

Lecture 8

Clark Saben
TOI

April 3, 2023

1 Todos

- HW5 (2.4.2, 2.4.3, 2.5.2, 2.5.3) due tomorrow 10am
- HW6 due next tuesday 10am (7 is due next next double check if i need to)
- hw6 q1 is that amortization schedule that I made last time
- get these notes into Charlie Cruz's notation (or someone not me lol)
- tex lect 7 from kevin and the earlier lect from kat
- today's mantra: write math first then tex in dead moments

2 3.2. Amortized Loans with Level Payments

2.1 3.2.1: Remark

$$L = OB_0 = a_{\overline{n}|i}$$

Prospective View:

$$OB_t = a_{\overline{n-t}|i}$$

Retroactive View:

$$OB_t = L(1+i)^t - S_{\overline{t}|i}$$

From the above, we can observe that,

$$I_t = a_{n-(t-1)}i = a_{\overline{n-t}|i}i$$

$$I_t = ia_{n-t+1}$$

$$I_t = i \left(\frac{1 - v^{n-t+1}}{i} \right)$$

$$I_t = OB_{t-1}i = 1 - v^{n-t+1}$$

2.2 3.2.2: Remark:

Sometimes we like to know the total interest paid. In particular,

$$\begin{aligned} I &= I_1 + I_2 + \cdots + I_n \\ &= OB_0i + OB_1i + \cdots + OB_{n-1}i \\ &= \text{re-write in terms of } a_{\overline{n}|i} \\ &= a_{\overline{n}|i}i + a_{\overline{n-1}|i}i + \cdots + a_{\overline{n-(n-1)|i}i}i \\ &= (a_{\overline{n}|i} + a_{\overline{n-1}|i} + \cdots + a_{\overline{n-(n-1)|i}i})i \\ &= \left(\frac{1-v^n}{i} + \frac{1-v^{n-1}}{i} + \cdots + \frac{1-v^1}{i} \right)i \\ &= (1-v^n) + (1-v^{n-1}) + \cdots + (1-v^1) \\ &= n - (v^n + v^{n-1} + \cdots + v^1) \\ &= n - a_{\overline{n}|i} \end{aligned}$$

2.3 3.2.3: Example hw6 pr2 see GB:

Sam borrows X for 10 years at an annual effective rate of 8%. If he pays the principal and the accumulated interest in one lump sum at the end of 10 years, he would pay 468.05 more in interest than if he repaid the loan with ten level payments at the end of each year. Calculate X .

2.4 3.2.4: Example hw6 pr3 see GB:

A loan L is to be repaid with 40 payments of 100 at the end of each quarter. Interest on the loan is charged at a nominal rate i , where $0 < i < 1$, convertible monthly. The outstanding principals immediately after the 8th and 24th payments are 2308.15 and 1345.50, respectively. Calculate the amount of interest repaid in the 15th payment.

2.5 3.2.5: Example hw6 pr4 see GB:

A loan at a nominal rate of 24% convertible monthly is to be repaid with equal payments at the end of each month for $2n$ months. The n th payment consists of equal amounts of interest and principal. Calculate n .