

Lecture 6

Saturday, September 14, 2024 3:16 PM

Today, we start Chapter 4: the basic math in finance.

What is tricky about finance is that a lot of things involving money change over time. For example, you usually don't borrow money for free but at an interest rate. Inflation is also a factor that makes the value of products change over time. That is why understanding the math of finance is important.

Let's start with a static model: nothing change over time. You have a budget and never have to change it. Consider the following example:

Example: *In addition to your monthly expenses, you have the following college expenses that you pay twice a year: \$3500 for your tuition each semester, \$750 in student fees each semester, and \$800 for textbooks each semester. How should you handle these expenses in computing your monthly budget?*

You should break these expenses down into monthly expense so that you can keep track of how much you earn and how much you spend. To *make a budget* is to keep track of how much money you have coming in and going out and then deciding what adjustments you need to make. Your *net monthly cash flow* is obtained by subtracting your total monthly expense from your total monthly income.

Example: *You have the following sources of income: part-time job (\$1200/month), college fund from parents (\$400/month), scholarship (\$800/year). Expenses are: rent (\$750/month), grocery (\$100/week), tuition and fees (\$3000 twice a year), out with friends (\$60/week). Find your total monthly cash flow.*

See more examples on the worksheet.

Money can increase or decrease in value through the notion of interest rate. You don't borrow money from a bank for free but at an expense. Also, you don't lend your money to the bank for free, but at some compensation. There are two types of interests: static interest and compound interest.

Let's consider an example: you have \$1000 to spare. You decided to put into your bank account. In other words, you are lending your money to the bank at a monthly interest of, say, 1%.

At the end of Month 1, you have $1000 + 1000 \times 1\% = 1000(1+1\%) = 1010$

At the end of Month 2, you have $1010 + 1010 \times 1\% = 1010(1+1\%) = 1020.1$

At the end of Month 3, you have $1020.1 + 1020.1 \times 1\% = 1020.1(1+1\%) = 1030.301$

The interest from a previous cycle later generates an interest of its own. This is compound interest.

On the other hand, if you withdraw the interest immediately right after it is generated, then you have the same amount of \$1000 in the bank at all time. And each month, you have \$10 to spend. This is static interest.

University endowment works like static interest. Most universities has a big lump of money. They can spend the interest for the their day-to-day operation.