Methods of assessing the profitability of investments on the capital market

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Profit and risk

Profit and risk are the most important characteristics of investments. When the risk is higher, the expected rate of return on investment should also be higher.

$$\label{eq:rt} \begin{array}{l} \mbox{Rate of return} \\ r_t = \frac{P_t - P_{t-1} + D_t}{P_{t-1}} \\ r_t - \mbox{tr}_t - \mbox{tr}$$

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Expected rate of return

This measure informs us what the projected rate of return on investment is in the next period. It is usually calculated in two ways:

based on expert analysis

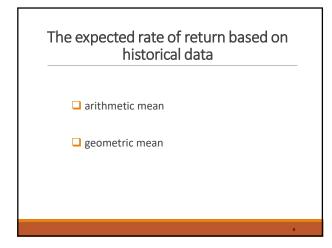
based on historical data

When we use expert analysis

$$E(r) = \sum_{i=1}^{m} p_i \times r_i$$

 $\label{eq:expected} E(r) - \text{expected rate of return on the financial instrument}$ $r_i - \text{realizable rate of return i}$

 $\mathbf{p_i}-\mathbf{the}\ \mathbf{probability}\ \mathbf{of}\ \mathbf{realizing}\ \mathbf{the}\ \mathbf{rate}\ \mathbf{of}\ \mathbf{return}\ i$



$$E(r_a) = \frac{r_1 + r_2 + r_3 + \dots + r_n}{n}$$

 $E(r_{a})-\text{expected rate of return based on arithmetic mean} \\ n-\text{number of periods}$

 $\boldsymbol{r}_n-\boldsymbol{r}ate$ of return in the n-th period (historical data)

Example

 Price changes in the first investment period:

 100 PLN
$$\rightarrow$$
 150 PLN \rightarrow rate of return +50%

 Price changes in the second investment period:

 150 PLN \rightarrow 75 PLN \rightarrow rate of return (-50%)

 Arithmetic mean:

 $E(r_a) = \frac{0.5 + (-0.5)}{2} = 0 = 0\%$

Formula for the geometric mean
using rate of return
$$E(r_g) = [(1 + r_1) \times (1 + r_2) \times \dots \times (1 + r_n)]^{\frac{1}{n}} - 1$$
$$E(r_g) - \text{expected rate of return based on geometric mean}$$
$$n - number of periods$$
$$r_n - rate of return in the n-th period (historical data)$$

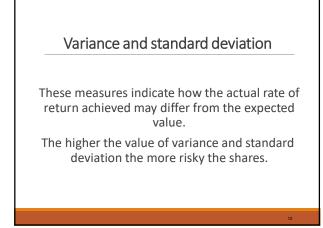
r₁, r₂, ... - historical rate of return

Formula for the geometric mean using share prices

$$E(r_g) = \left(\frac{P_n}{P_0}\right)^{\frac{1}{n}} - 1$$

 $E(r_g) - expected rate of return based on geometric mean $P_n - the value of the shares at the end of the analysis period $P_0 - the value of the shares at the beginning of the analysis period $n - number of periods$

Example
Price changes in the first investment period:
100 PLN
$$\rightarrow$$
 150 PLN \rightarrow rate of return +50%
Price changes in the second investment period:
150 PLN \rightarrow 75 PLN \rightarrow rate of return (-50%)
Geometric mean:
 $E(r_g) = \left(\frac{75}{100}\right)^{\frac{1}{2}} - 1 = (-0.1340) = (-13.40\%)$



Formula for variance based on expert analysis

$$\delta^2 = \sum_{i=1}^n p_i \times [r_i - E(r)]^2$$

 δ^2 – variance

 r_i – realizable rate of return i E(r) – expected rate of return

 p_i – the probability of realizing the rate of return i

Formula for variance based on
historical data
$$\delta^{2} = \frac{\sum_{t=1}^{n} [r_{t} - E(r)]^{2}}{n-1}$$

$$\delta^{2} - \text{variance}$$

$$r_{t} - \text{rate of return in the t period}$$

$$E(r) - \text{expected rate of return}$$

$$n - \text{number of periods}$$

$$\delta = \sqrt{\delta^2}$$

 δ – standard deviation $\delta^2 - \text{variance}$

Co-efficient of variation

A measure that can be used to compare securities from a risk point of view and the expected rate of return. When we present it in percentage, it informs us what percentage of the expected rate of return is a standard deviation.

Formula for co-efficient of variation

$$CV = \frac{\delta}{E(r)}$$

 $\begin{array}{l} \mbox{CV--co-efficient of variation} \\ \mbox{δ-standard deviation$} \\ \mbox{$E(r)-expected rate of return$} \end{array}$

Interpretation

Variance:

is not interpretable - the higher the value of variance the more risky the share

Standard deviation:

actual rate of return differs from expected rate of return for example by 0.1894

Co-efficient of variation:

co-efficient of variation informs us that standard deviation is $\underline{\text{for example}}$ 195% of expected rate of return

Task 3

1. Estimate historical rates of return from prices, use the following formula:

$$r_t = \frac{P_t}{P_{t-1}} - 1$$

2. Calculate the expected rate of return based on the formula for the arithmetic mean $% \left({{{\rm{T}}_{{\rm{T}}}}_{{\rm{T}}}} \right)$

3. Estimate the level of historical return deviations from the expected rate of return

4. Square the deviation levels

5. Sum up the squares of deviations

 ${\rm 6.}$ Use the formula for variance, standard deviation and co-efficient of variation and calculate the measures

9