

Problem set 1  
Answers  
266: Fi. Markets and Institutions  
Spring 2017  
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**Directions.** You are to do this problem set on your own.

**Due Date/time.** Your work is due by beginning of class (10:30am) on the date listed on the online syllabus. You can hand the work in to me at the beginning of class or drop it by office hours (Daily Grind) before class.

**Questions.** If you have questions, email me or the TAs, raise them in class, or come to office hours.

**Grading.** All parts have equal value.

**Note:** Be sure to note the proper units (e.g., millions, billions, etc.) in the following answers.

1 Calculating returns. Suppose that I can buy a financial instrument that will pay me \$100 7 months from now. Assume that the asset will pay in full.

1.1 I pay \$98 today for the asset. What will be the annualized rate of return on my investment?

**Answer:**

The annualized rate  $AR = (1 + X)^{1/h} - 1$  where  $X$  is the percent change and  $h$  is the holding period. You can compute  $X$  or  $1 + X$ :

$$X = \frac{Final - Initial}{Initial}$$
$$1 + X = Final/Initial$$

The holding is period is 7 months,  $7/12$  of a year, so  $h = 7/12$ , and  $1 + X = 100/98 \approx 1.02$ , which implies that the annualized rate  $AR = 1.02^{(12/7)} - 1 \approx .03$ , or 3%.

1.2 The price falls so that I only have to pay \$94 for the asset. What is the annualized rate of return on my investment?

**Answer:**

The holding period is 7 months,  $7/12$  of a year, so  $h = 7/12$ , and  $1 + X = 100/94 \approx 1.064$ , which implies that the annualized rate  $AR = 1.064^{(12/7)} - 1 \approx 0.11$ , or 11%.

1.3 What is the implied relationship between the price of the asset and the return?

**Answer:**

Price and yield move in opposite directions.

1.4 Suppose instead I pay \$100.50 for the asset, what is the annualized rate of return?

**Answer:**

The holding period is the same so  $h = 7/12$ , and  $1 + X = 100/100.5 \approx .995$ , which implies that the annualized rate  $AR = .995^{(12/7)} - 1 \approx -0.01$ , or -1%.

1.5 What is a reason I would ever pay more than \$100 for this asset?

**Answer:**

Safety and convenience. It might be worth it to pay a fee to store your savings in a safe, liquid location. Another potential reason is insurance: if you think in the case of a bad event, the price of the asset will rise, you might be willing to ‘overpay’ in this way.

## 2 Corporate bonds.

2.1 Describe the payments associated with a simple, ‘plain vanilla’, corporate bond with a maturity of 10 years.

**Answer:**

The bond-buyer pays price  $P$  today, and in return receives coupon payments  $C$  at regular intervals (e.g, once a year) for 10 years. In the 10th year, the buyer also receives the face (or par) value,  $F$ :

Time	Payment
today	-P
year 1	C
year 2	C
⋮	
year 10	C+F

2.2 Take a plain vanilla coupon bond with face value of \$100, a coupon rate of 2%, and 3-years remaining maturity. (Note: assume annual coupon payments.) The bond is currently selling for \$105. What is the yield to maturity?

**Answer:**

The coupon rate is  $= C/F$  so  $C = 2$ . The yield to maturity is the  $i$  that makes

the following equation true:

$$P = \frac{C}{1+i} + \frac{C}{(1+i)^2} + \frac{C+F}{(1+i)^3}$$
$$105 = \frac{2}{1+i} + \frac{2}{(1+i)^2} + \frac{102}{(1+i)^3}$$

Which turns out to be  $i \approx 0.003$  or 0.3% Wolfram Alpha can be pretty helpful for these type of quick calculations. You could also just stick the formula in a calculator that allows formulae and just guess different  $i$ s until you get the value that makes the price 105. Or you could use a financial calculator or financial functions in excel.

2.3 Many corporate bonds are not ‘plain vanilla.’ For each of the following, explain the listed feature of a bond and state whether, all else equal, adding this feature to a plain vanilla bond should increase or decrease its value:

2.3.1 Callable bond. circle one: increase/decrease\*\*\*

**Answer:**

Callable bonds: The issuer has the option to re-purchase the bond (essentially the option to repay the bond early) at a predetermined price. The value decreases since the issuer gets seller gets something valuable, she is willing to sell for less. Buyer face repayment risk and thereby willing to pay less.

2.3.2 Convertible bond. circle one: increase\*\*\* / decrease

**Answer:**

(Conventional) Convertible bonds: The bond buyer (lender) can convert the bond into a specified number of shares of common stock at a specified price. The buyer gets a valuable option and is thereby willing to pay more.

2.3.3 Covenants on a bond. circle one: increase\*\*\* / decrease

**Answer:**

A binding term of agreement between a bond issuer and a bond holder to protect the interests of both parties. Negative or restrictive covenants forbid the issuer from undertaking certain activities; positive or affirmative covenants require the issuer to meet specific requirements. The value may increase or decrease depending on the type of the covenant. Usually when we think of covenants we think of ones restricting borrower behavior, and these increase the value of the bond.

2.3.4 AT1 CoCo bonds. circle one: increase/decrease\*\*\*

**Answer:**

Additional tier-1 (AT1) securities and contingent convertible capital instruments, known as CoCo bonds. These are issued by financial institutions. When the capital of the financial institution falls below some specified level,

the bond converts to equity helping to replenish the capital of the issuer. They have insurance value for the issuer so adding this feature to a bond decreases its market value.

### 3 Reality

3.1 What is the 2-year and 10-year yield (in percent) on the following government securities.

Country	2-year yield	10-year yield
U.S.	1.15	2.33
Germany	-0.9	0.19
Japan	-0.27	0.07
Sweden	-0.6	0.66
Brazil	1.6	4.74

(values in percent)

Note: any reasonable time and date will do for your answer.

Note: Your answer will depend on the day and time you look these up.

Put the date and approximate time here: February 24, 11 a.m.

Hint: You can get these from many places, including from a Bloomberg machine. Go to page WB for example. pick the 2-year and 10-year maturities.

3.2 What was the annualized percent change in the following stock indices between Dec. 31, 2008 and Feb. 14, 2017 and between Nov. 7, 2016 and Feb. 15, 2017.

**Answer:**

Your prof. is calendar challenged and botched up these dates a bit. So long as you did something reasonable here, your answer will be accepted. The data in the answer set are for the date specified.

Collect the index values on each date, calculate total returns, and convert them

to annual returns using  $AR = (1 + X)^{1/h} - 1$  where  $X$  is the total percent change and  $h$  is the holding period.

The holding period is  $h = 8 + 45/365 \approx 8.12$  for Dec. 31, 2008 - Feb. 14, 2017 and  $h = 100/365 \approx .28$  for Nov. 7, 2016 - Feb. 15, 2017.

For example, the close values for the S&P 500 were 903, 2131, 2337, and 2349 for Dec. 31, 2008, Nov. 7, 2016, Feb. 14, 2017 and Feb. 15, 2017, respectively.

The annualized returns are  $AR_{Dec.31,2008-Feb.14,2017} \approx (2337/903)^{(1/(8+45/365))} - 1 \approx 12\%$  and  $AR_{Nov.7,2016-Feb.15,2017} \approx (2349/2131)^{(365/100)} - 1 \approx 43\%$ .

index	return in percent		country
	since Nov. 7, 2016	since Dec. 31, 2008	
S&P 500	43	12	U.S.
DAX	55	11	Germany
Nikkei	57	10	Japan
Bovespa	24	7	Brazil

Hint: There are a lot of places to get this information online. You can also get the information from Bloomberg, page WEI. To annualize the rate of return for since the election this year, for example, assume that each day is  $(1/365)^{th}$ s of a year.

3.3 Each of the above indices is a major index for a particular country. Fill in the country column in the above table.