Chapter 7

Personal Financial Management

MATHEMATICAL IDEAS

THIRTEENTH EDITION ●●●●

CHARLES D. MILLER | VERN E. HEEREN | JOHN HORNSBY | CHRISTOPHER HEEREN
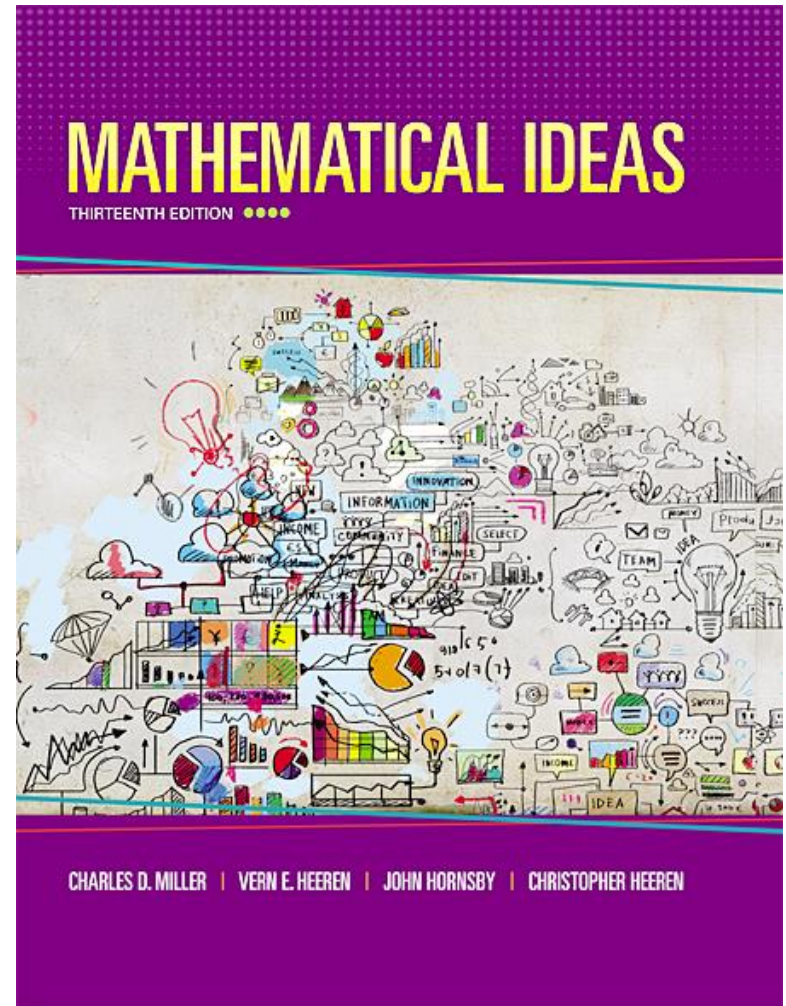
Chapter 13: Personal Financial Management

Section 7-3

Truth in Lending

PEARSON

Truth in Lending

- Determine the annual percentage rate for different types of loans.

- Calculate unearned interest.

PEARSON

Truth in Lending

The Consumer Credit Protection Act, which passed in 1968, has commonly been known as the **Truth in Lending Act**. Two major issues are addressed in the law:

1. How can I tell the true interest rate a lender is charging?

2. How much of the finance charge am I entitled to save if I decide to pay off a loan sooner than originally scheduled?

PEARSON

Annual Percentage Rate (APR)

Truth in Lending standardized the so-called annual interest rate, or **annual percentage rate**, commonly denoted **APR**. All sellers must disclose the APR when you ask, and the contract must state the APR whether or not you ask.

APR Table

The table on page 725 relates the three quantities:

APR = true annual interest rate

n = total number of scheduled monthly payments

h = finance charge per $100 of amount financed

Example: Finding the APR for an Add-On Interest Loan

Find the APR for a $2400, two-year, add-on interest loan, that had a finance charge of $288.

Solution

First, we find the finance charge per $100 financed:

$$= \frac{\text{Finance charge}}{\text{Amount financed}} \cdot \$100 = \frac{\$288}{\$2400} \cdot \$100 = \$12.$$

Example: Finding the APR for an Add-On Interest Loan

Solution (continued)

This $12 represents h, the finance charge per $100 of the amount financed. Because the loan was to be paid over 24 months, look down to the "24 monthly payments" row of the table (page 725). Then look across the table for the h value closest to $12, which is $11.86. From that point read up the column to find the APR, 11.0%.

Unearned Interest

If a loan is paid off early, the amount by which the original finance charge is reduced is called the **unearned interest**. We cover two common methods of calculating unearned interest, the **actuarial method** and the **rule of 78**. The borrower may not save all the unearned interest since the lender is entitled to impose an **early payment penalty**.

Unearned Interest – Actuarial Method

For a closed-end loan requiring *monthly* payments, which is paid off earlier than originally scheduled, let:

$R =$ regular monthly payment

$k =$ remaining number of scheduled payments (*after* current payment)

$h =$ finance charge per \$100, corresponding to a loan with the same *APR* and *k* monthly payments.

Then the **unearned interest, *u*,** is calculated as follows:

$$u = kR\left(\frac{h}{\$100+h}\right)$$

Payoff Amount

An installment loan requiring regular monthly payments R can be paid off early, along with the current payment. If the original loan had k additional payments scheduled (after the current payment), and the unearned interest is u, then disregarding any possible prepayment penalty, the **payoff amount** is calculated as follows:

$$\textbf{Payoff amount} = (k + 1)R - u$$

Example: Finding Early Payoff Amount (Actuarial Method)

Suppose you have a loan for 4 years, with monthly payments of $185, and an APR of 9.0% (original finance charge of $1426). If you decide to pay it off in 3 years rather than 4 years, find

   a) the unearned interest and

   b) the payoff amount.

Solution

   a) Use $u = kR\left(\dfrac{h}{\$100+h}\right)$

Example: Unearned Interest/Payoff Amount

Solution (continued)

From the APR table (12 payments left), we find that $h = \$4.94$. With $R = \$185$ and $k = 12$, we have:

$$u = 12 \cdot \$185 \left(\frac{\$4.94}{\$100 + \$4.94} \right) = \$104.51.$$

b) Payoff amount $= (k + 1)R - u$

$$= (12 + 1)\$185 - \$104.51 = \$2300.49$$

Unearned Interest – Rule of 78

For a closed-end loan requiring *monthly* payments, which is paid off earlier than originally scheduled, let:

$F =$ original finance charge

$n =$ number of payments originally scheduled

$k =$ remaining number of scheduled payments (*after* current payment)

Then the **unearned interest, u,** is calculated as follows:

$$u = \frac{k(k+1)}{n(n+1)} \cdot F$$

Example: Finding Early Payoff Amount (Rule of 78)

Use the rule of 78 to compute the unearned interest from the last example.

Solution

$$u = \frac{k(k+1)}{n(n+1)} \cdot F = \frac{12(12+1)}{48(48+1)} \cdot \$1426 = \$94.58.$$

Note that this is $9.93 *less* than your savings by the actuarial method.

Finance Charge per $100 Financed

If an installment loan requires n equal monthly payments and APR denotes the true annual interest rate for the loan (as a decimal), then h, the **finance charge per $100 financed**, is calculated as follows.

$$h = \frac{n \cdot \dfrac{APR}{12} \cdot \$100}{1 - \left(1 + \dfrac{APR}{12}\right)^{-n}} - \$100$$

Example: Finding Unearned Interest and Early Payoff Amount

A loan states an APR of 10% and stipulates 30 payments of $125.40 each. If the loan is paid off on the eighteenth payment, find the unearned interest and the payoff amount.

Solution

a. $h = \dfrac{n \cdot \dfrac{APR}{12} \cdot \$100}{1 - \left(1 + \dfrac{APR}{12}\right)^{-n}} - \$100 = \dfrac{12 \cdot \dfrac{.10}{12} \cdot \$100}{1 - \left(1 + \dfrac{.10}{12}\right)^{-12}} - \$100$

Example: Finding Unearned Interest and Early Payoff Amount

Solution (continued)

$$\frac{12 \cdot \frac{.10}{12} \cdot \$100}{1 - \left(1 + \frac{.10}{12}\right)^{-12}} - \$100 = \$5.50.$$

Next use the actuarial formula for unearned interest u.

Regular monthly payment: $R = \$125.40$

Remaining number of payments: $k = 30 - 18 = 12$

Example: Finding Unearned Interest and Early Payoff Amount

Solution (continued)

Finance charge per $100: $h = \$5.50$

$$u = 12 \cdot \$125.40 \cdot \frac{\$5.50}{\$100 + \$5.50} = \$78.45$$

Amount of interest saved: $78.45

b. Payoff amount $= (12 + 1)(\$125.40) - \$78.45$

$$= \$1551.75$$