EnpRisk - Lecture Notes Week 5

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April 1, 2022

0.1 Wrapping up The Deal

Before we draft the legal documents, we need to agree on the most important principles of the deal:

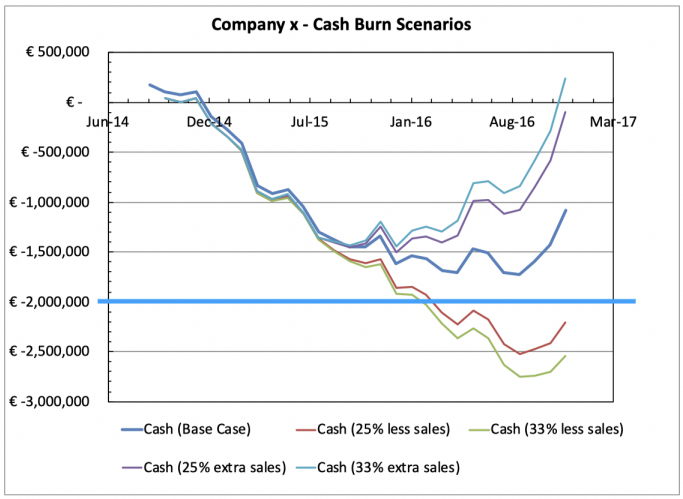
- The amount invested, and how it will be made available
- The value of the company
- The cap table, who owns what percentage of the company
- The governance principles

0.1.1 The Amount Invested

The previous part on corporate finance and company valuation, we explained how to calculate cash flows and cash position. Based on all the information gathered during the due diligence, the investor will calculate a number of cash burn scenarios. This will be used to assess the amount of capital that needs to be invested.

Capital invested in a startup is used for burning cash, so, it is important to have a good understanding of different cash burn scenarios!

In the example below, we decided to invest 2M Euro's, which was our base case scenario. The investment amount turned out to be too small and follow-up rounds were needed:



As a founder, it is important to negotiate for a strong **cash buffer.** If the cash burn is higher than expected, you may need to find new capital in a situation under stress. At that time your company valuation will be low, and you will dilute (i.e. start losing ownership of the company).

0.1.2 The Value of The Company

Some common metrics, which we already defined previously, are:

- ΔWC = Change in accounts receivable + change in inventory - change in accounts payable
- Accounts receivable = Sum of all invoices send out to customers that have not been paid yet
- Accounts payable = Sum of all invoices received from vendors that you have not paid yet
- Taxes: You only pay taxes when the cumulative EBT (Earnings before taxes) of the previous years is positive
- Depreciation: Not a cash flow item, it is a loss, but it's not a cash-out. The cash-out occurred at the time if the investment, so to got from P&L to cash flow you have to add the non-cash items again.

0.1.3 Cap Table

With the value of the company determined, we can create the **pre- and post-money valuation and cap table:**

Pre-money	**Ownership**	**Value**
Founder 1	33.3%	EUR 1′333′333
Founder 2	33.3%	EUR 1′333′333
University	33.3%	EUR 1′333′333
Total		EUR 4′000′000

Table 1: Pre-money cap table.

Post-money	**Ownership**	**Value**
Investor	33.3%	EUR 2′000′000
Founder 1	22.2%	EUR 1′333′333
Founder 2	22.2%	EUR 1′333′333
University	22.2%	EUR 1′333′333
Total		EUR 6′000′000

Table 2: Post-money cap table.

With this new investment, the initial owners get diluted by $\frac{1}{3}$, that is the pre-money valuation of $4M$, divided by the post-money valuation of $6M$. In other words, $\frac{1}{3}$ ownership becomes $\frac{2}{9}$.

0.1.4 Governance Principles

The **governance principles** are outlining the responsibility, the composition, and the authority (the decision-making process) of the management team (MT), the supervisory board (SVB), and the general meeting of shareholders (GMS) of the company.

This allows for an efficient management of the company based on objective criteria and processes independently of existing persons and historical relationships.

0.2 Corporate Bodies

The **corporate bodies** of a company are usually made out of the following three groups: General meeting of shareholders, supervisory board, and management team.

The *management team* is to do day-to-day affairs. Furthermore:

- Has the authority to decide in line with the annual budget and business plan
- In case of significant deviation from the budget and business plan, the decision is escalated to the board

The *supervisory board* is to do supervision. In particular:

- Composed of representatives of the shareholders, independent board members, and senior management
- Composition and voting rights are clearly defined in the shareholders' agreement
- Must supervise and advise the management and oversee the general affairs within the company
- Should be guided by the interests of the company

Finally, the *general meeting of shareholders* is responsible for value creation. More specifically:

- Composed of the shareholders of the company
- Meets at least once per year to approve the annual accounts, discharge the board and follow up and/or adapt the value creation plan
- Appoints the members of the supervisory board and sometimes also members of the management team

0.3 Legal Documents

Once the amount invested, the value of the company, the cap table, and the governance principles are agreed upon, the legal documents are drafted.

The main documents are the following:

- Subscription Agreement (the transaction)
- Shareholders Agreement (governance and organization)
- Management Agreement (day-to-day operations)

0.3.1 Subscription Agreement

A **subscription agreement** is between a company and a private investor to sell a specific number of shares at a specific price. It contains, amongst others, information regarding the amount invested, the cap table, issue of new shares or transfer of existing shares, payment conditions, etc.

Some agreements include a specific rate of return that investors are guaranteed to receive (the so-called *preference shares.*)

0.3.2 Shareholders Agreement

A **shareholder's agreement** describes how the company should be operated and outlines shareholder's rights and obligations. It is intended to make sure that all shareholders are treated fairly and that their rights are protected.

It also outlines the governance principles: the responsibility, the composition and the authority of the management team, the supervisory board, and the general meeting of shareholders of the company.

Furthermore, it describes the exit scenarios (i.e. the transfer of shares) with specific care for the rights of minority as well as majority shareholders.

The different EXIT strategies are as follows:

- *Lock-up:* A predetermined amount of time when shareholders are restricted from selling their shares.
- *Right of first refusal:* After the lock-up period, when one shareholder can sell shares to a third party, other shareholders must be given the opportunity to match the price and buy shares instead of the third party.
- *Drag along* (protection of majority): A drag along right allows a majority shareholder of a company to force the remaining minority shareholders to accept an offer from a third part to purchase the whole company at the same price, terms and conditions.
- *Tag along* (protection of minority): Tag along rights are the inverse of drag along rights. When a majority shareholder sells their shares, a tag along right will entitle the minority shareholder to participate in the sale at the same time for the same price, terms and conditions.

0.3.3 Management Agreement

Finally, the **management agreement** is an agreement between the management and the company outlining:

- Expected management services
- Management fees
- Targets and objectives
- Intellectual property rights
- etc.

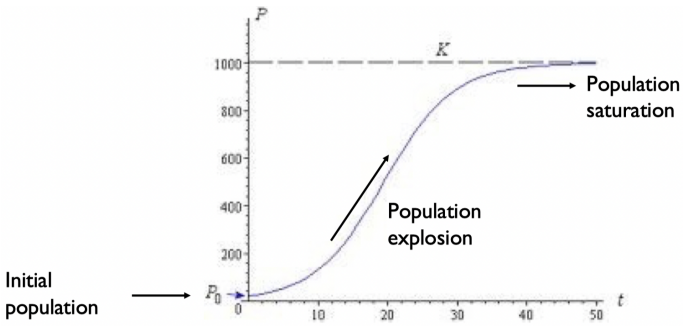
1 How To Predict The Future

1.1 The Logistic Equation

1.1.1 Intuition

> The size of a population, with competition for **limited resource,** grows according to a very specific process. It has an **S-shape.**

Think of a pair of rabbits on a fenced-off range. There is a population explosion in the beginning. However, the available food can feed only a limited number of rabbits. As the population approaches its limit, the growth rate slows down. Eventually, the population stabilizes as the S-curve reaches its ceiling.



1.1.2 Mathematical Formulation

The growth of a population P in competition can be described by what we call the **"logistic" differential equation:**

$$\frac{dP}{dt} = rP(t)\Big[1 - \frac{P(t)}{K}\Big]$$

In the beginning, for small t, we are in the exponential phase with $P(t) << K$, the growth is proportional in p with factor of r:

$$\frac{dP}{dt} \simeq rP(t)$$

Later, $P(t)$ plateaus and reaches the constant value of K, growth stops and the population remains constant. It has reached a ceiling, which is, by definition, the **carrying capacity** (K).

The solution to this differential equation, with P_0 being the initial population $(P(t = 0) = P_0)$, is called the **logistic function:**

The **logistic function** can be written as follows:

$$P(t) = \frac{KP_0e^{rt}}{K + P_0(e^{rt} - 1)}$$

If there are no limitations, K is infinite and:

$$P(t) = P_0e^{rt}$$

1.1.3 Generalized Logistic Model of COVID-19

There are two types of models to describe epidemics:

- **Phenomenological models:** an empirical approach without a specific basis on the physical laws or mechanisms that give rise to the observed patterns in the data.
- **Mechanistic models:** incorporate key physical laws or mechanisms involved in the dynamics of the problem under study in order to explain patterns in the observed data.

We can relax the assumption of exponential growth via "scaling of growth" parameter p:

$$\frac{dC}{dt} = rC^p(t),$$

where $\frac{dC}{dt}$ describes the incidence growth phase over time t, the solution $C(t)$ describes the cumulative number of cases at t:

- $p = 0$: this equation describes constant incidence over time and the cumulative number grows linearly.
- $p = 1$: well-known exponential growth model.
- $0 < p < 1$: sub-exponential growth patters.
- $1 < p$: super-exponential growth leading to finite-time singularity.

We can give some extensions to the logistic type model:

- Generalized-logistic growth model (GLM):

$$\frac{dC}{dt} = rC^p(1 - \frac{C}{K})$$

- Richards model:

$$\frac{dC}{dt} = rC(1 - \left(\frac{C}{K}\right)^\alpha)$$

- Generalized Richards model (GRM):

$$\frac{dC}{dt} = rC^p(1 - \left(\frac{C}{K}\right)^\alpha)$$