

Lecture 13: Chapter 4

Section 4C: Bills, Bills, Bills

Loans

Definition 1. The amount of money you owe on a loan at any given time is the loan **principal**

Consider the following example of a \$1200 loan with a 12% APR which is paid off monthly in six months.

| End of | Prior Principal | Interest | Payment | Total Payment | New Principal |
|---------|-----------------|----------|---------|---------------|---------------|
| Month 1 | \$1200 | \$12 | \$ 200 | \$212 | \$1000 |
| Month 2 | \$1000 | \$10 | \$200 | \$210 | \$ 800 |
| Month 3 | \$800 | \$8 | \$200 | \$208 | \$ 600 |
| Month 4 | \$600 | \$6 | \$200 | \$206 | \$ 400 |
| Month 5 | \$400 | \$4 | \$200 | \$204 | \$ 200 |
| Month 6 | \$200 | \$2 | \$200 | \$202 | \$ 0 |

Note that interest decreases as your pay on your principal.

There is more than one type of loan.

Definition 2. An **installment loan** is a loan that you make equal regular payments on.

We must use the loan payment formula to calculate how much the regular payment value is. The formula is given by

$$PMT = \frac{P \cdot \left(\frac{APR}{n}\right)}{\left[1 - \left(1 + \frac{APR}{n}\right)^{-nY}\right]}$$

where PMT is the regular payment amount, P is the starting loan principal, APR is your annual interest rate, n is the number of payment periods and Y is the term of the loan in years.

Example 1. Calculate the necessary monthly payments on installment loan of \$1200 with an interest rate of 12% that you desire to pay in 6 months.

$$PMT = \frac{1200 \cdot \left(\frac{0.12}{12}\right)}{\left[1 - \left(1 + \frac{0.12}{12}\right)^{-12 \cdot .5}\right]} = 207.06$$

Note this is slightly more than the \$207 average payment we considered above.

Example 2. You decide to pay for your education cost of \$25000 via student loans with an APR of 8%. If you wish to pay off these loans in 15 years, what are your monthly payments? How much do you spend in total?

Solution:

Credit Cards

A credit card is exactly like an installment loan except you are not required to pay your balance in any set period of time.

Because of the luxury, credit cards have very high interest rates. Credit companies often allow you to pay a **minimum payment** which covers all the interest for a given payment and only a small portion of the principal. What is bad about this?

Example 3. You have a credit balance of \$3700 and an APR of 24%. You wish to pay your balance off over 1 year. What are your monthly payments? How much do you pay in total?

Solution:

Mortgages

Definition 3. An installment loan that helps you buy a home is called a **mortgage**.

Definition 4. Closing fees are charged as **points** where each point is 1% of the loan amount.

Mortgage Considerations:

1. What is the required interest rate and down payment?
2. What are the **closing costs**?
3. What does the fine print say?

The simplest type of home loan is a **fixed rate mortgage**.

Example 4. You need \$300,000 for a house. You are offered a 30 year loan from the bank at an APR of 8% or a 15 year loan at 7.5%. Compare the monthly payments and total cost under the two plans.

Example 5. You need \$500,000 for a house. You are offered a 30 year loan from the bank at an APR of 9% where closing fees are 2 points. How much do you pay total for the loan?

Definition 5. An **adjustable rate mortgage** is a mortgage where the interest rate you pay changes when prevailing rates change.