MA111: Contemporary mathematics

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September 16, 2011

SCHEDULE:

- Participation quiz on BB should be done **today** (and take like 30 seconds)
- HW 10.1 is due Today, Sep 16th, 2011.
- HW 10.2 is due Monday, Sep 19th, 2011.
- HW 10.3 is due Wednesday, Sep 21st, 2011.
- Exam 1 is Monday, Oct 3rd, during class.

Today we will look at simple interest, pawn shops, and payday loans.

Time value of money

- Would you prefer to have $100 today or $100 in 5 years?
- Discuss in groups: what are at least 3 very different reasons why?
- If today, then you should be willing to receive $1 today on the promise to pay it back in 5 years.
- If in 5 years, then you should be willing to loan $1 today on the promise that it will be paid back in 5 years.

Why take the risk?

- "Money" is meant to be easily exchanged
- We can put a price on anything
- The price we put on "taking the risk" or "being apart from the money" is called **interest**
- $100 now for $500 in five years is $400 interest
- What are the most important factors to determine how much interest to charge?

One answer is **simple interest**

- Two main factors: **how much** loaned and **how long** it is loaned
- Suppose we thought \$100 now for \$500 in five years is fair
- \$100 now for \$180 in one year is fair

$$\frac{\$500 - \$100}{5 \text{ years}} = \$80 \text{ per year}$$

- \$200 now for \$1000 in five years is fair

$$\frac{(\$500 - \$100)}{\$100} = 4 \text{ dollars per dollar loaned over five years}$$

$$4(\$200) + \$200 = \$1000$$

Simple interest formulas

- This chapter has too many formulas
  Understand them; only memorize a few
- **Variables**:
  - P: present value; how much money now
  - F: future value; how much money then
  - $I = F - P$: interest; how much extra money then
  - t: time; often measured in years
  - r: interest rate; often measured in dollars per dollar per year (APR)

$$I = Prt$$

$$F = P(1 + rt)$$

Easy example: Savings bond

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  until you cash it in
- \$1000 present value, 5% annual percentage rate
- The interest is 5% of \$1000 $=$ (0.05)(\$1000) $=$ \$50 per year
- After 2 years, worth \$1100
- After 4 years, worth \$1200

Treasury bond

- Treasury bonds are named by their future value
- A \$1000 bond with 5% APR (simple) and 7 year maturity
- Gives you \$1000 in 7 years
- $\$1000 = P + P(0.05)(7) = P(1.35)$, so
  $P = \$1000/1.35 = \$740.74$ now
- Moving from future value to present value is often called **discounting**

Examples of simple interest

- Pawn an iPod for \$25 plus 2% interest and \$5 processing fee, due in one month
- After one month, loan is in default, another 2% interest charged
- After two months, the pawn shop owns the iPod, debt is forgiven, and will sell it to anyone for \$75
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- What sort of interest rate is this?
  - One month: $5.50 interest per month on $25 is 264% APR
  - Two month: $6.00 interest per 2 months on $25 is 144% APR
  - Three months: $50 interest per 3 months on $25 is 800% APR

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  On time: $130.56
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- LG 50-inch plasma 1080p HDTV
  Up front: $890
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- What sort of interest rate is this? 95%?
  Why is this one complicated?
  I get 139% APR using compound interest.

Homework

- Calculations: Percentage decrease, percentage increase
- Participation (15%): There is a quiz on blackboard, under **Assignments**. Should do it today. Due by Sunday.
- Read section 10.2 of the textbook.
- Online homework (30%):
  - HW 10.1 is due Today. People did very well on it.
  - HW 10.2 is due Monday. Shorter, still looked hard.
  - HW 10.3 will be due Wednesday.