Problem set 1
266: Fi. Markets and Institutions
Spring 2016
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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) Thursday, February 18. You can hand the work in to me at the beginning of class. If you put the work under my office door or in my mailbox, it must be in before I leave for lecture at about 10:20 am.

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

Grading. All parts are worth 4 points, except 3.2 which is worth 8 points, for a total of 56.

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 four months from now.

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 $1 + X$:

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

1.1 I pay $99 today for the asset. What is the annualized rate of return on my investment?

Answer:
The holding is period is 4 months, a third of a year, so $h = 1/3$, and $1 + X = 100/99 \approx 1.01$, which implies that the annualized rate $AR = 1.01^3 - 1 \approx .03$, or 3%.

1.2 The price falls so that I only have to pay $93 for the asset. What is the annualized rate of return on my investment?

Answer:

The holding is period is 4 months, a third of a year, so $h = 1/3$, and $1 + X = 100/99 \approx 1.075$, which implies that the annualized rate $AR = 1.075^3 - 1 \approx .24$, or 24%.

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

Answer:

When the price goes down, the return increases.

1.4 Suppose instead I pay $101 for the asset, what is the annualized rate of return?

Answer:

The holding is period is 4 months, a third of a year, so $h = 1/3$, and $1 + X = 100/101 \approx .99$, which implies that the annualized rate $AR = .99^3 - 1 \approx -.03$, or -3%.

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 may be willing to overpay on average.

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
$\vdots$	
year 10	C+F

2.2 Take a plain vanilla coupon bond with face value of $100, a coupon rate of 3%, and 2-years remaining maturity. (Note: assume annual coupon payments.) The bond is currently selling for $108. What is the yield to maturity?

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Answer:
The coupon rate is $= C/F$ so $C = 3$. The yield to maturity is the i that makes the following equation true:

$$P = \frac{C}{1+i} + \frac{C+F}{(1+i)^2}$$
$$108 = \frac{3}{1+i} + \frac{3+100}{(1+i)^2}$$

Which turns out to be $i \approx -.94\%$. Wolfram Alpha can be pretty helpful for these type of quick calculations.

2.3 Many corporate bonds are not 'plain vanilla.' Describe two major examples of features bonds may have that allow the payoff from the bond to be changed at either the discretion of the bond holder or the bond issuer.

Answer:

- Callable bonds: The issuer has the option to purchase the bond at a predetermined price.
- (Traditional) Convertible bonds: The buyer can convert into a specified number of shares of common stock at a specified price.
- Contingent convertible bonds: There are many varieties here. Recently banks have used CoCos that convert into equity when a given bad event happens to the firm, such as a capital ratio falling to a certain level.

2.4 Suppose we add a feature to a bond that gives the bond issuer some discretion over the payments stream. This should raise or lower the price of the bond? And why?

Answer:
Lower the bond price (raise the yield to maturity). If the option is good for the issuer, the issuer will accept a lower price. Put differently, if the option is bad for the holders, they will be willing to pay less for it.

2.5 What is the key feature of CoCo bonds that makes them attractive to banks? Hint: You might want to start with this piece on the CFE website:
`http://cfe.econ.jhu.edu/2011/03/cocos-the-movie/`

Answer:
CoCos have insurance value. If a bank's equity falls below a predetermined level (a bad event) CoCos will convert into equity, thereby giving the bank higher net worth (more equity, less debt).

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.	.76%	1.76%
Germany	-.53%	.20%
Japan	-.21%	-.01%
Brazil	14.47%	15.92%

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

Put the date and approximate time here: February 22, 12 m

Hint: You can get these from 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. 15, 2016 and between Dec. 31, 2015 and Feb. 15, 2016.

Answer:

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. See question 1.

The holding period is $h = 46/365 \approx .12$ for Dec. 31, 2015 - Feb. 15, 2016 and $h = 7 + 46/365 \approx 7.12$ for Dec. 31, 2008 - Feb. 12, 2016. (Market was closed on Feb. 15, 2016; it is OK if you used Feb. 12 or 16 or did some other adjustment).

For example, the close values for the S&P 500 were 903, 2043, and 1864 for Dec. 31, 2008, Dec. 31, 2015, and Feb. 15, 2016, respectively.

The annualized returns are $AR_{Dec.31,2015-Feb.15,2016} \approx (1864/2043)^{(1/.12)} - 1 \approx -51\%$ and $AR_{Dec.31,2008-Feb.15,2016} \approx (1864/903)^{(1/7.12)} - 1 \approx 10\%$.

	return		
index	since Dec. 31, 2015	since Dec. 31, 2008	country
S&P 500	-51%	10%	U.S.
DAX	-70 %	10%	Germany
Nikkei	-75%	9%	Japan
Bovespa	-48%	1%	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 this year, for example, assume that by Feb. 15, $(46/365)^{th}$s of the year had passed.

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