Section 9.2 HW solutions

Problem	Ans	Reason
1	$\frac{10000}{(1.05)^{10}}$	P = present value $P(1.05)^{10} = 10\,000$ $P = \frac{10\,000}{(1.05)^{10}}$ $[\ P \simeq 6139.13\ ]$
2	$\frac{10000}{(1.0125)^{40}}$	P = present value $P\left(1 + \frac{.05}{4}\right)^{40} = 10\,000$ $\frac{.05}{4} = .0125$ $P = \frac{10\,000}{(1.0125)^{40}}$ $[\ P \simeq 6084.13\ ]$

Problem	Ans	Reason
3	$\frac{1000}{(1.015)^{20}}$	P = present value

$$P\left(1+\frac{.06}{4}\right)^{20}=1000$$

$5 \cdot 4 = 20$

$\frac{.06}{4} = .015$

$$P=\frac{1000}{(1.015)^{20}}$$

$$\left[\quad P \simeq 742.47 \quad\right]$$

4	$\frac{10\,000}{(1.04)^{20}}$	P = present value

$$P\left(1+\frac{.08}{2}\right)^{20}=10\,000$$

$$P=\frac{10\,000}{(1.04)^{20}}$$

$$\left[\quad P \simeq 4563.87 \quad\right]$$

Problem	Ans	Reason
5	$\frac{1000}{1.05625}$	let P = amt borrower received 9 mo is $\frac{3}{4}$ year 9 mo interest rate is $\frac{3}{4}$ 7.5 = 5.625 $P(1.05625) = 1000$ $P = \frac{1000}{1.05625}$ $[\ P \simeq 946.75\ ]$
6	$\frac{4000}{(1.02)^6}$	Let P = amt borrowed 18 mo = 6 quarters quarterly interest rate is $\frac{.08}{4} = .02$ $P(1.02)^6 = 4000$ $P = \frac{4000}{(1.02)^6}$ $[\ P \simeq 3551.89\ ]$

Problem	Ans	Reason
7	More cash for option 2	option: 1 — 2 cash payment: $\frac{1000}{(1+\frac{.09}{4})^4}$ — $\frac{1200}{(1+\frac{.10}{4})^8}$ $[\simeq 914.84]$ — $[\simeq 984.90]$
8	40.53	option: 1 — 2 Mike receives: $\frac{5000}{(1.075)^2}$ — $\frac{5000}{(1.07)^2}$ $[\simeq 4326.66]$ — $[\simeq 4367.19]$ $4367.19 - 4326.66 = 40.53$

Problem	Ans	Reason

9

(a) $1200\,\frac{(1.04)^8-1}{.04}$

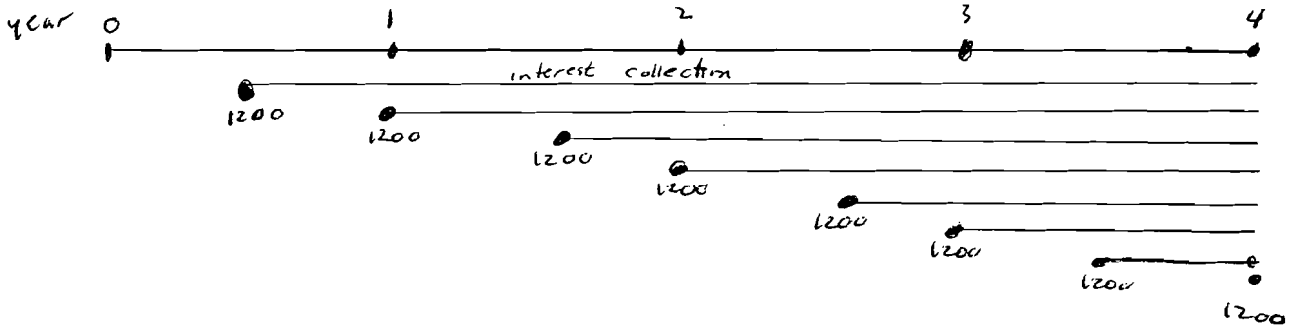
semi annual interest rate is 4%

$$amt = 1200(1.04)^7 + 1200(1.04)^6 + \cdots + 1200(1.04)^1 + 1200(1.04)^0$$

$$= 1200\,\frac{(1.04)^8-1}{1.04-1}$$

$$= 1200\,\frac{(1.04)^8-1}{.04}$$

$$\left[\simeq 11057.07\right]$$



(b) $600\,\frac{(1.02)^{16}-1}{.02}$

quarterly interest rate is $\frac{.08}{4} = .02$

$$amt = 600(1.02)^{15} + 600(1.02)^{14} + \cdots 600$$

$$= 600\,\frac{(1.02)^{16}-1}{.02}$$

$$\left[\simeq 11183.57\right]$$

Problem	Ans	Reason
10	(a)	

$$12000(1.06)^4 + 12000(1.06)^3 + \cdots + 12000(1.06)^0$$

$$= 12000 \frac{(1.06)^5 - 1}{.06}$$

$$\left[\simeq 67645.12 \right]$$

(b)

monthly payments is $5 \cdot 12 = 60$

monthly interest is $\frac{.06}{12} = .005$

$$1000(1.005)^{59} + \cdots + 1000(1.005)^0$$

$$= 1000 \frac{(1.005)^{60} - 1}{.005}$$

$$\left[\simeq 69770.03 \right]$$

No. 9.2

Date 7

Problem	Ans	Reason
11	(a) $\frac{1200}{1.04} + \frac{1200}{(1.04)^2} + \cdots + \frac{1200}{(1.04)^8}$	
	$= \frac{1200}{(1.04)^8} \quad \frac{(1.04)^8 - 1}{.04}$	
	$\left[\simeq 8079.29 \right]$	
	(b) $\frac{600}{(1.02)^{16}} \quad \frac{(1.02)^{16} - 1}{.02}$	
	$\left[\simeq 8146.63 \right]$	

Problem	Ans	Reason
12	(a) $\frac{12000}{(1.06)^5} \frac{(1.06)^5 - 1}{.06}$ $\left[\simeq 50548.37 \right]$	
	(b) $\frac{1000}{(1.005)^{60}} \frac{(1.005)^{60} - 1}{.005}$ $\left[\simeq 51725.56 \right]$	

Problem	Ans	Reason
13		

$$Amt = 10\,\frac{(1.001)^{128}-1}{.001}$$

$$\left[\simeq 1364.80\right]$$

Pres value is

$$\frac{10}{(1.001)^{128}}\,\frac{(1.001)^{128}-1}{.001}$$

$$\left[\simeq 1200.90\right]$$

Problem	Ans	Reason

14

Cash price is present value of the implicit annuity

Call it P

$$P - 4000 = \frac{200\left(\left(1+\frac{.08}{12}\right)^{48}-1\right)}{\left(1+\frac{.08}{12}\right)^{48}\ \ .08/12}$$

(monthly interest rate $\frac{.08}{12}$)

$$\left[\ P \simeq 12192.38\ \right]$$

15

P = cash price of car

$$P = 49 + \frac{166.36}{\left(1+\frac{.0825}{12}\right)^{48}}\ \frac{\left(1+\frac{.0825}{12}\right)^{48}-1}{\frac{.0825}{12}}$$

$$\left[\ P \simeq 6830.78\ \right]$$

Problem	Ans	Reason

16

P = cash price

$$P = 500 + \frac{286.68}{\left(1 + \frac{.0695}{12}\right)^{60}} \cdot \frac{\left(1 + \frac{.0695}{12}\right)^{60} - 1}{\frac{.0695}{12}}$$

$$\left[\quad P \simeq \quad 14995.17 \quad \right]$$

17

Present value of two loans is

$$\frac{5000}{\left(1 + \frac{.09}{2}\right)^{6}} + \frac{3000}{\left(1 + \frac{.09}{2}\right)^{18}}$$

After 5 years this becomes

$$\left(1 + \frac{.09}{2}\right)^{10} \left(\frac{5000}{\left(1 + \frac{.09}{2}\right)^{6}} + \frac{3000}{\left(1 + \frac{.09}{2}\right)^{18}} \right)$$

$$\left[\quad \simeq \quad 8072.15 \quad \right]$$

Problem | Ans | Reason

18

Present value of 3 Loans is

$$\frac{100\,000}{1.1} + \frac{200\,000}{(1.1)^2} + \frac{300\,000}{(1.1)^3}$$

In 5 years this becomes

$$(1.1)^5 \left(\frac{100\,000}{1.1} + \frac{200\,000}{(1.1)^2} + \frac{300\,000}{(1.1)^3} \right)$$

$$\left[\simeq 775610.00 \right]$$

19

R = interest rate

Require

$$4800 = 1000 + \frac{4600}{(1+R)^2}$$

$$3800 = \frac{4600}{(1+R)^2}$$

$$(1+R)^2 = \frac{46}{38}$$

$$R = \left(\frac{46}{38}\right)^{\frac{1}{2}} - 1$$

$$\left[R \simeq .10024 \right]$$

about 10%

Problem	Ans	Reason
20		

R = annual interest rate

Require

$$16\,695 = 10\,000 + \frac{10\,000}{(1+R)^3}$$

So

$$6695 = \frac{10000}{(1+R)^3}$$

$$(1+R)^3 = \frac{10\,000}{6695}$$

$$R = \left(\frac{10\,000}{6695}\right)^{1/3} - 1$$

$$\boxed{\begin{aligned} R &\simeq .143097 \\ \text{ie} &\simeq 14.31\,\% \end{aligned}}$$

Problem	Ans	Reason

21

R = interest rate (annual)

Require

$$800\left(1+R\right)^5 = 1000$$

$$\left(1+R\right)^5 = \frac{1000}{800} = \frac{10}{8} = \frac{5}{4}$$

$$1+R = \left(\frac{5}{4}\right)^{1/5}$$

$$R = \left(\frac{5}{4}\right)^{\frac{1}{5}} - 1$$

$$\left[\quad R \doteq .04564 \quad \text{about } 4.564\% \quad\right]$$

22

$$R = \left(\frac{5}{4}\right)^{\frac{1}{4}} - 1$$

$$\left[\quad R \doteq .05737 \quad \text{about } 5.737\% \quad\right]$$

Problem	Ans	Reason

23

P = offering price

$$P(1.06)^5 = 1000$$

$$P = \frac{1000}{(1.06)^5}$$

$$\left[P \simeq 747.26 \right]$$

24

$$8500(1+R)^4 = 10000$$

$$(1+R)^4 = \frac{10000}{8500} = \frac{100}{85}$$

$$1+R = \left(\frac{100}{85}\right)^{1/4}$$

$$R = \left(\frac{100}{85}\right)^{\frac{1}{4}} - 1$$

$$\left[\begin{array}{l} R \simeq .04146 \\ \text{about } 4.146\% \end{array} \right]$$

Problem	Ans	Reason
25	(a)	X = offer price Y = redemption value $X(1.08)^8 = Y$ $\frac{X}{Y} = \frac{1}{(1.08)^8}$ $\left[\simeq .540269 \right.$ $\left. \text{about } 54\% \right]$
	(b)	Z = sale price after 1 year $X = 10000$ $Y = 10000(1.08)^8$ $Z(1.07)^7 = Y$ $Z = \frac{10000(1.08)^8}{(1.07)^7}$ $\text{Profit} = Z - 10000$ $= 10000\left(\frac{(1.08)^8}{(1.07)^7} - 1\right)$ $\left[\simeq 1526.66 \right]$
	(c)	$\frac{1526.66}{10000} = .152666$ or 15.2664%

Problem	Ans	Reason
26	Profit of about $456.39	Z = sale price after 1 year

$$Z(1.085)^7 = Y$$

$$Y = X(1.08)^8$$

$$X = 10000$$

$$Z = 10000 \frac{(1.08)^8}{(1.085)^7}$$

$$\text{Profit} = Z - 10000$$

$$= 10000 \left(\frac{(1.08)^8}{(1.085)^7} - 1 \right)$$

$$\left[\approx 456.392 \right]$$

Problem	Ans	Reason
27		quarterly interest rate is $\frac{.06}{4} = .015$

Deposit amount is

$$\frac{2000}{1.015} + \frac{2000}{(1.015)^2} + \cdots + \frac{2000}{(1.015)^{40}}$$

$$= \frac{2000}{(1.015)^{40}} \quad \frac{(1.015)^{40} - 1}{.015}$$

$$\left[\simeq 59831.69 \right]$$

28

$$\frac{2000}{(1.02)^{40}} \quad \frac{(1.02)^{40} - 1}{.02}$$

$$\left[\simeq 54710.96 \right]$$

Problem	Ans	Reason
29	Cheaper to Lease	Buy option: present value of cost is

$$1{,}200{,}000 - \frac{100000}{(1.02)^{40}} + 150000$$

$$\left[\approx 1304710.96 \right]$$

Lease is \$45000 / quarter

Lease option: present value of cost is

$$45000 + \frac{45000}{1.02} + \frac{45000}{(1.02)^2} + \cdots \frac{45000}{(1.02)^{39}}$$

$$= \frac{45000}{(1.02)^{39}} \quad \frac{(1.02)^{40} - 1}{.02}$$

$$\left[\approx 1255616.50 \right]$$

Problem	Ans	Reason
30	Lease option is better	Buy option: present value of cost is

$$1000\,000 + 24000 + \frac{24000}{1.1} + \cdots + \frac{24000}{(1.1)^4} - \frac{500\,000}{(1.1)^5}$$

$$\left[\approx 789616.11 \right]$$

Lease option: present value of cost is

$$120000 + \frac{120000}{1.1} + \cdots \frac{120000}{(1.1)^4}$$

$$\left[\approx 500\,383.85 \right]$$