

Section 2.2

Future Value for Compound Interest

The future value of an investment of PV dollars earning interest at an annual rate of r compounded (reinvested) m times per year for a period of t years is

$$FV = PV \left(1 + \frac{r}{m}\right)^{mt} \quad \text{or} \quad FV = PV(1 + i)^n$$

where $i = r/m$ is the interest paid each compounding period and $n = mt$ is the total number of compounding periods.

Present Value for Compound Interest

The present value of an investment earning interest at an annual rate of r compounded m times per year for a period of t years, with future value FV , is

$$PV = \frac{FV}{\left(1 + \frac{r}{m}\right)^{mt}} \quad \text{or} \quad PV = \frac{FV}{(1 + i)^n} = FV(1 + i)^{-n}$$

where $i = r/m$ is the interest paid each compounding period and $n = mt$ is the total number of compounding periods.

Effective Interest Rate

The effective interest rate r_{eff} of an investment paying a nominal interest rate of r_{nom} compounded m times per year is

$$r_{\text{eff}} = \left(1 + \frac{r_{\text{nom}}}{m}\right)^m - 1$$

To compare rates of investments with different compounding periods, always compare the effective interest rates rather than the nominal rates.

Problem 1. You deposit \$1,000 in an account at the Lifelong Trust Savings and Loan that pays 6% interest compounded quarterly. By how much will your deposit have grown after 4 years?

Problem 2. Calculate, to the nearest cent, the future value of an investment of \$10,000 at 6.5% per year, compounded daily (assume 365 days/year), after 10 years.

Problem 3. Calculate the present value of an investment that will be worth \$1,000 at 4.2% per year, compounded weekly (assume 52 weeks/year), in 5 years.

Problem 4. I want to be earning an annual salary of \$80,000 when I retire in 10 years. I have been offered a job that guarantees an annual salary increase of 5% per year, and the starting salary is negotiable. What salary should I request in order to meet my goal?

Problem 5. During a prolonged recession, property values on Long Island depreciated by 2% every 6 months. If my house cost \$200,000 originally, how much was it worth 5 years later?

Problem 6. Housing prices have been rising 0.6% each month. A new house now costs \$220,000. What would it have cost 8 years ago?

Problem 7. When I was considering what to do with the \$10,000 proceeds from my sale of technology stock, my broker suggested I invest half of it in municipal bonds, whose value was growing by 6% per year, and the other half in CDs, which were yielding 3% per year, compounded every 2 months. Assuming these rates are sustained, how much will my investment be worth in 10 years?

Problem 8. You are offered three investments. The first promises to earn 15% compounded annually, the second will earn 14.5% compounded quarterly, and the third will earn 14% compounded monthly. Which is the better investment?

Homework for this section: Read the section and watch the videos/tutorials. Then do these problems in preparation for the quiz: #3, 12, 17, 22, 23, 27, 31, 37, 43