Formula Sheet

1 Time Value of Money

1.1 Future Value

The future value of x after n periods of growth at (annual) interest rate a compounded m times per year is

$$x(1+r)^n$$

where $r = a/m$ is the per-period interest rate.

The effective annual interest rate is

$$i = (1 + a/m)^m - 1.$$

The future value of x after t years of growth at annual growth rate d is

$$x(1+d)^t.$$

1.2 Present Value

In the following, r is the per-period discount rate, d is the annual discount rate, and there are m periods per year.

The present value of y to be received n periods later is

$$y(1+r)^{-n} = \frac{y}{(1+r)^n}.$$

The present value of y to be received t years later is

$$y(1+d)^{-t} = \frac{y}{(1+d)^t}.$$

The relationship between r and d is

$$d = (1+r)^m - 1 \quad \text{and} \quad r = (1+d)^{1/m} - 1.$$

1.3 Present Value: Perpetuities and Annuities

When the discount rate is r per period, an annuity making n payments of C, each one period apart, starting in one period:

$$\frac{C}{r}(1-(1+r)^{-n}).$$

Present value of a perpetuity of C per period, starting in one period:

$$\frac{C}{r}.$$