Solutions to Problems - Chapter 5

Adjustable and Floating Rate Mortgage Loans

Problem 5-1

(a) Compute the payments at the beginning of each year of the PLAM.

Principal	=	$95,000	Inflation Adjustment	=	6.00%
Term	=	30 years	Points	=	6.00%
Interest Rate	=	4.0%			

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year	BOY Balance	Annual Interest Rate	Monthly Interest Rate (2)/12	Payments	Monthly Interest (3) x (1)	Monthly Amort (4) - (5)	Annual Amort	EOY Balance (1) -(7)	Inflation Adjusted EOY Balance
0	$95,000	4.00%	0.33%	$453.54	$316.67	$136.88	$1,672.98	$93,327	$98,927
1	98,927	4.00%	0.33%	480.76	329.76	151.00	1,845.61	97,081	102,906
3	102,906	4.00%	0.33%	509.60	343.02	166.58	2,036.05	100,870	106,922
4	106,922	4.00%	0.33%	540.18	356.41	183.77	2,246.15	104,676	110,956
5	110,956	4.00%	0.33%	572.59	369.85	202.73	2,477.92	108,479	114,987

(b) The loan balance at the end of the fifth year = $$108,479.

(c) **IRR(CF1, CF2, ….CFn)**

CF_j	n_j
-$89,300	
453.54	n = 12
480.76	n = 12
509.60	n = 12
540.18	n = 12
572.59	n = 11
572.59 + 114,987	n = 1

Solve for the *annual* IRR:

= 0.85% x 12 = 11.11%

Problem 5-2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Year	BOY Balance	Annual Interest Rate	Monthly Interest Rate (2)/12	Payments	Monthly Interest (3) x (1)	Monthly Amort (4) -(5)	Annual Amort.	EOY Balance (1) - (7)
0								
1	$200,000	6.00%	0.50%	$1,199.10	$1,000.00	$199.10	$2,456.02	$197,544
2	$197,544	7.00%	0.58%	$1,327.75	$1,152.34	$175.41	$2,173.82	$195,370

(a)

Monthly Payment = $1,199.10

(b)

Loan balance at EOY 1 = $197,544

(c)

Monthly Payment = $1,327.75

(d)

Loan balance at EOY 2 = $195,370

(e)

Monthly Payment for year 1= $1,000

(f)

Monthly Payment for year 2= $1,166.67

Problem 5-3

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Annual Interest Rate	Monthly Interest Rate (2)/12		Monthly Interest (3) x (1)	Monthly Amort (4) -(5)	Annual Amort.	EOY Balance (1) - (7)
Year	BOY Balance			Payments				
0								
1	$150,000	7.00%	0.58%	$997.95	$875.00	$122.95	$1,523.71	$148,476
2	148,525	7.00%	0.58%	$997.95	$866.11	$131.84	$1,633.86	$146,842
3	146,942	7.00%	0.58%	$997.95	$856.58	$141.37	$1,751.98	$145,090
4	145,244	6.00%	0.50%	$905.34	$725.45	$179.89	$2,219.06	$142,871

(a)
Monthly Payment = $997.95

Loan Balance EOY 3 = $145,244

(b)
New Monthly Payment = $906.30

(c)
Interest only monthly payment = $875

Monthly payments in year 4 = $935.98

Problem 5-4

Year	(1) BOY Balance	(2) Annual Interest Rate	(3) Monthly Interest Rate (2)/12	(4) Payments	(5) Monthly Interest	(6) Monthly Amort (4) -(5)	(7) Annual Amort.	(8) EOY Balance (1) - (7)
0								
1	$100,000	2.00%	0.17%	$423.85	$166.67	$257.19	$3,114.70	$96,885
2	96,885	6.00%	0.50%	$635.55	$484.43	$151.12	$1,864.15	$95,021

(a)

Monthly payment during 1 year = $423.85

(b)
Monthly payment in 2 year = $635.55

(c)

Percentage increase in monthly payment = 50%

(d)

Year	(1) BOY Balance	(2) Annual Interest Rate	(3) Monthly Interest Rate (2)/12	(4) Payments	(5) Monthly Interest (3) x (1)	(6) Monthly Amort (4) -(5)	(7) Annual Amort.	(8) EOY Balance (1) - (7)
0								
1	$100,000	2.00%	0.17%	$423.85	$166.67	$257.19	$3,114.70	$96,885
2	96,885	2.00%	0.17%	$423.85	$161.48	$262.38	$3,177.57	$93,708
3	93,708	2.00%	0.17%	$423.85	$156.18	$267.67	$3,241.71	$90,466
4	90,466	6.00%	0.50%	$617.95	$452.33	$165.62	$2,043.02	$88,423

Monthly payments at beginning of year 4 = $ 617.95

Problem 5-5

(a)

Interest only payments for the 1 year = $833.33

(b) The loan balance is $200,000. To reset the interest rate at 6% and to amortize the loan over the remaining 27 years (or 324 months) we have:

	PV	=	-$200,000
	i	=	6 ÷ 12
	FV	=	0
	n	=	324
Solve	PMT	=	$1,247.97

Problem 5-6
Compute the payments, loan balance, and yield for an unrestricted ARM

Principal	=	$150,000
Points	=	2.00%
Term	=	30 years
Initial Rate	=	6.0%

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Annual Interest Rate	Monthly Interest Rate (2)/12		Monthly Interest (3) x (1)	Monthly Amort	Annual Amort.	EOY Balance (1) - (7)
BOY Balance					(4) -(5)		
Year			Payments				
0							
1	$150,000	6.00%	0.50%	$899.33	$750.00	$149.33	$1,842.02	$148,158
2	148,158	9.00%	0.75%	$1,200.31	$1,111.18	$89.13	$1,114.78	$147,043
3	147,043	10.50%	0.88%	$1,359.42	$1,286.63	$72.79	$916.79	$146,126
4	146,126	11.50%	0.96%	$1,467.12	$1,400.38	$66.74	$844.50	$145,282
5	145,282	13.00%	1.08%	$1,630.42	$1,573.89	$56.53	$720.27	$144,562

IRR(CF1, CF2, ….CFn)

CF_j	n_j
-$147,000	
899.33	n = 12
1200.31	n = 12
1359.42	n = 12
1467.12	n = 12
1630.42	n = 11
1630.42 + 144,562	n = 1

Solve for the IRR:

= 0.85% x 12 = 10.16% (annual rate, compounded monthly)

Problem 5-7
Compute the payments, loan balances, and yield for an ARM that has a maximum 5% annual payment cap and does allow negative amortization.

Principal	=	$150,000
Term	=	30 years
Points	=	2.00%
Initial Rate	=	7.0%

	(1)	(2)	(3)	(4)	(5)
Year	BOY Balance	Uncapped Rate	Payment Uncapped	Payment Capped	EOY Balance
1	$150,000	7.00%	$997.95	$997.95	$148,476
2	$148,476	9.00%	$1,202.89	$1,047.85	$149,298
3	$149,298	10.50%	$1,380.27	$1,100.24	$151,894
4	$151,894	11.50%	$1,525.03	$1,155.26	$155,695
5	$155,695	13.00%	$1,747.28	$1,213.02	$161,731
6	$161,731				

Note: EOY Balance is calculated by using: FV(n,i,pv,pmt)

PV = Loan amount
n = 12 months
i = Uncapped rate
PMT = Capped payment
FV =

Calculator: **IRR(CF1, CF2, ….CFn)**

CF_j	n_j
-$147,000	
997.95	n = 12
1047.85	n = 12
1100.24	n = 12
1155.26	n = 12
1213.02	n = 11
1213.02 + 161,731	n = 1

Solve for the IRR:
= 0.8706% x 12 = 10.45% (annual rate, compounded monthly)

Problem 5-8

Compute the payments, loan balances, and yield for an ARM that has a 1% annual and 3% lifetime interest rate cap and does not accumulate negative amortization.

Principal	=	$150,000
Points	=	2.00%
Term	=	30 years
Initial Rate	=	7.5%

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year	BOY Balance	Uncapped Interest Rate	Capped Interest Rate	Monthly Interest Rate (3) /12	Payment (@ Capped Rate)	Monthly Interest (1) x (3)/12	Monthly Amort (5) - (6)	Annual Amort	EOY Balance (1) - (8)
0									
1	$150,000	7.50%	7.50%	0.63%	$1,048.82	$937.50	$111.32	$1,382.75	$148,617
2	148,617	9.00%	8.50%	0.71%	$1,151.44	$1,052.71	$98.74	$1,232.11	$147,385
3	147,385	10.50%	9.50%	0.79%	$1,255.55	$1,166.80	$88.75	$1,112.59	$146,273
4	146,273	11.50%	10.50%	0.88%	$1,360.78	$1,279.88	$80.89	$1,018.84	$145,254
5	145,254	13.00%	10.50%	0.88%	$1,360.78	$1,270.97	$89.81	$1,131.12	$144,123
	144,123								

Calculator: **IRR(CF1, CF2, ….CFn)**

CF_j	n_j
-$147,000	
1048.82	n = 12
1151.44	n = 12
1255.55	n = 12
1360.78	n = 12
1360.78	n = 11
1360.78 + 144,123	n = 1

Solve for the IRR:

= 0.80% x 12 = 9.65% (annual rate, compounded monthly)