SOLUTIONS TO PRACTICE EXERCISES LECTURE 2

Solution Q1:

This question is about valuing decisions.

Stock bonus = 120 × $58 = $6,960

Cash bonus = $5,700

Since you can sell the stock for $6,960 in cash today, its value is $6,960 which is higher than the cash bonus.

To answer the questions: In this case, the form of the bonus you should choose is the stock bonus and its value is $6,960.

Solution Q2:

This question is about arbitrage and the law of one price

We can trade one share of Nokia stock (NOK) for $5.76 per share in the U.S. and €5.24 per share in Helsinki (NOKIV). By the Law of One Price, these two competitive prices must be the same at the current exchange rate. Therefore, the exchange rate must be:

$$\frac{\$5.76/\text{share}}{€5.24/\text{share}} = \$1.0992/€$$

Solution Q3:

This questions relates to: arbitrage, interest rate, PV

The PV of the security's cash flow is ($154 in one year)/(1 + r), where r is the one-year risk-free interest rate. If there are no arbitrage opportunities, this PV equals the security's price of $137 today.

Therefore,

$137 today = ($154 in one year) / (1 + r)

r = 154 / 137 – 1 = 12.41%

Solution Q4:

This question makes use of the concepts of NPV and perpetuity.

a. To decide whether to build the machine you need to calculate the NPV. The cash flows the machine generates (C = \$900) are a perpetuity, so by the PV of a perpetuity formula:

   PV = 900 / 0.095 = \$9,473.68

   Thus, NPV = –9,000 + 9,473.68 = \$473.68 > 0. He should build it.

b. The cash flows the machine generates are a perpetuity with first payment at year 2. Computing the PV of perpetuity at *year 1* gives:

   PV_1 = 900 / 0.095 = \$9,47**3**.68

   The value today is: PV_0 = 9,47**3**.68 / 1.095 = \$8,651.77

   Thus, NPV = –9,000 + 8,651.77 = –\$348.23 < 0. He should not build the machine.

Solution Q5:

Q5 is about growing perpetuity.

a. Using the formula for the PV of a growing perpetuity:

$$PV = \left(\frac{2,000}{0.15 - 0.08}\right) = \$28,571.43$$

b. After the first payment is made, that means the cash flow will be \$2,000(1+0.8)

   Again, using the formula for the PV of a growing perpetuity:

$$PV = \frac{2,000(1.08)}{0.15 - 0.08} = \$30,857.14$$

Solution Q6:

This question is an application of growing perpetuity with a negative growth rate.

We must value a growing perpetuity with a *negative* growth rate of –0.04:

$$PV = \frac{4,000}{0.1 - (-0.04)} = \$28,571.43$$

Solution Q7:

This question applies the concept of annuity.

$$C = \frac{250,000 - 36,000}{\frac{1}{0.05}\left(1 - \frac{1}{1.05^{30}}\right)} = \$13,921.01$$

Solution Q8:

This question consists of two parts:

(1) A growing annuity for 5 years;

(2) A growing perpetuity after 5 years.

First we find the PV of (1) where the growing annuity:

$$PV_{GA} = \frac{5(1.4)}{0.07 - 0.4}\left(1 - \left(\frac{1.4}{1.07}\right)^5\right) = \$60.128 \text{ million.}$$

Now we calculate the PV of (2). In year 5, the cash flow is $5(1.4)^5(1.03)$ The value at year 5 of the growing perpetuity is

$$PV_5 = \frac{5(1.4)^5(1.03)}{0.07 - 0.03} = \$692.448 \text{ million} \Rightarrow PV_0 = \frac{692.448}{(1.07)^5} = \$493.706 \text{ million.}$$

Adding the present value of (1) and (2) together gives the PV value of future earnings:

PV = 60.128 + 493.706 = $553.83 million

Solution Q9:

This question can be solved using EAR.

For an account that pays 9% every 18 months for three years, the EAR is:

$(1+9\%)^{\frac{12}{18}} - 1 = 5.91\% < 6\%$. Thus, the 6% per year option is preferred.

Solution Q10:

This question shows you an application of the real interest rate.

r= 7.98%-12.26%/1.1226 = -3.81%

The purchasing power of your savings declined by 3.81% over the year.

Solution Q11:

This question relates to NPV and IRR

$$NPV = -290,000 + \left(\frac{1,070,000}{1.21^8}\right) = -\$57,137$$

$$IRR = \left(\frac{1,070,000}{290,000}\right)^{1/8} - 1 = 17.73\%$$

NPV is negative and IRR<21% so both NPV and IRR indicate that you should not undertake the project.

Solution Q12:

In order to answer this question, we use the profitability index = NPV / cost. Then, we buy as many high-profitability-index bunches as possible, and move on to the next flowers in terms of profitability index, until we have exhausted the budget:

	NPV per bunch	Cost per bunch	Max. bunches	Profitability index	Rank	Max. investment
Roses	$2.00	$15.00	25	0.13	4	$375.00
Lilies	$9.00	$24.00	10	0.38	1	$240.00
Pansies	$6.00	$31.00	10	0.19	3	$310.00
Orchids	$20.00	$84.00	5	0.24	2	$420.00

Natasha should purchase $240 of lilies (10 bunches), $420 of orchids (5 bunches), and $310 of pansies (10 bunches), which exhausts her $970 budget.