MORE RISK OR LOWER RETURN?
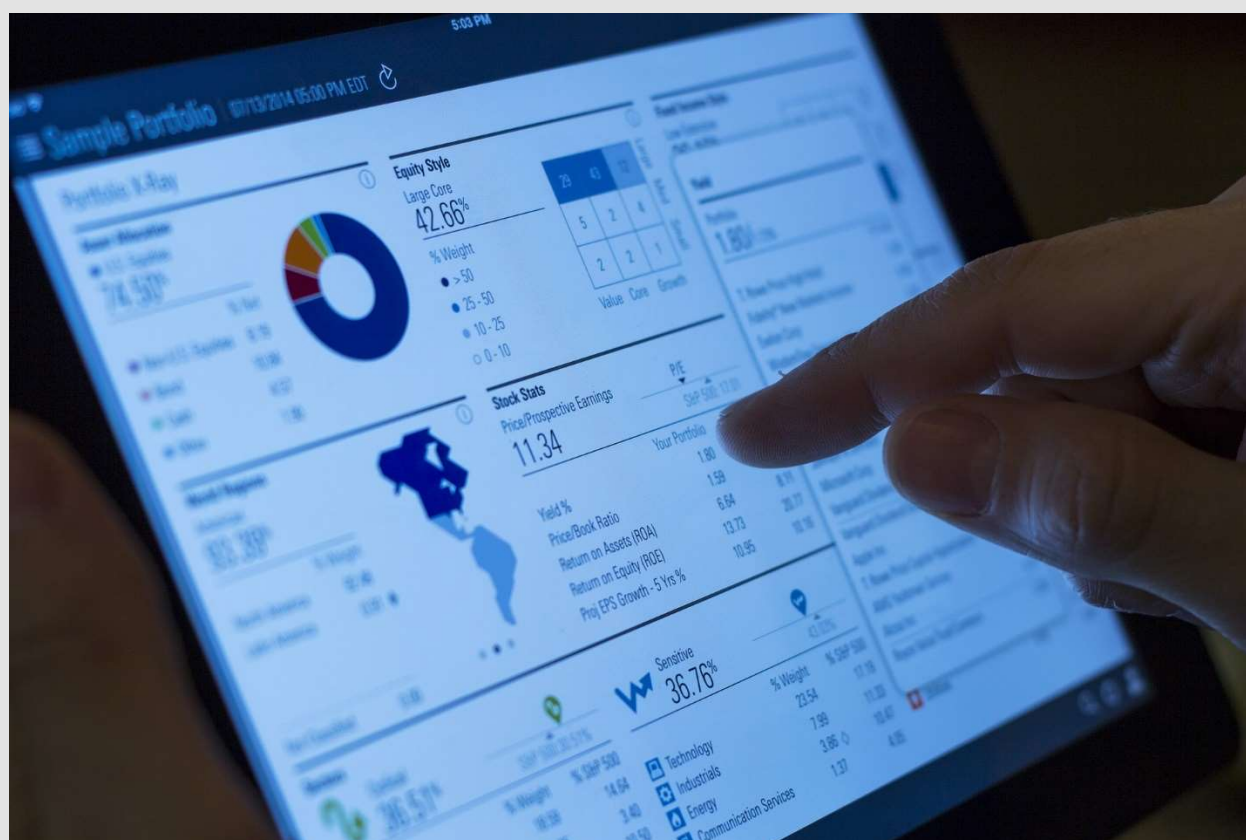

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What you should consider if you want to invest?

Each investor should consider three objectives in connection with investment - risk, liquidity and return. The best investment decision will be the one, which has the best possible compromise between these three objectives. When selecting where to invest we have to analyse and manage these three objectives. We call it the investment triangle.
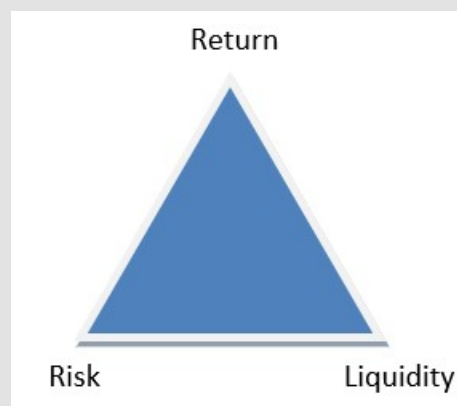
Return: How much I can earn? Hence given the level or kind of risk and liquidity of the investment, the appropriate return should encourage the investor to go for the investment. If the return is low compared to the expectation of the investor, s/he may prefer to avoid such investment and keep the money in the bank account or in worst case, in cash form in lockers.

Risk: Is it sure that I will earn the return? Central to any investment objective, we have to basically ensure the safety of the invested principal. Each rational investor prefers low rate of risk and for higher risk higher return should be required.

Liquidity: How fast and at which cost I am able to convert my investment back to cash? Higher liquidity is preferred. Investors prefer investment that can be converted without loss and without any difficulty into cash. If not, we may have to borrow or raise funds externally at high cost and at unfavourable terms and conditions. High liquidity can be possible only in the case of investment, which has always-ready market and willing buyers and sellers.

Investor can´t maximize each objective in the same time. There is a trade-off between risk and return on the one hand and liquidity and return on the other. The higher the risk normally the higher the return is expected, to compensate the possible losses. When the investment is illiquid, (i.e. one cannot get out of such investment without any loss) the returns will be higher.

All these points – risk, liquidity and return – are highly dynamic in any market and they are always subject to change and investor has to periodically watch the investment and make appropriate decisions at the right time.

How to measure the return?

There are 3 basic methods used in practice to evaluate investment opportunities. They are:

1. **Payback period (PP)**

2. **Net present value (NPV)**

3. **Internal rate of return (IRR)**

Payback period (PP)

It is based on the calculation of the length of time it takes for an initial investment to be repaid out of the net cash inflows from a project. The PP is calculating the cumulative cash flows. That means that we measure in which year the initial investment is fully covered.

If there are two (or more) competing projects whose payback periods were all shorter than the maximum payback period requirement, the project with the shorter PP should be selected. The advantage of this method is that it is easy to calculate, easily understood by the management. The disadvantage of PP is that it does not measure the profitability of the project.

Net present value (NPV)

The net present value (NPV) shows how much a project contributes to investors wealth—the larger the NPV, the more value the project adds. The formula to calculate the net present value is based on the expected cash flow of the investment, time and the discount rate:

$$NPV = \sum_{n=0}^{N} \frac{CF_n}{(1+i)^n}$$

Where:

CFn   is the expected cash flow in period n

i   is the discount rate

N   is the total number of periods

n   is the given period

In case of NPV the project or investment with the highest NPV should be accepted (in case of the equal level of risk and liquidity).

Internal rate of return (IRR)

Internal rate of return (IRR) stands for the real interest that the investor earns. It is the average interest earned by the investor. The basic formula to calculate the IRR is the modified NPV:

$$NPV=0= \sum_{n=0}^{N} \frac{CF_n}{(1+IRR)^n}$$

The discount rate that causes the equation (and the NPV) to equal zero is defined as the IRR. We calculate the IRR using Excel.

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Example:

Imagine you have the option to invest 20 000EUR today and in following four years you expect to receive cash flow 5 000EUR after one year, 6 000EUR after two years, 7 000EUR after three years and 10 000EUR after four years. The second option is to invest 20 000EUR and to receive cash flow 10 000EUR

after one year, 10 000EUR after two years, 5 000EUR after three years and 5 000EUR after four years. The data are shown in table:

Period	Cash flow project A	Cash flow project B
0	-20 000	-25 000
1	5 000	10 000
2	6 000	10 000
3	7 000	5 000
4	10 000	5 000

We assume that the projects are equally risky. The investor requires the minimum interest 10%.

1.   Payback period (PP)

In this case we calculate the length of time it takes for an initial investment to be repaid out of the net cash inflows from a project. That means that we measure in which year the initial investment is fully covered:

Period	Cash flow project A	Cumulated Cash flow project A
0	-20 000	-20000
1	5 000	-15000
2	6 000	-9000
3	7 000	-2000
4	10 000	+8000

The PP is 4 years for Project A. Calculated Payback period in case of Project B is 3 years. According to this method the project B is better. The disadvantage of PP is that it does not measure the profitability of the project. It is not considering the next cash flows.

2.   Net present value (NPV)

The formula to calculate the net present value is based on the expected cash flow of the investment, time and the discount rate. In case of Project A is the discount rate 10% and the Cash flows as follows:

Period	Cash flow project A
0	-20 000
1	5 000
2	6 000
3	7 000
4	10 000

To calculate the NPV we use the formula:

$$NPV_A = \sum_{n=0}^{N} \frac{CF_n}{(1+i)^n} = \frac{-20000}{(1+0,1)^0} + \frac{5000}{(1+0,1)^1} + \frac{6000}{(1+0,1)^2} + \frac{7000}{(1+0,1)^3} + \frac{10000}{(1+0,1)^4}$$

$$NPV_A = 1593,5$$
$$NPV_B = 4527,0$$

In case of NPV the project or investment with the highest NPV should be accepted and therefore we chose Project B.

3. Internal rate of return (IRR)

Internal rate of return (IRR) stands for the real interest that the investor earns. The basic formula to calculate the IRR is the modified NPV:

$$NPV=0= \sum_{n=0}^{N} \frac{CF_n}{(1+IRR)^n}$$

The calculated IRR for project A using excel is 13, 23% and for project B 22,77%. A rational investor should decide to invest into project B.
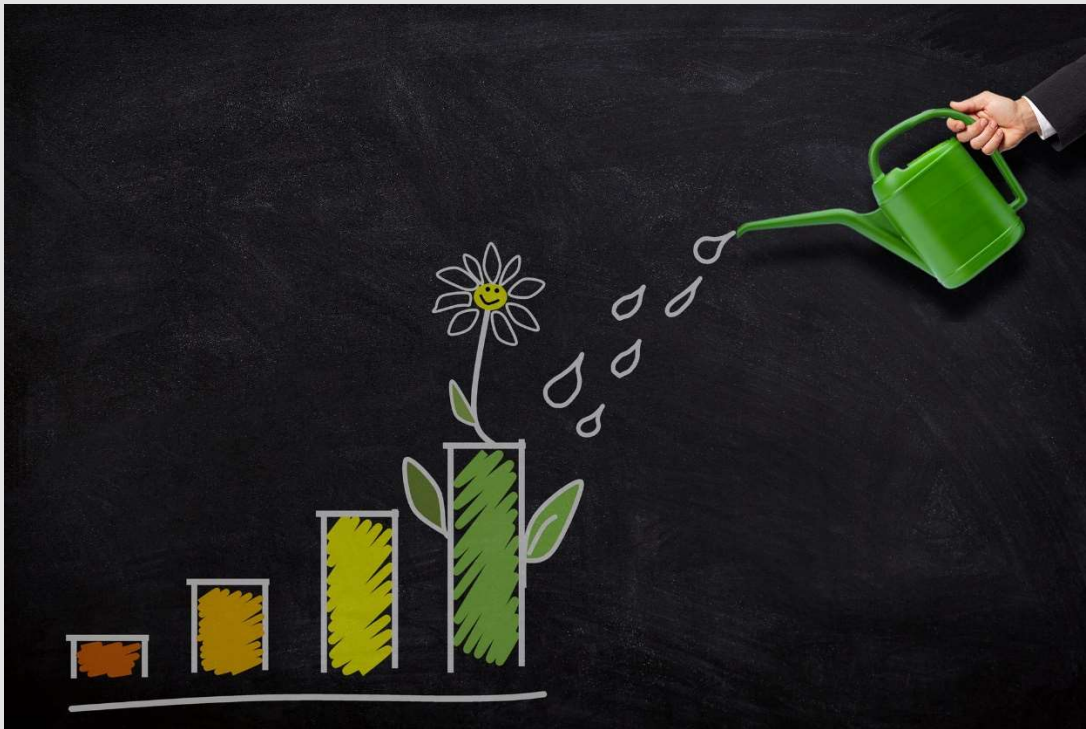

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How to measure the risk?

The process of risk quantification starts with the calculation of average expected return from the investment. To measure the risk we need information on return volatility in the history. If we have historical changes in returns, we can conclude the probability of expected returns.

For example consider an investment project with following probability of returns based on the economic development:

Projects predicted returns with probability:

	Probability (Pn)	Expected return in EUR (Rn)
Recession	0,3	70 000
Normal	0,4	90 000
Expansion	0,3	110 000

In graphical form the table can be displayed as follows:
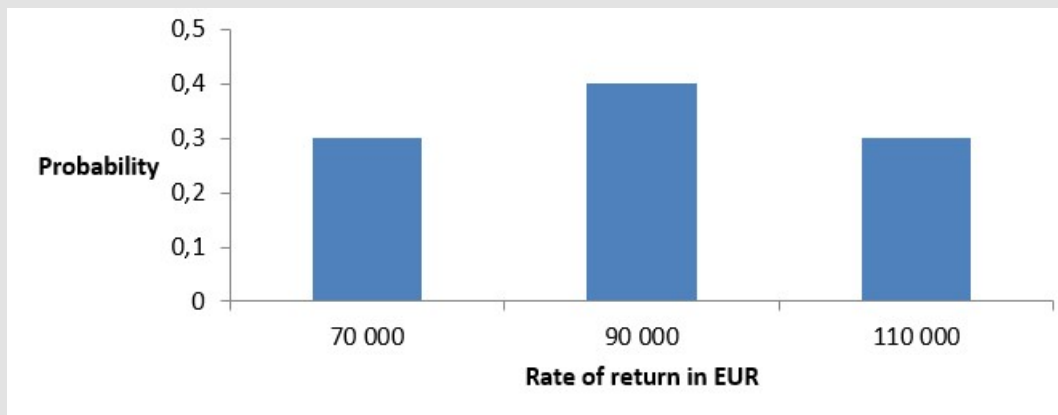
The sum of the probabilities for each investment has to be 1 or 100% and the probability of each scenario has to be positive.

The calculation of stand-alone risk is a process of basically 3 steps:

1. **Calculation of average expected return**

2. **Calculation of risk**

3. **Interpretation of the results**

1.   **Calculating the average expected return.**

If we multiply each possible outcome by its probability of occurrence and then sum up we get the average expected return. The formula for expected rate of return is as follows:

$$R(e) = \sum_{n=1}^{N} R_n * P_n$$

The expected rate of return for the example investment is:

$$R(e) = 0{,}3 * 70\,000 + 0{,}4 * 90\,000 + 0{,}3 * 110\,000 = 90\,000$$

2.   **Calculation of risk**

To calculate the risk we use standard deviation, the symbol for which is σ , pronounced "sigma." The smaller the standard deviation, the lower the riskiness of the investment.

The formula for the standard deviation is as following**:**

$$\sigma = \sqrt[2]{\sum_{n=1}^{N} (R_n - R_e)^2 * P_n}$$

The standard deviation in our case is:

$$\sigma = \sqrt[2]{(70\,000 - 90\,000)^2 * 0{,}3 + (90\,000 - 90\,000)^2 * 0{,}4 + (110\,000 - 90\,000)^2 * 0{,}3}$$
$$\sigma = 15\,491{,}93\ EUR$$

If a choice has to be made between two investments that have the same expected returns but different standard deviations, most people would choose the one with the lower standard deviation and therefore, the lower risk. Similarly, given a choice between two investments with the same risk (standard deviation) but different expected returns, investors would generally prefer the investment with the higher expected return. To most people, this is common sense—return is "good," risk is "bad," and, consequently, investors want as much return and as little risk as possible.

3.   **Interpretation of results**

If a probability distribution is normal, the actual return will be within +/-1 standard deviation of the expected return 68.26 percent of the time. In case of our example, the expected return 90 000,-EUR +/- the standard deviation 15 491,93EUR will be earned with the probability 68, 26 percent in case of normal distribution.

How to evaluate the liquidity?

To evaluate the liquidity of investments we do not use calculations. Generally, groups of investments are ranked according to liquidity. Let us explain the different level of liquidity on example of a flat and gold.

Flat has lover liquidity than gold. Why? First: Flat is linked to a specific place. Therefore, the number of potential buyers is limited. A flat in Slovakia has benefits for only a small number of potential owners. Gold is transferable and offers benefits to a much larger group of people. Second: Each flat is individual with respect to location, number of rooms or colour of a kitchen. Gold is gold and has always the same quality. Third: If you want to sell flat to transfer your investment back to cash, it takes more time then to sell gold.

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