

Consider shares issued by BP and GM. Assume that the current price of each share is \$100. You are looking one year ahead and thinking about only two states of the world, high oil price and low oil price. Both states are equally likely, i.e., the probability of each state is 0.5. Analyst, after due calculations, assign the following next year prices of these shares, in the two possible states:

| Firm | Share Price next year (high oil price) | Share Price next year (low oil price) |
|------|--|---------------------------------------|
| BP | 115 | 95 |
| GE | 95 | 115 |

1. What are the expected returns on the two stocks?
2. What are the standard deviations of these two stocks? Which one is more risky?
3. Can you think of a portfolio of the two stocks which is risk less?

Solution:

It is easy to see that the above table in terms of rate of returns can be rewritten as

| Firm | Return (high oil price) | Return (low oil price) |
|------|-------------------------|------------------------|
| BP | 15 | -5 |
| GE | -5 | 15 |

1. The expected returns are:

$$E(R_{BP}) = 0.5 * 15 + 0.5 * (-5) = 5,$$

$$E(R_{GE}) = 0.5 * (-5) + 0.5 * 15 = 5.$$

Thus both have the same expected rate of return.

2. Now the variances

$$\sigma_{BP}^2 = 0.5 (15 - 5)^2 + 0.5 (-5 - 5)^2 = 100$$

$$\sigma_{GE}^2 = 0.5 (-5 - 5)^2 + 0.5 (15 - 5)^2 = 100$$

Thus both have identical volatilities and will be considered to be equally risky.

3. Invest 50% in BP and the other 50% in GE. If high oil price state occurs, your return will be $0.5 * 15 + 0.5 * (-5) = 5$. If the low price state occurs, it will be $0.5 * (-5) + 0.5 * 15 = 5$. Thus, it is 5% in either case – there is no risk.