WACC – Weighted Average Cost of Capital

- Up until now we always are told the MARR, interest rate, or discount rate.
- But how much does it really cost a company to fund projects?
- The answer is that we can discover this (for a publicly traded company) relatively easily.
- The procedure gives us the WACC.

WACC

- The funding cost for many corporate projects
- How are corporations funded?
  - Equity:
    - Funds provided by shareholders
    - Cost of equity: r_E
  - Debt:
    - Funds provided by lenders
    - Cost of debt = borrowing rate net of corporate taxes: $r_D*(1-T_C)$

WACC formula

$$WACC = r_E * \underbrace{\frac{E}{E+D}}_{\text{the percentage of equity used to finance the firm}} + r_D(1-T_C)* \underbrace{\frac{D}{E+D}}_{\text{the percentage of debt used to finance the firm}}$$

where

$r_E = the\ firm's\ cost\ of\ equity - the\ return\ required\ by\ the\ firm's\ shareholders$

$r_D = the\ firm's\ cost\ of\ debt - the\ return\ required\ by\ the\ firm's\ debtholders$

$E = market\ value\ of\ the\ firm's\ equity$

$D = market\ value\ of\ the\ firm's\ debt$

$T_C = the\ firm's\ tax\ rate$

r_E as the cost of equity

- r_E is the return demanded (or expected) by shareholders
- r_E increases as the riskiness of the shareholder returns increases
- The after-corporate-tax cost of equity is r_E. [Note that equity payouts are not an expense for corporate tax purposes.]

$(1-T_C)*r_D$ as the cost of debt

- r_D is the rate charged by lenders to company
- When lenders perceive that the company has higher risk, they demand a larger r_D
- The after-corporate-tax cost of of debt is $(1-T_C)*r_D$

$r_E > (1-T_C)*r_D$!

- Equity is riskier than debt (Can you guess why?)
- On an after-corporate-tax basis: the cost of equity will be greater than the cost of debt

WACC example

- United Transport Inc. has 3 million shares outstanding; the current market price per share is $10. The company thinks its shareholders want an annual return on their investment of 20%; this 20% return is the company's cost of equity r_E.
- The company has also borrowed $10 million from its banks at a rate of 8%; this is the company's cost of debt, r_D. United Transport has a tax rate of T_C = 40%.5

United Transport (continued)

$$WACC = r_E * \frac{E}{E+D} + r_D(1-T_C)* \frac{D}{E+D}$$

$$= 20\% * \frac{30}{30+10} + 8\% * (1-40\%)* \frac{10}{30+10} = 16.20\%$$

$r_E = 20\%$

$r_D = 8\%$

$E = 3{,}000{,}000 \text{ shares each worth } \$10 = \$30{,}000{,}000$

$D = \$10{,}000{,}000$

$T_C = 40\%$

	A	B	C
1	**UNITED TRANSPORT--WACC**		
2	Number of shares	3,000,000	
3	Market price per share	10	
4			
5	E, market value of equity	30,000,000	<-- =B3*B2
6	D, market value of debt	10,000,000	
7			
8	r_E, cost of equity	20%	
9	r_D, cost of debt	8%	
10	T_C, firm's tax rate	40%	
11			
12	WACC, weighted average cost of capital: $WACC=r_E*E/(E+D)+r_D*(1-T_C)*D/(E+D)$	16.20%	<-- =B8*B5/(B5+B6)+B9*(1-B10)*B6/(B5+B6)

United Transport: Where did $r_E = 20\%$ come from?

- How did United Transport come to the conclusion that its shareholders want a 20% return? This is ***the*** question in the computation of the WACC, and we will spend a lot of this chapter discussing the answer.
- So be patient!

When is the WACC an appropriate discount rate?

- Use WACC when the riskiness is appropriate.
- Example 1: White Water Rafting
  - Wants to purchase a new raft
  - Risk of purchase approximately same as riskiness of White Water Rafting
  - ➔ Use WACC to discount cash flows from new raft

WACC is the appropriate rate to use when the riskiness of the cash flows under consideration is approximately equal to the riskiness of the company's current cash flows.

Determining the WACC components

- Reminder:

$$WACC = r_E \frac{E}{E+D} + (1 - T_C) r_D \frac{D}{E+D}$$

- E=market value of equity
  = #shares * current market price/share
- D=market value of debt
  (but often use book value of debt)
- T_C = Corporate tax rate

- r_D = Cost of debt = Corporate borrowing rate
- r_E = Cost of equity
  In this chapter we determine r_E using the Gordon dividend model (see below)

Computing the WACC for UPS

- Use data from Yahoo
- Have to compute 5 parameters:
  - E = value of equity
  - D = Value of debt
  - r_D = cost of debt
  - T_C = the corporate tax rate
  - r_E = cost of equity

Basic WACC Template

	A	B	C
1	**COMPUTING THE WACC FOR UPS**		
2	E		
3	D		
4	r_D		
5	T_C		
6	r_E		
7			
8	WACC	#DIV/0!	<-- =B6*B2/(B2+B3)+B4*(1-B5)*B3/(B2+B3)

We will fill this template in the next slides.

UPS value of equity, E

- Current stock price * number of shares

Key Statistics

Data provided by Capital IQ, except where noted.

Valuation Measures	
Market Cap (intraday)[5]:	66.88B
Enterprise Value (Oct 5, 2010)[3]:	71.76B
Trailing P/E (ttm, intraday):	25.26
Forward P/E (fye Dec 31, 2011)[1]:	16.55
PEG Ratio (5 yr expected)[1]:	1.52
Price/Sales (ttm):	1.38
Price/Book (mrq):	8.35
Enterprise Value/Revenue (ttm)[3]:	1.51
Enterprise Value/EBITDA (ttm)[3]:	10.90

UPS debt D

Balance Sheet	
Total Cash (mrq):	4.01B
Total Cash Per Share (mrq):	4.05
Total Debt (mrq):	10.26B
Total Debt/Equity (mrq):	130.46
Current Ratio (mrq):	1.43
Book Value Per Share (mrq):	7.92
Cash Flow Statement	
Operating Cash Flow (ttm):	5.14B
Levered Free Cash Flow (ttm):	3.70B

NOTES:

- **Debt for WACC should be net debt: Debt minus Cash**
- **Debt for WACC should be market value of debt, but this is pretty hopeless—standard to replace market value with book value**
- **Upshot: UPS Debt = 10.26 – 4.01 = 6.25 B**

Template update

	A	B	C
1	**COMPUTING THE WACC FOR UPS**		
2	E	66.88	<-- Billion $, from Yahoo **Key Statistics** for UPS
3	D	6.25	<-- Book value of debt minus cash
4	T_C		
5	r_D		
6	r_E		
7			
8	WACC	0	<-- =B6*B2/(B2+B3)+B5*(1-B4)*B3/(B2+B3)

Computing r_D

	A	B	C	D
1	**COMPUTING r_D for UPS**			
2		31-Dec-09	31-Dec-08	
3	Cash and cash equivalents	1,542,000	507,000	
4	Long term debt	8,668,000	7,797,000	
5	Net debt	7,126,000	7,290,000	<-- =C4-C3
6	Interest expense	445,000		
7	r_D	6.17%	<-- =B6/AVERAGE(B5:C5)	

Computing T_C for UPS

	A	B	C	D
1	**COMPUTING T_C FOR UPS**			
2		31-Dec-09	31-Dec-08	
3	Income before tax	3,366,000	5,015,000	
4	Income tax expens	1,214,000	2,012,000	
5	T_C	36.07%	40.12%	<-- =C4/C3

Template update

	A	B	C
1	**COMPUTING THE WACC FOR UPS**		
2	E	66.88	<-- Billion $, from Yahoo **Key Statistics** for UPS
3	D	6.25	<-- Book value of debt minus cash
4	r_D	6.17%	
5	T_C	36.07%	
6	r_E		
7			
8	WACC	0.34%	<-- =B6*B2/(B2+B3)+B4*(1-B5)*B3/(B2+B3)

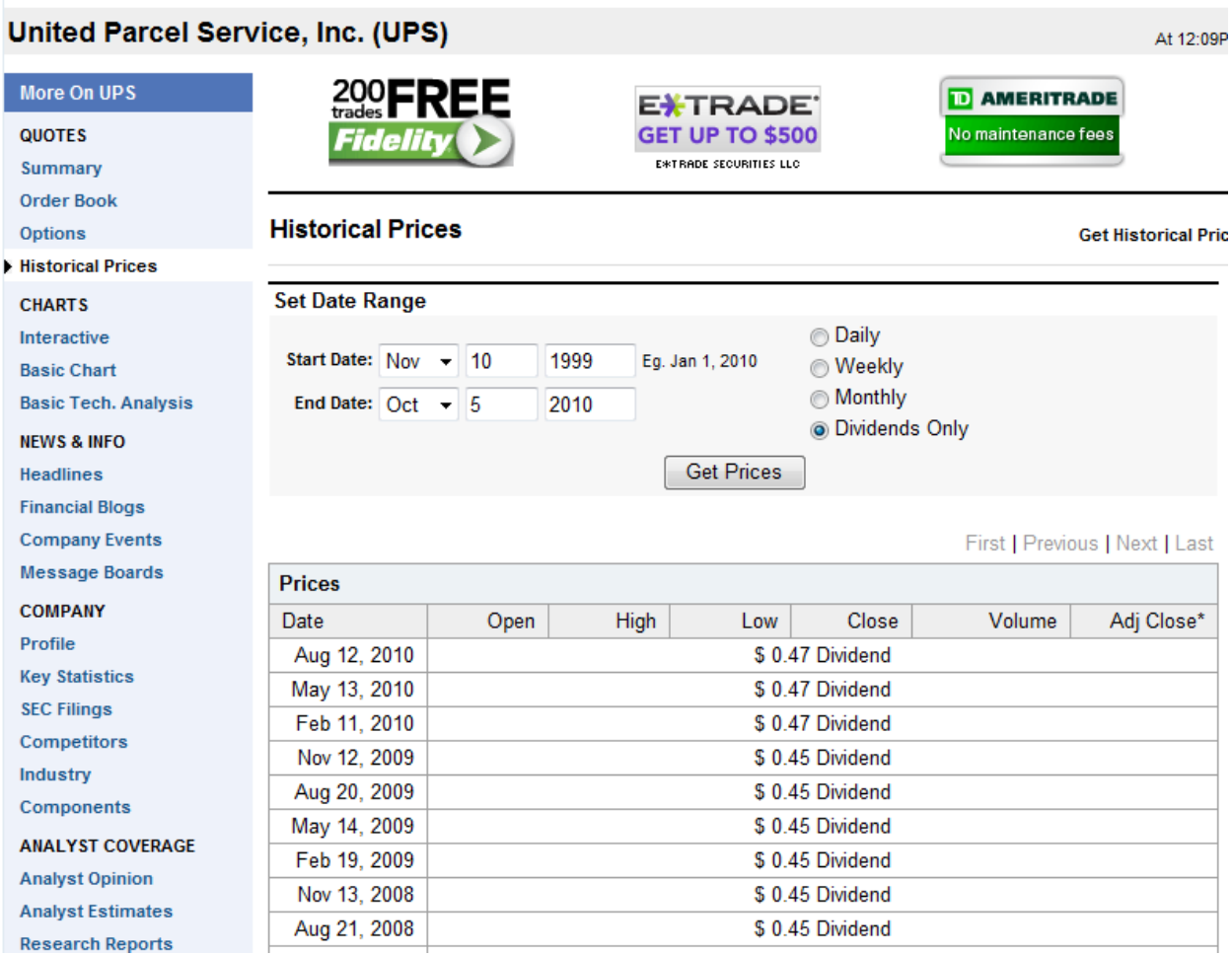
Computing r_E for UPS

- Use Gordon dividend model

$$r_E = \frac{Div_0\left(1+g\right)}{P_0} + g$$

UPS dividend history, Yahoo

	A	B
11	**Date**	**Dividend**
12	24-Nov-99	0.30
13	24-Feb-00	0.17
14	25-May-00	0.17
15	24-Aug-00	0.17
16	22-Nov-00	0.17
17	22-Feb-01	0.19
18	25-May-01	0.19
19	24-Aug-01	0.19
20	23-Nov-01	0.19
21	25-Feb-02	0.19
22	23-May-02	0.19
23	22-Aug-02	0.19
24	21-Nov-02	0.19
25	20-Feb-03	0.21
26	15-May-03	0.21
27	21-Aug-03	0.25
28	20-Nov-03	0.25
29	19-Feb-04	0.28
30	13-May-04	0.28
31	19-Aug-04	0.28
32	24-Nov-04	0.28
33	17-Feb-05	0.33
34	12-May-05	0.33
35	18-Aug-05	0.33
36	23-Nov-05	0.33
37	16-Feb-06	0.38
38	11-May-06	0.38
39	17-Aug-06	0.38
40	22-Nov-06	0.38
41	15-Feb-07	0.42
42	17-May-07	0.42
43	6-Sep-07	0.42
44	15-Nov-07	0.42
45	7-Feb-08	0.45
46	15-May-08	0.45
47	21-Aug-08	0.45
48	13-Nov-08	0.45
49	19-Feb-09	0.45
50	14-May-09	0.45
51	20-Aug-09	0.45
52	12-Nov-09	0.45
53	11-Feb-10	0.47
54	13-May-10	0.47
55	12-Aug-10	0.47



United Parcel Service, Inc. (UPS) At 12:09P

More On UPS

QUOTES
Summary
Order Book
Options
Historical Prices

CHARTS
Interactive
Basic Chart
Basic Tech. Analysis

NEWS & INFO
Headlines
Financial Blogs
Company Events
Message Boards

COMPANY
Profile
Key Statistics
SEC Filings
Competitors
Industry
Components

ANALYST COVERAGE
Analyst Opinion
Analyst Estimates
Research Reports

Historical Prices Get Historical Pric

Set Date Range

Start Date: Nov 10 1999 Eg. Jan 1, 2010
End Date: Oct 5 2010

Daily
Weekly
Monthly
Dividends Only

Get Prices

First | Previous | Next | Last

Prices

Date	Open	High	Low	Close	Volume	Adj Close*
Aug 12, 2010	$ 0.47 Dividend					
May 13, 2010	$ 0.47 Dividend					
Feb 11, 2010	$ 0.47 Dividend					
Nov 12, 2009	$ 0.45 Dividend					
Aug 20, 2009	$ 0.45 Dividend					
May 14, 2009	$ 0.45 Dividend					
Feb 19, 2009	$ 0.45 Dividend					
Nov 13, 2008	$ 0.45 Dividend					
Aug 21, 2008	$ 0.45 Dividend					

Applying the Gordon model

	A	B	C	D	E	F	G
1	**COMPUTING COST OF EQUITY r_D for UPS**						
2	Current UPS stock price P_0	67.71					
3	Current **annual** dividend	1.88	<-- =B55*4				
4	Growth rate of dividends						
5	Whole period	1.03%	4.17%	<-- =(1+B5)^4-1			
6	Last 5 years	1.78%	7.33%	<-- =(1+B6)^4-1			
7	r_E, cost of equity	10.31%	<-- =B3*(1+C6)/B2+C6				

Contains formula =(B55/B35)^(1/20)-1

NOTES:

- The dividend growth rate g depends on the period chosen
- We've chosen the last 5 years … but you could choose other time frames
- Critical question: What is the <u>future anticipated dividend growth rate</u>**?**
- Note that dividends are quarterly. We have derived the quarterly growth rate and then annualized.

WACC template, UPS

	A	B	C
1	**COMPUTING THE WACC FOR UPS**		
2	E	66.88	<-- Billion $, from Yahoo **Key Statistics** for UPS
3	D	6.25	<-- Book value of debt minus cash
4	r_D	6.17%	<-- Interest from income statement, average net debt over last two years
5	T_C	36.07%	<-- From income statement
6	r_E	10.31%	<-- Using Gordon model
7			
8	WACC	9.77%	<-- =B6*B2/(B2+B3)+B4*(1-B5)*B3/(B2+B3)