Chapter 14

Effects of Inflation

Solutions to Problems

14.1 Inflated dollars are converted into constant value dollars by dividing by one plus the inflation rate per period for however many periods are involved.

14.2 Something will double in cost in 10 years when the value of the money has decreased by exactly one half. Thus:

$$(1 + f)^{10} = 2$$
$$(1 + f) = 2^{0.1}$$
$$= 1.0718$$
$$f = 7.2\% \text{ per year}$$

14.3 (a) Cost in then-current dollars = $106{,}000(1 + 0.03)^2$
$= \$112{,}455$

(b) Cost in today's dollars = \$106,000

14.4 Then-current dollars = $10{,}000(1 + 0.07)^{10}$
$= \$19{,}672$

14.5 Let CV = current value
$CV_0 = 10{,}000/(1 + 0.07)^{10}$
$= \$5083.49$

14.6 Find inflation rate and then convert dollars to CV dollars:
$$0.03 + f + 0.03(f) = 0.12$$
$$1.03f = 0.09$$
$$f = 8.74\%$$
$CV_0 = 10{,}000/(1 + 0.0874)^{10}$
$= \$4326.20$

14.7 CV_0 for amt in yr 1 = $13{,}000/(1 + 0.06)^1$
$= \$12{,}264$

CV_0 for amt in yr 2 = $13{,}000/(1 + 0.06)^2$
$= \$11{,}570$

CV_0 for amt in yr 3 = $13{,}000/(1 + 0.06)^3$
$= \$10{,}915$

14.8 Number of future dollars = $2000(1 + 0.05)^5$
= $2552.56

14.9 Cost = $21,000(1 + 0.028)^2$ = $22,192

14.10 (a) At a 56% increase, $1 would increase to $1.56. Let x = annual increase.

$1.56 = (1 + x)^5$
$1.56^{0.2} = 1 + x$
$1.093 = 1 + x$
x = 9.3% per year
(b) Amount greater than inflation rate: 9.3 – 2.5 = 6.8% per year

14.11 $55,000 = 45,000(1 + f)^4$
$(1 + f) = 1.222^{0.25}$
f = 5.1% per year

14.12 (a) The market interest rate is higher than the real rate during periods of inflation
(b) The market interest rate is lower than the real rate during periods of deflation
(c) The market interest rate is the same as the real rate when inflation is zero

14.13 $i_f = 0.04 + 0.27 + (0.04)(0.27)$
= 32.08% per year

14.14 $0.15 = 0.04 + f + (0.04)(f)$
$1.04f = 0.11$
f = 10.58% per year

14.15 i_f per quarter = 0.02 + 0.05 + (0.02)(0.05)
= 7.1% per quarter

14.16 For this problem, i_f = 4% per month and i = 0.5% per month

$0.04 = 0.005 + f + (0.005)(f)$
$1.005f = 0.035$
f = 3.48% per month

14.17 $0.25 = i + 0.10 + (i)(0.10)$
$1.10i = 0.15$
i = 13.6% per year

14.18 Market rate per 6 months = 0.22/2 = 11%
$0.11 = i + 0.07 + (i)(0.07)$
$1.07i = 0.04$
i = 3.74% per six months

14.19 Buying power = $1{,}000{,}000/(1 + 0.03)^{27}$
= \$450,189

14.20 (a) Use i = 10%
F = 68,000(F/P,10%,2)
= 68,000(1.21)
= \$ 82,280

Purchase later for \$81,000

(b) Use $i_f = 0.10 + 0.05 (0.10)(0.05)$
F = 68,000(F/P,15.5%,2)
$= 68{,}000(1 + 0.155)^2$
= 68,000(1.334)
= \$90,712

Purchase later for \$81,000

14.21 Find present worth of all three plans:
Method 1: PW_1 = \$400,000
Method 2: $i_f = 0.10 + 0.06 + (0.10)(0.06) = 16.6\%$
PW_2 = 1,100,000(P/F,16.6%,5)
= 1,100,000(0.46399)
= \$510,389
Method 3: PW_3 = 750,000(P/F,10%,5)
= \$750,000(0.6209)
= \$465,675

Select payment method 2

14.22 (a) PW_A = -31,000 – 28,000(P/A,10%,5) + 5000(P/F,10%,5)
= -31,000 – 28,000(3.7908) + 5000(0.6209)
= \$-134,038

PW_B = -48,000 – 19,000(P/A,10%,5) + 7000(P/F,10%,5)
= -48,000 – 19,000(3.7908) + 7000(0.6209)
= \$-115,679

Select Machine B

(b) $i_f = 0.10 + 0.03 + (0.10)(0.03) = 13.3\%$
PW_A = -31,000 – 28,000(P/A,13.3%,5) + 5000(P/F,13.3%,5)
= -31,000 – 28,000(3.4916) + 5000(0.5356)
= \$-126,087

$PW_B = -48,000 – 19,000(P/A,13.3\%,5) + 7000(P/F,13.3\%,5)$
$= -48,000 – 19,000(3.4916) + 7000(0.5356)$
$= \$-110,591$

Select machine B

14.23 $i_f = 0.12 + 0.03 + (0.12)(0.03) = 15.36\%$

$CC_X = -18,500,000 – 25,000/0.1536$
$= \$-18,662,760$

For alternative Y, first find AW and then divide by i_f

$AW_Y = -9,000,000(A/P,15.36\%,10) – 10,000 + 82,000(A/F,15.36\%,10)$
$= -9,000,000(0.20199) – 10,000 + 82,000(0.0484)$
$= \$-1,823,971$

$CC_Y = 1,823,971/0.1536$
$= \$-11,874,811$

Select alternative Y

14.24 Use the inflated rate of return for Salesman A and real rate of return for B

$i_f = 0.15 + 0.05 + (0.15)(0.05) = 20.75\%$

$PW_A = -60,000 – 55,000(P/A,20.75\%,10)$
$= -60,000 – 55,000(4.0880)$
$= \$-284,840$

$PW_B = -95,000 – 35,000(P/A,15\%,10)$
$= -95,000 – 35,000(5.0188)$
$= \$-270,658$

Recommend purchase from salesman B

14.25 (a) New yield = 2.16 + 3.02
= 5.18% per year

(b) Interest received = 25,000(0.0518/12)
= \$107.92

14.26 (a) F = 10,000(F/P,10%,5)
= 10,000(1.6105)
= $16,105

(b) Buying Power = $16,105/(1 + 0.05)^5$
= $12,619

(c) $i_f = i + 0.05 + (i)(0.05)$
$0.10 = i + 0.05 + (i)(0.05)$
$1.05i = 0.05$
$i = 4.76\%$

or use Equation [14.9]

$i = (0.10 – 0.05)/(1 + 0.05)$
$= 4.76\%$

14.27 (a) Cost = 45,000(F/P,3.7%,3)
= 45,000(1.1152)
= $50,184

(b) P = 50,184(P/F,8%,3)
= 50,184(0.7938)
= $39,836

14.28 740,000 = 625,000(F/P,f,7)
(F/P,f,7) = 1.184
$(1 + f)^7 = 1.184$
f = 2.44% per year

14.29 Buying power = $1,500,000/(1 + 0.038)^{25}$
= $590,415

14.30 $i_f = 0.15 + 0.04 + (0.15)(0.04) = 19.6\%$

PW of buying now is $80,000

PW of buying later = 128,000(P/F,19.6%,3)
= 128,000(0.5845)
= $74,816

Buy 3-years from now

14.31 In constant-value dollars, cost will be $40,000.

14.32 In *constant-value dollars*

$$\begin{aligned}\text{Cost} &= 40{,}000(F/P,5\%,3)\\ &= 40{,}000(1.1576)\\ &= \$46{,}304\end{aligned}$$

14.33 In then-current dollars for f = - 1.5%

$$\begin{aligned}F &= 100{,}000(1 - 0.015)^{10}\\ &= 100{,}000(0.85973)\\ &= \$85{,}973\end{aligned}$$

14.34 Future amount is equal to a return of i_f on its investment

$$i_f = (0.10 + 0.04) + 0.03 + (0.1 + 0.04)(0.03) = 17.42\%$$

$$\begin{aligned}\text{Required future amt} &= 1{,}000{,}000(F/P,17.42\%,4)\\ &= 1{,}000{,}000(1.9009)\\ &= \$1{,}900{,}900\end{aligned}$$

Company will get more; make the investment

14.35 (a) $653{,}000 = 150{,}000(F/P,f,95)$

$$4.3533 = (1 + f)^{95}$$

f = 1.56% per year

(b) Total of 14 years will pass.

$$\begin{aligned}F &= 653{,}000(1 + 0.035)^{14}\\ &= 653{,}000(1.6187)\\ &= \$1{,}057{,}011\end{aligned}$$

14.36 $F = P[(1 + i)(1 + f)(1 + g)]^n$

$$\begin{aligned}&= 250{,}000[(1 + 0.05)(1 + 0.03)(1 + 0.02)]^5\\ &= 250{,}000(1.6336)\\ &= \$408{,}400\end{aligned}$$

14.37 $i_f = 0.15 + 0.06 + (0.15)(0.06) = 21.9\%$

$$\begin{aligned}AW &= 183{,}000(A/P,21.9\%,5)\\ &= 183{,}000(0.34846)\\ &= \$63{,}768\end{aligned}$$

14.38 (a) In constant value dollars, use i = 12% to recover the investment

$$AW = 40{,}000{,}000(A/P,12\%,10)$$
$$= 40{,}000{,}000(0.17698)$$
$$= \$7{,}079{,}200$$

(b) In future dollars, use i_f to recover the investment

$$i_f = 0.12 + 0.07 + (0.12)(0.07) = 19.84\%$$

$$AW = 40{,}000{,}000(A/P,19.84\%,10)$$
$$= 40{,}000{,}000(0.23723)$$
$$= \$9{,}489{,}200$$

14.39 Use market interest rate (i_f) to calculate AW in then-current dollars

$$AW = 750{,}000(A/P,10\%,5)$$
$$= 750{,}000(0.26380)$$
$$= \$197{,}850$$

14.40 Find amount needed at 2% inflation rate and then find A using market rate.

$$F = 15{,}000(1 + 0.02)^3$$
$$= 15{,}000(1.06121)$$
$$= \$15{,}918$$

$$A = 15{,}918(A/F,8\%,3)$$
$$= 15{,}918(0.30803)$$
$$= \$4903$$

14.41 (a) Use *f* rate to maintain purchasing power, then find A using market rate.

$$F = 5{,}000{,}000(F/P,5\%,4)$$
$$= 5{,}000{,}000(1.2155)$$
$$= \$6{,}077{,}500$$

(b) $A = 6{,}077{,}500(A/F,10\%,4)$
$$= 6{,}077{,}500(0.21547)$$
$$= \$1{,}309{,}519$$

14.42 (a) Use i_f (market interest rate) to find AW.

$$AW = 50{,}000(0.08) + 5000 = \$9000$$

(b) For CV dollars, first find P using i (real interest rate); then find A using i_f

14.43 (a) For CV dollars, use i = 12% per year

$AW_A = -150,000(A/P,12\%,5) – 70,000 + 40,000(A/F,12\%,5)$
$= -150,000(0.27741) – 70,000 + 40,000(0.15741)$
$= \$-105,315$

$AW_B = -1,025,000(0.12) – 5,000$
$= \$-128,000$

Select Machine A

(b) For then-current dollars, use i_f

$i_f = 0.12 + 0.07 + (0.12)(0.07) = 19.84\%$

$AW_A = -150,000(A/P,19.84\%,5) – 70,000 + 40,000(A/F,19.84\%,5)$
$= -150,000(0.3332) – 70,000 + 40,000(0.1348)$
$= \$-114,588$

$AW_B = -1,025,000(0.1984) – 5,000$
$= \$-208,360$

Select Machine A

FE Review Solutions

14.44 $i_f = 0.12 + 0.07 + (0.12)(0.07) = 19.84\%$

Answer is (d)

14.45 Answer is (c)

14.46 Answer is (d)

14.47 Answer is (b)

14.48 Answer is (c)

14.49 Answer is (a)

Extended Exercise Solution

1. Find overall i* = 5.90%.

2. $i_f = 11.28\%$
   F = 25,000(F/P,11.28%,3) – 1475(F/A,11.28%,3)

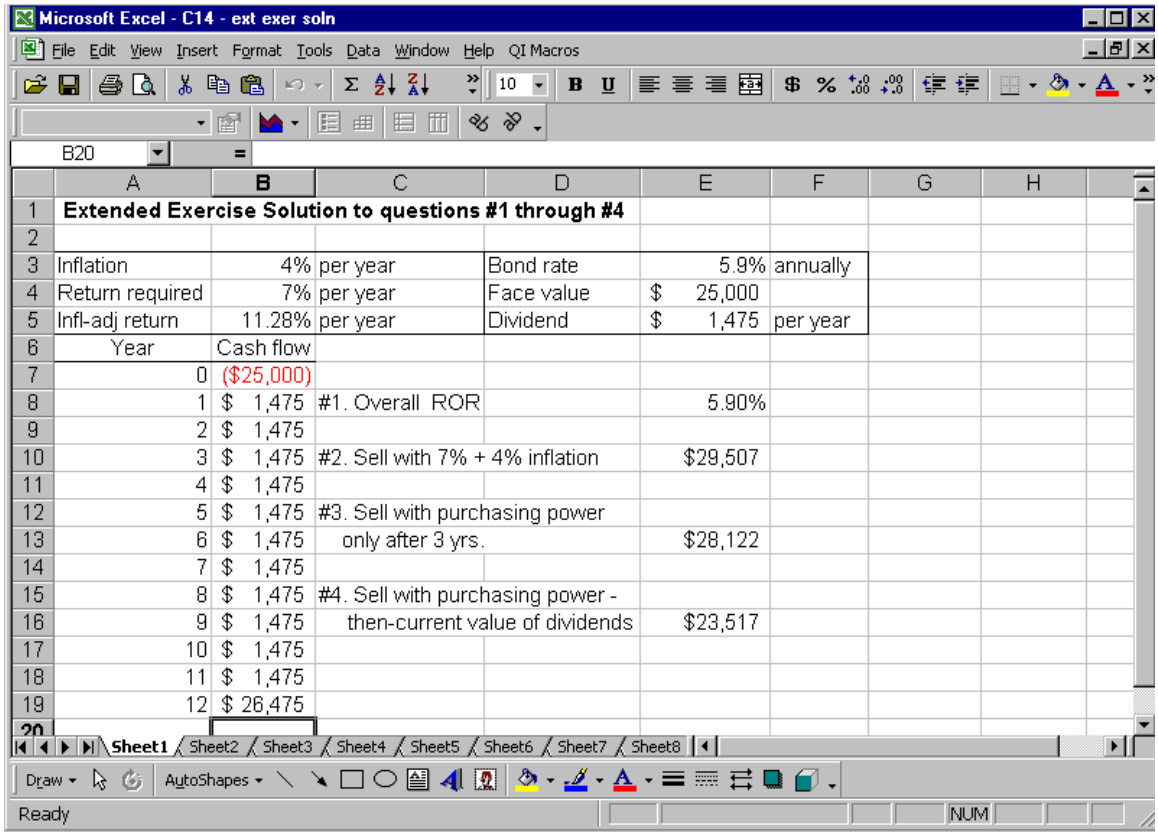
3. F = 25,000(F/P,4%,3)

4. Subtract the future value of each payment from the bond face value 3 years from now. Both amounts take purchasing power into account.

   $F = 25{,}000(F/P,4\%,3) - 1475[(1.04)^2 + (1.04) + 1] = \$23{,}517$

   In Excel, this can be written as:

   FV(4%,3,1475,–25000) = $23,517



5. Use SOLVER to find the purchase price (B7) at 11.28% (E8).

Microsoft Excel - C14 - ext exer soln

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A21 =

	A	B	C	D	E	F	G	H
1	**Extended Exercise Solution for question #5**							
2								
3	Inflation	4%	per year	Bond rate	5.9%	annually		
4	Return required	7%	per year	Face value	$ 25,000			
5	Infl-adj return	11.28%	per year	Dividend	$ 1,475	per year		
6	Year	Cash flow						
7	0	($16,383)						
8	1	$ 1,475	#1. Overall	ROR	11.28%			
9	2	$ 1,475						
10	3	$ 1,475						
11	4	$ 1,475						
12	5	$ 1,475						
13	6	$ 1,475						
14	7	$ 1,475						
15	8	$ 1,475						
16	9	$ 1,475						
17	10	$ 1,475						
18	11	$ 1,475	#5. Purchase price to make		$ 16,383	(by Solver)		
19	12	$ 26,475	return + inflation					
20								
21								

Sheet1 Sheet2 Sheet3 Sheet4 Sheet5 Sheet6 Sheet7 Sheet8

Draw AutoShapes