THE UNIVERSITY OF CHICAGO
HARRIS SCHOOL OF PUBLIC POLICY

PPHA 42510 APPLIED FINANCIAL MANAGEMENT

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Practice PV Problems – Due Thursday

- These problems review TVM calculations and interest rate conversions. The only way to learn this stuff is practice
- GRADING – I will grade you on whether you hand in the problems – not on whether they are right. (Since I am supplying answers to the problems, I assume you can get the right answer.)
- For this problem I am not looking for a fancy or a detailed solution – I just want you to go through the numbers. I want you to hand in your own solution (handwritten is fine), but please feel free to work together if you wish.
- ANSWERS – I am supplying answers for these problems in a separate document. My intention is that you practice and learn from these – it is not a test of your knowledge. **But please work through problems before looking at the answer sheet.**

1. This is the four year 6.5% annual coupon bond we discussed in class on Wednesday. (4 year Eurobond, exact 4 years, with annual coupon 6.5%).

   a) What is the price of the bond if the yield is 6.6%? And draw the CF diagram _____
(this should be easy since this is exactly what was in lecture)

   b) What is the price of the bond if the yield is 6.7%? _____

   c) How much ($) have you lost going from 6.6% yield to 6.7% yield? _____

   d) Why does the price go up when the yield goes down?

2. Say we are now one year later, so the bond is now a 3 year Eurobond with annual coupon 6.5%

   a) What is the price of the bond if the yield is 6.6%? _____

   b) Why is the price different for a 3 year and a 4 year bond?

   c) What is the yield if the price is 99.0? _____

3. Somebody offers to sell you a 3 year Eurobond with annual coupon of 7.0% at a price of 99.50. Which bond is a better buy, the 6.5% coupon at 99.0 or the 7.0% coupon at 99.5? Answer this as follows:

   a) What is the yield on the 3 year 6.5% coupon bond at $99? (from above): _____

   b) What is the yield on the 3 year 7% coupon bond at $99.5? _____

c) Would you prefer to invest money at 6.880% or 7.191%? Or to say another way, would you rather have a bank account that pays you 6.880% or 7.191%?

d) So which bond would you rather buy?

4. What would be your answer if the 6.5% coupon bond is priced at $102 and the 7.0% coupon bond at $103

a) What is the yield of the 6.5% coupon bond at $102? _____

b) What is the yield of the 7.0% coupon bond at $103? _____

c) Which bond would you prefer to buy?

d) What if the 6.5% coupon bond were offered to you at $101? _____

Now some interest rate conversions. Remember that the basic PV relations are:

$$PV = \frac{FV}{\left(1+y_{ab}\right)^{yr}} \quad PV = \frac{FV}{\left(1+y_{sab}/2\right)^{2*yr}}$$

and since the cash flows (PV and FV) are the same for each equation, we must have

$$\left(1+y_{ab}\right) = \left(1+y_{sab}/2\right)^{2}$$

which means that

$$y_{ab} = \left(1+y_{sab}/2\right)^{2} - 1 \quad ; \quad y_{sab} = 2\cdot\left(\sqrt{1+y_{ab}} - 1\right)$$

5. Fill in the following table of interest rate conversions.

y_{ab}	y_{sab}
.08	.07846
.06	
.04	
	.06
	.04
.10	

6. Now let's deal with a bond that has semi-annual coupons. This gets a bit messy because there are two ways to think about it.

Consider a 10-year semi-annual bond (exact half-years so you can use TVM).

- **10 year maturity**

- **2.25% semi-annual coupon**
- **Price $95**

a) Easiest, keep everything per period
- 10 years = 20 periods (20 half-years)
- 2.25% semi-annual coupon = 1.125 payment (per half-year)

With 1 P/YR:

Key		Display	Description		
FIN TVM OTHER			Accesses TVM menu		
1 P/YR END EXIT	1 …		pmts per year		
	N	I%YR	PV	PMT	FV
GIVEN	20		-95	1.125	100
SOLVE FOR					

The sab yield is then 2x the "I%YR": Yield = _____

b) Alternative, set P/YR=2. This keeps N=20 and PMT=1.125, but now the I%YR is the sab rate (already multiplied by 2)

With 2 P/YR:

Key		Display	Description		
FIN TVM OTHER			Accesses TVM menu		
2 P/YR END EXIT		2 …	pmts per year		
	N	I%YR	PV	PMT	FV
GIVEN	20		-95	1.125	100
SOLVE FOR					

7. And finally, for a hard problem.

Consider a 10-year **annual** bond.
- **10 year maturity**
- **2.25% annual coupon**
- **Price $95**

a) What is the ab yield for this bond? _____

Set back to 1 P/YR:

Key		Display	Description		
FIN TVM OTHER			Accesses TVM menu		
1 P/YR END EXIT	1 …		pmts per year		
	N	I%YR	PV	PMT	FV
GIVEN	10		-95	2.25	100
SOLVE FOR					

b) Convert the sab yield from the 10 year semi-annual bond above to an ab yield so we can compare the two bonds. Which is "cheaper" (higher yield)?
