

## Homework Solutions - Lecture 2

1. Consider a \$100 investment that doubles in value during the first year and loses half its value in the second year. Calculate both the arithmetic average return and the geometric average return across this two-year period. Which average is a better representation of the investment's past performance?

The return in the first year equals  $(200 - 100)/100 = 100.0\%$

The return in the second year equals  $(100 - 200)/200 = -50.0\%$

The arithmetic average is a simple average of the two returns, or:

$$\bar{R}_A = \frac{[(100\%) + (-50\%)]}{2} = 25\%$$

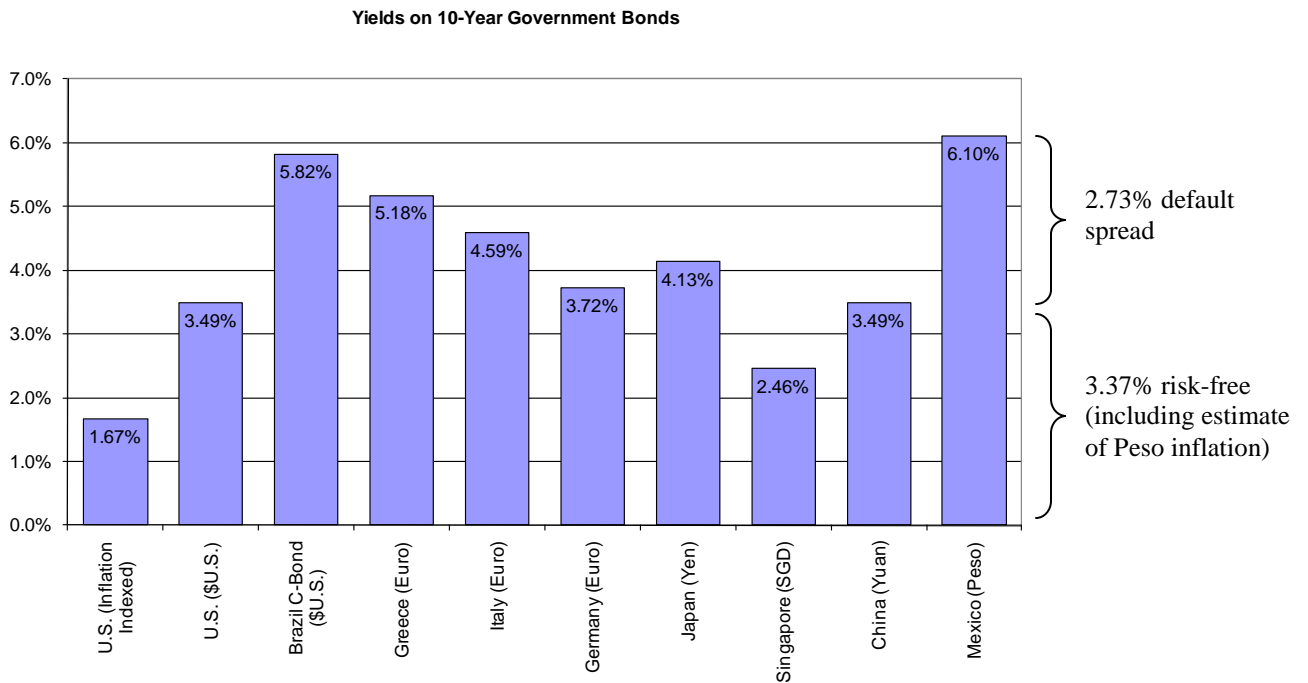
The geometric average incorporates the compounding of returns across the two years, giving:

$$\bar{R}_G = [(1 + 1.0) \times (1 - 0.5)]^{1/2} - 1 = 0\%$$

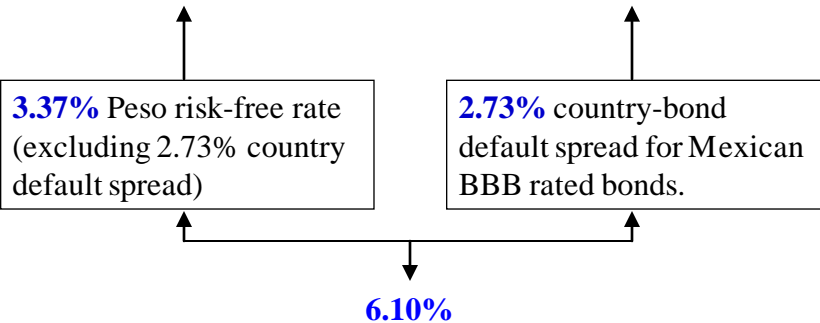
In general, the arithmetic average is a good measure of the expected return one period ahead. However, because it incorporates compounding, the geometric average is a better measure of past compounded performance and a better estimate of expected return over a multi-period horizon.

2. An analyst at your firm comes to you with a valuation of a Mexican firm done with Peso cash flows. The analyst has used the 6.10% yield on the Peso-denominated Mexican government bond as the risk-free rate in the cost of equity calculation, along with the 4.5% U.S. equity risk premium. What assumptions is this analyst making about country risk? Would it be appropriate for the analyst to add a separate country risk premium to the CAPM equation?

The **6.10%** yield on the Peso bond includes a real risk-free rate, an expectation of inflation, and a default spread. Including the default spread is one method of estimating country risk. As a result, an additional country risk term should not be added separately.



$$E(R) = R_f + \beta(\text{Risk Premium}_{U.S.}) + \text{Country Spread}$$



3. The current value of the S&P 500 index is 825.88 and the treasury rate is 2.87%. In a typical year, stock repurchases increase the average payout ratio on S&P 500 stocks to over 4%.
- a. Calculate the implied equity premium assuming the dividend yield in the most recent year was 4% of the current index value and dividends are expected to grow at a constant rate of 5% annually. How does this implied premium compare to the value we calculated when ignoring repurchases?

$$Div_1 = 825.88(.04)(1.05) = 34.69$$

$$R = g + \frac{Div_1}{CurrentValue} = .05 + \frac{34.69}{825.88} = .05 + .0420 = 9.20\%$$

$$Implied Risk Premium = 9.20 - 2.87 = 6.33\%$$

All of the values in this problem are the same as the problem we did in class except the dividend yield. Because the current value of the index (825.88) does not change, but the forecasted dividends here are higher, the implied premium is higher than the one we calculated in class.

- b. Calculate the implied equity premium assuming the dividend yield in the most recent year was 4% of the current index value, dividends are expected to grow at an annual rate of 10% for the next five years, and at a constant rate of 5% thereafter (Hint: you can use the solver function in excel). How does this implied premium compare to the value we calculated when ignoring repurchases?

Here you will need to use the Solver function in excel. Specifically, you should solve for the required return that sets the present value of future dividends equal to the current index value.

$$Div_1 = 825.88(.04)(1.10) = 36.34$$

$$825.88 = \frac{36.34}{(1+R)} + \frac{39.97}{(1+R)^2} + \frac{43.97}{(1+R)^3} + \frac{48.37}{(1+R)^4} + \frac{53.20}{(1+R)^5} + \frac{55.86/(R-.05)}{(1+R)^5}$$

$$R = 10.20\%$$

$$Implied Risk Premium = 10.20 - 2.87 = 7.33\%$$

Again, all of the values in this problem are the same as the problem we did in class except the dividend yield. Because the current value of the index (825.88) does not change, but the forecasted dividends here are higher, the implied premium is higher than the one we calculated in class.

4. In 1995, Time Warner Inc. had a Beta of 1.61. Part of the reason for this high Beta was the debt left over from the leveraged buyout of Time by Warner in 1989, which amounted to \$10 billion in 1995. The market value of equity at Time Warner in 1995 was also \$10 billion. The marginal tax rate was 40%.

a) Using the formula for leveraging a beta that includes tax effects (to account for the extremely high and changing leverage), we get:

$$\beta_u = \beta_e \left( \frac{E}{D(1-T) + E} \right) = 1.61 \left( \frac{10}{10(1-.4) + 10} \right) = 1.006$$

b) The debt/equity ratio in 1995 was  $10/10 = 1.0$ . If the debt ratio goes from 1.0 in 1995, to 0.9 in 1996, and 0.8 in 1997, the levered betas for 1996 and 1997 would equal:

$$\beta_e = \beta_u \left( 1 + \frac{D(1-T)}{E} \right) = 1.006(1 + .9(1-.4)) = 1.549$$

$$\beta_e = \beta_u \left( 1 + \frac{D(1-T)}{E} \right) = 1.006(1 + .8(1-.4)) = 1.489$$

5. Cost of Capital for Nike:

In this problem, you will calculate the cost of equity and weighted average cost of capital for Nike as of May 31, 2009. Be sure to explain any assumptions you make to arrive at your answers.

- a. Collect monthly return data for both Nike and the S&P 500 Index for the 60-month period ending in May 2009. Using this data, estimate the Beta for Nike based on a market model (CAPM) regression. Using this Beta estimate, calculate the cost of equity ( $K_e$ ) for Nike based on the CAPM model. Note that you must choose an appropriate risk-free rate and market risk premium to use in the CAPM equation. Briefly explain your choice for each of these variables.

I will assume that the risk-free rate equals the 10-year Treasury Yield as of 5/29/09, or 3.47%.

The market model regression using 60-months of returns for Nike and the S&P gives a Beta estimate of 0.8597 (see the attached graph).

I will use a market risk premium of 4.5%. This estimate reflects both the historical equity risk premium relative to U.S. Treasury Bonds and the implied equity premium calculations we discussed in class.

Using this information, the cost of equity can be calculated as:

$$K_e = 3.47\% + 0.8597(4.5\%) = 7.34\%$$

- b. Estimate the market value of debt and the market value of equity for Nike as of May 31, 2009. Use the firm's A+ rating and the default spreads provided in the course notes to estimate the firm's cost of debt ( $K_d$ ). Using these estimates and your answer to (a), calculate the weighted average cost of capital (WACC) for Nike. Assume a marginal tax rate of 40%.

Based on the default spread table provided in the class notes, the average default spread on A+ rated corporate bonds is 1.456%. Combining this with the risk-free rate from (a) gives a cost of debt equal to 4.926% (3.47% + 1.456%).

In the Notes to the Consolidated Financial Statements, Nike estimates the market value of long-term debt to be \$456.4 million. Combining this with the firm's short-term notes payable valued at \$342.9 million gives a total market value for debt of \$799.3 million. Using methods we will discuss in Lecture 3, I find that the debt value of Nike's operating leases equals \$1,496.52 million (see the attached table). Together, this gives a total market value for debt of \$2.296 billion.

Nike's shares outstanding include 95.3 million class A shares and 390.2 class B shares. Treating these shares as identical and multiplying by the stock price as of May 31, 2009 (\$57.05) gives a total equity market value of \$27.698 billion.

Using this information, the weighted average cost of capital (WACC) can be calculated as:

$$WACC = \left( \frac{27.698}{27.698 + 2.296} \right) 7.34\% + \left( \frac{2.296}{27.698 + 2.296} \right) (4.93\%)(1 - .4) = 7.00\%$$

Ignoring operating leases gives WACC=7.22%.

6. Synthetic Debt Ratings:

- c. The following information was taken from the income statement and balance sheet of a real firm. Use this information to calculate the EBITDA-to-interest ratio, the Debt-to-EBITDA ratio, the Debt-to-Capital ratio, and the Return on Capital. Based on the values you calculate, use the S&P Ratings Guide on the attached page to estimate a synthetic debt rating for this firm.

EBIT = \$7,242  
 EBITDA = \$8,944  
 Interest Expense = \$696  
 Total Debt = \$13,430  
 Stockholder's Equity = \$17,714  
 Tax Rate = 36.4%

$$\frac{EBITDA}{Interest} = \frac{8944}{696} = 12.85$$

$$\frac{Debt}{EBITDA} = \frac{13340}{8944} = 1.49$$

$$\frac{Debt}{Capital} = \frac{13430}{13430 + 17714} = 43.12\%$$

$$ROC = \frac{7242(1 - .364)}{13430 + 17714} = 14.79\%$$

Based on these ratios, the firm is roughly similar to other firms in the **A** ratings category.

- d. The firm described above has significant operating leases. The notes to the financial statements show that the firm's operating lease expenses during the period were \$958, of which \$340 is estimated to be interest expense. In addition, you calculate the debt value of operating leases to be \$5,919. Recalculate the ratios above incorporating this new information. Based on these corrected values, use the S&P Ratings Guide to estimate a revised synthetic debt rating for this firm.

**EBIT = \$7,242 + 340 = \$7,582**  
**EBITDA = \$8,944 + 958 = \$9,902**  
**Interest Expense = 696 + 340 = \$1,036**  
**Total Debt = 13,430 + 5,919 = \$19,349**  
 Stockholder's Equity = \$17,714  
 Tax Rate = 36.4%

$$\frac{EBITDA}{Interest} = \frac{9902}{1036} = 9.56$$

$$\frac{Debt}{EBITDA} = \frac{19349}{9902} = 1.95$$

$$\frac{Debt}{Capital} = \frac{19349}{19349 + 17714} = 52.21\%$$

$$ROC = \frac{7582(1 - .364)}{19349 + 17714} = 13.42\%$$

Based on these revised ratios, the firm appears to fall at the middle or high end of **BBB** rated firms (or the very low end of A rated firms). Note that I assume the operating lease expense of \$958 is a combination of interest expense and depreciation.

Question 2 Regression Output:

SUMMARY OUTPUT	
<i>Regression Statistics</i>	
Multiple R	0.6210
R Square	0.3857
Adjusted R Square	0.3751
Standard Error	0.0491
Observations	60
<i>ANOVA</i>	
	<i>df</i>
Regression	1
Residual	58
Total	59
<i>Coefficients</i>	
Intercept	0.0131
S&P 500	0.8597



## Question 2 Nike Operating Lease Information:

### *Contractual Obligations*

Our significant long-term contractual obligations as of May 31, 2009, and significant endorsement contracts entered into through the date of this report are as follows:

Description of Commitment	Cash Payments Due During the Year Ending May 31.						
	2010	2011	2012	2013 (In millions)	2014	Thereafter	Total
Operating Leases	\$ 330.2	\$ 281.3	\$ 233.6	\$ 195.6	\$ 168.6	\$ 588.5	\$ 1,797.8
Long-term Debt	32.0	6.9	167.1	46.9	56.9	144.6	\$ 454.4
Endorsement Contracts <sup>(1)</sup>	711.7	654.6	601.0	509.7	431.0	1,293.9	\$ 4,201.9
Product Purchase Obligations <sup>(2)</sup>	1,985.7	—	—	—	—	—	\$ 1,985.7
Other <sup>(3)</sup>	247.1	106.3	67.8	78.0	3.0	2.0	\$ 504.2
Total	\$ 3,306.7	\$ 1,049.1	\$ 1,069.5	\$ 830.2	\$ 659.5	\$ 2,029.0	\$ 8,944.0

<b>Current Year:</b>	2009
<b>Inputs:</b>	
Cost of Debt	4.67%
Round Annuity Length? (1=yes, 0=no)	0
<b>Operating Lease Commitments (mil)</b>	
20010 (or year +1)	330.20
2011 (or year +2)	281.30
2012 (or year +3)	233.60
2013 (or year +4)	195.60
2014 (or year +5)	168.60
>2014 (after year )	588.50
	1,797.80
<b>Estimation (based on yr 5 pymt):</b>	
Year 5 payment	168.60
Annuity yrs	3.49
PV of Lease Pmts	1,496.52

## Credit Rating Reference Guide

S&P Credit Statistics, S&P / Moody's Comparison, Short-Term Credit Ratings F:\Rewards Network\2005\09-05\DTPI\IRN - Convert Pricing.xls\Sheet1

		Primary Credit Statistics			Other Information			
		EBITDA/ Interest	Total Debt/ EBITDA	Total Debt/ Total Cap.	Return on Capital	FFO/ Total Debt	FOCF/ Total Debt	L-T Debt/ Total Cap.
AAA	Upper Quartile	35.1x	0.4x	13.1%	44.1%	204.3%	127.3%	13.1%
	Mean	27.5x	0.3x	6.7%	31.7%	169.3%	110.0%	6.7%
	Median	27.0x	0.2x	6.5%	27.9%	197.7%	111.4%	6.5%
	Lower Quartile	21.6x	--	--	22.7%	148.6%	93.4%	--
AA	Upper Quartile	31.7x	1.3x	51.7%	33.1%	102.2%	60.1%	51.7%
	Mean	46.7x	1.1x	34.0%	27.6%	174.9%	151.4%	34.0%
	Median	17.7x	0.9x	30.6%	27.6%	89.2%	52.9%	30.6%
	Lower Quartile	16.6x	0.6x	19.2%	21.4%	54.8%	42.3%	19.2%
A	Upper Quartile	15.9x	2.3x	48.2%	23.1%	65.5%	42.3%	48.2%
	Mean	16.4x	1.9x	40.1%	19.5%	76.7%	43.1%	40.1%
	Median	10.2x	1.7x	38.0%	16.9%	45.9%	26.3%	38.0%
	Lower Quartile	7.1x	1.2x	27.8%	11.8%	33.6%	14.2%	27.8%
BBB	Upper Quartile	9.1x	3.2x	53.9%	17.5%	50.4%	29.2%	53.9%
	Mean	8.1x	2.7x	44.3%	14.4%	49.8%	27.0%	44.3%
	Median	5.9x	2.3x	43.1%	13.1%	36.3%	17.4%	43.1%
	Lower Quartile	4.4x	1.7x	32.8%	9.1%	23.7%	8.9%	32.8%
BB	Upper Quartile	5.7x	4.9x	68.9%	15.6%	32.7%	16.6%	68.9%
	Mean	8.2x	4.1x	57.1%	11.6%	33.9%	15.8%	57.1%
	Median	3.3x	3.6x	55.4%	10.8%	21.1%	9.9%	55.4%
	Lower Quartile	2.5x	2.5x	43.6%	7.0%	13.9%	2.2%	43.6%
B	Upper Quartile	2.7x	7.3x	100.3%	12.9%	17.8%	8.9%	100.3%
	Mean	2.1x	7.9x	82.4%	7.7%	14.4%	(3.0%)	82.4%
	Median	1.9x	5.2x	77.5%	7.6%	10.9%	3.2%	77.5%
	Lower Quartile	1.3x	3.7x	57.0%	3.2%	5.1%	(4.7%)	57.0%
CCC	Upper Quartile	1.4x	11.0x	149.1%	13.3%	7.2%	3.1%	149.1%
	Mean	0.6x	10.6x	83.5%	4.9%	(0.5%)	(10.8%)	83.5%
	Median	1.0x	7.6x	108.6%	4.6%	3.4%	(0.4%)	108.6%
	Lower Quartile	0.5x	5.8x	85.2%	(2.9%)	0.3%	(4.9%)	85.2%

FOCF = Funds from operations - Capital Expenditures ± Change in Non-Cash, Non-Interest Bearing Working Capital

FFO = Net Income from Continuing Operations + Depreciation & Amortization and Other Non-Cash Items

S&P Industrials 3 Year Average Credit Statistics - Industrial Comparative Ratio Analysis; Publication Date: August 20, 2002

S&P	Moody's	Long-Term Ratings			Short-Term Ratings		
		S&P	Moody's	Fitch	S&P	Moody's	Fitch
AAA+	Aaa1	AAA	Aaa	AAA			
AAA	Aaa2	AA+	Aa1	AA+	A-1+	P-1	F1+
AAA-	Aaa3	AA	Aa2	AA			
AA+	Aa1	AA-	Aa3	AA-			
AA	Aa2	A+	A1	A+	A-1	P-1	F1
AA-	Aa3	A	A2	A			
A+	A1	A-	A3	A-			
A	A2	BBB+	Baa1	BBB+	A-2	P-2	F2
A-	A3	BBB	Baa2	BBB			
BBB+	Baa1	BBB-	Baa3	BBB-	A-3	P-3	F3
BBB	Baa2	BB+	Ba1	BB+	B	NP	B
BBB-	Baa3						
BB+	Ba1						
BB	Ba2						
BB-	Ba3						
B+	B1						
B	B2						
B-	B3						
CCC+	Caa1						
CCC	Caa2						
CCC-	Caa3						
CC+	Ca1						
CC	Ca2						
CC-	Ca3						
C+	C1						
C	C2						
C-	C3						