

Jacob: How do we determine the correlation between the returns on two stocks? In this homework assignment, we are given the correlations. In practice, how do we derive them?

Rachel: The correlation $\rho_{a,b}$ is defined as the covariance between the returns on stocks A and B divided by the product of the standard deviations of stocks A and B:

$$\rho_{a,b} = \text{covariance}(A,B) / (\sigma_a \times \sigma_b)$$

If we have a sample of returns, such as returns for the 252 trading days in the year, the correlation is

$$\rho_{a,b} = \frac{\sum r_a r_b}{\sqrt{\sum r_a^2 \sum r_b^2}}$$

Jacob: Do we use this formula to derive correlations between stocks?

Rachel: The high stochasticity of stock returns causes random fluctuations to overwhelm the true correlation. Many analysts assume the same correlation exists between any two firms in an industry. We examine the correlations of several large stock insurers, take the average, and assume the average holds for all insurers.

Jacob: The correlation between two auto insurers is greater than that between an auto insurer and a life insurer.

Rachel: We use averages of insurers of the same type. But much of the correlation estimate is judgment; we don't always have good data.