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● 20 Savings and Investment Spending

● 21 The Market for Loanable Funds

● **22 The Time Value of Money**

● 23 The Financial System

The Concept of Present Value

- When someone borrows money for a year, the interest rate is the price charged by the lender.
- The interest rate can be used to compare the value of a dollar realized today with the value of a dollar realized later, because it correctly measures the cost of delaying a dollar of benefit.
- The **present value** of \$1 realized one year from now is equal to $\$1/(1 + r)$: the amount of money you must lend out today in order to have \$1 in one year.

More on Present Value

- Call **$\$X$** the amount of money you need to lend today, at an interest rate of r in order to have **$\$100$** in **two years**.
- If you lend $\$X$ today, you will receive $\$X(1 + r)$ in one year.
- And if you *re-lend* that sum for another year, you will receive $\$X (1 + r)^2$ at the end of the second year.
- If $r = 0.10$, this becomes $\$X (1.10)^2 = \$X (1.21)$.

More on Present Value

- *What is \$100 realized two years in the future worth today?*
- In order for the amount lent today, \$X, to be worth \$100 two years from now, it must satisfy:

$$\boxed{\$X (1 + r)^2 = \$100}$$

- If $r = 0.10$, $\$X = \$100 / (1 + r)^2 = \$100 / 1.21 = \82.64 .
- The present value formula for N periods is:

$$\$1 / (1 + r)^N$$

Practical Use of Present Value

The **net present value** of a project is the present value of current and future benefits minus the present value of current and future costs.

The Net Present Value of Three Hypothetical Projects

Project	Dollars realized today	Dollars realized one year from today	Present value formula	Net present value given $r = 0.10$
A	\$100	—	\$100	\$100.00
B	-\$10	\$115	$-\$10 + \$115/(1 + r)$	\$94.55
C	\$119	-\$20	$119 - \$20/(1 + r)$	\$100.82

Economics in Action

How Big Is That Jackpot, Anyway?

- On March 30, 2012, Mega Millions set the record for the largest jackpot ever in North America, **\$656 million**.
- The \$656 million was available only in the form of an “annuity” consisting of an annual payment for the next 26 years. If you wanted the cash up front, the jackpot was only \$474 million.
- If the winner took the annuity, the lottery would have invested the money in U.S. government bonds and using the prevailing interest rates at the time, the present value of a \$656 million spread over 26 years was just about \$474 million.