Chapter#3

LOANS:
LOAN AMORTIZATION

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Summary

✗ **What is Loan Amortization?**

Amortizing a loan is repaying a loan with payments at regular intervals, such as monthly, annually, etc.
We can allocate each loan payment into two categories:

1) interest due and

2) loan principal repayment.

Note that each loan payment will first pay off the interest due, then the remaining

amount of the payment is used to repay the loan principal.

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✗ Outstanding Loan Balance:
The Retrospective and Prospective Method

The retrospective method is backward-looking because it is based on previous cash flows. Calculate the time-t outstanding loan balance by accumulating the original loan with interest rate i to time t, and then subtract the loan payments accumulated to
time t.

The prospective method is forward-looking because it is based on future cash flows. Calculate the time-t outstanding loan balance as the present value at time t of the remaining loan payments at interest rate i.
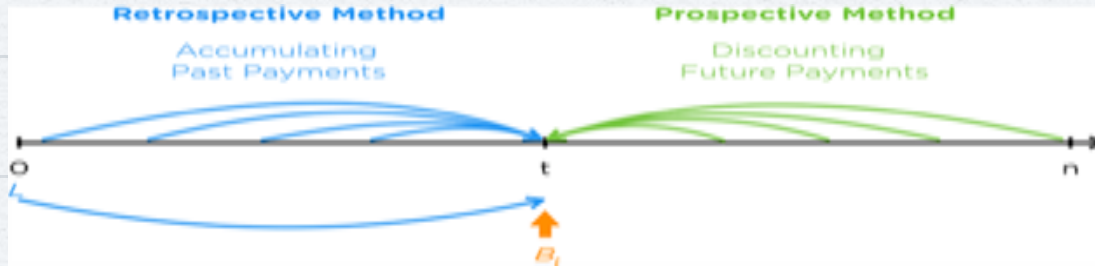
$$B_t = L(1+i)^t - R \cdot s_{\overline{t}|}$$

$$B_t = R \cdot a_{\overline{n-t}|}$$

Here is a summary of the formulas for a level payment loan amortization. Assume loan L is repaid with n level payments of R based on a constant effective interest rate i.

(1) The relationship between L and R is:

$$R = L/a_{\overline{n}|}$$

→ level payment only

(2) The time-t interest due is:

$$I_t = i.OB_{t-1} = R(1-v^{n-t+1})$$

— level only

(3) The time-t principal repaid is:

$$P_t = Rv^{n-t+1}$$

$$P_{t+k} = P_t(1+i)^k$$

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\begin{bmatrix}
I_t = i \, OB_{t-1} \\
OB_t = OB_{t-1} - P_t \\
P_t = R_t - I_t
\end{bmatrix}
$$

total int = total payment − L

total princ = L

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✗ Bernard borrows $100,000 on January 1, 1993, to be repaid in 360 monthly installments at a nominal annual interest rate of 9% convertible monthly. The first monthly payment is due February 1, 1993. Bernard misses the first payment, but begins payments on March 1, 1993, and makes 359 payments.

Determine how much Bernard still owes on the loan after making his 359th payment. **A** Less than $11,500

B At least $11,500 but less than $11,600

C At least $11,600 but less than $11,700

D At least $11,700 but less than $11,800

E At least $11,800

✗ A loan is to be repaid by annual installments of X at the end of each year for 10 years.

You are given:

the total principal repaid in the first 3 years is 290.35; and

the total principal repaid in the last 3 years is 408.55.

Calculate the total amount of interest paid during the life of the loan.

A 300

B 320

C 340

D 360

E 380

✗ Anand purchased a 30year mortgage at 6.00% convertible monthly. The amount of the loan is for $200,000.

Anand plans to make the required monthly payments.

The first month that his outstanding balance is $100,000 or less, he plans to purchase a larger home.

How many monthly payments will Anand need to make?

A 252

B 108

C 251

D 290

E 109

✗ Rachel buys a house and takes out a $150,000 30-year mortgage. The interest rate is 12% convertible monthly and Rachel makes monthly payments of $1,400 for the first 3 years. Determine how large her monthly payment needs to be for the remaining 27 years in order to pay off the mortgage at the end of the 30-year period.
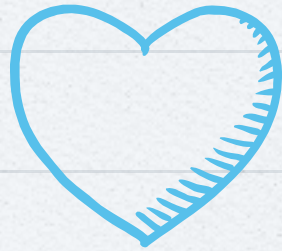
A Less than $1,550

B At least $1,550 but less than $1,600

C At least $1,600 but less than $1,650

D At least $1,650 but less than $1,700

E At least $1,700

THANKS!

Any questions?

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