the average yield on the company's debt
  - Usually just interest expense/total debt unless the company is in distress

Note: WACC increases if beta and rate of return on equity increase because an increase in WACC denotes a decrease in valuation and an increase in risk



# More Concepts

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- Lenders and equity holders will expect to receive certain returns on the funds or capital they have provided
- Since the cost of capital is the return that equity holders (shareholders) and debt holders will expect, WACC indicates the returns that both kinds of stakeholders (equity holders and lenders) can expect to receive
- WACC is an investor's opportunity cost of taking on the risk of investing money in a company
- In a DCF, one may apply WACC as the discount rate for future cash flows in order to derive a business's net present value



# WACC Practice

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A company has \$75 in debt through a single bond offering and \$125 in equity. The bond pays an interest rate of 8%. Assume cost of equity of 10%, and a corporate tax rate of 20%.

- What is the WACC?
- The company is growing at a rate of 1%, and generates cash flows of \$100 at time 1. What is the Present Value (PV) at time 0 (aka now)?
  - Round your answer to the nearest cent

$$\text{WACC} = \frac{E}{D + E} (r_e) + \frac{D}{D + E} (r_d)(1 - t)$$

Where:

E = market value of equity

D = market value of debt

$r_e$  = cost of equity

$r_d$  = cost of debt

t = corporate tax rate



# Answer

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$$WACC = [E/(D+E)] * (r_e) + [D/(D+E)] * (r_d) * (1-t)$$

$$WACC = (125/200) * (0.10) + (75/200) * (.08) * (0.80)$$

$$WACC = .0865 = 8.65\%$$

$$PV = CF/(r-g)$$

$$PV = 100/(.0865 - .01)$$

$$PV = 1307.189542 = \$1,307.19$$



# Practice Questions

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1. You undertake an investment that will pay 7% annual interest. If you invest \$1,000, how much will you have at the end of 5 years?
2. If you invest \$120 for 2 years, earning 8% interest per year, how much will you have at the end of the 2 years?
3. You want to have \$500 at the end of 7 years. If you believe you can generate returns at a rate of 9% per year, how much money should you start with?
4. Calculate the WACC of a company with \$5B in debt and \$11B in equity, assuming an interest rate of 10%, a cost of equity of 5% and tax rate of 20%.
5. Calculate the WACC of a company with \$12B in debt and \$6B in equity, assuming the bond pays an interest rate of 5%, a cost of equity of 8% and tax rate of 30%.



# Question 1

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You undertake an investment that will pay 7% annual interest. If you invest \$1,000, how much will you have at the end of 5 years?

$$FV = PV(1+r)^n$$

$$FV = 1000(1.07)^5$$

- $PV = 1000$        $FV = \$1,402.55$
- $r = 7\%$
- $n = 5$



## Question 2

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If you invest \$120 for 2 years, earning 8% interest per year, how much will you have at the end of the 2 years?

$$FV = PV(1+r)^n$$

$$FV = 120(1.08)^2$$

- $PV = 120$        $FV = \$139.97$
- $r = 8\%$
- $n = 2$



## Question 3

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You want to have \$500 at the end of 7 years. If you believe you can generate returns at a rate of 9% per year, how much money should you start with?

$$FV = PV(1+r)^n \rightarrow PV = FV / (1+r)^n$$

$$PV = 500/(1.09)^7$$

$$PV = 273.5171224 = \$273.52$$



## Question 4

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Calculate the WACC of a company with \$5B in debt and \$11B in equity, assuming the bond pays an interest rate of 10%, a cost of equity of 5%, and tax rate of 20%.

$$WACC = [E/(D+E)] * (r_e) + [D/(D+E)] * (r_d) * (1-t)$$

$$WACC = 11/16 * .05 + 5/16 * .1 * .8$$

$$WACC = .059375 = 5.9375\%$$



## Question 5

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Calculate the WACC of a company with \$12B in debt and \$6B in equity, assuming the bond pays an interest rate of 5%, a cost of equity of 8% and tax rate of 30%.

$$WACC = [E/(D+E)] * (r_e) + [D/(D+E)] * (r_d) * (1-t)$$

$$WACC = 6/18 * .08 + 12/18 * .05 * .7$$

$$WACC = .05 = 5\%$$



# Recap

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- Time Value of Money
- Intrinsic Value of Company: All the cash the company is going to generate into the future discounted to the present
- Capital Structure
- $K_e$  and  $K_d$
- WACC



# Interview Questions

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- What's the formula for discount rate?
- Why is money worth more now compared to the future?
- What is WACC? What's the formula?
- What does the graph of cost of equity vs debt/equity ratio look like and why?
- What's generally cheaper, debt or equity and why? Is that always true?



Thank You!

Make sure to sign in

