Section 5.2

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

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

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

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

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

Effective Interest Rate

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

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

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 \$100,000 when I retire in 15 years. I have been offered a job that guarantees an annual salary increase of 4% 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 my \$10,000 Lottery winnings, my broker suggested I invest half of it in gold, the value of which was growing by 10% per year, and the other half in CDs, which were yielding 5% per year, compounded every 6 months. Assuming these rates are sustained, how much will my investment be worth in 10 years?

Problem 8. You are offered two investments. One promises to earn 12% compounded annually. The other will earn 11.9% compounded monthly. Which is the better investment?

Homework: Read section 5.2, do #4, 12, 18, 22, 24, 32, 38, 44