HOMEWORK 2 SOLUTION

Problem 1:

1.) Monthly payment?

n = 25x12 or 300
i = 6% per year
PV = $100,000
FV = 0
Solve for payment: PMT= $644.30

2.) Month 1:

Interest payment: $100,000 x (6%/12) = $500

Principal payment: $644.30 **-** $500 = $144.30

3.) Entire 25 Year Period:

Total payments: $644.30 x 300 = $193,290.42

Total principal payment: $100,000

Total interest payments: $193,290.42 **-** $100,000 = $93,290.42

4.) Outstanding loan balance if repaid at end of 5 years = $89,932.09, as presented below using FV method.

n = 60 (pay off period)
i = 6% per year
PMT = $644.30
PV = $100,000

Solve for FV: FV = $89,932.09

5.) Through 5 years:

Total payments: $644.30 x 60 = $38,658.08

Total principal payment (principal reduction): $100,000 – $89,932.09 = $10,067.91

Total interest payment: $$38,658.08 - $10,067.91= $28,590.17

6.) Step 1, Solve for loan balance at the end of month 59 using PV method:

n = 300 **-** 59 = 241
i = 6% per year
PMT = $644.30
FV= 0

Solve for loan balance: PV = $90,125.76

Step 2, Solve for the interest payment at month 60:

Interest payment: $90,125.76 x (.06/12) = $450.63

Principal payment: $644.30 - $450.63 = $193.67

Problem 2:

1.) Monthly Payment PMT?

n = 20 x 12 = 240
i = 5% per year
PV = $150,000
FV = 0

Solve for payment: PMT = $989.93

2.) Outstanding loan balance if repaid at end of year 10?

n = 120
i = 5% per year
PMT = $989.93
PV = $150,000

Solve for mortgage balance: FV = $93,332.28

Total interest collected = Total payment - (loan amount - mortgage balance)
= $989.93 x 120 - $150,000 + $93,332.28
= $62,123.88

3.) Loan balance reduced by $20,000 at the end of year 10:

Remaining balance = $93,332.28 - $20,000 = $73,332.28

The new loan maturity if payment not reduced?

i = 5% per year
PMT = - $989.93
PV = $73,332.28
FV = 0

Solve for maturity: n = 88.8 ≈ 89 months

Problem 3:

1) Annual Payments?

n = 10
i = 8% per year
PV = - $3,000,000
FV = $1,500,000

Solve for annual payment: PMT = $343,544.23

2) Loan balance at the end of year 5?

n = 5
i = 8%
PMT = $343,544.23
FV = $1,500,000

Solve for the loan balance: PV = -$2,392,547.30

Total payment at end year 5 = Year 5 payment + loan balance
= $2,392,547.30 + $343,544.23 = $2,736,091.53

Problem 4:

1.) Loan amount = $300,000 x 80% = $240,000

Amount disbursed by the lender = $240,000 - $5,000 = $235,000

2.) Monthly payments?

n = 360
i = 6% per year
FV = 0
PV = $240,000

Monthly Payment PMT = $1,438.92

The effective interest rate if no prepayment?

n = 360
PMT = $1,438.92
FV = 0
PV = $235,000

Effective Interest rate = 6.2%

3.) Assuming the loan payoff occurs after 5 years, determine the mortgage balance:

n = 300
PMT = $1,438.92
FV = 0
I = 6% per annum

Loan balance at end of year 5 is: PV = $223,330.46

The effective interest rate would be:

n = 60
PMT = $1,438.92
PV = -$235,000
FV = $223,330.46

Effective interest rate = 6.50%

This effective interest rate is higher because the loan origination fee is amortized over a much shorter period (5 years instead of 30 years).

4.) With a prepayment penalty of 2% on the outstanding loan balance at the end year 10.

n = 120
PMT = $1,438.92
PV = -$240,000

I = 6% per annum

Loan balance at end of year 10 is: FV = $200,845.74

The effective interest cost would be:

n = 120
PMT = $1,438.92
PV = -$235,000
FV = $200,845.74 x 1.02 =

Effective interest rate i = 6.43%

Problem 5:

1.) Monthly Payments to the borrower?

n = 120
i = 8% per annum
PV =0
FV = $400,000

Solve for monthly payments: PMT = $2,186.44

2.) Balance at end year 5 if borrower receives $2,186.44 per month

n = 60
i = 8%
PV = 0
PMT = $2,186.44

Solve for loan balance: FV = $160,652.53

3.) The borrower will receive $3,000 per month for 60 months and then the maximum amount he can receive from months 61 to 120 is:

n = 60
i = 8%
PV = 0
PMT = $3,000

Solve for loan balance: FV = $220,430.57

Step 2, Solve for payments during months 61 to 120:

n = 120 – 60 = 60
i = 8% per annum
PV = - $220,430.57
FV = $400,000

Max monthly payments 611 through 120: PMT = $974.35

Problem 6

1.) Calculate constant monthly amortization: $200,000 ÷ 180 months = $1,111.11 per month

Month	Beg. Balance	Interest	Amortization	Total Payment	End Balance
1	200,000.00	2,000.00	1111.11	3,111.11	198,888.89
2	198,888.89	1,988.89	1111.11	3,100.00	197,777.78
3	197,777.78	1,977.78	1111.11	3,088.89	196,666.67
4	196,666.67	1,966.67	1111.11	3,077.78	195,555.56
5	195,555.56	1,955.56	1111.11	3,066.67	194,444.44
6	194,444.44	1,944.44	1111.11	3,055.56	193,333.33

2.) For a constant payment loan (CPM) we have:

PV = $200,000
n = 180
i = 12% per year
FV = 0

Solve PMT = $2,400.34

Month	Beg. Balance	Total Payment	Interest	Amortization	End Balance
1	200,000.00	2,400.34	2,000.00	400.34	199,599.66
2	199,599.66	2,400.34	1,996.00	404.34	199,195.32
3	199,195.32	2,400.34	1,991.95	408.38	198,786.94
4	198,786.94	2,400.34	1,987.87	412.47	198,374.47
5	198,374.47	2,400.34	1,983.74	416.59	197,957.88
6	197,957.88	2,400.34	1,979.58	420.76	197,537.13

3.) During the first year of the loan, a CAM would be less risky for the lender because it pays down the principal faster.

4.) <u>In the absence of point and origination fees</u>, the effective interest rates on both loans will be an annual rate of 12%, compounded monthly. This is true regardless of when either of the loans are repaid. Monthly payments are different, however i is the same for both loans.