

Problem set I W DUE IN CLASS WEDNESDAY OCTOBER 15

Ground rules: The “recommended problems” from the book (RWJ or BKM) and listed in the lecture notes are for practice, and are not to be turned in. The questions in Problem Sets I, II, III and IV are at or sometimes above the level of the book problems. These problems are to be turned in. Although you may discuss these problems with others, you should calculate everything yourself (just to make sure that you can get your calculator to give the same answers that everyone else is getting). Your solutions must be written up by yourself: you must turn in the original. If you won’t be in class on the day the problem set is due, you can fax me a pdf, and turn in the original at the next meeting.

1. Ten years ago, an investor put \$10,000 into an investment paying 7%. Today, she plans to roll over the investment for eight more years, but the available interest rate is 5%. How much will she have at the end of eight years?
 For the first 10 years: 10,000 PV; 10 N; 7 I/YR → FV=19,671.51
 For the next 8 years: 19,671.51 PV; 8 N; 5 I/YR → FV=29,063.78
2. Multicorp is trying to finance an equipment sale. The cash price of the machine (today) is \$1,000,000. Their customer, Newey, has asked for financing in the form of a ten-year loan (with equal payments at the end of each year) at 8.5%.

- a. What is the amount of the payment on the loan?
 1,000,000 PV; 10 N; 8.5 I/YR → PMT=152,408
- b. What are the first four payments if the loan is structured as a constant amortization loan?
 1,000,000/10 = 100,000 (i.e., 100,000 is the amortization each year) We get the interest component of the payment from

Year	Start Balance	Interest @ 8.5%	Amortization	Total	
1	1,000,000	85,000	100,000	185,000	
2	900,000	76,500	100,000	176,500	
3	800,000	68,000	100,000	168,000	
4	700,000	59,500	100,000	159,500	
...					

3. I can buy red ABC commercial paper with a nine-month maturity for 97.0 (percent of par). [For example, if the face (par) value is \$100, I pay \$97, and at maturity I receive \$100.] What is the percent return over the holding period? What are the APR and EAR of the investment?
 The growth in the investment is $(100-97)/97 = 3.09\%$ This is the start-to-finish (holding period) return
 The APR is $3.09\% \times 4/3 = 4.12\%$ with compounding every nine months. I.e., there are 4/3 compounding periods per year. On the calculator, you can’t set P/YR to a fractional value. So we have to do something else. There are a couple of ways of getting the EAR.

First, $(1.0309)^{4/3} = (1.0309)^{1.33333} = 1 + \text{EAR} \rightarrow \text{EAR} = 4.14\%$

OR, suppose that we have one dollar on deposit for 4 9-month periods.

The FV is $(1.0309)^4 = 1.1294$. But this is 36 months (3 years), so to get the EAR,

1 P/YR; -1 PV; 1.1294 FV; 3 N \rightarrow I/YR = 4.14%

4. Arthur bought 1900 shares of SPQR at a price of \$140. It was a margin trade: with an initial margin of 50%, he put up the minimum amount of cash.

- a. If the maintenance margin is 30%, verify that Arthur will get a margin call when the stock price drops below \$100.

Arthur borrowed an amount equal to half value of the stock ($1900 \times 140 / 2 = \$133,000$) and contributed an identical amount of cash (his net worth). The price at which he'll get a margin call is P where $.30 = (1900P - 133,000) / 1900P \rightarrow 570P = 1900P - 133,000 \rightarrow 1,330P = 133,000 \rightarrow P = 100$.

- b. Arthur has no cash to meet a margin call. The broker knows this and will close out (sell) Arthur's entire position immediately when the maintenance margin is violated. The bid side of the limit order book in SPQR looks like this:

Bid	Shares
\$100.00	100
\$99.50	300
\$99.20	800
\$89.20	700
\$88.00	300
\$86.00	100

A market sell order arrives for 200 shares. What is the new bid after this order executes? What is bid after Arthur's broker sells his position using market orders?

The sell order will hit the bid side of the book. 100 shares will trade @ \$100, but the next 100 sh will have to go to the next (lower) price: 100 shares will trade @ 99.50. At this point, the best bid is \$99.50 and the book looks like this:

Bid	Shares
\$99.50	200
\$99.20	800
\$89.20	700
\$88.00	300
\$86.00	100

Since the 100 per share threshold has been crossed, the broker will sell Arthur's 1900 shares. This will go through the book, leaving the best bid at 88:

Bid	Shares
\$88.00	100
\$86.00	100