Chapter 3: DIVERSIFICATION & PORTFOLIO SELECTION.

Risk and Return situation of common stocks

We are going to start by considering that **prices** of common stocks cannot be predicted. If the market is efficient, that should be the case, so we could consider the prices a **random variable.**

Formula

$$Annual\ Return = \frac{P1 - P0 + D + PSR}{P0}$$

P1 = Stock price at the end

P0 = Stock price at the beginning of the year

D = Dividend paid during the year

PSR = Preferential subscription rights

Risk and Return situation of equity portfolios

This is the situation when and investor combines different stocks into 1 portfolio. Even if they are stocks from different companies, the return still is **random**.

Formula

The formula makes a lot of sense. Is basically, the return of one stock and the weigh it has in the portfolio, sum with each different stock.
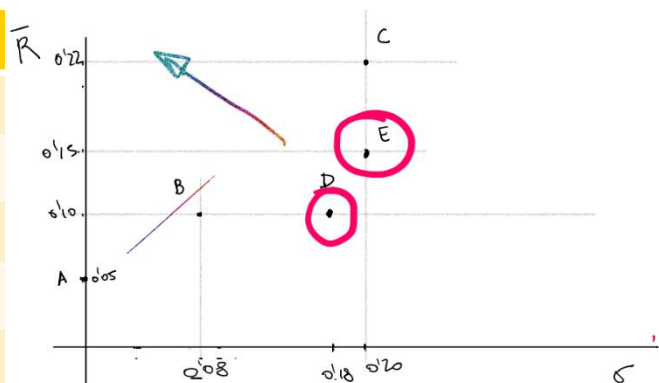
$$Portfolio\ Rate\ of\ Return = Rate\ of\ return\ stock * Weight\ of\ the\ stock + \cdots$$

Covariance

The covariance expresses how much the rates of return on two stocks move in tandem. It also expresses the volatility of the asset, which could be define as the risk of it.

Example:

ASSET	R ·	σ ·
A	0,05	0
B	0,10	0,08
C	0,22	0,20
D	0,10	0,18
E	0,15	0,20

As you can see, in this table, point E and D have a lot of volatility and less return than other assets. If it was for me, I would either choose B or C, both having similar ratios when combining Volatility and Return.

Diversify and risk reduction

To diversify means to invest in more than one asset. Basically, to construct a risky portfolio reducing the overall risk thanks to combining different variabilities of different assets.

Limits to this technique

- **Firm specific risk and return:** You combine risk and return but that changes through time.
- **Common sources of risk affecting all firms:** Macroeconomics, economic cycles…

Characteristics

Each portfolio has both, specific risk for each asset called **nonsystematic risk** and another type called **market risk,** affecting all firms.

Formula

$$\sigma^2 = x_1^2 \cdot \sigma_1^2 + x_2^2 \cdot \sigma_2^2 + 2\left(x_1 \cdot x_2 \cdot \sigma_1 \cdot \sigma_2 \cdot \rho_{12}\right)$$

The *P* at the end is the correlation we were talking before, if it is 1, they all move together to the same direction and distance.

Example

	E (R)	Covariance
Asset Z	10%	12%
Asset Q	30%	50%

When *P* is:

- 0,5

$$E(R)_p = 0'10 \times 0'50 + 0'30 \times 0'50 = \boxed{0'20}$$

$$\sigma_p^2 = 0'12^2 \times 0'50^2 + 0'50^2 \times 0'50^2 + 2 \cdot 0'50 \times 0'50 \times 0'12 \times$$
$$\times 0'50 \times 0'50 = \boxed{0'0811} \rightarrow \sigma_p = \boxed{0'28478}$$

Jokes

- I have a joke about chemistry, but I don't think I am going to get a reaction

- I am on a seafood diet.
- I see food and I eat it

- I made a pencil with two erasers, it was **pointless.**

The Markowitz portfolio selection model

Basically, is a model to help the investor to combine **non-risky assets** with **risky assets** in order to help increase the return for **risk averse** investors.

Characteristics

- ▪ **Risk over Return:** The avoidance of risk goes before than return.
- ▪ **Maximization of expected return:** Self-explanatory.
- ▪ **Investment budget fully invested:** Self-explanatory.
- ▪ **No short sales allowed:** Easy.

The efficient frontier of risky assets

This set is determine by:

- • **All stocks:** Consider as an individual investment.
- • **All possible portfolios:** With different combinations diversification

The efficient frontier is the one which has the best combination between risk and return. However, the **efficient portfolios** lay upwards the slope of the frontier, while the **NON-**efficient portfolios lay downwards the frontier.

Different stages and types of investors

First Investor:

This type of investor only invests in **risk free assets** like bonds.

- ▪ **Expected Return:** Rf
- ▪ **Risk associated:** 0
- ▪ **Budget distribution:** All in that risk-free asset

Second Investor:

This type of investor diversifies between **risk free assets** and the **optimal risky portfolio.**

- ▪ **Expected Return:** 1 – Weight in risk free assets * rf + Weight in optimal risk portfolio * E(R)
- ▪ **Risk associated:** Weight in optimal risk portfolio * covariance in portfolio
- ▪ **Budget distribution:** A percentage in each.

Third Investor:

When the investor invests **everything** in the **optimal risky portfolio**.

- ▪ **Expected Return:** Expected return of the portfolio.
- ▪ **Risk associated:** Only the one of the portfolio.
- ▪ **Budget distribution:** Everything in that risk portfolio.

In order to know the return that this third investor is going to get we have a formula we use:

$$E(R_p) = r_f + \frac{E(R_{P^*}) - r_f}{\sigma_{P^*}} \sigma_p$$

Fourth Investor

This investor invests more than what he has, he asks for a borrowing, to invest more than a 100%, and invests everything in the **optimal risky portfolio** while **paying interest of risk free assets.**

- **Expected Return:** 1 – Weight risk free asset * rf + Weight optimal risky portfolio * E(R)
- **Important:** The weight of risk free asset * rf needs to be below 0, meaning is a payment of interest.
- **Risk associated:** The ones of the optimal risky portfolio.
- **Budget distribution:** The distribution needs to be higher than 1 for the optimal and smaller than 0 for the other.
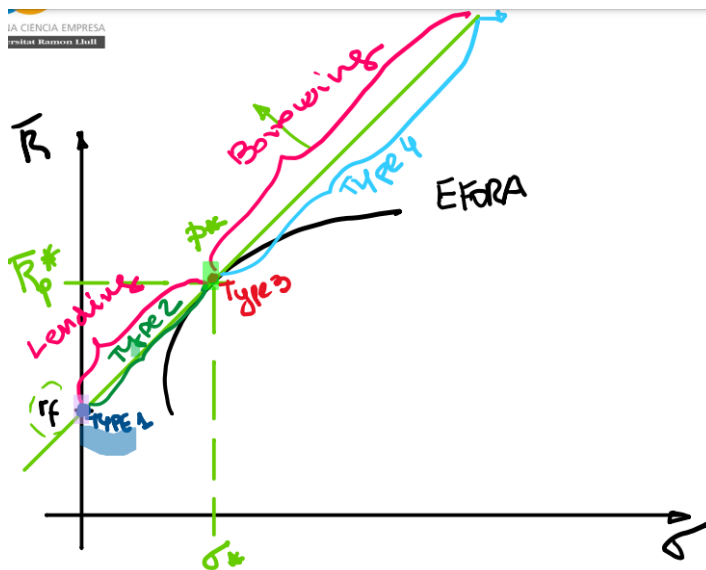
The separation Theorem

The theorem tell us that if the **rate** of lending and borrowing is the same, it won't matter the **attitude** towards risk of the investor. So, basically, the investor will have to go through two stages:

1. **Determination of the best portfolio of common stocks:** Regardless of their risk aversion.
2. **Allocation of funds between this portfolio and the risk free assets:** Being here the only time that the investor actually makes a decision.

I believe most of this term is easy to understand it if the exercises are done.

The end.

https://www.youtube.com/watch?v=7yd-Cz4yZnA - Laugh video, however, is in Spanish.

Jokes

➢ I am so good at sleeping…
➢ … I can even do it with my eyes closed.