CHAPTER 20

INVESTMENT LESSONS FROM BLACKJACK AND GAMBLING

1. A die is weighted so that the probability of getting a six is 0.3, of getting a 1 is 0.1, and of getting 2, 3, 4 or 5 is 0.15 each. You bet on 6, receiving odds of 5 to 1 (fair odds for an unbiased die). What is your expected profit? What is your standard deviation of profit? What is the formula for the expected return as a function of the fraction of your wealth that you bet? What fraction maximizes this expected return?

If you bet \$1 then the expected profit is

$$0.3 \times 5 - (0.1 + 4 \times 0.15) \times 1 = 0.8.$$

The standard deviation is

$$\sqrt{0.3 \times (5 - 0.8)^2 + 0.1 \times (-1 - 0.8)^2 + 4 \times 0.15 \times (-1 - 0.8)^2}$$
$$= 2.75$$

The expected return is given by

$$0.3 \times \ln(1 + 5f) + 0.7 \times \ln(1 - f).$$

where f is the fraction of wealth that is bet. This is maximized by $f = 4/25$, the Kelly fraction.

2. Build a spreadsheet that simulates the above, in which you keep betting the same fraction of your accumulated wealth.

Once you have built the spreadsheet experiment with different betting fractions.