



**LUT University**

**School of Business and Management**

**Strategic Finance and Business Analytics**

# **REAL OPTIONS IN PRIVATE EQUITY FIRMS**

**Master's thesis**

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<b>ABSTRACT</b>	
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<b>Title:</b>	Real Options in Private Equity Firms
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<b>Keywords:</b>	Real options, Private Equity, Private Equity firms, Private Equity funds
<p>Real options existing in private equity firms have not been extensively studied previously. The objective of this study is to provide opening research on the subject as only a few relevant studies have been made before. The aim is to recognize different real options that private equity firms have in their organizations, funds, and their portfolio companies. In addition to recognizing these real options, the value of these real options is discussed. Also, this research discusses how real options are used in private equity firms in practice.</p> <p>Broad introductions to both real options and private equity are presented to understand how real options work and what types of them may exist in private equity firms. The research process of finding and recognizing real options in private equity firms is based on the state-of-the-art literature review that further proved the gap in the academic literature for this subject. Five interviews provided an empirical viewpoint for the study. In the interviews the practical use of real options, existence of previously recognized real options, and new real options existing in private equity firms were discussed and found.</p> <p>The findings of this research suggest that the use of real options seem not to be used in practice in private equity firms. Even when talking about things related to real options, the actual term is not often used. In this study, a total of 29 different real options were recognized, of which 18 were not previously found in the academic literature. Lastly, the demonstrative examples show that these real options are valuable for private equity firms.</p>	

<b>TIIVISTELMÄ</b>	
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<b>Tutkielman nimi:</b>	Reaaliopiot pääomasijoitusyhtiöissä
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<p>Reaaliopioita pääomasijoitusyhtiöissä ei ole aiemmin laajasti tutkittu. Tämän tutkimuksen tarkoituksena on toimia tutkimuskentän avaavana tutkimuksena, koska vain muutamia relevantteja tutkimuksia tästä aiheesta on tehty aiemmin. Tavoitteena on tunnistaa pääomasijoitusyhtiöiden organisaatioissa, rahastoissa ja heidän portfolion yhtiöissä olevia reaaliopioita. Näiden reaaliopioiden tunnistamisen lisäksi myös niiden arvot käsitellään ja keskustellaan. Tämä tutkimus myös käsittelee kuinka reaaliopioita käytetään pääomasijoitusyhtiöissä käytännössä.</p> <p>Laajat esittelyt molempiin aiheisiin, reaaliopioihin ja pääomasijoitusyhtiöihin, käydään lävitse, jotta ymmärretään kuinka reaaliopiot toimivat ja millaisia niitä voi löytyä pääomasijoitusyhtiöistä. Tutkimus reaaliopioiden löytämiseksi ja tunnistamiseksi pääomasijoitusyhtiöissä uusimpaan ja perusteelliseen kirjallisuuskatsaukseen aihepiiristä, mikä entisestään todistaa aukon akateemisessa kirjallisuudessa tälle tutkimukselle. Empiirisen näkökulman tutkimukselle antoi viisi eri haastattelua. Haastatteluissa keskusteltiin reaaliopioiden käytöstä käytännössä, aiemmin löydettyjen reaaliopioiden olemassaolosta ja uusien reaaliopioiden löytämisestä pääomasijoitusyhtiöissä.</p> <p>Tutkimuksen tulokset osoittavat, että reaaliopioita ei juuri käytännössä käytetä pääomasijoitusyhtiöissä. Vaikka reaaliopioihin liittyvistä asioista puhutaan, niin itse termiä ei usein käytetä. Tässä tutkimuksessa löydettiin yhteensä 29 erilaista reaaliopioita, joista 18 ei oltu aiemmin akateemisessa kirjallisuudessa löydettyjä. Lopuksi havainnolliset esimerkit näyttävät, että näillä reaaliopioilla on arvoa pääomasijoitusyhtiöille.</p>	

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*Teemu Karuluoto*

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## **ABBREVIATIONS**

CAPM	Capital asset pricing model
CVC	Corporate venture capital
DCF	Discounted cash flow
GP	General Partner of a limited partnership
IBO	Investor-led buyout
IPO	Initial public offering
IRR	Internal rate of return
KYC	Know your customer
LBO	Leveraged buyout
LP	Limited Partner of a limited partnership
MBI	Management buy-in
MBO	Management buyout
MEBO	Management-led employee buyout
MOIC	Multiple of invested capital
NPV	Net present value
PE	Private equity
R&D	Research and development
RO	Real option



## 1 INTRODUCTION

Even though real options can be found almost anywhere, in practice the using of the actual term has remained rare. However, multiple studies have been made of them, thus proving that the research field of real options is active and healthy. Most of the studies have focused on analyzing real options in production and manufacturing, uncertainty and investment cases, in R&D and technology space or supply chain and logistics (Trigeorgis & Tsekrekos, 2018). This research does not solely belong to any of the previously mentioned categories, but it is instead overlapping a couple of those categories.

Real options in private equity (PE) firms has attracted only a limited amount of attention in academic research. Only a few significant closely related studies have been made before. Chen, Conover, and Kensinger (2011) demonstrated in their article the real options found in private equity arrangements with three case company examples and argued business units and asset pools of companies forming real options to a PE investor. In another article Folta & Miller (2002) studied the acquirement of additional equity in research-intensive industries with a real options perspective and highlighted the costs involved in holding a real option. Mathonet & Meyer (2008) and Meyer (2014) focused their book chapters on the real options an investor of a PE fund has as a limited partner. However, they also highlighted a few essential real options a PE firm has when operating a fund. The focus of this research is on PE firms and what type of real options exist inside of them.

The research combines the academic literature of real options and private equity to find significant real options in PE companies. The findings found from the thorough research on real options in private equity will be used as the base for interviews with industry experts. The interviews are done as collaborative discussions together with the experienced industry experts. In the interviews, the goal is to confirm the existence of real options found from the academic literature in practice. In addition, a goal is to find new real options that they may have confronted in practice. Real options found from academic literature and the interviews are presented in the last part of this research, and a few demonstrative case examples of their value are shown.

## 1.1 Research background

The lack of significant studies of real options and PE companies makes the research space wide open for future research. In addition to studies made by Chen et al. (2011) and Folta & Miller (2002), only a few research articles have been written on the subject. Liu and Yang (2015) studied the optimal investment strategy on PE with a real option method. Krohmer, Lauterbach and Calanog (2009), and Smit (2001) used and analyzed the use of staging investment as real options. Another essential point of view is legal covenants in investment contracts (Cossin, Leleux and Saliasi, 2002; Leisen, 2012) that often appear as real options in PE context through various agreements with target companies and investors. A thorough understanding of real options in PE firms is missing, and this research aims to help in it.

PE is often related and sometimes mixed with Venture Capital (VC), but there are significant differences between the two in practice. PE investments usually are made in more mature companies that need capital. Often, these investments are so-called leveraged buyouts, where PE companies buy the majority equity of the target company and leverage it to the maximum level. VC firms, on the other hand, are focused more on companies in their earlier stages, which enables young innovative companies to fundraise. (Breuer & Pinkwart, 2018) Previously PE investments have often been larger than VC investments, but nowadays the situation is not necessarily that simple. VC investments have grown larger, and so have the VC funds. A good example of this is the Softbank's Vision Fund of 100 billion USD (Rowley, 2018). However, even though the two have significant differences in practices, VC funds operate in often in a similar matter than larger PE firms investing in more mature companies. Different PE strategies are discussed more thoroughly in chapter 3.1.

After the financial crisis of 2008, PE companies have been flourishing thanks to the low interest rates. Due to this, PE companies have been able to highly leverage their portfolio companies, which has sparked some heated discussions (Breuer & Pinkwart, 2018). The discussions are often stating that PE companies are overleveraging the portfolio companies, causing some of them to declare bankruptcy eventually (Agathis, 2016). PE companies have been trusting to future exponential growth with leveraging the companies, which increases the possible return of the investment but also significantly increases the risk of the investment.

Even though only a few studies about real options in PE has been made, it does not mean PE companies are not familiar with real options. Real options are often used by investment companies when valuing hi-tech startups (Eichner, Gemuenden & Kautzsch, 2007), real assets (Mardones, 1993), claims on real assets (Paddock, Siegel & Smith, 1988), or R&D projects (Van Zee & Spinler, 2014). Multiple different real option valuation methods have been created to simplify the use of them in practice, e.g., a Datar-Mathews method (Mathews, Datar and Johnson, 2007) and a fuzzy pay-off method (Collan, Fullér, and Mezei, 2009). However, the use of these real options in practice in PE has not been studied.

Ragozzino, Reuer, and Trigeorgis (2016) mentioned the need for more empirical studies in real option academic literature. They also further highlighted that most of the previous studies have focused on project-level investment and real options analysis and that more business unit/firm-level studies should be done on real options. This research answers their call of an empirical firm-level study on real options as one view of this study is to collect information about how real options are used in practice on a PE firm level.

Lastly, Mathonet and Meyer (2008, 254) and Meyer (2014, 248) mentioned that real options in PE are indirect, and are challenging to manage systematically. However, Meyer (2014, 248) further argued that the real option framework has potential to be realized in practice. This research aims to be a steppingstone guiding towards the practical implementation of real options in PE firms.

## 1.2 Objectives and research problem

This study aims to find different real options appearing in PE investment companies and their structures. The objective is to recognize these options and demonstrate possible values of a few of them with simple calculations. Understanding the value of real options existing inside PE companies helps them to optimize their operations efficiently, agreements, organization and fund structures, et cetera. Finding these real options together with the experienced industry experts helps to fully understand what type of real options exists in practice, and what their possible value for the company might mean to them.

In addition to the possible practical use case of this research, the academic literature clearly has a gap in the subject matter. This gap is further shown in a thorough state-of-the-art literature review in chapter 4. Therefore, this research acts as an opening study for the real options in PE firms to some extent. Real options in PE are confirmed with discussions with a few experienced professionals in the field.

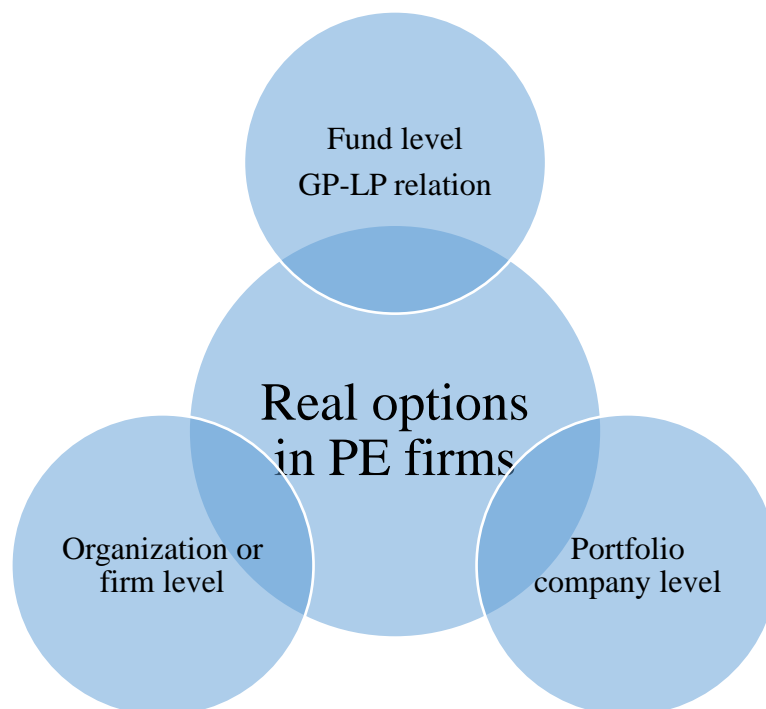
This thesis tries to find answers to three interrelated questions:

1. *Are real options used in private equity in practice?*
2. *What type of real options exists in private equity firms?*
3. *What is the value of these real options?*

The objective of the study is thus to form an understanding of real options used in PE. Firstly, the use of real options in PE in practice is discussed with industry experts, and their views of the Finnish PE field and real options are shown later. Secondly, the thorough academic literature review and the interviews with industry experts provide information about the different types of real options and different singular real options found in PE. These can exist inside organization, and fund structures, agreements, or in their investments. Lastly, values of some of these real options are demonstrated with simple examples. Different real options can be

found in many different places, and worth noting is that not all real options can be mathematically evaluated, but their value can be reasoned in other ways.

Figure 1 shows how real options PE firms can be found on different levels. PE firms possess real options in many different levels of which at least can be easily recognized and separated. In fund level real options exist based on the general partner (GP) and limited partner (LP) relation, and these real options relate to the fund level actions. On a portfolio company level real options exist inside of these companies and thus are in control of PE firms as their value is closely related to their target companies. Lastly, there are the actual organizational or firm-level real options that concentrate on the actual PE firm and its possibilities and opportunities. This division will be used at the end of this research to understand real options in PE firms better.



*Figure 1. Different levels of real options in PE firms*

If the acquisition of a PE firm was to happen, these real options in the target company should be taken into consideration when evaluating it. As Trigeorgis, Rainer, and Smit (2007) state in their newspaper article related to real options in cooperative real options; “Those who manage portfolio of options most effectively will be in the best position to realize their company’s

growth potential.” The real options in PE firms can be viewed as a portfolio of options, thus managing them effectively will be desired to maximize the value of a PE firm.

### 1.3 Research Methods

Literature reviews together with the interviews of industry experts are the primary methods of this study. The process to find real options from PE companies is started from literature review of both real options and private equity. After that a state-of-the-art literature review on real options in PE is made and findings from it are discussed. To confirm these findings from the academic literature and to find new real options, the interviews with industry professionals are done. The process of the research is shown in Figure 2. After confirming the existence of the real options their value is demonstrated through case examples.

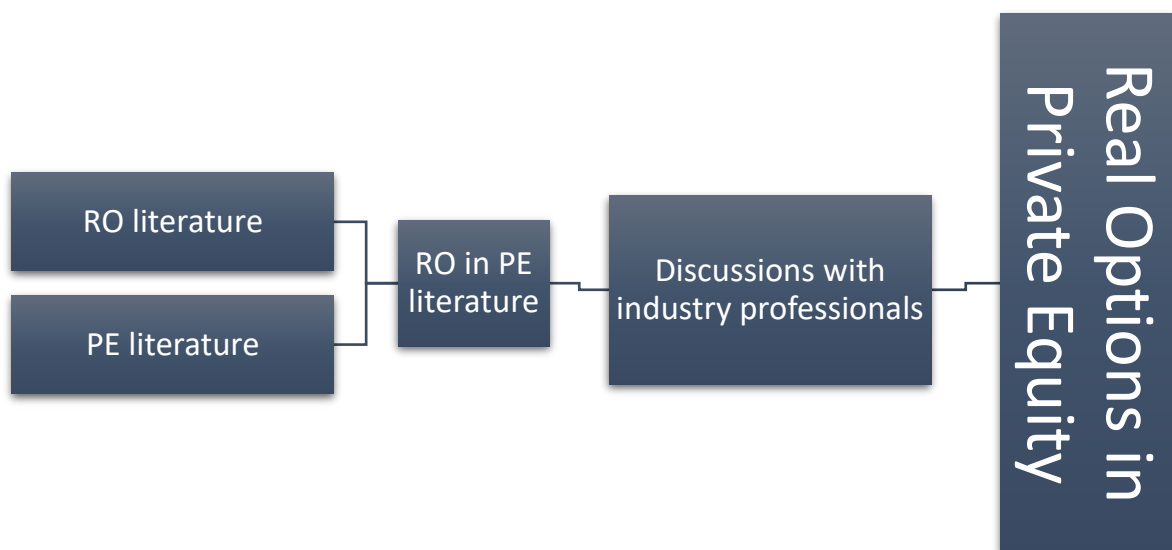


Figure 2. Research process

A literature review was chosen as the starting point of the research because of the lack of previous comprehensive research on the subject. A literature review helps to define the context

of the study and sharpens the objectives of the research (Boote & Beile, 2005). The comprehensive literature reviews of both areas, real options and PE, provides valuable information about the gaps in the academic literature and helps to raise future research topics (Kostopoulos Nackoney, Munn, and Fernandez, 2011, 26-28). Both research fields need to be analyzed to fully understand the subject in hand and concluding it correctly. After analyzing the academic field of both subjects a synthesis is made with a thorough literature review. The state-of-the-art literature review makes a solid background for the interviews.

Interviews need to be planned carefully to achieve the goal of this research. Open discussions with industry professionals could be useful, but they are likely to be time-wasting in terms of achieving the goal of this research. Therefore, the interviews need to have some form of structure but not too much since the point is to find the real options together with the industry professional. The middle ground of an open discussion and a strict interview is a semi-structural interview which has been chosen to be the interview style of this research. A semi-structured interview provides a more natural way of conversation (Grindsted, 2005), thus being a more discursive way of gathering information for the research.

Suchman and Jordan (1992) argued that an interview is always an interactive event that differs significantly from regular conversations because of the nature of the interview. The nature of the interview is caused by the interviewer's aims to stand his ground as an objective researcher instead of a person affecting the outcome of the research. However, Gindsted (2005) argued strict neutrality in an interview is not possible even though very well-known interviewer bias is often considered in the interviews. She concludes her research arguing that aiming for ordinary interactive conversation in interviews increases the validity as both parties experience common goal of producing actual knowledge.

Preparations for the interviews were mainly done by researching the subject in hand and finding the different possible real options found in the literature. For the interviews and this research real options were categorized to better understand the different types of real options existing in PE firms. This categorization is introduced in chapter 2.2. The real options discussed in the interviews were mostly derived from the thorough literature review on real options in PE. Especially, the book chapters of Mathonet & Meyer (2008) and Meyer (2014) provided a good

background for the interviews. These ideas formed the basis for the interviews together with the other relevant previous literature.

Interviewees are chosen because of their professional history in the field of PE. All the interviewees are experienced professionals working currently or have recently worked in significant roles in different PE firms in Finland. Each of them is introduced in the before actual interviews on real options in chapter 5. Reserved time for the interview was approximately an hour due to the fact the interviewees are busy professionals. Worth noting is that only five interviews were done, and all of the interviewees are working or have worked for Finnish based PE or VC firms. Therefore, a generalization of the outcomes of this research should be made carefully because of the small number of interviewees.

#### **1.4 Structure of the study**

As this research is done mostly as a qualitative study, the basis of this study is formed by very elaborate literature reviews of both main subjects: real options and private equity. After researching both areas, a state-of-the-art literature review is done in the following chapter. The literature review further highlights the gap in the academic literature and shows the previous findings of different real options in PE. A thorough literature review forms a synthesis, thus, combines the literature from both subjects into one to fulfill the aim of the research.

Findings made in the state-of-the-art literature review act as the basis for the interviews. The interviews are confirming the real options found based on the literature reviews and are possibly providing information about new real options found in practice but not in the academic literature.

Findings of the state-of-the-art literature review together with the interview results are shown in chapter 6. In the same chapter the most significant real options in PE field are presented based on the research done in previous chapters. From these real options a few are picked for numerical examples that prove their monetary value in the context of PE. These numerical



examples are not necessarily real-life cases but more of possible scenarios happening in the real world based on the interviews and literature reviews.

Lastly, conclusions present the results of the research. The results are reflected in how well they answered the research questions presented above. The numerical examples and their results can provide valuable information for PE companies in practice that can more effectively build their structure by knowing the actual values of present real options. The reliability of the study is discussed at the end as well as the possible future research subjects for which this research provides an excellent ground to build on.

## 2 REAL OPTIONS

The purpose of this chapter is to introduce the basic concept of real options, its origins, and different use cases in practice. Firstly, a short history of real options is explained together with the definition of the term. Next, different types of existing real options are introduced based on the academic literature. After that, the concept of real option reasoning is introduced followed by a chapter item on real option valuation methods. Then, some practical applications of real options and their studies are discussed. To conclude the chapter on real options, issues with using real options are shortly discussed.

The term real option, in short, refers to opportunities and possibilities that one may encounter when making a decision. Like any option, real option has a right but not an obligation for an action in the future at specified cost. Real options have existed since the beginning of humankind as many choices in life can be described as a real option. Even today people face real options in their everyday life; to leave for work 8 am and commute for an hour because of the traffic, or to leave half an hour earlier and commute only 30 minutes. These options exist everywhere and mostly they are made intuitively without further analysis.

In the business environment, these real options may have financial value, whereas in our personal lives the everyday real options are mostly valued in time, or in some other form. Despite the long history of real options in decision making, valuing them objectively is extremely difficult or even impossible in some cases. Real option values change depending on their context and situation in hand. Because of the uniqueness of real options often, the valuation and exercise decisions of them are subjective and based on the practitioners' intuition and experience (Lambrecht, 2017). Damodaran (2005) raised the controversial issue with practitioners not knowing unanimously what to do with real options; some want to use them as only rhetorical tools to justify decisions without any quantifications, while others think values of real options should be tried to estimate mathematically.

Before the actual concept of real options, the strategic and operational flexibility decisions were made intuitively by managers (Trigeorgis, 1993). A few years before Myers' (1977) introduced the concept of real options, a significant financial options study was made by Black and Scholes

(1973). The formulation introduced in the paper by Black and Scholes together with Merton's (1973) extended theory of it has acted as the basic principle of financial options pricing since then. The new mathematical pricing model of options helped to develop the applications related to options, thus acting as a sound basis for Myers (1977) to introduce the concept of real options as a method to understand the growth opportunities of companies.

The most substantial argument for the need to create a new valuation method was the need to value future flexibility in the decisions. Myers (1984) himself highlighted DCF analysis' insufficiencies by arguing its lack of usability in strategic applications. At the same time, he emphasized real options as a better method for some applications. However, Hodder and Riggs (1985) argued that the arguments regarding discounted cash flows (DCF) models' insufficiencies are caused by the users of those models, and not the model itself.

The field of real options has expanded from being a little sibling of the traditional financial option to a significant independent option. Addition to the traditional option pricing methods Black & Scholes (1973) and binomial option (Cox, Ross and Rubinstein, 1979) pricing models, new valuation techniques for real options have been developed e.g. Generalized binomial model (Jackwerth, 1997), Monte-Carlo approach (Gamba, 2002), Datar-Mathews method (Mathews, Datar and Johnson, 2007) and Fuzzy-payoff method (Hassanzadeh, Collan and Modarres, 2012).

Trigeorgis and Tsekrekos (2018) did a comprehensive analysis of the academic field of real options. They divided the published articles related to real options between 2004-2015 to sub-categories to understand where the academic field is going. Figure 3 shows how the real option categories are divided over different sub-categories. Valuation models and other topics have been the least researched area in the academics of real options. This research could be categorized as "Other Topic" as a sub-category of real options. Trigeorgis & Tsekrekos (2018) saw one of the promising future research areas to be in case-studies and practical applications, which further supports the purpose of this research.

## Real Options articles categories from 2004 to 2015

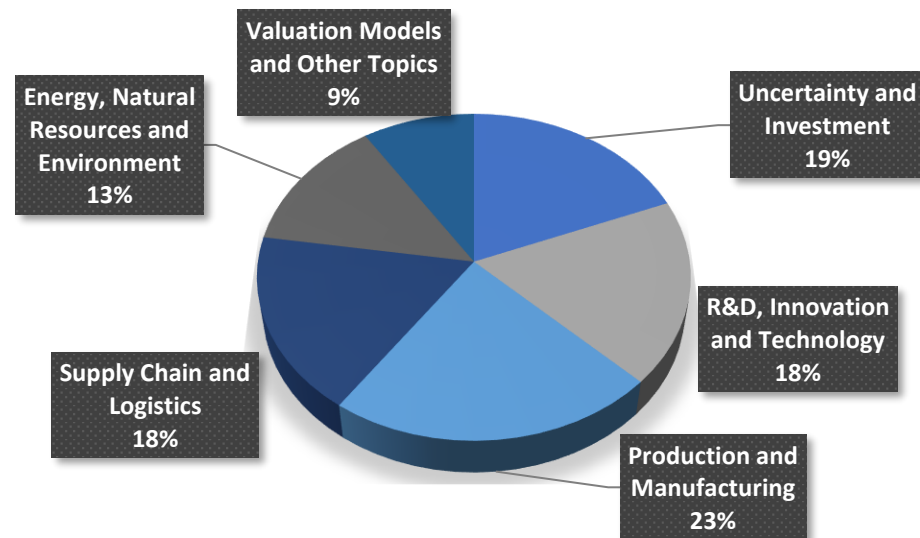


Figure 3. Real Options Articles Categories (Trigeorgis & Tsekrekos, 2018)

Another important finding is the development of real options research. Trigeorgis and Tsekrekos (2018) compared real option articles published in operational research in two different periods; years 2004-2009 and 2010-2015. They found that the number of published articles in almost all of the categories mentioned above had grown significantly and nearly doubled. Only *R&D, Innovation and Technology* category had decreased in terms of published articles. However, *Valuation Models & Other Topics* category had not grown as strongly as other theme categories. Therefore, this research is situated in one of the areas least researched by in the operations research.

According to Google Scholar at the beginning of August 2019 “real option” or “real options” were a part of the title in total of 9140 papers, and 1332 of these are since 2015. Only in 2019 these two terms were mentioned in 145 papers in Google scholar. The academic field of real options is thus alive and well.

## 2.1 Option variations

As mentioned before, real options are often unique and complex, which makes them very hard to value objectively as the situation in hand is never the same. Like financial options, real options can be divided to call and put options as well. Call and put real options act in a similar matter as their counterparties in financial options. The summary of changes affecting option prices is shown in Table 1.

Table 1. Variables affecting Call and Put option prices (Damodaran, 2005)

Factor	Effect on Call Value	Effect on Put Value
<b>Increase in underlying asset's value</b>	Increases	Decreases
<b>Increase in Strike Price</b>	Decreases	Increases
<b>Increase in variance of an underlying asset</b>	Increases	Increases
<b>Increase in time to expiration</b>	Increases	Increases
<b>Increase in interest rates</b>	Increases	Decreases
<b>Increase in dividends paid</b>	Decreases	Increases

Options can have different variations that affect their value and usability. Damodaran (2005) demonstrated three different variations for simple real options: *Barrier options*, *Compound option*, and *Rainbow option*. In barrier options, the option value is limited if price of the underlying asset exceeds the pre-agreed level, e.g. call options may have an upside limit. The value of compound options comes from other options instead of the underlying asset, thus making it harder to value the more real options are involved. Lastly, rainbow options derive their value from at least two different sources of uncertainty instead of one as in a simple option.

## 2.2 Different types of real options

To better understand and analyze real options in PE companies, further categorization of the different types of real options needs to be done. In the previous literature real options may have been categorized in many ways and there is no one right answer how to categorize them. Even same researches have used different ways of dividing the real options into categories (compare Trigeorgis (1993) and Trigeorgis & Reuer (2016)). These different categories could be further divided into subcategories and their sub-subcategories, and so on. Some options can have characteristics of multiple different categories, thus meaning an option can belong to multiple different categories at the same time.

In this study, the categorization of the most common real options is based on the paper of Trigeorgis (1993). He found the most common existing real options to be: *Option to Defer*, *Staged Investment*, *Option to Alter*, *Option to Abandon*, *Option to Switch*, *Growth Option*, and *Multiple interacting options*. The first six of these option categories are relatively easy to understand and model. The multiple interacting options are somewhat extensions of these first five options. There are many more possible extensions for these options available, but for the purpose of this research, one more extensive option should be added to this list: *learning option* (Trigeorgis (1996), and Trigeorgis & Reuer (2016)). This categorization is believed to cover the most important areas of real options found in PE companies. All categories discussed in this study are mentioned below:

- *Option to Defer*,
- *Staged Investment*,
- *Option to Alter*,
- *Option to Abandon*,
- *Option to Switch*,
- *Growth Option*,
- *Multiple interacting options and*
- *Learning option*

The next few chapters thoroughly describe the meaning and the use of each real option category. Real-world examples and studies related to the specific real option category will be introduced as well. Later in this study, in chapter 4 the focus is solely on what type of options a PE has according to the previous literature. In chapter 5 the findings of the interviews are presented under these same categories. After collecting academic literature and empirical findings, these two views are matched in the synthesis and discussed in chapter 6 before concluding this study.

### **2.2.1 Option to Defer**

An option to defer is what it implies, an option to defer a decision, a project, an investment, et cetera. The value of this option often stems from the fact that with time a decision-maker has better information about the possible investment or project. Therefore, extended time brings value to the holder of this option.

McDonald and Siegel (1986) argued that timing investments is essential in practice, particularly in not optimal investment situations. They found that in these types of situations timing can affect 10-20 % of a project's value. There could be many examples where companies must make investments in imperfect situations, e.g., when money in a bank account is burning a hole in the pocket and stockholders are putting pressure on the management to put the money to work. The further a decision-maker can hold an option to defer, the better investment decision he is likely to make it because of the time available to thoroughly analyze potential investment targets. However, the more reversible a project or an investment is, and thus the more quickly its value depreciates, the less valued an option to defer is (McDonald & Siegel, 1986).

Dixit and Pindyck (1994) continued with the pricing of an option to defer pricing with different methods and taking into account multiple different scenarios in their book "Investment under uncertainty." In addition to the fundamental value model presented by McDonald & Siegel (1986), they added value models by dynamic programming and by contingent claims analysis.

Option to defer has clear use cases in natural resources. A resource owner has an option to defer to extract the resource from the ground. Tourinho (1979) argued that exploration investments

for resources increase under uncertainty as the value of an option increases. He also found that contrary to the intuition of many, the variance of the resource price has a more significant effect on the decision to extract resources instead of the expected return on the resource price. As mentioned before, option value increases with uncertainty thus making Tourinho's findings very rational as option holders want to exercise their options when the price is high. If the variance of the resource price was low the option value would have a lower value as well.

Option to defer type of analysis has been included in many research articles related to environmental resources. Shogren and Crocker (1990) showed that reduced supply uncertainty does not indicate a positive option value, thus supporting that with higher uncertainty the value of an option is higher. Lin and Wang (2012) argued resource extractions have multiple different real options at the same time; defer, close and reopen (alter) or even abandon, which provides the holder a set of real options. For this purpose, they created a Dynamic Option Simulation for natural resource projects that can calculate sophisticated multi-variable American real options.

In addition to natural resources real estate is another industry often applying the option to defer. Titman proved (1985) using west Los Angeles area as a case area that the option to defer was heavily used by real estate speculators who had bought land and chose not to build on it immediately but instead waiting for a better time order to construct the most appropriate buildings for that location at that time. Deferred project development has attracted enough attention in the academic literature to have a useful evaluation tool made especially for real estate developers making strategic decisions (Wang, Tsai and Huang, 2013).

Options to defer can be found in many more situations, but the few mentioned before are very commonly used examples in the literature. The possibility to defer a decision and wait additional information related to the decision is a valuable option to defer to have. However, it is not often possible to defer the decision forever, and the decision needs to be made at some point. Waiting too long can diminish the possibility of making the decision as planned previously, thus proving that option to defer may have its costs as well.



### 2.2.2 Staged Investment option

Staged investment option or staged option is closely related to the previously discussed option to defer. Staged investment option could be sometimes even argued to be under option to defer (Trigeorgis & Reuer (2016)). Staging investments provides the option holder a possibility to abandon the project if new information about the project does not satisfy the option holder. In addition to a possibility to abandon the holder may have a possibility to alter the planned investment or defer it or make any action as a response. Staged investment option consists of multiple compounding options, and each stage may have different options in it for the option holder depending on the context. Staged investment option is also known as time to build option as it provides option holder time for additional decisions.

Majd and Pindyck (1987) argued that the traditional discounted cash flow methods understate project values as they do not take into account the flexibility in investment decisions made sequentially. Typical sequential investments are made in construction as they must have some level of flexibility as new information arises. For these purposes, Majd and Pindyck (1987) included in their valuation calculations variables, simple NPV did not necessarily include; time to build, opportunity cost, and uncertainty on the investment decision. However, Milne and Whalley (2000) argued against the fact a real option approach would always be a better valuation estimate. They found that if project's time to build is long, an NPV will give a more appropriate estimate as the volatility of a project decreases when project time to build increases.

In his paper, Carr (1988) derived a pricing formula for compounding options with application examples. One of these examples was the investment decision option, which was valued as a finite-lived American exchange option using CEO pricing theory (Carr, 1988). A compounding investment decision option can be seen as a staged investment option. To fully exploit the use of Carr's pricing model, further information about the next stages in the investment decision process should be available for the analysis. This information can be complicated to derive as the future of the staged investment process is highly uncertain.

Staged investment option is a combination of multiple different options at different times. Options at different stages are not in a vacuum, but instead they have positive or negative effects

on each other. Trigeorgis (1993b) studied the interactive options highlighting the complexity of interactive options which size and type of the effect for a project depend on the type, separation, degree of being in or out of the money, and order of the options involved.

There are many examples of multi-stage projects that could benefit from using a real option analysis to derive the value for the project entirely. Pendharkar (2010) showed how real option analysis could assist valuing multistage IT investments with the binomial real option valuation model. However, he added that the valuation process gets relatively complicated when the time increases, and more nodes are added to the binomial model. Other valuation methods are not necessarily any better than the binomial model. Benaroch, Shah and Jeffery (2006) found that heuristic real option analysis models, like Black-Scholes, could overvalue a multistage IT project by more than 100 percent. They concluded their research by stating a custom-made binomial model or a nested version of Black-Scholes model should always be used in order to achieve more accurate results.

Another everyday use of staged investments is in capital financing. Zhang, Xiang, Ding, and Chen (2017) analyzed venture capital financing through a framework of option value, and comparative static, which included two different uncertainties; uncertainty caused by significant events, and economic uncertainty. They found that if both uncertainty sources increase, the project or venture will become more attractive in value. They concluded this type framework would help venture capital fund to decide the most profitable projects and to optimize to fund size accordingly. Furthermore on VC financing, Tian (2011) found VCs' staging investments to target companies have a positive effect on their probability of going public, operating performance, and post-IPO survival rate, but only if the geographical distance between VC and the target firm is considerable. In another study, Herath and Park (2002) developed a binomial lattice model to analyze and value nested multi-stage real options with multiple uncorrelated assets underlying for different investment projects. They argued their model is more flexible than standard pricing model as it can calculate multiple sources of uncertainty, and it can use any type and number of input distribution to calculate cash flows.

As Trigeorgis, Brosch, and Smit (2007) describe in their article directed to practitioners that *“the idea is to create flexibility by breaking decision down into stages.”* As mentioned before,

the stages can have multiple options, or for example a different option in each stage. These staged investment option valuations should be taken into considerations when making capital investments in companies, in projects, et cetera. Staging investments is therefore in a way at the core of using real options in practice.

### **2.2.3 Option to Alter**

Option to alter can be divided into different sub-categories as there are many ways that the option to alter holder could exercise his option. The most common alternations are probably an option to expand and option to contract. Other types of alternation can be, for example, option to shut down, restart or outsource. Multiple studies related to these types of options have been made. Some of these studies are introduced next to provide an overall picture of different existing options to alter that are found in the academic literature.

Sohn (2012) analyzed the real options affecting equity value, and he found that companies with large expansion option values have a better financial performance than companies with smaller options to expand. As one may logically infer, he also found that companies with large abandonment options have worse financial performance than their counterparties. In another study on options to alter in public companies, real adaption options of the firm were argued to be important input to the equity value of companies with Price to Book ratio being around unity or below (Ataullah, Higson, and Tippett, 2006). Options to alter can be found outside of publicly traded companies as well. Laurikka & Koljonen (2006) provided a new perspective for decision making on emission trading and investment decisions in power sector with DCF model including an option to alter operation scale and an option to wait.

As mentioned before, real options type categories analyzed in this study could be further divided into different subcategories, and some options can belong to multiple categories simultaneously. The most common subcategories to the option to alter are likely to be option to expand and option to contract. A very concrete example of these options is provided with the papers of Cruz Rambaud and Sánchez Pérez binomial option model for an option to expand (2017a) and for an option to contract or reduce (2017b).

Option to expand has been recognized in many different circumstances. Asawachatroj and Banjerdpongchai (2016) developed a valuation model for advanced process control and real-time optimization using option to expand as part of their economic assessment in chemical industry. If a natural resource holder owns the land but does not develop it waiting for better timing, the holder has exercised option to defer while holding an option to expand, meaning developing a mine or other natural resource extraction (Brennan & Schwartz, 1985).

An interesting analysis of the option to expand to a next-generation access network infrastructure was made by Charalampopoulos, Katsianis, and Varoutas (2011). In their research they analyzed the role of regulation in next-generation network expansion and found the ending of the pre-defined period of non-regulatory constraints is often the trigger for the option to expand to new network infrastructure. Another simple example of an option to expand is the vertical phasing option of real estate where there is an option to build another layer (Guma, Pearson, Wittels, de Neufville, and Geltner, 2009). Firms' joint ventures should also be analyzed as options to expand e.g. future technology or market development (Kogut, 1991).

Many of the options to expand mentioned before may also have a similar counterparty in the same situations, an option to reduce. However, option to reduce has not aroused as much attention in the academic literature as option to expand has. One vital and current topic in this sense is the option to reduce emissions. Kang and Létourneau (2016) presented a very troubling finding that government credibility risk in emission permit policies reduces investments in green plants as companies take advantage of the situation before the actual laws and policies are put in practice. One may argue that companies have a reason to act responsibly to brand themselves in front of their customers. However, it may be contradictory that companies who have large emissions and benefit the most from not reducing them are likely to maximize the profits while they still can. They are not likely to downsize their profits voluntarily before the actual laws and policies make them do so.

Another interesting finding is related to the field of the clean development mechanism (CDM) that provides a way for developed countries to earn certified emission reduction (CER) by investing in developing countries. Although it has a useful purpose, developed countries have exercised their option to reduce CDM market investments because of the high volatility of the

market price of CER. (Lee, Park, Kim, Kim and Kim, 2013) Seetahal and Alexande (2014) studied a more positive way to reduce emissions with a mahogany field in Trinidad and Tobago. The country of Trinidad and Tobago thus has an option to reduce its emissions.

Many real options can be found in R&D projects as they are highly uncertain and demand great flexibility in time and other resources. During these projects, management often holds an option to take corrective action that can be reduction, expansion, abandoning or any other needed action for the project (Huchzermeier & Loch, 2001). Closely related to the option to contract, or even the same situation under a different name is the option to shut down temporarily. McDonald and Siegel (1985) argued that if the variable costs are higher than operating income and shut down of the production can be done without additional costs, a rational risk-neutral company maximizing its value should shut down production temporarily.

The importance of available options to alter affects the needed capacity a firm must hold. If no options to alter are available, a firm needs to have more capacity for the changes in the demand. The more options to alter are available, the less capacity a firm needs to hold, thus freeing the capacity for other projects, investments or where ever capacity is needed at that time. (Pindyck, 1988) This chapter only introduced a few different options to alter, but as the word “alter” suggests, it can include many types of alterations, even some that are specific to the project or the investment in hand. A firm should aim to have multiple different options to alter with changing demand to operate more efficiently.

#### **2.2.4 Option to Abandon**

Option to abandon could be used in many different situations, and it can be a quite valuable option to have. Option to abandon can be described as exiting a market, selling technology or remaining assets of a company, or any other situation where the option holder has an opportunity abandon the case and therefore end it for his part. These types of options are essential in capital intensive industries and capital investments. Next a few different examples from academic literature are discussed. Like the previous option categories, this category also has many forms that one can think of, but only some of these are used as examples here.

Chi (2000) provided valuable research on the category of option to abandon and on acquiring a joint venture. In his paper he proposed 12 findings of the acquirement and abandonment of a joint venture with different scenarios affecting exercise price differently. He added that joint ventures have unique structures that make their real option values sometimes even counterintuitive. However, Sohn (2012) found that companies that hold significantly valuable options to abandon have worse financial performance than those with less valuable ones.

There have been a few studies that are providing an option pricing model for an option to abandon. Myers and Majd (1983) were one of the first to calculate abandonment value with option pricing theory. Since then more studies have analyzed abandonment value with option pricing theory. Berger, Ofek, and Swary (1996) proved that theory of pricing abandonment options holds as they found support for the prediction that the higher probability of exercising an option to abandon intensifies changes in market value caused by variation in exit value. Cruz Rambaud and Sánchez (2016) created a practical tool to value option to abandon for different periods with a mathematical expression. They also proved how the value of the option to abandon is greater or equal to zero, and how with maturity, its value also increases.

The value of an abandonment option has also been analyzed in a few empirical studies. Clark, Gadad, and Rousseau (2010) studied investor's abandonment option valuation of listed companies on the London Stock Exchange from 1985-1991. They found that investors price the abandonment option, but because of the private nature of exit values they value them imperfectly. Another empirical research studied the valuation of an option to abandon ISO 9001 certificate with fuzzy real option method (Sansalvador & Brotons, 2015). They found that even though firms have an option to abandon the certificate in times of crisis the ISO 9001 system increases the value of the company.

Option to abandon may have a major role in capital investment decisions and capital budgeting. De, Acharya, and Sahu (1983) presented a dynamic capital asset pricing model for multiple periods using abandonment options in part of the calculations. Sercu and Uppal (1994) proposed that option pricing model may be better suited for international capital budgeting than the NPV approach because of the slowly resolving uncertainty over time. Abandonment option values in capital budgeting depend on the timing of information when signing contracts; if the

information is timely (before contract signing), abandonment option value is zero, but if it is delayed (after contract signing) the abandonment option has a positive value (Pfeiffer & Schneider, 2010). Options to abandon are an essential part of investing and projects. One should consider the abandonment value and possible options to abandon the investment or projects if things do not go as planned. An option to abandon is a put option, thus it can be seen even as an insurance for the investor or whoever who is holding the option. Even if things go as planned, there may still be an option to abandon for whatever the reason if the holder decides to do so.

### **2.2.5 Option to Switch**

As the option categories mentioned before, an option to switch can also have multiple different use cases. A holder of an option to switch has the opportunity to change inputs, outputs, suppliers, producers, or other factors affecting the result, to another while getting the same or at least similar results. Option to switch is essential, for example, for multinational corporations that can optimize their profit and income. Often, the result is profit or earnings of the company, investment or project.

Margrabe (1978) studied probably one of the most apparent use cases of the option to switch. He provided evidence that the option value to exchange asset for another, depends on the current value of the asset and the maturity of the option. Margrabe (1978) discussed mostly financial assets, but this framework can be extended to real assets as well (e.g. changing business premises with another firm, etc.). Kulatilaka (1988) developed a model to value the flexibility in manufacturing systems that better cope with economic uncertainties in the world. More complex valuation models of flexible manufacturing can integrate financial analysis of multiple variables affecting manufacturing to strategic analysis of substitute products, competition, suppliers, and new market entrants (Chen, Kensinger and Conover, 1998). In the modern world information moves faster than ever and rapidly changing situations cause uncertainty for firms' manufacturing. Hence, it could be argued that now more than ever before, an option to switch is very valuable for manufacturing companies.

Belderbos, Tong, and Wu (2013) found firms are likely to reduce downside risk with internationalism if the organization can coordinate cross-border activities thus making it

possible for using the shifting options. A more efficient organization could, therefore, benefit more of shifting options provided by the multinational business than an inefficient company. Shifting options can be gathered with different contracts that enable the buyers, e.g. international apparel industry, to switch suppliers when costs or exchange rates change (Kogut & Kulatilaka, 1994). Multinational organizations face exchange rate risks when doing business in different currencies and under different corporate tax rates. Huchzermeier and Cohen (1996) developed a compound option valuation model that incorporated these multiple variables and demonstrated how it could be used for financial and operational hedging. The optimization in a multinational environment is important as often the companies are large and even smallest changes in exchange or tax rates can mean millions of euros/dollars.

Many studies have analyzed switch options in energy sector; Gatfaoui (2015) priced the switch option of switching from crude oil to natural gas, Brandão, Penedo and Bastian-Pinto (2013) valued switch option for inputs in a biodiesel production, and Taschini and Urech (2010) developed a model addressing how expected windfall profits affect the profitability of gas-fired and coal-fired power plants. Rising attention and worry over global warming highlights the importance of these types of options as more climate-friendly options are searched to replace the old, more polluting solutions.

Switch options can be used in many other use cases as well. The option to switch strategy is one that is very on point for this research as well. One recent study analyzed the option to switch in video game industry from pay-to-play to free-to-play, and they found that in certain situations switching strategy should be done (Seidl, Caulkins, Hartl, and Kort, 2018). Similar switching strategy options could be found in many different industries and situations. The crucial unit economics and key figures depend on the industry and the company so each scenario could be very different from each other.

### **2.2.6 Growth Option**

A growth option is somewhat self-exploratory as it indicates an option that has significant growth aspect in it in terms of increased revenue, return, or something similar that provides the company value. Myers (1977) discussed determinants of corporate borrowing especially from



the point of view of growth opportunities that can be seen as call options. He found the corporate borrowing is conversely related to real options value in a company. Similarly, Ai and Kiku (2012) developed a model with companies' options for value and growth assets and found assets in place being riskier than options indicating the growth assets should be used for hedging against the risks in assets place.

Kulatilaka and Perrotti (1998) wrote an article on strategic growth options and found uncertainty increases considerations on investing in growth options when the strategic advantage is strong for the company. Growth options can be as well seen as new investment opportunities that generate more revenue or profit in the future. Kester (1984) discussed in his article how growth option thinking relates capital budgeting and strategic planning to one another. Pindyck (1986), Chung and Charoenwong (1991) have written similar research papers discussing investments as growth options. For this research, the growth option perspective for investments is crucial as making investments is at the core of PE companies.

Growth options reasoning is very well suited for R&D projects as well. As Boer (2005) wrote research costs should be seen as an investment and not as an expense. He also added the surge of venture capital and private equity had enabled new types of financing vehicles for funding research investments. For example, in pharmaceutical industry where R&D expenses are very high real option thinking is important. Cook, Golex, Vernon, and Pink (2011) showed how making innovations in steps consists of multiple growth options. These types of investment options align with previously mentioned staged investment options as well.

New ventures and technological innovation projects also benefit from the use of growth option thinking in decision making. Blazenko, Pavlov, and Eddy-Sumeke (2012) compared the differences in R&D for technological innovation for startups and already established businesses. They provided information how the R&D growth option is more valuable to startups than established businesses because of the startups' ability to avoid commercialization costs if an R&D project fails. Thinking innovation projects as growth options is very useful real option application in practice.

### 2.2.7 Multiple interacting options

Different options that affect the value of each other can be viewed in the form of multiple interacting options. This real option type is an extension of aforementioned options as it can include many different option types. Analyzing multiple interacting options can be viewed as managing portfolio of real options. Anand, Oriani, and Vassolo (2007) analyzed variables affecting the value of real options portfolio and the implications of this portfolio management to strategic management. Smith and Thompson (2008) provided practical information how to manage portfolio of multiple real options in their findings from their research. In practice, understanding and analyzing real options as a portfolio is important as many of the options have interactive effects on each other.

Multiple interacting options are involved when making investment decisions, as many variables affect the profitability of the investment. Changes in variables may turn the investment from profitable to loss. In their article Brennan and Schwartz (1985) used the logic of multiple interacting options as they demonstrated how a company or a resource-holder should take different options into account. For example, an owner of an option to defer can either hold the resource by not mining it and waiting for a better price for the resource or he can expand the mine right away by exercising the option to expand. Both options have their costs, which should be taken into consideration when making the decision. Similarly, Kensinger (1988) analyzed capital investment projects with real options focusing on switch option perspective but highlighted that other options, e.g. option to abandon, have to take into consideration together with other real options in these projects.

Trigeorgis (1993) focused solely on the interactions of multiple real options in the valuation of investments. He showed the added value of an additional option to a portfolio of multiple options is often less than its value separately. He also highlighted the fact that the interaction between the options can be either positive or negative, and interactions are more often negative indicating that simply ignoring the interactions may not cause considerable valuation errors. From his findings a conclusion could be made that if there is no significant proof that two or more real options have a strong positive correlation between them, the interaction between them could be ignored.

Some studies have focused on the so-called dueling options between an option to defer and an option to grow. Meaning the dueling option stems from the fact that if a company is exercising its option to defer all the time, in other words deferring its decision and holding the possibility open, some expansion benefits are lost. Folta and O'Brien (2004) proved the importance of consideration of both types of options when making an entry. They found the relationship between uncertainty and market entry to be controlled by three different variables; irreversibility, the total value of growth opportunities and early-mover advantages controlling. McIntyre (2014) found the presence of network effects affects market entry, enhancing both options to grow and to defer, but the extent of the effect depends on the strength of network effects and the existence of dominant design in the market. Option to grow and option to defer are therefore interacting options, but their correlation is likely to be negative as a company is only able to exercise one of them and still to destroy the other option as well.

Alliances between two or more companies cause many interactive real options as the cooperation opens new possibilities. Vassolo, Anand, and Folta (2004) showed redundancies in outcomes that cause multiple real options in alliances to be sub-additive but some real options to be super-additive because of the fungible inputs. This supports the previously mentioned fact that not all real options are comparable to each other. Bérard and Perez (2014) identified real options rising from the alliance between pharmaceutical companies that could be exercised in cooperation between the alliance members, or independently by each partner or not exercised at all. An unexpected discovery option is an example of an option that they both hold in their alliance. Even though the two previously mentioned studies of real options in alliances focused on pharmaceutical sector, similarly alliances could be created in other sectors that would provide alliance members valuable real options to exercise or hold.

### **2.2.8 Learning option**

A learning option can be seen overlapping of the option to grow or option to expand, or even option abandon. One could argue that new project, investment or any other business-related matter a company does is partly because of learning that may enable it to grow its business or expand to another sector in the future. Abandonment could also be a learning option, for

example in a case where company wants to learn how to abandon a worthless investment by selling its assets and maximizing the salvage value.

Bowman and Hurry (1993) argued that businesses should uncover linkages and opportunities resources may create in the future. These options are so-called hidden or shadow options. Trigeorgis & Reuer (2017) added that companies that are not able to recognize these options or do not value the follow-on opportunities arising from earlier investments might not have the same opportunities or the same terms in the future. The follow-on opportunities arising from earlier investments often arouse because of the gathered learning of doing it before.

The research made by Ihli, Maart-Noelck, Syster, and Musshoff (2014) provided an excellent practical example with farmers' investment decision making. They found that farmers' investment decisions are better explained by real option analysis than traditional NPV analysis, and farmers learn from their repetitive investment decisions over time. Thus, farmers are exercising their option to learn from experience to make better and more profitable investment decisions in the future.

Another concrete example of a valuable learning option can be found in recruitment processes. Hiring a wrong person can become very expensive for a company to do, thus making the option to learn about a candidate very valuable. Uncertainty and adjustment costs of a new worker slow down the investment or the hiring of a person. However, the competition of very talented workers is high in some sectors which causes them to make permanent decisions faster. (Kuhnen & Oyer, 2012) The value of option to learn therefore increases when the competition of workers is high and decreases when it is low.

Kogut and Kulatilaka (2001) argued that discounted cash flow analysis faults as the tool of evaluating a firm after recognizing that combining people with technology is the real source of the value. They highlighted the fact that the fundamental value of the firm is based on its ability to exploit its current assets and explore future opportunities. Investments could be made for technology and other assets, but the responsibility for fully enabling the exploiting of them is on the people of the company. Similarly, the exploration of future growth opportunities lies in

the staff of the company. Therefore, it could be argued that a company that does not actively provide learning options for its staff to exercise may not be successful in the long-term.

### **2.3 Real Option Reasoning**

Real options are opportunities and can be found in many places. The challenge is to decide which of these opportunities is worth any value. However, not all opportunities are quantifiable which makes them difficult to evaluate. Just because of the qualitative nature of the opportunities, they should not be ignored either. Often, the real option valuation methods are sophisticated and require customized complex calculations for each scenario, which may explain their limited use in practice (Bowman & Moskowitz, 2001; Rigby 2001). Real option reasoning highlights the importance of thinking and recognizing different real options but not necessarily always quantifying their value.

Busby and Pitts (1997) found that instead of quantifying the value of real options, many firms use real option reasoning guiding their strategic decision making. This further confirms the view that real options valuation methods for many decisions are too difficult to implement. Instead, recognizing opportunities and intuitively evaluating real options should be the preferred method. Even before the development of the theoretical option pricing model (Black & Scholes, 1973), investors and brokers had valued option prices for almost 100 years and managed to make profitable investments (Kairys & Valerio, 1997). Therefore, deriving an exact value for every real option does not need always to be the final goal.

McGrath and Nerkar (2004) explained real option reasoning to be recognizing valuable real options that their strategic actions have provided and act accordingly to capture the value of these real options even though not necessarily quantifying the financial value of the options. McDonald (2000) argued that firms use hurdle rates and “rules of thumb” to account for management’s ability to act accordingly when changes occur. Through economic evaluation of real option reasoning in firms, the importance of management’s judgment and gut feelings in decision making can be legitimized (Bowman & Hurry, 1993). However, Adner and Levinthal (2004) highlight the fact that managers’ intuitively made decisions are not always correct, thus making it possible to justify bad decisions with real option reasoning. Similarly, it can be argued

that managers are able to prove their favorite projects to have option values using real option reasoning (Kogut & Kulatilaka, 2004). Thus, using real options reasoning should be done carefully since not every project can be made profitable by solely reasoning its value with different real options.

A recent study made by Jahanshahi and Nawaser (2018) compared the similarities and differences between dynamic capabilities and real option reasoning. They argued that real option reasoning needs a changing and dynamic environment to function, but dynamic capabilities can be used in a stable environment as well. From this perspective, real option reasoning should be at the core of decision making as the change is constant and is happening everywhere with increasing speed as new technology arises. However, Jahanshahi & Brem (2017) found in their empirical study that even though real options are linked to environmental uncertainty, higher uncertainty does not explicitly increase the use of real options reasoning. The former indicates real option reasoning is not often enough used even though the circumstances around it would imply to do so.

Barnett (2008) combined an attention-based view for real option reasoning explaining the effects of a firm's attention structure to its decision-making managers when analyzing value-creating and value-destroying opportunities. Barnett (2008) argued that options are everywhere, but they can only be valuable if they are first even noticed. Figure 4 shows the attention structure and portfolio selection developed by Barnett (2008). From the universe of possibilities, the contextual structure of a company sets boundaries to what possibilities are available. Then by noticing, selling or letting go and exercising these real options, the company has the most valuable options for it at that time. The outcome of different projects, good or bad, can be accepted as it may still provide value for the company exercising these options. In the end, valuable real options for the company are held and others will be let go.

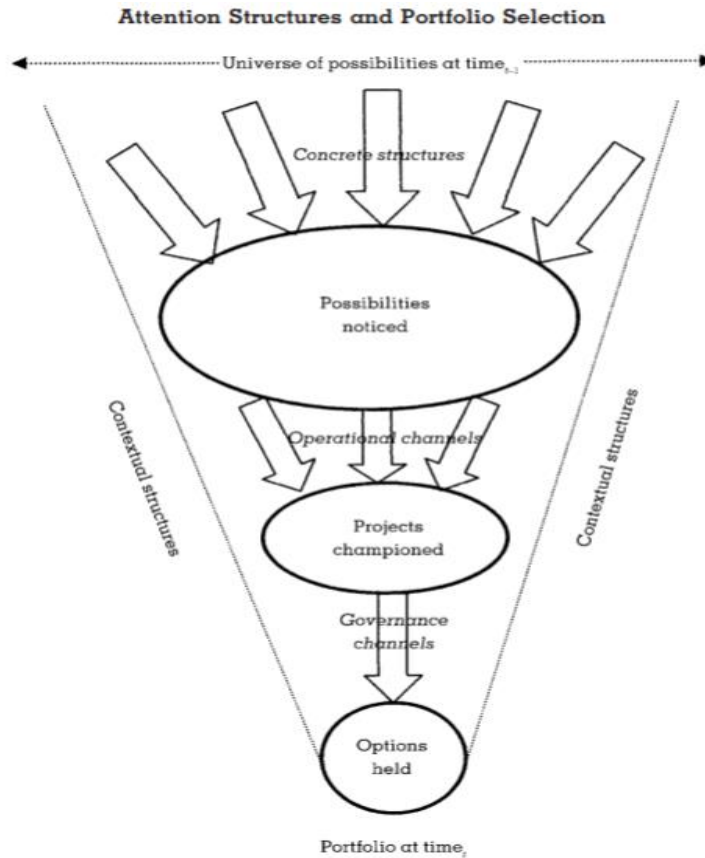


Figure 4. Attention Structure and Portfolio Selection (Barnett, 2008)

A few studies provide industry-focused information on real option reasoning. McGrath and Nerkar (2004) focused their article on the R&D investment strategies of pharmaceutical firms and found them to be consistent with the logic of real option reasoning. Avadikyan and Llerena (2010) used real option reasoning to approach hybrid vehicle investments that can have a significant role in helping to partly solve threats the automotive industry is facing aroused by global climate change.

McGrath and MacMillan (2000) described a STAR (strategic technology assessment review) process that helps to implement real option reasoning to practice. They argue that “trying to apply complicated methodologies to uncertain situations is usually futile.” These complicated methodologies also take a lot of effort and time that in the modern world often is never enough, thus making the STAR philosophy suited for today’s world according to them. The critical finding every practitioner can take from their study is their argument “lots of inexpensive

failures from which you can learn are the key to effectively applying real options reasoning.” This philosophy is discussed further later in this chapter.

## 2.4 Real Option Valuation

Even though there might be some arguments against calculating an exact value for a real option, in many cases it is possible and important to do so. Real option reasoning might be in favor of strategic real options and other types of real options that may have unknown or not quantifiable variables affecting the uncertainty of the real option. In some cases (e.g. in real estate, natural resources), more exact calculations should be made as the variables affecting the value of real options are often more easily identifiable and quantifiable.

A few different valuation methods have been developed the most traditional ones being Black & Scholes (1973) and binomial option pricing model (Cox et al., 1979). Black & Scholes pricing model is mathematically fairly complicated as can the binomial option pricing model be in multi-period models. Jackwerth (1997) extended the original binomial option pricing model to include American and exotic options as well in addition to European options. All mentioned pricing methods were developed for pricing financial options, which is why they need information not easily available for every real option analysis.

Real Options valuation methods are not all based on the financial option pricing models. Gamba (2002) presented a real option valuation model using the Least Squares Monte Carlo algorithm for evaluating the real option values. Mathews, Datar, and Johnson (2007) developed Datar-Mathews valuation method for real option valuation that is based on Monte Carlo method and its probabilistic valuation framework. Another valuation tool is the fuzzy pay-off method that uses fuzzy logic in creating pay-off distribution of an investment or project (Collan, Fullér, and Mezei, 2009). Lastly, fuzzy logic can be used in a binomial valuation model that was developed to further include the flexibility in real options (Ho & Liao, 2011).

Methods mentioned before are meant to be used in the real option valuation scenarios, but that does not necessarily mean they are easy to use. For example, the mathematical calculations



behind Monte Carlo analysis may be too much to handle for a manager. The logic behind these methods is more straightforward than in financial option pricing models, and their practical implementation is easier. The fuzzy pay-off method and Datar-Mathews method are similar, but the difference is that the first is calculated based on the pay-off distribution created with fuzzy numbers while the last is based on probabilistic distribution of different outcomes. Additionally, the fuzzy pay-off method is usable and trustworthy even if constructing the simulation model lacks information (Kozlova, Collan and Luukka, 2016).

As mentioned before, the numerical calculation of option values comes specifically handy when discussing natural resources. Paddock et al. (1988) provided a good example how financial option theory can be used for the real option valuation of offshore petroleum leases. A real option analysis does not need to be complicated with multiple different variables affecting the outcome. Deaves and Krinsky (1998) demonstrated three different option valuation examples with an option to defer investment, an option to change inputs and an option to expand. In their simple example they proved how traditional NPV is faulty and the NPV should be instead calculated as:

*Equation 1. Option-Based NPV (Deaves & Krinsky, 1998)*

$$\text{OptionBased NPV} = \text{Traditional NPV}(\text{NPV of cash flows}) + \text{Option premium}$$

As mentioned, real option valuation is not always possible, but when it is it can be calculated with methods presented above. More methods to evaluate a real option are available, but they are not in the focus of this study. Simple reasoning might be enough to realize the value of a real option, especially in more qualitative cases. Next, a few different practical applications of real options are presented.

## **2.5 Real option applications**

A few different papers have valued managerial flexibility in different industries. Slade (2001) valued managerial flexibility using real option theory in mining investments, Cirjevskis and Baduns (2015) in time of economic transitions, and Rebiasz, Gawel, and Skalna (2017) in steel

industry investments. Real option applications can help in times of climate change as well. Ryu, Kim, Seo, and Seo (2018) used real option analysis to water resource planning that is affected by floods in Korea. Similarly, real option analysis could be extended or partly included in many other extreme weather scenarios as they are highly uncertain, and they may have a significant impact on the daily lives of people.

Real options can affect the value of each other if multiple real options are present. Mulder (2011) presented in his paper a practical hands-on valuation model for land and real estate development projects with embedded real options. In his model, options to defer, to abandon, to expand, to contract, and to switch were included to value the development project's value with multiple real options. Similar research was done by Saluga (2011), who presented a real option valuation model for a mineral project with simultaneous options to expand, to contract, and to abandon. Many projects may often have two or more real options that should be valued together to have the correct valuation for the project.

As real option valuation models may go over some decision-makers' heads, a couple of papers have been written to solve this issue. Copeland and Tufano (2004) argued in their research that theoretical and realized values of real options differ significantly in all real option types. According to them this is due to managers missing the optimal timing of exercising an option. To improve timing of exercising options they proposed a binomial option model that should consider all the possibilities of either exercising an option, holding an option, or deciding not to exercise an option in every node of the binomial tree.

Another practical use case of real option reasoning is STAR method presented by McGrath and MacMillan (2000) to help evaluate the value of a technology option. Figure 5 shows their findings of how a technology option could easily be valued in practice without any actual option pricing methods. A similar method could be used to analyze the value of other similar, e.g. research and development, types of real options addition to just a technology real option.

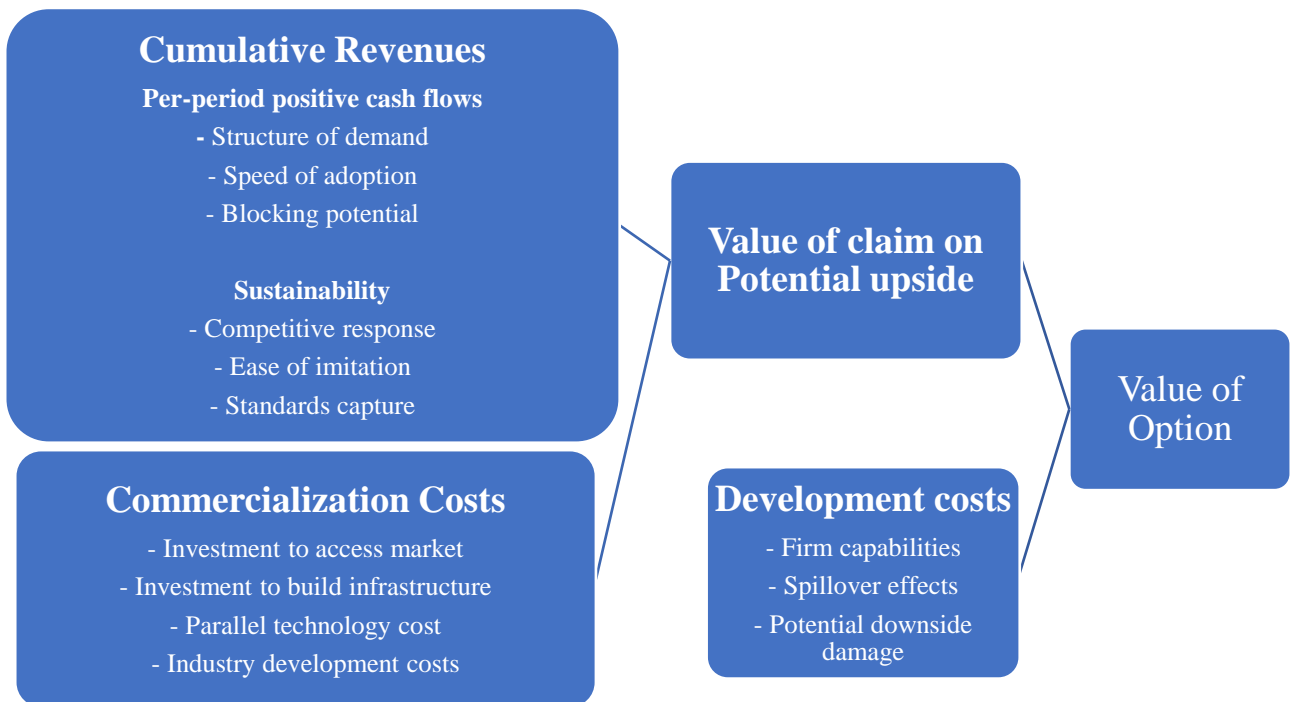


Figure 5. Factors influencing the value of technology real option (McGrath & MacMillan, 2000)

A few articles have analyzed public-private partnerships from real options perspective. Alonso-Conde, Brown, and Rojo-Suarez (2007) used a massive toll road project as a case study to demonstrate how real options could be implemented in incentives and risk transferring from the public sector to the private sector. Similar research was done by Chen and Qin (2010) in which they proposed a real option approach to relieve pressure from the government, to increase expected return for the private partner, and to improve well-being. Barbosa, Carvalho, and Pereira (2016) presented a real option model to improve private investment with a macroeconomic perspective using Portuguese economy as an example. These examples show that real option thinking could be easily used in public project analyses and even in macroeconomic decision-making.

Real option valuation and reasoning can be used solely or supporting financial analysis. Baldi (2005) presented a real option view of the adjusted present value (APV) method commonly used in leveraged buyouts (LBO). He included two real options to APV model; a financial default American call option and an operating default American call option, which expands the

equity value of the firm and enables more flexible management of the firm. Ahammad, Leone, Tarba, Glaister, and Arslan (2017) provided an empirical analysis based on 1872 cross-border mergers and acquisitions by British firms and found that firms from distant cultures are more likely to be partially acquired than acquired completely without previous knowledge of the country or culture. Their research proves the importance of staging options where a company can first “test the waters” when the uncertainty is high and later expand its investment if its targets are met.

Driouchi and Bennett (2011) argued that “the ability of decision-makers to explore and appraise real options prospects is a source of value for corporations.” However, simultaneously they mention the fact that flawed real options thinking, and complexity may cause firms to be in a distressful position. Folta and O’Brien (2004) have proved this finding as they found that managers may choose to acquire firms with comparatively low expected performance due to their unique information about growth options in target companies. For a PE firm, an investment itself is a growth option that may have many growth options inside of it. Hence, recognizing the importance of real option is valuable for the PE firms, but these should be evaluated carefully without falling into the trap of flawed real option thinking.

## **2.6 Issues with using real options**

Real option thinking and analysis has practical challenges. Bowman and Moskowitz (2001) argued that the complexity of real option approach causes overly optimistic predictions and assumptions, and the complexity makes it difficult to find errors in the analysis. They argue that these difficulties are part of the reason for real option approach to be rare. Lander and Pinches (1998) had also previously recognized the practical challenges of using real options. They found that real option models are not well understood by managers and practitioners. Furthermore, they argued that modeling assumptions are often violated in practice and that the required additional assumptions limit the scope of applicability. They proposed that more alternative models should be developed for practical modeling and valuing real options. The proposition has somewhat come true as many new methods have been developed, but more different practical methods are needed to implement the use of real options in practice more widely.

### 3 PRIVATE EQUITY

The purpose of this chapter is to enlighten the reader about the Private Equity (PE) industry, what it does, how it works and what are the most common characteristics of it. At the beginning of this chapter, definition and basic characteristics of PE are explained. Later, different types of PE companies are presented and some of the most common transaction types are discussed. After these, the focus is turned on PE firm and its functions, structures and working models. These are highly important in terms of the topic of this research as it focuses on PE firm itself.

#### 3.1 Private Equity definition

The word *private* does not indicate that this type of investing is done in secret, but instead, it is just the opposite of *public* markets. PE often refers to the firms investing in private companies and does not necessarily indicate that these investments are made in equity. In practice, PE is often thought to be investments in later-stage companies. However, PE can in many cases refer to the whole industry from investing in young startups to mature or distressed companies. Venture Capital (VC) is often a commonly discussed area of PE, and it is sometimes mixed in conversations with the more mature PE investing. British Private Equity & Venture Capital Association (BVCA) explains the difference between PE and VC as “Private equity investments typically support management buyouts and managing buy-ins in mature companies, as supposed to venture capital which provides funding for early-stage and younger companies” (BVA, 2019). Thus, VC focuses more on companies in their earlier stages whereas PE is often thought to be investing in more mature companies. In this study the focus is more on mature PE firms with a perspective to VC as well. Later in this chapter, the differences between these PE strategies are more thoroughly explained.

Gilligan & Wright (2014, 14) highlight in their explanatory guidebook on PE, the fact that most of the investing in PE market is done by PE funds which objective is to invest in portfolio of private companies and eventually generate profits from selling these companies. They add that the point in PE investing is to buy equity in the business, actively manage the business, and then realizing the value created by selling it or listing it the business on the public market. Like in other funds as well, the purpose of the fund is to provide return for its principal investors.

However, instead of counting on dividends or interest payments, PE funds create value from growing and eventually selling their investments in target companies.

A good example of how PE industry works was provided by Tykvová (2018) in Figure 6. PE funds are tax-neutral financial intermediaries that are managed by the PE firms who are acting as general partners (GPs) in these funds. Funds collect capital from limited partners (LPs) who are often institutional investors, family offices or funds of funds. PE firms act as on behalf of the LPs in the fund when selecting the portfolio companies (PCs), and in return the PE firms receive management fees from the LPs. When the life of the fund is coming to an end the fund returns the money to LPs with profits if successful. However, before returning the money, the PE firm gets its carried interest from the profits. The purpose of this type of structure and its fees are later explained.

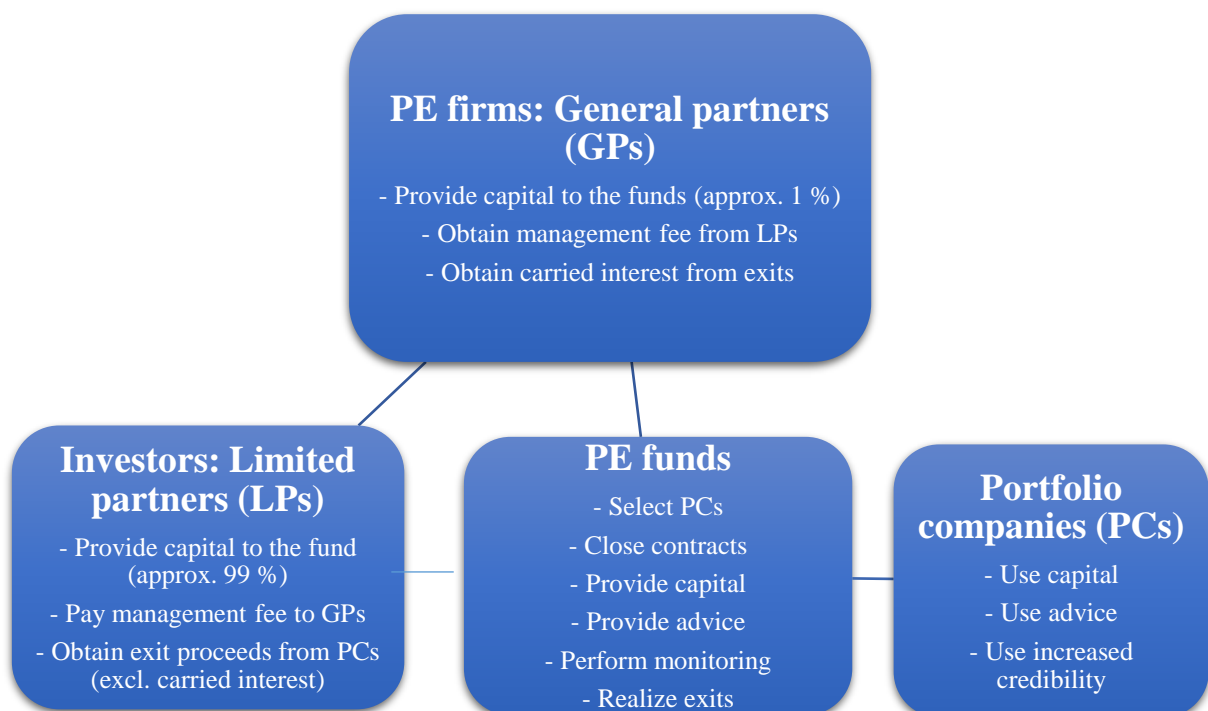


Figure 6. Private Equity structure (Tykvová, 2018)

### 3.2 A short history of private equity

Private investments have been around since the beginning of businesses. The rise of the PE-backed takeovers of firms started in the late 1970s and early 1980s when most of the academics, media, and corporate executives blamed these PE-backed takeovers for being greedy, destroying the US competitiveness, employees, and communities (Wruck, 2008). Similar accusations can be often heard even though the PE field has shown it has a place in the economy.

In almost a decade from the late 1970s to the late 1980s, the total value of buyouts increased from 1.3\$ billion to 77\$ billion dollars (Jensen, 1989). PE investments drove new entrants and more funds to the PE sector, and by the late 1990s the industry was very globalized. The industry has faced some challenges over time. The early 1990s recession and high interest rates struggled many of the leveraged investments. The hardest-hit for the industry was the financial crisis of 2007-2008 when the whole PE market was ceased as banks needed to hold their fistfuls of cash and were not able to provide debt for the investments that PE firms need to operate. The former caused the whole industry to a hangover in terms of PE firms raising new funds because of the losses caused during the financial crisis. (Gilligan & Wright, 2014, 23-26) PE firms have been recovering from financial crisis with the learnings in the fresh memory. Bain & Company's Global Private Equity Report 2019 shows the last five years have been the strongest in the history of the industry, but the levels of buyout deal values and deal counts of the years of 2006-2007 before financial crisis are still in their category from the yearly point of view.

Most of the PE literature has focused on the US, and this must be considered when applying research results in other countries. Academic literature has recognized the wide variety of PE firms and that they have differences. Worth noting is that single bad cases do not inherently make all the PE of that type wrong since cases are always different. (Wood & Wright, 2009) The world is moving faster and faster pace, and so is the bad news. One bad case may defame the whole industry without recognizing the source of the wrong thing that may not necessarily have nothing to do it with the ownership of the company. A recent practical example in Finland was the case of Esperri Care that offers nursing and care centers. They neglected their customers as they did not have enough nurses per client, and in media the PE investors of the company were partly blamed for because of the high expected returns of their investments in these

companies. Without taking any stance on the issue, this surely affected the image of the whole PE industry in Finland. Later, it was found out that some of their competitors had similar problems and the whole industry was under the government's and media's scope.

### **3.3 Private Equity around the world**

Even though the field of PE is often very international, there may be significant differences between the countries and industries when making PE investments. Bernstein, Lerner, Sorensen, and Strömberg (2016) found that industries, where PE funds are actively taking part in, have grown more quickly in the past five years. They highlighted that this finding does not indicate these industries are more exposed to economic shocks. The different practices in different countries cause heterogeneity in the PE industry. Thus, implementing new practices and ideas from other countries may have different outcomes because of the different laws and practices.

Imad' Eddine and Schwienbacher (2013) studied the US limited partners' capital flows to Europe and found that pension funds are more likely to invest in European focused funds, which may be since pension funds are often larger than many other LPs, e.g. banks or insurance companies. They also analyzed different investment strategies run by LPs and found that LPs with offices in Europe are more likely to invest directly in European PE funds whereas the other LPs are indifferent to either investing in a US fund investing in Europe or a European fund.

Another significant difference between countries is their legislation and their creditor rights. Cao, Cumming, Qian, and Wang (2015) found that leveraged buyouts (LBO) are more actively done in countries with secure creditor rights even though they have lower premiums in them. They pointed out that cross-border LBOs are mostly done from countries with secure creditor rights to countries with weaker creditor right because of the better creditor protection helps to access debt financing. Similar research was done by Humphery-Jenner, Sautner, and Suchard (2017) in which they found PE backing of the acquirer company to get higher returns of cross-border takeovers in poor information environments. This further highlights the value a PE backing can bring to a company.



Jääskeläinen and Maula (2014) argued that VC firms should build cross-border relationships with other investors as they provide valuable future opportunities for successful exits of the portfolio companies. This could be argued to be a real option that the investor needs to hold in order to exercise the option to sell a company abroad with possibly higher results. Though this research was done with VC firms in focus, similarly PE firms are doing. Many PE firms are very international as their portfolio companies often operate in multiple countries. Hence, a PE firm to successfully exit the investment of their portfolio companies, often international investors need to be looked for because of the illiquidity and large size of these transactions.

As different countries have their differences in practices, legislation, et cetera, so can different states within a single country have similar differences. Pe'er and Gottschalg (2011) studied the differences in the US between the states dominated by the US Republican Party and the states dominated by the Democratic Party. They analyzed 10 746 different US buyout investments made between 1980 and 2003 and found strong support for their presumption of Republican states to have greater volume of buyout investment activity and better performance of buyouts.

Legal differences can have a substantial effect on the PE industry in the region. Lerner and Schoar (2005) found that the types of investments are dependent on the effectiveness of legal enforcement. They found that in countries with secure and effective legal enforcement, PE investments are more likely to be made in preferred stocks, and they have more contractual protection for the PE investor (e.g. voting rights and anti-dilution provision). Vice versa, in countries with ineffective legal enforcement, PE investments are likely to be made with more in common stock or even in debt, and the control of the firm is secured with majority ownership and control of the board. They further found that the latter way of making PE investments cause the valuation and returns to be lower than with making investments with contractual protections. Taussig and Delios (2015) found that PE firms with local origins or with local experience enjoy better performance when contract enforcement in the country is weak. Hence, a local presence or partnership should be considered when making investments in countries with weak legal enforcement.

PE industry is closely followed and regulated in many countries to evade the ugly consequences for the economy if another crisis comes. While regulation certainly has its place and it needs to

be done, it may have its consequences. Cumming and Zambelli (2013) studied the strictly regulated PE investments 1999-2009 in Italy and argued that the extreme regulation reduces the capital supply, causes 15-20 % lower PE returns on average, decreases firm performance, and lowers the possibility of IPO exit. They further argued that extreme regulation weakens the capital quality and the involvement of PE funds. The research proves what types of effects an extreme regulation can have in the industry in a country. In a global environment too strictly regulated PE sector may cause the investment flows to move to another country.

### **3.4 Different stages of Private Equity**

Next, different stages of PE are shortly introduced. Like mentioned before, often PE relates to the more mature type of strategies like to leveraged-buyout firms, but depending on the context it can also relate to the other mentioned strategies. The most common strategies are introduced. The purpose is not to include every possible strategy available as the financial industry is very creative and investors are coming up new strategies or mixing different strategies.

Different categorizations of PE fields could be done, but for this research, a simple introduction to strategies is enough, for different categorizations see, e.g. Klonowski (2010). In Europe, investments in PE and VC made by funds of funds, government agencies, and pension funds are close to 50 % of all investments (Dziekonski & Ignatiuk, 2015). Another important fact to realize is that the buyout investments account for 50–67 % of PE investments made in value, but VC investments are the majority in terms of the number of deals made (Metrick & Yasuda, 2011). However, as Kelly (2012) argued, the two have significant differences between and different factors affect on the level of their activity in an economy.

Next, the different stages and strategies are discussed. Figure 7 below shows how different PE investment strategies are used over the life of a company. The arrow demonstrates a timeline of a company's life. However, worth noting is that this is a generalization of the strategies used in what phase of a company, but it may not always be the case. For example, a very young company can get distressed and needs distressed financing. The strategies are discussed in the same order as presented here below.

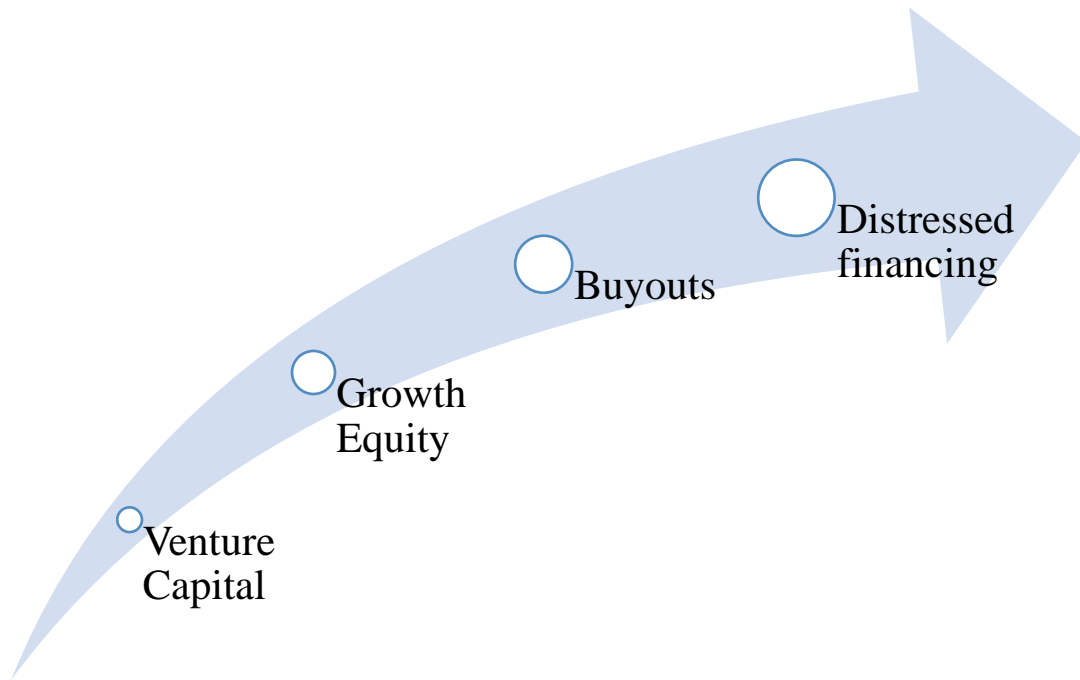


Figure 7. Different stages of PE

### 3.4.1 Venture Capital

In spoken language, buyouts and growth equity are still under the umbrella of PE, but VC is often separately mentioned as it is distinct from the other categories of PE. VC is a reasonably actively researched field, but here only a few examples of different papers are introduced to give an understanding of the field to the reader.

VC funds are financial intermediaries that combine investors with small companies as banks do as well. However, the difference between banks and VC firms is that VC investments are only optimal if firms are highly risky with positively skewed cash flows, low probability of success, low liquidation value, and high returns if successful. Banks do not have the resources to take such risks with high returns and focus more on lower risk and lower return investments. (Metrick & Yasuda, 2011) The economy has its place for both banks and VC firms, and the increasing regulation of banks certainly does not make it easy for banks to do straight VC investments even if they wanted to.

VC investments are almost always minority investments; hence, they do not give controlling power for VC firms over their portfolio companies. This may create classical principal-agent problems as companies are not necessarily always acting most beneficially from the point of view of a VC firm. Kaplan and Strömberg (2001) found three closely interrelated ways that VC firms are mitigating these problems; sophisticated contracting, pre-investment screening, and post-investment monitoring and advising. Their findings highlight the fact that the purpose of VCs is not only to decide on whether or not to invest in a startup but also to create value over the lifetime of the investment.

Popov and Roosenboom (2013) found in their comprehensive research on 21 European countries that VC investments increase the rate of new business creation, especially in countries with low taxes on capital gains, high entry costs, and high protection of intellectual property rights. Elitzur and Gavius (2011) proved the somewhat inevitable finding that VC funding is more beneficial when there is larger number of entrepreneurs competing for the funding. They further argued that VCs could focus on a single industry and thus increasing their payoff. VC funding has many positive effects on the whole economy in the long run as innovation drives economies forward.

Contrary to PE investments, a common strategy in VC investing is to stage investments during a longer period to minimize the risk. Tian (2011) found the more significant geographic distance between the VC investor and the target firm to cause VC investors to use a higher number of financing rounds, shorter durations between the rounds and investing smaller amounts in each round. He also added that this staging has a positive effect ongoing public, operating performance during the IPO year, and post-IPO survival rate. However, Li, Vertinsky, and Li (2014) argued that the national distances on international VC investments affect negatively on the performance of the investment. They added the reasons for this to be in institutional and cultural distances between the VC and the target firm.

Li and Mahoney (2011) analyzed VC investments in the US from 1980 to 2007 and found that market volatility in the target industries defers the investments. However, according to their findings, high sales growth of the target industry and the tight competition between VCs decrease this effect. The former is due to the fact the VC investments have a deadline, and VCs

usually are aiming to exit their investment after 4-7 years. The two most often used exit routes are an acquisition by a larger firm and an initial public offering (IPO). Often, the VC and the entrepreneur may not agree on the exit strategy, as the entrepreneur may want to stay in a management position that could not be possible in a trade sale case. (Schwienbacher, 2008) The exit routes of VC investments are already brainstormed at the beginning of the investment process, even if the exit is many years ahead. Some target companies may have a more obvious exit plan than others.

Traditional private VC firms are not the only ones making VC investments. Another important source of capital and resources for startups can be corporate venture capital (CVC). Wadha, Phelps, and Kotha (2016) proved how CVC provides the corporation diverse knowledge through its venture investments and how this diversity has an inverted-U shaped effect on the innovation in the corporate firm. Tong and Li (2011) used real option theory to analyze the choice between CVC or acquisition in corporations and found that market uncertainty causes corporates rather predictably to use CVC instead of acquisitions. A CVC investment can later even turn to a full acquisition if it matches the corporate goals, thus acting in a way to stage investments in a corporate setting.

In addition to large corporates, also governments take part in the VC industry in their governmental venture capital (GVC) investments. For example, in Finland GVC investments are often done by, e.g. Business Finland or Finnish Industry Investment. Guerini and Quas (2016) found the GVC investment of a startup at least triples the company's probability of receiving private VC investments. They argued that this result proves the screening ability and certification effect of GVC in Europe. GVC funding enables many projects to come alive that may not have come with just private VC funding. Government-supported organizations are often able to invest in very early stage (e.g. Business Finland with innovation voucher) and later continue their investments with GVC funding if the business starts as planned. Governments are hoping for active VC market to bring innovation and thus growth to the country which is why they have strong incentives to be part of the ecosystem.

### 3.4.2 Growth Equity

Growth Equity (or capital) is also known as expansion capital and can be categorized to be somewhere between venture capital and PE buyouts. As the name growth suggests, this type of investing is focused on strong growth companies. Mooradian, Auerbach, Slotsky, and Gilfix (2019) from Cambridge Associates described growth equity investments to have most or all the following characteristics: “

- Founder-owned
- No prior institutional capital
- No, or limited, leverage
- Proven business model (established product and/or technology, and existing customers)
- Substantial organic revenue growth (usually in excess of 10%; often more than 20%)
- EBITDA positive, or expected to be so within 12-18 months”

Many PE firms are doing both buyouts and growth equity, but the main difference between the two is that growth equity investments are often made with less (if any) leverage than buyout investments (Gompers, Kaplan, and Mukharlyamov, 2016). Because the risk in growth equity investments is high, massive leveraging of companies should be carefully used.

Even though PE growth capital investment might be expensive for a company, it is often more flexible in its terms than debt financing for growth (Barton, 2012). Besides, PE firms provide valuable industry expertise to their target companies (Davis, Cieniewski and Birenbaum, 2016). Davis et al. (2016) continued that having a minority private investor is like a marriage, but the PE firm always has a right to make key decisions. PE firms make sure before investing that they have veto rights over critical decisions even though they only have a minority share of the company. Even though PE backing may provide additional benefit over debt financing, it is worth remembering it is more expensive than debt in terms of the PE firm earning a higher return for its risky investment.

In their study, Sharma and Saini (2014) found the returns from growth equity are dependent on the PE investor to find lucrative investments and to create profitability in its portfolio companies, whereas buyout PE investments have a greater connection to the public market

indices. Mooradian et al. (2019) found in their research that growth equity investment returns have a gross internal rate of return (IRR) of 19.7 % return after 5-year holding period whereas buyout investments have a gross IRR of 10.6 %. The difference in IRR shows the potential in growth equity, which likely the reason why many of the largest PE firms are likely to be doing both at the same time. However, high growth companies are often more volatile and, therefore more vulnerable to changes in the economic situation.

Growth equity has been profitable for investors in the long run as well. Ritter (2015) argued based on his research, that investing in growth capital-backed IPOs have returned higher adjusted returns when comparing to other VC or buyout backed IPOs since the 1980s. This may have a relationship to the anomaly of small-cap firms in the public markets yielding better average returns than more massive companies (e.g. Fama & French, 1992).

### **3.4.3 Buyouts**

The most commonly used strategy of PE is likely to be leveraged buyouts (LBO) that buy the majority stakes in their target companies. In spoken language, PE as a term is often inseparable from the buyout firms. In LBOs, as the name suggests, the financing of the company is mainly arranged with external debt and only a small portion with equity financing from the investment firm. In LBOs, PE firms often obtain the majority control of the established target firms. (Kaplan & Strömberg, 2009) LBOs are often done by the PE companies who are specialized in them and are well connected to the banks offering the debt for these buyouts.

In addition to buyouts being a tool for streamlining mature companies, Wright, Hoskisson, and Busenitz (2001a) recognized that buyouts offer entrepreneurial upside in growth opportunities. They argued that buyouts focusing on efficiency of the company might be failures as they drive the entrepreneurial management away with their strict financial rules. However, buyouts focusing on the innovativeness of a company benefit from entrepreneurial management and may have a beneficial result for the PE investment. Their results indicate that buyouts should certify the management is the right for the right type of buyout, e.g. entrepreneurial management for buyout focusing on innovation.

Wright, Hoskisson, and Busenitz (2001b) highlighted in their other article published later the same year, the same important view of entrepreneurial growth opportunities that PE investments can offer. They provided an excellent example of the categorization of different buyouts, which is derived and adapted in Figure 8. In addition to LBOs, their categorization shows the other types of buyouts as well. Management buyout (MBO) enables the management to take majority control of the company or its division and grow its potential based often on their skills. This type of buyout is often with the support of PE firms, but in smaller cases could be done without any outside support, though this is highly dependent on the management's resources. Investor-led buyout (IBO) is self-exploratory as it describes the investors buying out a division of a company to earn return for them with various tactics.

Management-led employee buyouts (MEBO) is described by Wright et al. (2001b) to be so-called "job-saving attempts" in firms that seem to face layoffs. In these cases, the management often holds the controlling majority, but the employees have their stakes of the businesses as well. They add that management buy-in (MBI) is used when insiders of the company are not able to do an MBO, but often some hybrid between these two (MBI and MBO) is used because of the information asymmetry.

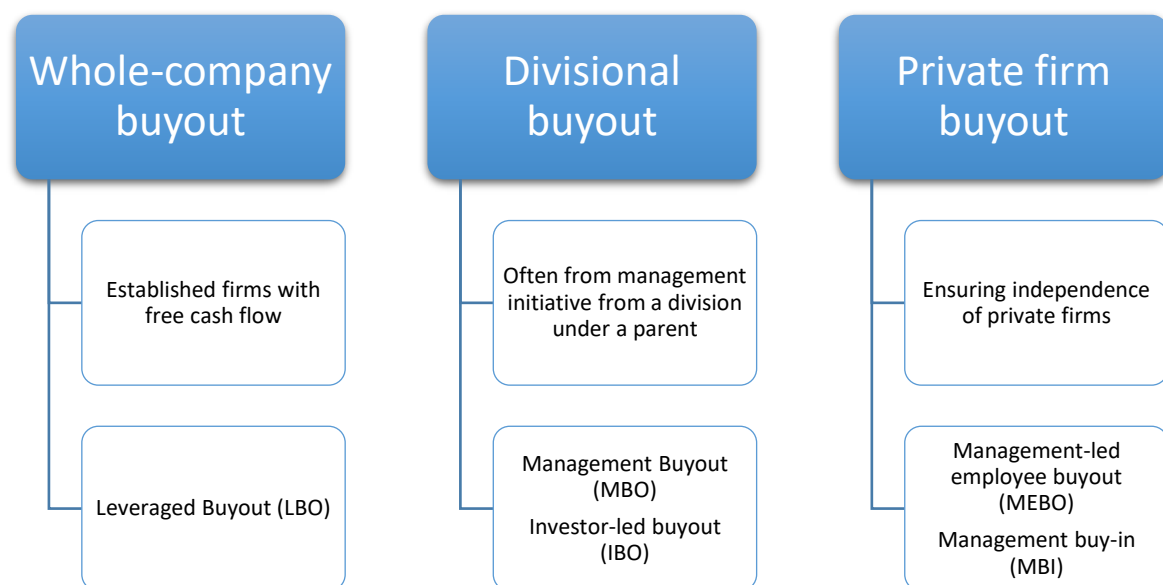


Figure 8. Types of Buyouts (derived from Wright et al., 2001b)



Another important type of buyout addition to the ones mentioned above are secondary buyouts. As the name suggests it refers to a buyout of a buyout which is often organized by professional PE firms sitting at the both sides of the table. Wang (2012) showed that the secondary buyouts do not have a strong value creation for the target firms even though they are often priced higher due to the favorable debt market and cold equity market conditions that cause the secondary buyout to happen. For PE firms, secondary buyouts are relevant potential exit opportunities especially when an investment needs to be liquidated fast.

Bernstein and Sheen (2016) studied the operational consequences of PE buyouts in the restaurant industry. They found that PE buyouts of restaurants improve the operational practices and decrease the number of health violations made, thus making the restaurants cleaner, safer and better. They further supported their findings by arguing that franchises should have similar effects for their restaurants as the best practices should be spread around the company. However, they found that franchisees do not have similar effects, which highlight the influence PE firms have on their portfolio companies in this case in the restaurant industry. Similar research could be done in other industries as well. Scellato and Ughetto (2013) found similar results that buyouts have a positive influence on the growth of the assets and of employment in target firms. These findings indicate the impact PE buyout firms have on different companies.

Even though the evidence of the positive effects is clear, they may have some harmful consequences as well. Shaked, Plastino, and D'Arezzo (2013) wrote an article on common themes found in failed leveraged transactions that may cause companies to financial distress or even bankruptcy. They found one of the common themes to be stable cash flows that are often analyzed too optimistically or some crucial parts of the source of the cash flows were ignored. They also highlighted the opportunities of efficiencies and growth that were often overvalued in cases with new technologies or innovation and in cases of merging companies and creating synergies. Their findings prove that even though smart rational investors make the PE deals, they can be wrong as well, showing the difficulty of the industry and this strategy.

### 3.4.4 Distressed Investing

Distressed or vulture investing is often seen as a traditional PE funding strategy. As the name suggests, the focus in this type strategy is to invest in companies that are financially distressed or even on the edge of the bankruptcy. These firms may not have many options for other types of funding making this type of capital often costly for the firms. Distressed financing has always been available through specialized funds. These funds use either a strategy of finding undervalued debt cases or a strategy of actively taking a role in the target company by negotiating debt terms and restructuring of the company (Gilligan & Wright, 2014, 134).

As Moyer, Martin, and Martin (2012) wrote “distress investing requires a high level of business acumen combined with deep knowledge of accounting, finance, and corporate and restructuring law.” They also added that distress investing requires investors' active participation in terms of investigating information, confronting conflicts of interest of creditors and equity holders, and in restructuring the business. Their argument supports the high specialization of these distressed investing firms in order to function profitably.

Andrade and Kaplan (1998) differentiated financial distress from economic distress in companies, and they found the costs of financial distress to be 10-20 % of the enterprise value. The upside potential of lifting a company from financial distress through restructuring or active management of the company is therefore clear. If the company is economically distressed at the same time, the upside potential is likely to be significantly higher, thus opening great investment opportunities for PE firms specialized in distressed investing.

The risks of acquiring or investing in distressed firms are high. Buyland and De Maeseneire (2016) found that the default risk of the bidder is far higher when acquiring distressed companies compare to other companies. Johnson (2009) discussed the role of banks and commercial lenders that play a significant role in distressed financing. He added that the secondary loan market could become more important as a tool to mitigate lending risks and thus providing some market players new opportunities in this traditional industry. Das and Kim (2014) found that portfolios of the distressed debt can be attractive to fixed-income investors through debt restructuring that has a Pareto improving effect on the portfolio and makes these

distressed financing lucrative for investors, borrowers, and lenders. They further argued that a more efficient aftermarket for distressed debt is needed.

An exciting finding of distressed firms that are not identified as distressed was made by Pryshchepa, Aretz, and Banerjee (2013). They found that the distressed firms seeing as healthy would pay out more and make more aggressive investments than their peers, and even doing accounting policy that enables hiding the financial distress. If the investors of distressed companies were to find out about such practices, they would be able to affect them, but creditors often do not have the right to do so before the debt has defaulted. Their findings indicate the critical role of investors and owners of the company as the supervisors of the company practices.

The relationships with banks play a significant role in distressed financing. Rosenfeld (2014) found that if a bank has issued a relationship backed loan to the company shortly before distress identification, it increases the likelihood of the company to emergence from the distress. However, this positive effect decreases when financial distress deepens. In another study Höwer (2016) found firms with multiple bank relationships are better absorbers of financial shocks, but in case of financial distress it makes it more difficult for the banks to restructure the firm. He also found that larger and more complex banks make less efficient liquidations, thus opening a market for private distress capital.

### **3.4.5 Other strategies**

In addition to these strategies, many others are used, but this categorization provides understanding of the whole lifecycle of investing in companies from very early stage to very mature distressed companies. In addition to investing in firms, many PE companies often invest in other types of assets. Next, a few different most common asset classes where PE firms invest are introduced.

One of the most recognized sectors where PE firms often have a strong presence is in real estate. Many PE firms are specialized in making only real estate investments. PE real estate funds differ significantly from previously mentioned types of PE funds because of the stable nature

of the real estate. For example, Van Der Spek (2017) found that the average total fee for PE real estate funds is only 2,7 %, which is significantly lower than in other PE funds. However, he also found that larger funds have lower costs than smaller funds. According to the research by Tomperi (2010), large PE real estate funds also have higher returns, and he added that fund performance negatively correlates with the number of funds had, meaning even first-time managers are able to achieve good returns.

Case (2015) argued based on his analysis on the 25-year historical performance data that all PE real estate fund strategies; core, value-add, or opportunistic, have been worse than unleveraged property investments on a risk-adjusted basis. Also, he found that the expected returns for PE real estate investments have been far higher (even as much as 10 %) than the realized average returns. His findings indicate that they may have had much hype around them and are not necessarily always the best option for real estate investing.

Investing in infrastructure is another common area for some PE firms. Gemson, Gautami, and Thillai (2012) found that PE investments are associated with larger projects, and the projects with PE investment have a successful financial outcome. They also found that in developed countries PE investments were more often used, but in developing countries PE firms help to share the project risks between different parties. From their research it seems that PE firms bring efficiency into the traditional infrastructure industry which in history has been often controlled by the governments. Gemson and Rajan (2017) compared the two commonly used risk mitigation strategies: staging and syndication. They found that PE investors often invest later in infrastructure projects, and they would prefer staging investments in infrastructure projects to control their cashflows, but if staging is not possible, syndications are formed to share the risks of the project with other investors. All in all, these types of PE investments have been increasing (e.g. Gemson et al., 2012; Gemson and Rajan, 2017) and are likely to increase in the future as well.

Somewhat similar, and sometimes even overlapping with infrastructure, are energy and power investments. Haarmeyer (2014) argued that energy and power sector is an excellent investment opportunity for PE investors as it is an asset that has significant value creation possibilities and long-term staying power. He further found three different long-term trends that provide these

good investment opportunities for investors; shale gas revolution that enables abundant low cost gas and oil, global demand for energy that is growing together with developing economies, and regulation and technology that moves the energy and power sector towards more sustainable solutions (e.g. to renewable energy). The fight against global warming is arguably one of the megatrends of today, and it opens new great investment opportunities in the energy and power sector.

Lastly, some PE firms are operating as a so-called fund of funds that raises investment commitments from investors and invests this collected capital into PE funds making direct investments. Therefore, its investment targets are the PE firms operating funds that invest in startups, buyouts, real estate, energy, et cetera. As funds of funds are well-diversified, an investment to a fund of funds is far less risky than a straight investment to a fund (Weidig, Kemmerer, and Born, 2005). When analyzing the returns of fund of funds compared to funds, Gresch and Von Wyss (2011) found that direct fund investments provide pro-cyclical returns whereas in fund of funds investments similar pattern was not present.

Funds of funds differ from their strategies. Others are making investments to VC funds and others in buyout funds, et cetera. Harris, Jenkinson, Kaplan, and Stucke (2018) found that the performance of funds of funds varies depending on its strategy. They found that both, funds of funds investing in VC and in buyout funds, yield same or higher returns than public market indices. However, they found that funds of funds' investments on buyouts outperform market indices, but the direct investments in buyout funds underperform. For VC, they found that fund of funds and direct VC fund investments have similar returns, thus indicating that funds of funds investing in VC can find and invest in better performing funds. Depending on the resources of the investor, the use of fund of funds should be therefore be focused on VC funds, and direct investments should focus on buyout funds, assuming the investor has enough knowledge to make a rational investment decision.

### 3.5 Exit strategies

This research focuses on PE strategies investing in firms and especially to firms employing a buyout strategy but including a point of view to VC strategy as well. The introduced exit strategies in this chapter are based mainly on these previously mentioned strategies.

Gilligan and Wright (2014, 83) identified the following exit strategies for PE investments:

- Trade sale
- Initial Public Offering (IPO)
- Receivership and liquidation (write-offs)
- Secondary buy-out/sale to another PE fund
- Leveraged recapitalization/repayment of loans and preference shares; and
- Secondary market transactions including the sale of portfolios of investments to other financial institutions

The first three of these exit strategies are very commonly known and have been historically often used. The last three secondary buy-out, leveraged recapitalization, and secondary market transactions are the latest inventions of exit strategies. Secondary buyouts have become closely as popular as trade sales during the 2000s (Gilligan & Wright, 2014, 84).

Schmidt, Steffen, and Szabó (2010) found in their empirical analysis on buyout exit strategies that PE investors can recognize and write-off worse investments in target firms early to avoid more significant losses. They also added that IPO as an exit strategy is only used for the few most profitable companies, and instead a trade sale is more often used. In addition, they found that buyout exits are cyclical, but they found no support of cyclicity affecting the choice of the exit strategy. A hot IPO market affects the duration of LBO cases as investors want to float their target companies during the good market period when valuations are often higher (Cao, 2011). This finding can easily be rationalized as a way to maximize investor value.

Ayash, Bartlett, and Poulsen (2017) argued that IPOs reduce PE firms realized IRRs which may incentive them to prefer acquisitions exits over IPOs. However, Jenkinson and Sousa (2015)

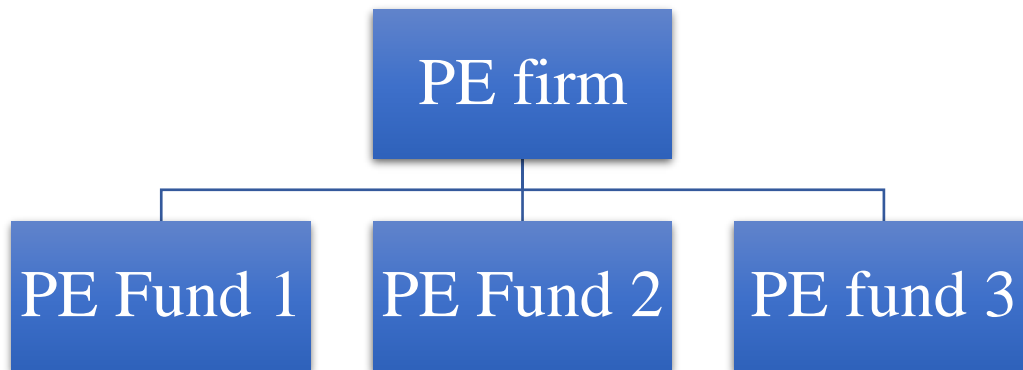
had previously found that the exit decision heavily depends on the debt and equity market conditions; favorable stock market increases the uses of IPOs compare to secondary sales, and vice versa strong debt market increases secondary buyouts. They also argued that the exit decision between a secondary buyout, or a trade sale is more affected by the characteristics of the target company while companies exited through trade sale often being smaller companies with stronger growth. To add, Rigamonti, Cefis, Meoli, and Vismara (2016) argued that specialization of PE firms affects their exit strategy. They found PE firms specialized in both industry and stage of target firms increase the possibility of an IPO exit whereas PE firms specialized only industry are more likely to exit via a trade sale. According to them, non-specialization of a PE firm increases the possibility of using secondary buyout as an exit strategy.

Traditionally in VC, the two main exit strategies have been an IPO and a trade sale to a strategic buyer, but Fair (2017) argued PE buyout companies are a valuable option to consider for VC backed companies. According to him, PE firms have turned their heads to the technology industry as the companies in it are maturing are becoming attractive to PE investors. However, PE firms are only a temporary home to a VC backed up firm as it will eventually sell their investment in previously mentioned ways, most likely with a trade sale or via an IPO. The scale of the firm should be significantly larger after going through a PE firm's ownership.

### **3.6 Private Equity firms and funds**

Next, the focus is on the company itself and its and its funds' structures. To fully understand how they work, a comprehensive introduction of them is needed. PE firms are the ones operating the PE funds, thus they are responsible for the investment decisions of the fund. They are in a way, acting as the intermediary party between the LP investors and the target firms through their funds. After a successful fund, a PE firm is likely to establish a new larger fund to grow its business after 3-5 years of the previous fund (Metrick & Yasuda, 2011). One PE firm can be therefore managing multiple PE funds at the same time. Figure 9 demonstrates the structure of a PE company operating multiple funds. Most of the time, these funds are in different stages, e.g. Fund 1 is at the end of its lifetime whereas Fund 3 is just in the beginning.

However, larger PE firms may also manage funds focusing on different strategies at the same time. Later, a closer look at the structure of these funds is presented.



*Figure 9. Private Equity firms managing multiple funds at the same time*

PE firms are often organized as a limited partnership or limited liability corporation, and the firms employ relatively small numbers of professionals when comparing to their portfolio companies (Kaplan & Strömberg, 2009). As mentioned, PE firms often demand some controlling rights in their target company, e.g. seats on the board, veto, and many contingent control rights that enable them to influence the management and the operations of the target company (Metrick & Yasuda, 2011). Therefore, employees of PE firms are often highly skilled professionals who are able to analyze possible deals before making investments but are also able to bring value to target companies.

Figure 10 below shows a common structure of a PE fund. Typically, each PE fund is a separate limited life partnership that enables the investors of the fund to avoid an extra layer of tax charges and to avoid guaranteeing other partners' liabilities. The limited life partnerships consist of limited partners (LP), whose liability is limited to the investment, and of general partner (GP) who has unlimited liability for the actions of the partnership. (Gilligan & Wright, 2014, 38-39) PE firms are acting as the GPs of the fund, and the investors are acting as the LPs. With contractual provisions in the LP agreements, the potential agency conflicts are solved. (Metrick & Yasuda, 2011) Worth noting is that the actual money is almost never in the bank account of



the PE fund, but instead it is always called from LP investors when needed, and when returns are earned it is paid back to them as soon as possible.

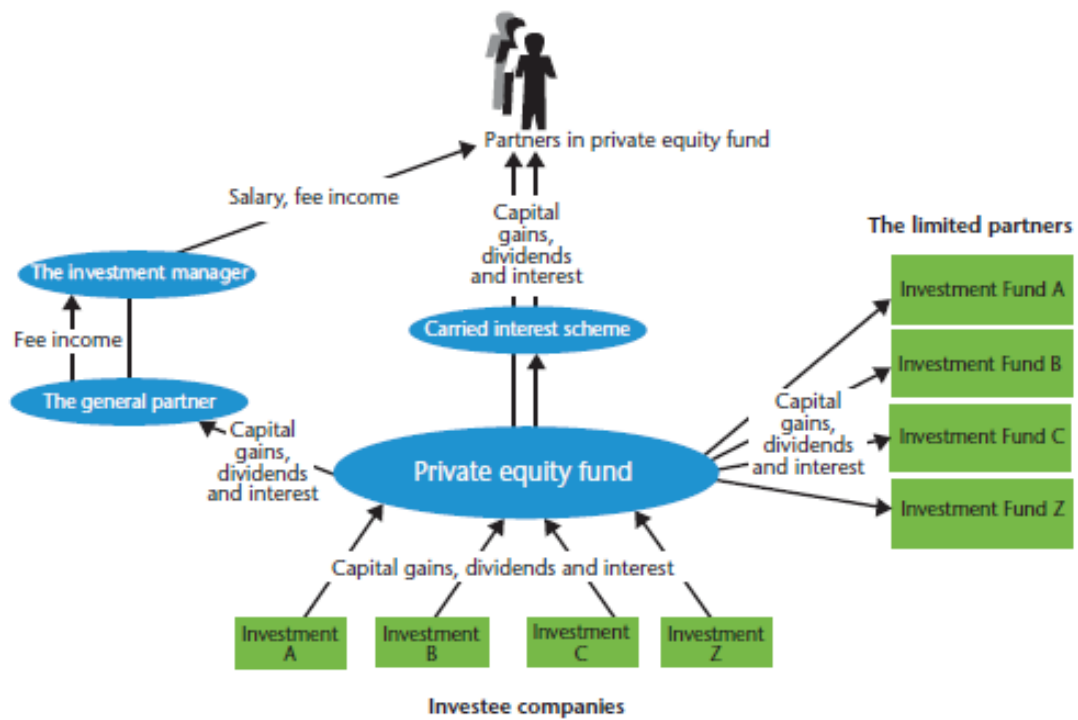
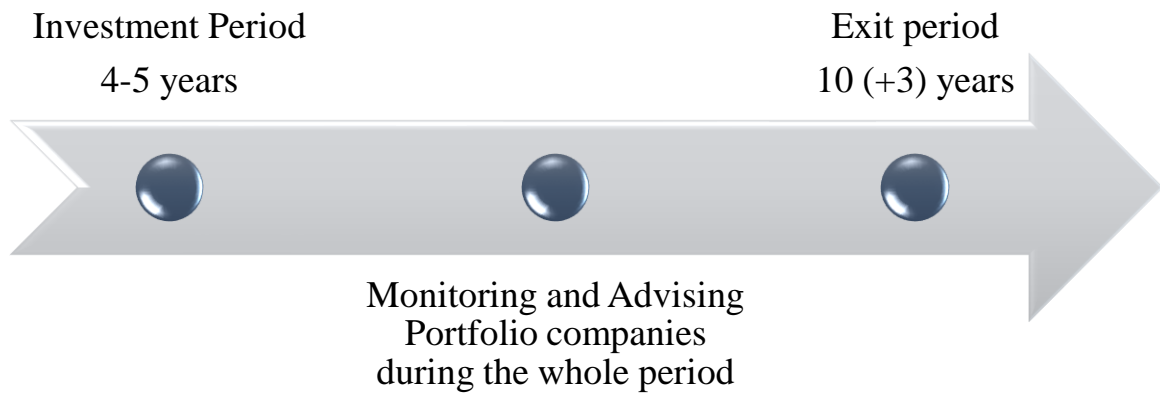


Figure 10. PE fund structure (Gilligan & Wriath, 2014, 38)

Normally, the life of the fund is restricted in time, and the funds invested are illiquid, thus meaning the investor is not able to derive the funds during that time. Typically, the life of a fund is ten years with the possibility to extend the life of the fund with three years. The first five years are so-called investment period when PE firm is investing the capital committed to the fund. Then the remaining five to eight years are left to make exits of their portfolio companies and return the invested capital to the investors. (Kaplan & Strömberg, 2009; Metrick & Yasuda, 2011). The exact timeline of the fund is normally agreed on before establishing the fund in the LP agreement. A general timeline of a PE fund is presented in Figure 11.



*Figure 11. Timeline of a Private Equity fund*

### **3.6.1 Fees and earnings of a PE fund**

During the life of the fund, GPs or PE firms earn a yearly management fee of approximately 2.0 % of the committed capital. In addition to this, GPs earn a success-based so-called carried interest fee (carry) of 20 % of the fund's profits but only above the minimum return promised into the LPs, which is often called the hurdle rate. A hurdle rate is not necessarily always used, but it is very ubiquitous. (Stoff & Braun, 2014) Kaplan and Strömberg (2009) mentioned that some PE firms as GPs of funds charge deal and monitoring fees from the companies that they have invested in, and these costs are often divided between the LPs and the GP. Figure 12 below demonstrates the flow of fees.



Figure 12. PE fund fees and GP earnings

Stoff and Braun (2014) argued that the classical relation 2.0 % management fee and 20 % carried interest has confronted challenges as the fund sizes have grown larger and larger. They found that management fee charged on committed capital during the investment period was 2.0 % for funds under \$1 billion, 1.75 % for funds between \$1-\$5 billion, and 1.5 % for funds larger than \$5 billion. They further found that the basis for calculating the management fee often changes after the end of the investment period from committed capital to net invested capital.

All in all, GPs are maximizing their absolute returns by gathering a larger fund with lower management fees, which is also known as the size effect (e.g. Stoff & Braun, 2014; Metrick & Yasuda, 2011; Gilligan & Wright, 2014, 170). Gilligan & Wright (2014, 170) highlight the inefficiency of the management fees as they provide steady income for the GPs but do not incentive them to make better investments. However, Stoff & Braun (2014) found that some larger funds and LPs have recognized this, and some new LP arrangements have lower management fees of 0.5-1.0 %, but the carried interest is up to 30 %. The incentives of GPs are a crucial part of maximizing the value of LPs' investments in the end.

Empirical research by Robinson and Sensoy (2013) supports the previously mentioned fee structures. They found that most of the VC and buyout funds closely follow the classic relation of 2.0 % management fee and 20 % carried interest. They also argued that the PE firms earning higher compensations as GPs in terms of management fees and carried interest provide higher gross returns for LP investors, thus meaning they earn their higher compensation.

Another essential point of GP earnings is their dependency on performance of previous funds in future fundraising. Chung, Sensoy, Stern, and Weisbach (2012) argued that as the incomes of the GP largely depend on the performance of the fund, in terms of the carried interest of the profits and the size of the fund, these incomes also have an indirect effect on the ability to raise future funds. Their findings highlight the importance of long-term view in PE firms. However, Metrick and Yasuda (2010) argued that two-thirds of the expected revenue for the GP of a PE fund come from “fixed-revenue components that are not sensitive to performance,” thus mostly from management fees. However, if a PE firm fails to provide good enough returns for its LP investors, it may not have a fund in the future from where it could earn management fees. The findings of fund fees from Robinson and Sensoy (2013) are shown below in Table 2.

Table 2. PE fund fees or GP compensation (Robinson & Sensoy, 2013)

	All funds	Venture capital	Buyout
<i>Management fees:</i>			
<i>Initial fee (% per year):</i>			
Mean	1.94	2.24	1.78
Median	2.00	2.50	2.00
SD	0.49	0.41	0.45
<i>Lifetime fees (% of fund size):</i>			
Mean	16.54	20.37	14.49
Median	16.50	21.38	14.23
SD	5.60	4.46	5.05
<i>PV Lifetime fees (% of fund size):</i>			
Mean	13.17	16.01	11.65
Median	13.53	16.69	11.52
SD	4.21	3.37	3.81
<i>Fraction with:</i>			
Initial fee = 1.5%	0.17	0.05	0.23
Initial fee = 2.0%	0.37	0.26	0.43
Initial fee = 2.5%	0.21	0.46	0.07
Initial fee basis = committed capital	0.92	0.94	0.92
Fee % changes	0.45	0.53	0.40
Fee basis changes	0.33	0.14	0.43
Either fee % or fee basis changes	0.59	0.61	0.59
Both fee % and fee basis change	0.18	0.06	0.24
<i>Carried interest:</i>			
Mean carry (%)	20.13	20.44	19.96
Median carry (%)	20.00	20.00	20.00
SD carry (%)	1.49	1.70	1.33
Fraction with carry=20%	0.94	0.89	0.97
Fraction with carry<20%	0.02	0.01	0.02
Fraction with carry>20%	0.05	0.10	0.01

### 3.6.2 Limited Partners of the funds

Almost all the capital to the fund is in a typical case provided by the LPs, but GPs typically provide at least 1 % of the capital to the fund (Robinson & Sensoy, 2013; Kaplan & Strömberg, 2009). Robinson and Sensoy (2013) further argued that even if GP ownership would be lower, it does not indicate poorer performance. LPs typically consist of pension funds, endowments and insurance companies, and wealthy individuals (Metrick & Yasuda, 2011; Gilligan & Wright, 2014, 39). Da Rin and Phalippou (2017) argued that the LP-GP relationship in PE has concentrated more and more on the large institutional investors who are already specialized in PE investments. Hence, LPs in PE funds are always experienced professionals and know how the PE funds work and how to evaluate PE firms acting as GPs of these funds.

From the LPs' point of view, PE investments are difficult to evaluate because of their private nature and their illiquidity. Ang, Chen, Goetzmaan, and Phalippou (2018) argued PE investments could be approximated to be similar to levered small- and mid-cap equity investments. In their study they confirmed the finding of Kaplan and Strömberg (2009) that the relationship between corporate earnings and debt interest level explain the returns of PE investments. Gompers et al. (2016) found that LPs in practice mainly focus on absolute returns on their investments and not to risk-adjusted returns that finance theory would suggest doing.

The increased popularity of PE investments has been in favor of LPs as the large capital inflows to the industry have lowered the costs. The importance of limited access to the field has also decreased as more players have established themselves on the market. PE investing has evolved over the years and now it is a crucial part of institutional investors' investments as it provides higher returns on average than the public markets and provides valuable diversification for the investors' portfolios. (Sensoy, Wang and Weisbach, 2014) Therefore, the PE industry has matured and established itself in large investors' portfolios.

Sorensen, Wang, and Yang (2014) studied the value of PE investments to LPs when calculating the costs of illiquidity, management fees and carried interest. They found that the fees GPs charge (management fees and carried interest) count together only for half of the total costs of LPs as the cost of illiquidity counts for 50 % of the total costs in present values. Furthermore,

they argued based on their study that on average LPs may just break-even when considering the previously mentioned costs. However, they also mentioned that more skilled LPs and LPs with lower risk aversion may still be able to earn contributable returns from PE investments. Their findings highlight the importance of LPs to consider alternative investment options with similar risk and return characteristics.

### **3.6.3 Leverage and PE firms**

Credit conditions drive the PE industry through leveraged buyout investments. However, the higher the leverage on deals, the higher transaction prices, and the lower buyout fund return. (Axelson, Jenkinson, Strömberg and Weisbach, 2013) Somewhat similar findings can be found in the VC industry where Gompers and Lerner (2000) have shown that the increased money flow to the VC funds causes the valuation of funds' new investments to increase. The increased popularity of PE investments may not therefore always be a good thing for LP investors.

Agathis (2016) argued that the extremely low interest rates cause overleveraging and even bankruptcies of portfolio companies. She also highlighted that overleveraging is not necessarily always a problem, but it may be if PE firms start to strip assets from their portfolio companies. However, Tykvova and Borell (2012) found that companies backed by experienced PE firms are considered even to have lower bankruptcy rates, though they mentioned the fact that PE firms do not back companies that may already be financially distressed. Thus, PE backing may often have positive effects on companies even if their investments are highly leveraged.

Even though investments in PE funds are highly important for institutional investors, Fang, Ivashina, and Lerner (2015) argued based on their study that large institutions could outperform PE fund returns by making direct PE investments themselves. However, the growing number of specialized PE firms indicate that most of the institutional investors do not have the interest, resources or capability to do them. Additionally, investing in PE through PE funds limits institutional investors' risk to just to their investment whereas making direct investments could cause additional obligations for the institution.

### 3.6.4 Value Creation of PE firms

PE firms aim to significantly increase value in their portfolio companies in approximately five years before exiting the investment. In addition to the capital, successful PE firms must have some additional information that makes the investment worth it. Gompers et al. (2016) found in their study that PE investors in practice highlight six different possibilities they used to create value in their target companies: increasing revenue, improving incentives and governance, facilitating a high-value exit or sale, making additional acquisitions, replacing management, and reducing costs. They further found PE investors strongly encourage their management teams and key persons with equity stakes and incentives. PE firms also make investments in employees and advisers who enable the creation of value in the company. Additionally, they found that the decision on which strategy a PE investor focuses on its value creation plan depends mostly on the experiences and skills of the PE firm founders.

In small and medium businesses, PE and VC investments may have significant contributions. Paglia and Harjoto (2014) found in their empirical study that PE and VC financing positively and significantly contributes to the target companies' net sales and employment growth rates. Furthermore, they found that the effect in PE financing is not immediate, but it lasts for three years after PE financing, whereas in VC financing the effect is immediate, but it lasts only for a year. Their findings indicate that the effect of PE financing is much more than just capital, whereas VC financing is more often a capital injection to the company.

Castellaneta and Gottschalg (2016) argued that "differences between PE firms are long-lasting due to the heterogeneity and low mobility of resources across such firms, which make buyouts' performance increasingly contingent upon PE-firm-specific value creation abilities. Their finding was supported by previous literature as well (e.g., Kaplan and Schoar, 2005; Phalippou and Gottschalg, 2009). They concluded their research by addressing that the ownership of the company matters. These findings emphasize the importance of investors choosing the right PE firm as some PE firms are more capable than others.

Ayash et al. (2017) compared the returns of two different strategies in buyouts; entrepreneurial strategy focused on growing revenue and the operating efficiency strategy in which the

operations are trimmed and modified to be efficient. According to their research, LBO strategies are maximizing returns by focusing on aggressive growth in revenues while capitalizing on favorably market cycles.

Perhaps the most essential part of the value creation of PE firms is their effect on the management. Bloom, Sadun and Van Reenen (2015) found that PE-backed firms have strong management practices on the people of the firm such hiring and firing people, paying salary and promotions. They further added that the management monitoring practices on lean manufacturing, continuous improvement, and monitoring are even stronger which may be why many managers working in these firms experience broader autonomy in their jobs. Bloom et al. (2015) highlighted that PE-backed firms are better managed than other firms in general.

The importance of monitoring managers for better overall management is supported by the research on monitoring managers by Cornelli, Kominek, and Ljungqvist (2013). They argued that when a new CEO is hired, his capabilities and ability to run the firm are unknown at the beginning; monitoring has a learning purpose to the board to judge if the new CEO is capable of the job. Through frequent monitoring the board can quickly decide if corrective actions are needed. Their findings on monitoring a CEO can be extended to monitoring other managers as well. The judge of possible further actions would likely be someone else than the board, depending on the manager. A PE-backed firm often grows quickly, and managers who have been in the company since the very beginning may not be the right people to manage the company anymore when the manager has 100 people working under him.

### **3.7 Private Equity Performance**

PE firms create value in their target companies to maximize the return of their investment. An important part is also to value the company before making the investments in order to not overpay for ownership of the company. Gompers et al. (2016) found PE firms practices differ from the academic findings of best practice since most of the PE firms use internal rates of return (IRR) or multiples of invested capital (MOIC) methods to evaluate their investments instead of discounted cash flow (DCF) or net present value (NPV) techniques which are highly recognized among the academics. They further found that PE firms do not really use capital



asset pricing model (CAPM) to determine the cost of capital but instead use IRR models that are elaborated differently in different firms. Gompers et al. (2016) further argued that the fact PE firms are aiming for returns over CAPM suggested return is in par with the PE firms' view that they are adding value to their target companies, hence earning their fees.

Kaplan and Schoar (2005) found that during their research period (1980-1997), on average, fund returns net of fees are close to equal to the S&P 500 returns while buyout funds are underperforming the index, and VC funds are outperforming it. Additionally, they found that both the relationship between performance and fund size and the relationship between fundraising ability and GP experience is concave, suggesting the PE firms located in the middle ground in terms of GP experience and fund size are the most lucrative ones. However, they found that funds raised during boom times have worse returns, which indicates an evident boom and bust cycle in PE fundraising as well.

Another more recent research by Harris, Jenkinson, and Kaplan (2014) found better performance of PE funds that previously contradicted to Kaplan and Schoar (2005) earlier study. In their study they argued they analyzed high-quality data that reached up to March 2011 while most of the previous studies focused on the earlier periods of PE funds in the 1990s. Harris et al. (2014) found that buyout funds have outperformed the S&P 500 by at least 20 % on a dollar invested, which is at least an outperformance of 3 % per annum, even net of fees and carried interest. They added that VC funds outperformed the public market in the 1990s but have underperformed public markets by 5 % since 2000. The differences between the two studies highlight the contradictory history of PE performance in academic literature.

Sensoy et al. (2014) argued that no matter the type of PE investment, it outperforms public markets on average. Phalippou (2014) found similar results on buyout performance outperforming S&P 500 by 5.7 % per annum. However, he added that the more appropriate benchmark index for buyout investments should be a leveraged small-value index because buyouts are mostly made on small and medium-sized companies. In that case, he found buyout funds to underperform by 3.1 % per annum on average to leveraged small-value indices. As noticed, these results differ from the findings of Harris et al. (2014).

Another critical view is the persistence of PE companies' performance. This view is especially important for investors making decisions on which PE manager they are willing to trust with their investment capital. Braun, Jenkinson, and Stoff (2017) found that as the PE industry has matured and more competition has aroused, the persistence of PE firms has declined as well. However, they found performance persistence has remained among the top-performing funds but only during low competition states of the market. Korteweg and Sorensen (2017) confirmed the finding of Braun et al. (2017) that persistence has declined and added that the decline is largest for VC firms, whereas buyout and other funds still have significant long-term persistence. However, they added that long-term persistence is more considerable for smaller funds. They also highlighted that the ability to recognize a good GP is complicated because of the history does not indicate future success as the industry performance persistence is so low, thus increasing the need for LPs to be able to recognize successful GPs. Fund of funds could in these cases be a rational choice because they are likely to have more information about recognizing successful fund managers as they screen and follow many different PE funds.

Contradictive findings of the academic literature on PE is mentioned by Gohil and Vyas (2016) as well. They found different studies establishing a widely different range of performance returns of PE funds, which they believed to be caused by flow of funds, movement of the public market and leverage factors. Their argument is logical as the PE fund has many moving parts and it is not as straight forward to find a comparable public market index to it.

## **4 REAL OPTIONS IN PRIVATE EQUITY LITERATURE**

The purpose of this chapter is to unify before discussed real options and private equity academic literature. Furthermore, this chapter highlights the need for this research through the state-of-the-art literature review of real options in PE from a few popular research databases. The literature review proves the gap in the research field for this research. As mentioned before, the focus is on real options in PE firms, and not so much in the valuation methods that they use since many studies have been made related to those.

### **4.1 Real options in Private Equity - state of the art literature check**

For the state-of-the-art literature review on real options in PE, a total of five different archives were used to prove the scarcity of the articles on the topic. Some of the articles were already mentioned before in this research as they are an important part of real option or PE theory. The keywords for the search were clear from the topic: “real options” and “private equity.” Both keywords were inside the brackets to exclude unnecessary research papers, e.g. private equity in real estate, et cetera. Next, the findings from each archive are introduced. The found articles are further discussed later in this chapter.

The first researched archive was the EBSCO – Business Source Complete. Figure 13 demonstrates the process and results that were made in that database. After that, Table 3 shows the articles chosen for further examination.



Figure 13. Search Process - EBSCO Business Source Complete

Table 3. Selected publications from EBSCO Business Source Complete

Title	Author(s)	Published	What is it?
Private Equity Arrangements as real options	Chen, A., Conover, J. & Kensinger, J.	2011	Real Options in PE
Valuing a Leveraged Buyout: Expansion of the Adjusted Present Value by Means of Real Options Analysis.	Baldi, F.	2005	Valuation
How Do Entrepreneurs View Opportunities: Rose Tinted Spectacles or the Real Options Lens?	Cave, F. & Minty, A.	2004	Real option thinking perspective

Next, the archives of Emerald Journals were researched. In this case, in addition to just research papers, chapter items were search for as well to find additional literature on this very subject. Figure 14 below demonstrates the search process for Emerald Journals with chapter items included as well. Table 4 below the figure shows the found publications on the topic from Emerald Journals.



Figure 14. Search Process in Emerald Journals

Table 4. Selected publications from Emerald Journal

Title	Author(s)	Published	What is it?
Private Equity Arrangements as Real Options	Chen, A., Conover, J. & Kensinger, J.	2011	Real Options in PE

After only finding only the couple book chapters relevant to this research from Emerald Journals, the focus was turned to Science Direct – Elsevier archives. The following Figure 15 shows the research process in that archive, and the articles selected for further examination are shown in Table 5.



Figure 15. Search process for ScienceDirect - Elsevier

Table 5. Selected publications from ScienceDirect - Elsevier

Title	Author(s)	Published	What is it?
Optimal investment of private equity	Liu, Y. & Yang, J.	2015	Optimal PE investment strategy with real option method
The bright and dark side of staging: Investment performance and the varying motivations of private equity firms	Krohmer, P., Lauterbach, R. & Calanog, V.	2009	Staging investments in PE funds
Staged venture capital contracting with ratchets and liquidation rights	Leisen, D.	2012	Real options as anti-dilution (ratchet) and liquidation preference

The archives of Springer Link were analyzed next. As no research articles from this archive were selected for further examination, chapter items were also analyzed. Only one interesting chapter of a book was selected for further examination. Figure 16 and Table 6 show the process and the findings of the research in Springer Link archive.



Figure 16. Search process for Springer Link

Table 6. Selected publications from Springer Link

Title	Author(s)	Published	What is it?
Real Options in <i>Private Equity Unchained</i>	Meyer, T.	2014	A book on PE where one chapter focuses on real options

Lastly, Wiley's archive was researched, including book chapters. The search process is shown in Figure 17. Table X shows all the selected publications for further examination from Wiley archive.



Figure 17. Search process for Wiley

Table 7. Selected publications from Wiley

Title	Author(s)	Published	What is it?
Real options in equity partnerships	Folta, T. & Miller, K.	2002	Real options in partnerships
ACQUISITION STRATEGIES AS OPTION GAMES	Smit, H.	2005	Integrates real options with game theory
Staged venture capital contracting with ratchets and liquidation rights	Leisen, D.	2011	Real option analysis with standard VC contracting
Private Equity Funds and Real Options in <i>J Curve Exposure: Managing a Portfolio of Venture Capital and Private Equity Funds</i>	Mathonet, P-Y. & Meyer, T.	2008	PE funds and real options which is closely related to the subject of this research



As perceptive readers may have recognized, there are some overlappings between the findings of different archives. The following Table 8 collects together all the articles and chapter items that were chosen for further examination. A total of 10 publications were used. In the next part these articles and the couple chapter items are shortly discussed.

Table 8. All publications chosen for further examination

Title	Author(s)	Published	Archive
Private Equity Arrangements as Real Options	Chen, A., Conover, J. & Kensinger, J.	2011	EBSCO -Business Source Complete
Valuing a Leveraged Buyout: Expansion of the Adjusted Present Value by Means of Real Options Analysis.	Baldi, F.	2005	EBSCO -Business Source Complete
How Do Entrepreneurs View Opportunities: Rose Tinted Spectacles or the Real Options Lens?	Cave, F. & Minty, A.	2004	EBSCO -Business Source Complete
Optimal investment of private equity	Liu, Y. & Yang, J.	2015	ScienceDirect - Elsevier
The bright and dark side of staging: Investment performance and the varying motivations of private equity firms	Krohmer, P., Lauterbach, R. & Calanog, V.	2009	ScienceDirect - Elsevier
Staged venture capital contracting with ratchets and liquidation rights	Leisen, D.	2012	ScienceDirect - Elsevier
Real options in equity partnerships	Folta, T. & Miller, K.	2002	Wiley
ACQUISITION STRATEGIES AS OPTION GAMES	Smit, H.	2005	Wiley
Private Equity Funds and Real Options in <i>J Curve Exposure: Managing a Portfolio of Venture Capital and Private Equity Funds</i> (Chapter Item)	Mathonet, P-Y. & Meyer, T.	2008	Wiley
Real Options in <i>Private Equity Unchained</i> (Chapter Item)	Meyer, T.	2014	SpringerLink

## 4.2 Analysis of the literature review articles

As the thorough literature review shows, there is a wide gap in the academic literature for this research subject. Furthermore, many publications chosen for further examination are not explicitly on real options in PE but instead in a closely related subject. Next, articles chosen before are discussed and introduced one by one.

Chen et al. (2011) provided a study where they demonstrated with different cases the importance and actions of PE firms. They used real option analysis to comprehend the different options PE arrangements create, and as they mentioned these options “tend to be straightforward.” They viewed the portfolio or acquired companies to be the underlying asset of the real option, and also argued a company to be an option portfolio which includes multiple real options as different business units and asset pools. They further argued that it makes sense for a PE firm to separate these units and pools from the parent company and to sell the unneeded ones to make their real option closer to the exercised price. They view the PE firm’s investment as a real option that increases in value with further actions. In a sense, they see the investment of a PE firm to be a growth option for a company.

The findings of Chen et al. (2011) relate to PE firms’ practice of making the organization more efficient. They sell unnecessary assets and business units to focus on the core business(es) that yields profits for their investment over time. In general, it could be said the value of a company is the present value of its future cash flows, which is why PE firms need to increase the cash flows and sell the unnecessary assets and business units to increase the value of the firm.

Baldi (2005) argued that the traditional adjusted present value (APV) method undervalues target companies in LBOs as it does not incorporate flexibility the management of a target firm has in value creation. He extended the APV analysis with two different real options that together form a compounding option; financial default option and operating default option. He argued that the choice of carrying an LBO is a financial default option itself, and the operating default option is acquired together with the target firm by the PE firm. According to Baldi (2005), the APV method alone undervalues the equity value of the target companies, but it can be extended by adding the value of the compounding option of financial and operating default options with

binomial option pricing model calculations to make valuation precise. He argued the extended equity value is more accurate because the PE firm has the capability of adding value to the target companies.

In another interesting research, Cave and Minty (2004) studied real options from the entrepreneurs' point of view. Their findings supported the argument of McGrath (1999) that entrepreneurial behavior and failure can be explained by real options reasoning. Cave and Minty (2004) and McGrath (1999) both found that entrepreneurs emphasize controlling the downside of their actions but are very much likely to accept high volatility in their returns. Cave and Minty (2004) further suggested that the similar action of trying to control the downside risk of projects can be found among administrators of companies, but they are not as likely to accept high volatility in their returns. These findings highlight the importance of real option reasoning in different situations even if the actual options may not be quantifiable.

Liu and Yang (2015) studied the optimal investment strategy on PE funds with a real option method. They argued that as investments in PE funds are always illiquid it causes investors to consider the tradeoff between skillful GP or the illiquidity of the capital. They also highlighted the importance of the compensation structure of PE firms. They found that most PE funds have a fund duration of ten years, and compensation structure is 2/20, meaning the 2 % management fee of the capital committed and 20 % carried interest from the profit of the investments. Their empirical findings suggested that PE investors will not accept a project or investment until the value gain is approximately four times the cost of the investment when calculating all costs.

Krohmer, Lauterbach, and Calanog (2009) researched the performance of staging PE investments. They argued that staging has different results depending on when it is used. Staging investments have a positive effect on returns when it is done at the beginning of the investment relationship because staging investments help to mitigate information asymmetry. Contrarily, staging at the later or closer to the exit of the investment affects negatively to the returns. Their findings highlight the importance of staging investment options correctly.

Leisen (2012) studied two standard VC rights that are often included in their investment contracts; anti-dilution (ratchet) and liquidation preference rights. He studied these rights

through a real option analysis model. Leison (2012) argued that a more significant liquidation right multiple could help to avoid dilution and the need for other prior VCs to use their ratchet rights. In the end, he also adds that the other typical VC rights, such as veto and control rights, should be studied in another research. Another subject related to Leisen's (2012) article was presented by Cossin et al. (2002) in which they similarly analyzed different covenants of VC contracts with real option methodology to provide knowledge for efficient contract negotiations. All these rights are real options themselves, and therefore it is important to acknowledge them in this study as well.

Folta and Miller (2002) focused their study on real options in equity partnerships and especially buyouts of partners. They argued that even though delaying capital commitment may be optimal from the financial point of view, real options may have opportunity costs for waiting to exercise. They argued examples of these to be a cash flow deduction or missed opportunities to learn or rivals could preempt their planned projects. Their finding of recognizing the costs of holding real options is a highly essential point.

As mentioned, real option method can be used as a valuation method that is extending the traditional NPV method. Smit (2001) introduced a way of using real options together with game theory when evaluating acquisitions. He primarily focused on an acquisition strategy of buy-and-build. Smit (2001) argued that the NPV analysis that contains the value of future cash flows undervalues single transactions as much of the acquisition value comes from the option to build on the acquisition either organically or with further acquisitions. He further highlights that the decision of which strategy will be used for creating value for the investment must be decided before making the acquisitions to value it correctly. He argued that the strategy of growing with further investments is in the acquisition phase a compounding option, whereas organic growth can be separated and thought to be only a simple option.

Furthermore, Smit (2001) said the buy-and-build strategy provides value in a few different ways. Firstly, the financial leverage effect creates valuable tax shields, and the high leverage structure of the company emphasizes the importance of improving efficiency and cash flow for the management. Secondly, the buy-and-build strategy creates synergy value with economies of scale and with the larger size of the company the firm is likely to have increased market

power. Lastly, as the target firm matures and expands more attractive it is as a future acquisition target, therefore, increasing the possible exit value. Smit (2001) also recognized the importance of staging investments in a buy-and-build strategy, which is shown in Figure 18. Furthermore, he highlighted the optimal timing of investments when the competition of acquisitions is present. Lastly, Smit (2001) mentioned that even though options theory suggests that options should be kept open, game theory contradicts it by arguing a player could have the first-mover advantage by investing early in the company.

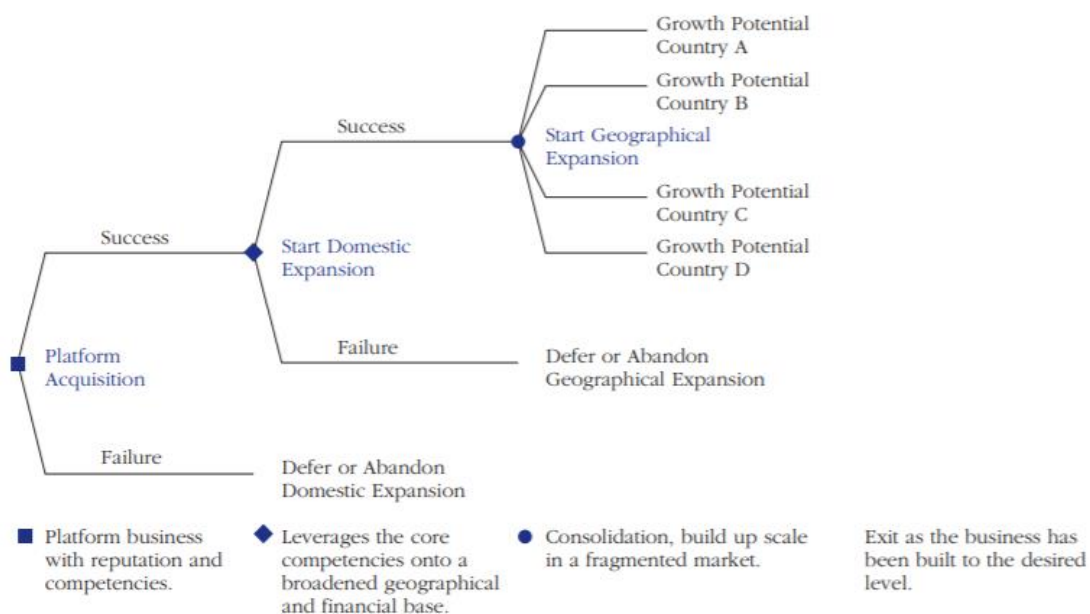


Figure 18. Staged decisions for a buy-and-build strategy (Smit, 2001)

Next, maybe the closest related to the topic of this research was the chapter Private Equity Funds and Real Options in the book *J Curve Exposure: Managing a Portfolio of Venture Capital and Private Equity Funds* (Mathonet & Meyer, 2008, 253-270). Mathonet and Meyer (2008, 253-270) analyzed real options in PE funds, mainly from the LP investors' point of view. They analyzed mainly three different real options; option to defer, option to expand, and option to contract or abandon but also recognized additional real options like staging investment option used by VC funds in different financing rounds. They found LPs to have a real option to defer that LPs are likely to use when making commitments. LPs' can exercise the option to defer by, for example, waiting on the later closing and not committing into the fund at the first closing. In these cases, LPs are waiting to see further information and some early clues of the future success of the fund. However, the cost of deferring committing capital is to pay an equalization

fee to the fund for the time since the first closing. They argue another cost is also the risk that LP would not be able to get as large stake of the fund as wanted.

Mathonet & Meyer (2008, 255-256) said LP investors could have an aversion to investing in first-time teams, but the importance of relationships in the industry incites LPs to invest in them in order to have the opportunity to invest in the follow-on funds as well. They found cornerstone investors are helping PE funds in the complicated fundraising processes, but on the other hand they have more bargaining power, can enjoy more friendly terms, and have a better influence on the management of the fund. The carried interest fees together with contractual key person provisions are aimed to solve the agency problem. They further mentioned the theoretical possibility for LP investors to default their commitments which however would have severe consequences on the LP investor's reputation (Mathonet & Meyer, 2008, 255-256; Fleischer, 2004; Litvak, 2004).

Lastly, Mathonet and Meyer (2008, 265) found an option to extend the life of the fund. In this research, this extension right is discussed under the option to defer as it is from another point of view deferring closing of the fund. They give an example of a VC fund that was supposed to be closed in 2003 when the public market was struggling, and valuations of VC backed companies were low. By deferring the closing of the fund and extending its life by two years, these portfolio companies could be exited in 2005 in a much better public market environment. They also mentioned that the management fee of the fund is often in the extension cases reduced to encourage the GP to focus on the financial performance. They argued an option to expand for LPs is to allow GP to re-invest earnings in follow-on investments. Also, LPs investing in follow-on funds of the same GP can be seen as an option to expand for LPs.

Mathonet and Meyer (2008, 254) said that "real options in the context of private equity are of a more indirect nature and difficult to manage systematically." They concluded their chapter by saying that LP agreements have many real option-like clauses, but these clauses are not easy to manage.

Meyer (2014, 235-248) continued with the same topic in a book chapter *Real Options* in the book *Private Equity Unchained*. The chapter vastly resembles and is written for the same

audience as the chapter *Private Equity Funds and Real Options*. Meyer (2014, 236) mentioned a practical use case of real options to LP investors by saying: “Rather than trying to predict the future, investors can guide their way into the future by building a portfolio of competing and independent real options that mirrors the evolution and competition going on in the markets.” He further continued by arguing that real option thinking helps LPs to gradually separate winner PE firms from loser ones in the same way as VC investors over time pick the winners of their portfolio companies. The real option thinking in portfolio structuring can cause some short-time failures and losses for investors, but in the long run this type of strategy will pay off.

Meyer (2014, 237-248) divided real options to implicit real options and explicit real options. He said that real option like features could be found in many forms in the standardized structures of private equity funds. Meyer (2014, 237-248) mentioned a few of them being; allowing the GP to reinvest parts of the proceeds in follow-on investments, winding up the fund in a situation where a key person leaves or extending the life of the fund. He further argued that the incompleteness and ambiguities in the limited partnership agreement can create multiple implicit real options. However, many of these real options often need renegotiation with the rest of the parties. Depending on the change, it must have either a simple or qualified majority support from LPs. For example, the extension of the fund’s life needs the LPs' majority vote.

Meyer (2014, 238) also mentioned an example of extending the investing period of the fund. He argued that LP investors are more likely to give the extension to funds with good GPs, but with bad GPs they want their money back faster so they could allocate their investments somewhere else. These findings also highlight the importance of PE firms’ reputation among LP investors. Another interesting example of a real option that Meyer (2014, 238) mentioned is the cornerstone investors’ possibility in emerging funds to have more bargaining power, can get better contractual terms, and can affect the management of the fund. These rights are often secured ex-ante since GPs are not likely to give more flexibility to fund investors during the lifetime of the fund.

Meyer (2014, 239) described explicit real options to be co-investments, secondary transactions, and side funds. He argued that co-investments and secondary transactions enable LP investors to concentrate their investments in areas where they are expecting to earn higher potential

earning in the stage of the cycle. In general, Meyer (2014, 240) mentioned the co-investing to be the syndication of a portfolio company's financing round between a PE fund and one or more of its LPs. He highlighted that the skills needed to make profitable co-investments require different skills than choosing which funds to invest in, which is the reason it may not interest all LPs. He added that for GPs, co-investments provide a possibility to make larger investments when the fund's capital alone is not enough. Choosing LPs that are known to have resources to make co-investments may, therefore, open up new real options to the PE firm and its financing rounds in its portfolio companies.

Secondary transactions in the context of the chapter in Meyer's book (2014, 242) relate to LPs' ability to have a right to buy shares before any third party to expand its investment to a portfolio company. Meyer (2014, 242) highlighted that these types of transactions are difficult to access and only open for the best known and connected LPs. The effects of the secondary transactions for LP investors are similar to in co-investments. Lastly, Meyer (2014, 242-243) mentioned side funds that can also be called-us 'annex' or 'top-up' funds, which are aimed to "increase follow-on investment capabilities of an original fund of with whom the side fund will invest in parallel." He mentioned that these side funds might have many forms, but the portfolio companies in them are always part of the portfolio of the original funds. Furthermore, he concluded that side funds are seen as an additional bet on the fund management firm.

Lastly, in the Real Option chapter Meyer (244-248) listed relationship-related real options. First, he mentioned the staged investment real options that LPs are effectively using by investing in emerging new funds have to have the option available to be part of the next fund. Second, he mentioned the option to abandon investing in a PE firm based on past experience (e.g. in their previous fund) or some soft information gathered from other investors. He also mentioned the previous fund investors to have a substantial informational advantage when GP is raising its next fund, which is also the reason why new potential investors carefully observe what the investors of the previous fund are doing. Third, Meyer (2014, 245) mentioned the option to expand that LP investors can exercise by committing higher amounts and by committing to other funds raised by the same GP.



When talking about the implementation of real options in practice for LP investors, Meyer (2014, 246) said that continuous monitoring of PE funds and quick accorded actions to the developments of the underlying assets is needed to exploit to benefits of real options portfolio. He also highlighted that monitoring is the primary tool for LP investors to gain information about their funds and to find additional investment opportunities with co-investments or side funds. To conclude the chapter on real options, Meyer (2014, 248) argued that real options in PE are indirect, are difficult to manage systematically, and are often not recognized as real options, thus making them underpriced. He argued the inaction of recognizing and exercising real options causes opportunity costs for the holder of a real option. As he said, “the real option framework remains a comparatively new paradigm with a potential that is rarely fully realized.”

## **5 EMPIRICAL SUPPORT FROM INTERVIEWS WITH INDUSTRY EXPERTS**

To confirm the findings of real options in PE that were discussed in the previous chapter, interviews with industry professionals are done. In addition to just confirming findings of the academic literature, the interviews help to understand the use of real options in practice and to find new real options existing in PE firms. Lastly in this chapter, the actual values of real options are presented through demonstrative examples.

Interviews were done during the spring of 2019. Each interview lasted approximately an hour, except for the first interview being closer to an hour and a half. All the interviews were recorded, and the recordings were analyzed later. Using recordings for the analysis helped to include all essential points aroused from the conversations. Additionally, they helped the interviewer to focus on the actual interview and to ask follow-up questions. Some notes were made during the interview, but most of the notes were made right after the interview during the first listening of the recording. All interviews were done in Finnish.

Next, introductions to interviewees' backgrounds and experiences in the field of PE are presented. After the short introductions, the focus is turned to using real options in practice. Different use cases of real options industry professionals have confronted in practice are discussed. Then, the different types of real options are discussed one by one. New real options found in PE is tried to be found here for each category of real options. Lastly, a short numerical comparison of the importance of different types of real options is done and discussed to demonstrate the seemed value differences between the real option categories.

### **5.1 Introductions to interviewees**

Before getting into the actual topic of real options in PE firms, short introductions of each interviewee are discussed to show their position in the PE industry and validate their expertise in the field. Hence, these introductions are showing their ability to provide meaningful and essential answers from the PE field to this research. The interviewees are presented in the same order as the interviews were made.

## **Tero Luoma – Taaleri Oyj**

Tero Luoma has been the investment director of Taaleri Private Equity Funds Ltd for eight years now. Before Taaleri, he was also working in the PE industry in another Finnish PE investor Panostaja for three years. He is responsible for Taaleri's corporate investments, which are mainly done in the field of VC and PE. In addition to his work experience, he has written a book on ownership and is currently working on his dissertation on the same subject.

Luoma describes his work mainly to be an active board member of their portfolio companies. At the moment, he is the acting chairman of the board in seven different companies, and he is a board member of two companies. Luoma acts as the investment manager of Taaleri's circulation economy fund. The fund is already past its investment period, and it is currently in its holding stage as it is a little over three years old. They have made investments in eight different firms, and now they are only allowed to make additional investments to these firms.

The listed parent company Taaleri Oyj manages a total of 6 billion € in capital of which 900 M€ is in PE funds. During the life of PE funds at Taaleri Oyj a total of 1.5 billion € has gone through the funds. Half of the capital comes from institutional investors, but the individual customers are a far larger group in numbers. These customers are wealthy individuals who can provide the minimum investment of 10 k€ - 100 k€ to each fund. Taaleri is often the largest owner their target companies, but even if they were in the minority, they would secure their decision-making right with agreements. Often, they have the chairman of the board position in their target companies that further enhance their position as an active owner. They usually have a total of 1-2 board seats in their portfolio companies.

Noteworthy is to mention that the circulation economy fund is the only fund of Taaleri Private Equity Funds Ltd that has invested in more than one company. Most of their funds, therefore, differ from traditional PE funds, since they are only raised to invest in one company. They use a co-investment model for their customers in which Taaleri is making investments in target companies and offering the possibility to invest with same terms through their funds. Luoma says this way, the diversification of investments happens at the customer-level instead of fund level. An example of their co-investment model is the following: Taaleri invests in a company

taking a 20 % stake in it, and they offer their customers to invest in the same firm through a fund. The fund owns 60 % of the company, and the rest 20 % is left for the management of the company. Taaleri Private Equity Funds Ltd acts as the GP of these funds and earns management fees and carried interest from it. As Luoma says Taaleri has brought PE investing closer to individual investors that had previously mostly been the luxury of institutional investors.

### **Vesa Uotila – Intera Partners**

Vesa Uotila has been at Intera Partners since 2010. Before joining Intera Partners, he worked at McKinsey & Company as a consultant. He says the diverse tasks and long-term view keeps him interested in the field. Uotila is part of the investment team like most of the people at Intera are. The rest of the people work in administrative tasks of the company. At Intera they usually work in small two or three-person teams in which they discuss, analyze and make decisions related to their target and portfolio companies. The process of investing starts a year or two before making the actual investment by discussing possible options with potential target firms.

Intera Partners operates three different PE funds, of which the first one was founded in 2007, second in 2011, and third in 2016. The newest fund manages 250 M€ committed capital. Their investors are mainly pension funds, funds of funds, and other large institutions from Finland, from the Nordics and other European countries. Intera makes approximately ten investments per fund, but this number may vary depending on the situation. Uotila says that ten different companies per fund provide diversification in terms of time and industry, but it is still small enough that they can still invest their own time and effort in helping portfolio companies to grow. Over their lifetime, they have made a total of 23 investments buying portfolio companies, but approximately 100 additional acquisitions for the portfolio companies.

Intera Partners is a majority investor, and generally they have 55-75 % ownership of their portfolio companies. The majority is often bought from the entrepreneur of the target company, but a significant stake is left to the entrepreneur as a strong incentive to grow the company. The key people of target companies are also strongly motivated with significant ownership stakes and additional incentives. Intera assures through shareholder agreements that they always have the right to make all pivotal financial decisions and that they have the control right of the

company. The controlling power of the company is further enhanced with majority seats on the board of the company. They always have the decision-making power in the board through one or two representatives from Intera and additional people from their networks.

Uotila says the investment strategy of Intera is practically always focused on growth, but it can be further divided into three different growth strategies; buy-and-build, internationalization, and organic growth, or it can be a combination of any or all of these strategies. Uotila explains that the buy-and-build strategy focuses on the development of a midsize company that is based on small companies (e.g. through acquisitions) to a large industry. Internationalization strategy focuses on internationalizing the business to other countries that often in Intera's case are Sweden or Germany. Organic growth is self-exploratory as the focus is to finance firms' operations and fuel the growth of the business. As Uotila says, a larger firm is generally more valuable than a smaller firm, which is why growing the firm is almost always their goal.

#### **Heikki Westerlund – Professional board member (previously Capman Oyj)**

Heikki Westerlund has a long experience in PE markets. He started working for Sitra at the beginning of the 1990s, and in 1994 he moved to Capman and was there 23 years until the spring of 2017. He has been both CEO and the Chairman of the Board at Capman. Since leaving Capman he has been working as a professional board member and is currently the Chairman of the Board in publicly listed company Orion and a board member in also publicly listed Tikkurila, and in privately owned Kemppi Oy and Duuri Oy.

Westerlund says that even though he has mostly left PE funds behind, he is still looking for new PE deals through a "virtual" PE without actually having a fund but collaborating with family offices and through syndicates, et cetera. He is always aiming to have a significant stake in the business and a board seat to be able to put valuable efforts in the target company and see these efforts to concretize in the value of his investment.

During Westerlund's time at Capman from 1994 until 2017, Capman grew from a private partnership to a publicly listed company and became a wide-ranging organization. Nowadays,

the largest single business area is not traditional PE, but real estate investing. The core of PE at Capman is the small and medium-sized buyouts, but they also do infrastructure investing, venture capital investing, investments in growth companies in Russia, and growth equity investments. Capman's current active buyout fund is their tenth buyout fund in order.

Almost all investors of Capman (90-95%) are institutional investors, but also wealthy individuals have been investors in their funds. Westerlund highlights that the fundraising at Capman was very international; attracting capital from not only traditional Finnish institutions, but also from Europe and the U.S. From Asia, fundraising was often tried but hardly ever succeeded because of its challenging nature in long-term relationships. Westerlund mentions that the fund structures are very complicated because the international investors and other investors need to have their tax-neutral partnership structure in order to avoid double taxation.

### **Sakari Pihlava – Vendep Capital**

Sakari Pihlava is the general partner (GP) of Vendep Capital. Vendep Capital has three GPs and one senior associate, so it is a relatively small team. At Vendep, GPs make decisions together in everything related to investments and the fund. Pihlava himself has a strong background in IT, but he also has an MBA. He has worked for TVM Capital as a specialist in software services. After that he spent three and a half years at Efecte before founding Vendep Capital in 2011.

Vendep Capital manages two funds, of which the first one was raised in 2013. The first fund Vendep Startup Fund I had 5 M€ in commitments, and it has made ten investments. Pihlava says this fund was a so-called accelerator fund. The second fund of Vendep Capital Fund II has 36 M€ commitments, and it was raised in 2017. The latter fund's investors consist of funds of funds, institutional investors, and private individuals whereas the first fund was mainly only private individuals. Pihlava says approximately 70 % of the investments come from institutional investors and 30 % from private individuals. All their LP investors are from Finland.

Vendep invests in early-stage startups and only in B2B Cloud or SaaS businesses. They have invested in 18 different companies, of which 17 investments are still active, and one company has been exited. Vendep Capital solely focuses on VC investments, and they aim to have 15 % or at least 10 % ownership of their target companies. They aim to have this ownership at the time of the first investment is made when startup is still at early stage. Pihlava says that growing and getting such ownership at a later stage is significantly more difficult. They usually have a board seat at a target company, but this is not mandatory term for their investment to be made.

### **Juha Peltola – Vaaka Partners**

Juha Peltola has been the CEO of Vaaka Partners since spring 2006. Before joining Vaaka Partners, he has been a consultant at McKinsey & Company, worked for OP Pohjola in Acquisition Finance unit, and has also been part of founding a stock and credit risk analysis provider Valuatum Oy.

Vaaka Partners has a long history but the focus in this case in the newest form of the company, which was started in 2008 with a management buyout from the majority owner Pohjola Pankki Oyj. In 2010 the company changed its name to Vaaka Partners. Before 2008 they had done many different types of PE investment since then the focus has been in buyouts. Peltola says they are a typical low-mid market buyout firm that is partner-owned. Vaaka Partners focuses on majority buyout investments that are strongly growth-oriented. Their average portfolio company has grown approximately 20 % year-over-year under their ownership. Half of the growth comes from mergers and acquisitions and half from organic growth. They have made 18 platform acquisitions since the company's new form 2008, and a total of 78 additional acquisitions for these companies have been made.

Vaaka Partners does not focus on any specific growth themes. Typically, the industries have stronger growth than others, and capital-intensive investments are avoided. Peltola adds that in principle three different themes can be found. First, they have built Finnish market leaders in service businesses. Second, they have expanded businesses to be international market leaders. Lastly, they have established and invested in international product businesses. The combined

revenue of their portfolio companies is approximately 800 M€ per year, and these companies are employing 4000 people.

Vaaka Partners has 500 M€ assets under management (AUM). Their investors are mainly institutional investors and funds of funds. Most of their investors are based in Finland, but they also have a strong European investor base in their funds. Peltola says that they have had excellent returns for their investments, which is why many international investors have wanted to commit capital to their funds. The currently actively investing fund Vaaka Partners Buyout Fund III is the third fund in the new era. The typical lifetime of their funds is 10 + 2 years, but Peltola highlights the average European lifetime for a buyout fund is close to 15 years.

## **5.2 Real Options in Practice**

After a short introduction of industry experts and the companies they work or have worked for, the interviews moved to actual discussion on real options. Before getting deep into different real option categories, overall usage of real options in practice was tried to perceive. Overall, the use of real options seems to be scarce in practice.

Luoma says that real options are not part of their decision making nor they are included in their investment proposals. He further mentions that real options at Taaleri and overall in the industry are, in some cases, almost seen as jokes about mitigating the imbalance of Excel calculations on valuation and the expectations. He adds that the term “real options” has an academic nuance, and it is not used even if they talk about the subject itself. Instead they often use other terms on the same subject. Though, he adds that with some people it is natural to discuss real options from strategical point of view. He concludes by saying that too often real options are seen only like the positive outcome, and together with it real risks should also be analyzed to view the negative side of things.

Uotila shares the view of Luoma that real options are not explicitly as a term used, but themes related to the subject are discussed. He says internationalization is thought with a real option type logic when starting a business in a new country opens new exit possibilities for their



investments. He uses Delete Group as a case example that expanded its business to Sweden during Intera Partners ownership. This expansion, even on a relatively small scale, opened an exit possibility to sell the company to another PE investors who, in its part saw growth opportunities in the Swedish market for Delete Group.

Westerlund says that during his years in PE, real options as a term have been mentioned now and then, but it is not a concept that would have always been used or at least not under the same term. Concepts and things related to real options have been talked about but not under the term real option, and these options have not been evaluated mathematically. However, Westerlund recognizes that real options can be found in different levels in PE; in fund level where structuring and building a fund is on focus, and in case level where a single case is evaluated.

Another real option reasoning type of view is the value creation plan of companies. The analysis could be done by asking how capital can be earned back five times the initial investment and or is it even possible. Then the growth themes for the case are recognized. Perhaps the primarily wanted strategy would be organic growth, which is often driven by the megatrends of the world. Westerlund says these organic growth cases are often challenging to find, and they are often extremely wanted which is seen in their valuations as well. Another strategy is the structural growth with mergers and acquisitions of companies. However, Westerlund highlights the importance of the question whether structural growth provides synergy and value, or is it just a large critical mass that does not provide any value. He further says these value creation plans can be divided into four different categories:

1. Growth
2. Improving profitability
3. Cash flow
4. Strategic interest

Pihlava sees real option as a term in a similar matter than previous interviewees, and that it is not explicitly used as a term. Pihlava highlights they make decisions and think about the possibilities they have but not use or analyze them through real option reasoning. For example, they think about a company expanding its business to a new market, which is often related to the next fundraising round and what it makes possible. Pihlava says that in the middle of the

investment period they start to analyze the market and form different possibilities the market has to offer. However, Peltola highlights that even though real options are sometimes used in discussions, they are not used as part of the actual decision making, nor exact values for these options are calculated. At Vaaka Partners it is a common practice to think and recognize possibilities and opportunities with real option reasoning type of practices.

### **5.3 Different real options in PE discussed in the interviews**

After getting short introductions to interviewees and discussing their views of real options in PE from the practical point of view, the focus is turned on the different real option categories in PE. The categorization is the same as used before when discussing real options in chapter 2.2. Each option category included multiple real options found from the academic literature. These previously found real options were mentioned and confirmed with the industry experts only after an overall discussion of the real option category was done. The purpose was to keep interviewees minds open about new real options that may exist in PE firms instead of just focusing on the previously found real options. Next, each real option category is discussed in light of the findings from the interviews.

#### **5.3.1 Option to Defer**

The category of the option to defer is the one with the most real options in PE that academic literature has previously found. The different options to defer are discussed one by one. These real options are based on discussions with industry professionals.

##### **Option to defer closing of the fund**

The most recognized option in the interviews was likely to be the option to defer closing of the fund or other words getting extensions to fund life. The extension of the fund life is almost always done with the permission of the investment council. A reasonably standard structure seems to be that the fund has a prescribed life of ten years with either one, two or three years of extension years. Each extension year is usually considered and decided separately. For

example, if the fund still seems to need more time after the first ten years, the one-year extension year is agreed at that time, and the second year after the first year and et cetera. The practices change case by case but are often easy to agree on as all investors want the outcome of their investment to be as good as possible. Additionally, if the fund was closed when it still has portfolio companies in it, the investments left would be shared between the LP investors. No institutional investor wants to get a part of the small or medium-sized companies straight to their investment portfolio.

Luoma mentions the real problem is to deal with the last portfolio companies of the fund as they may be more difficult to exit and thus are extending the closing of the fund. However, Uotila says that in some cases it is reasonable to extend the fund life also for other reasons. He provides a case example of their portfolio company Normek, that was one of the last investments of their first fund. The fund life extension enabled the exit price of the company to be higher than it would have been among the original life of the fund. Therefore, all the investors of the fund and the PE firm benefitted from deferring the closing of the fund.

All interviewees recognize the importance of the real option to defer the closing of the fund. However, Westerlund says the extension may be conditional on GP's management fee. For example, there may be cases where investors can give the extension for the fund if the management fee is cut in half or even to nothing. These can be described in the LP agreement but can also be agreed on case by case basis with LP investors. Westerlund also says the average holding period per case at Capman was approximately five years, but the longest ones could be closer to 15 years.

An important view of the extending VC fund life is presented by Pihlava. He says that most of the growth of their investments is focused on the end of the holding period, so if there is a possibility to defer the exit time it may have a large positive effect on the investors' return. He mentions a good case example of the American tech company Zoom. At Zoom's last private funding round the company was valued at 1 billion USD in early 2017, but it had an IPO valuation of 9 billion USD in April 2019. In two years, investors were able to get nine times return for their investments. A VC fund should, therefore, defer its closing if it has an active investment in a company that has the potential to earn an excellent return for the fund.

### **Option to defer investment period**

Another possible option to defer for a PE firm is the option to defer the investment period. Based on the discussions with the industry experts, the investment period in practice is often 3-5 years. Similar to the deferring the closing of the fund, extending an investment period often needs approval from the investment council. Luoma says it is always up to the investment council what things are held on to and what things in the fund agreement can be stretched.

Deferring the investment period may be caused by a bad market situation. However, Peltola says that they have never had to extend the investment period. Westerlund adds that there has sometimes been even pressure from LPs to shorten the investment period which could be questioned as the capital is committed for at least ten years in any case. However, he also mentions, as an example, a Finnish PE firm that did not make any investments for three to four years possibly causing some of their LPs to question why their capital is committed if no investments are made.

### **Option to defer exit of a portfolio company**

As Westerlund mentions, the GP has unambiguous right to decide on investment timing under the fund agreement. Therefore, the GP always has the option to defer exit time if it thinks it could earn a better price for its investments. Deferring exit of an investment is not possible forever as the life of the fund is limited. However, the life of the fund can be extended as well as mentioned before. Luoma also highlights that there are costs involved in holding the option to defer exit as there are risks involved in the development of the investment. He also adds that different perspective of analyzing the performance of the investment should be considered. Some investors may prefer to judge their returns by the multiple on invested capital (MOIC), and while others prefer the IRR return.

### **Option to defer calling capital**

Based on the fund structure and LP agreements, the PE firm, as the GP of the fund, always has the real option to call capital to the fund. All the interviewees confirmed that capital calls are almost always optimized to maximize the investors' IRR return. Similarly, when capital is returned from the investments, it is transferred as soon as possible back to the investors. The capital calls are often only done after the deal is certain, which in practice means that the letter of intent or even the deal is already signed before the capital is called. The time reserved for capital calls seems to be, in most cases, two weeks. Typically, the time needed for capital call is defined in the LP agreements.

As Luoma, Westerlund, and Peltola mention the IRR return for investors can be even further optimized by using credit at the beginning of the fund instead of calling capital. Therefore, a PE firm is using the capital commitments to get credit and using the credit to pay the management fees to GPs and even using it to make the first investments. According to the experts' knowledge, the using of credit lines is more common in larger funds than smaller funds, and more common in real estate funds, where the returns are less volatile. Peltola mentions that using a line of credit dramatically increases the IRR return but decreases the absolute return of the LPs' investment.

### **Option to defer making the investment**

Related to deferring the investment period, the PE firm has an option to defer making the investment. The deadline for deferring making investment is the duration of investment period, and therefore, the PE firm can not wait forever for a better investment opportunity to come. However, most interviewees highlight the fact that the information asymmetry decreases over time thus making the waiting and following a potential company often a rational choice. Uotila says that this is often done even if there is a slight doubt about the investment's profitability. Although, many of them mention that in the best cases investors are competing for the possibility to invest in them. In these cases, there is not always an option to defer for the PE firm. Letters of intents and due diligence process may include these types of options that enable the PE firm to defer making the investment.

### **Option to defer from LPs point of view**

From LPs' point of view, there is also an option to defer investing in a fund. As interviewees mention many LPs want to have some proof of what the fund will look like or what the team has done before. Hence, the importance of cornerstone investors is very significant, especially in the case of first-time teams. However, even though the previous literature has mentioned that cornerstone investors may have better terms and more substantial bargaining power in the fund, the industry experts have not recognized this type of practice in their work. Instead the use of equalization fee is almost always used to even up the situation between the investors committed in the first closing and last closing. Without any fee, the LPs would have too good an opportunity to defer their decision to invest. These findings were largely supported by almost all the interviewees.

### **Option to defer additional financing of the company**

Uotila also mentions another option to defer, which relates to the additional financing of portfolio companies. If things in the target company do not go as planned the company may need some additional capital for further growth or to manage its troubles. PE firms are likely to defer the decision to make the hard investment decision to help the company with additional funding. Instead of putting in capital, PE firms are demanding the management to make contributable decisions to help the company out without additional funding. This finding can also be seen as a staged investment option.

### **Option to defer starting of the fund**

To further optimize the efficiency of the fund, Peltola mentions a practice of using a soft closing where the fund only starts when the first investment is made. Before it, there are only commitments but not an actual fund. Deferring the starting of the fund increases the IRR return of LP investors as the capital is in the fund for a shorter time.

### 5.3.2 Staged Investment Option

Staged investment option or staging option is often overlapping other options but especially with the option to defer and option to alter. The findings of different staging options in PE are mentioned here.

#### **Option to stage investments to portfolio companies**

A common strategy used in VC financing is to stage investments in the portfolio companies is to invest in different financing rounds of the company. Pihlava says that if the business does not fly, it could be considered if the company has valuable business units or other businesses that could be worth something in creating further value for the investor. Pihlava adds that they are always trying to get Pro-rata right that allows them to invest in further financing rounds to avoid dilution and keep their initial ownership. However, he says that even though the investor would have the right, it does not always keep in good cases.

Staging investments to portfolio companies can be recognized in the PE sector as well but not in a similar matter as in VC because PE investments are mostly majority investments. Uotila highlights the importance of staging investments when implementing buy-and-build strategy in their acquisition. Typically, the total capital needed to be invested in a target company is approximated when making the first investment, but the additional capital for further acquisition and other purposes is only invested later. By later, Uotila says they look for clues and proofs if the planned strategy is working when implementing it in practice. If the planned strategy does not seem to work, no additional capital will be invested in the target company, at least not under the same strategy. Other interviewees support his view of staging options. Importantly, this staging is always analyzed case by case as the PE investors typically have the resources to be strongly committed to their target companies.

Luoma provides a case example of Taaleri's biogas factory investments that were carefully expanded according to their investment template. They opened different locations in different stages to diversify the risk geographically and over time. Before opening a new plant, they needed it to have agreements, some order backlog, and other similar things required by their

investment template. Uotila also provides a practical example of staging investments in their portfolio company Renta that was built from merging a few smaller companies into one. Then, PE firm invested in organic growth and machinery of the merged company. This growth strategy seemed to be working, and now PE firms' and banks' additional capital have been provided to support the growth of Renta.

### **Staging incentives**

In addition to just staging investments, different incentives of target companies can be done in stages. These incentives are often driven by the PE firm, who wants to have the management and key persons in the target company to be as motivated as possible. Many interviewees mentioned the use of this type of practice.

### **Option to stage financing type of investments**

Another interesting finding of staging investments into target companies is the possibility to make investments in all equity before leveraging the target company. Westerlund mentions that making investments into the target companies in all equity makes the investment process faster, and therefore, may provide advantage over competitors when wanting to invest in exceptional cases. The process is faster since the leveraging is done after the all-equity investment is finished, and hence the complex leverage discussions are only done when the portfolio company is already owned by the PE firm. The ability to make all equity investments, in the beginning, helps a PE firm to get extremely wanted cases.

### **LPs' option to stage investments in PE firms**

LPs of PE funds also have a similar staging option that PE firms have over their target companies. Like mentioned before, LPs may want to invest in first-time funds only to get access to invest in their second funds if the first one is successful. Uotila also mentions that new investors often look what the previous investors have done and if they are investing in the follow-on fund. Previous LP investors investing in follow-on funds is seen as a vote of



confidence for the PE firm from investors and thus making the fundraising process of a new fund easier. Many interviewees support this fact, and most of their investor base has stayed relatively same over different funds even though some changes always happen.

### **Option to stage investment throughout the investment period**

Another vital option to stage investments is to diversify them over the whole three to five year investment period. This option is built-in in the fund structure and is often perhaps unknowingly used. If all investments were to be made in the first year of the investment period and market crashes the next year, the whole fund would suffer significant losses. However, if only a couple of the investments were made during the first year and others after the crash, the loss suffered would be a lot smaller or even nothing depending on the success of the other investments.

### **5.3.3 Option to Alter**

Option to alter could be divided into multiple different categories, e.g. option to expand, option to contract or option restart. However, these all are in this case under the same category, and anything related options to alter were discussed in the interviews here. A lot of these types of options are considered in the management of portfolio companies since they may have more of these types of options. The findings of the interviews are presented next.

### **Option to expand the portfolio company**

PE firms often have a strong position to affect the management of their target companies, and thus it is holding an option to expand the business and the target company. Luoma says that they often encourage the target company's team to brainstorm and try new things, and even to found different new business units inside the company or spin-offs. Uotila mentions Renta as an excellent example of how they staged their investment to the company, but they always held the option to expand after financing, which was also exercised when things went as planned. Westerlund says the most critical expansion options should be included in the value creation

plans of the target companies as they are needed to increase the exit valuation, thus the profit of their investment.

### **Option to expand PE firm's business**

PE firms may have a relatively limited number of options to expand their own business. As Pihlava says, the most traditional way would be to raise another fund along with an existing one with a different strategy or to expand the fund size of follow-on funds. He also mentions a practice used in VC firms that they may raise an opportunity fund that does not have any management fees but a higher carried interest fee for the GP.

Luoma mentions an example of raising a fund with a new strategy at Taaleri. Their circulation economy fund got started from the previously successful biogas factory fund which showed the real possibilities lied in the circulation economy thus making an exciting option to expand for Taaleri. However, he highlights that the previous track record with biogas factories made the raising of the fund possible and without it, it may not have been possible. As he says, "You cannot jump to the end of the road without walking the road first."

### **Option to contract**

Option to contract in PE seems to be very straightforward. Contracting is done by not investing any more money or efforts in a target company. As many of the interviewees mention, this is, however, difficult to do as they are highly involved with the company. A couple of them mentioned that if a planned value creation strategy is not working, a PE firm can contract the initially planned investment amount. Alternatively, a PE firm can slow down the process of the growth if it is insecure if the value creation plan works, thus contracting their efforts in the target company.

## **Option to alter**

Option to alter includes everything related to the possibility of making changes. As Westerlund says, PE firms often have the full control right to the crucial decisions, e.g. the selling a business. A practical view of an option to alter is the possibility of the PE firm to sell assets of a target company to free cash in the short term, but worth noting is that it may not change the long-term rent debt that the company has to pay. Peltola also adds that the LP agreement is based on the option to alter; what are the reasons the agreement can be changed, and what are the clauses for those changes. Many agreements have similar options to alter and clause on making changes.

### **5.3.4 Option to Abandon**

Option to abandon is difficult for PE investors to exercise, especially if they are the majority owner of the company. However, in some cases, this is necessary as no other options may be available. Options to abandon may, in these cases, overlap with options to contract as they are very similar for PE investors. Other types of options to abandon are also discussed, and the different views of the different people are shown.

#### **Option to abandon an investment**

Many interviewees highlight the difficulty of entirely abandoning an investment, especially in the more mature cases. If abandonment is made, it is done in a relatively prudent way by contracting investments and decreasing resources put in the company. However, Pihlava says that for a VC firm like them, the option to abandon an investment is done by giving back the shares to the founders for free. This way they manage their reputation as an investor and avoid bankruptcies.

Abandonment of an investment is not as simple in buyout cases where PE investor is the majority owner of the company and has significantly more massive amounts of capital invested in the target firm than in VC investments. As Westerlund says options to abandon are exercised

more in the VC sector, but in buyouts, it is less common and more difficult. However, he says that it is possible just to quit putting additional capital to the company and focus on the resources somewhere else even if the PE firm cannot get initially invested money back out of the company. The faster a PE investor can recognize the investment is not worthy of pursuing, the better it is for the fund as it does not have time to wait forever if the company grows in a way planned or not. Uotila highlights the difficulty of exiting a bad target company as it can be challenging to sell at any price because of its high leverage structure, causing their equity values sometimes to be negative. Additionally, he mentions that the lenders (often banks) need to approve the buyer, and thus the buyer needs to be legitimate.

Uotila also mentioned an example of a PE firm that buys whole portfolios of companies from other PE firms or other owners. These portfolios consist of bad and good companies. For the bad companies they do not invest any more their time or money but instead hire a chairman of the board that has the sole purpose of finding a new home for the troubled company. The PE firm therefore efficiently tries to exercise the option to abandon an investment.

Luoma also mentions a practical example of how Taaleri has exercised the option to abandon. They invested in geothermal energy after being successful in other energy sector investments like wind and solar energy investments. For the geothermal energy project, they had to exercise the option to abandon because after two drillings they were not able to find energy. They could have drilled a third time, but instead, they decided to abandon the project, minimize losses and release the uncalled capital commitments.

Almost all interviewees highlight the investor's reputation when considering abandoning investments or potential investments. Luoma mentions that responsible investing has risen as a new trend in investing which has caused them to consider more carefully where they are investing in. For example, he mentions that even if payday loans could be a profitable investment, they are not investing in those since it is not ethical investing and it would hurt their reputation. He also highlighted that traditional sectors might also be risky investments for investors' reputation when looking at them from a different perspective. An example of this could be the nursing care industry in Finland, which has been criticized for trying to achieve profits at the expense of the quality of nursing older people.

As the majority investor, a PE firm has significant responsibility for the target firm to its creditors. This makes it very difficult for a PE firm to abandon investments entirely. Uotila says an ugly abandonment of a portfolio company may cause a bad reputation for the PE firm, which may hurt them to get good investment opportunities as they work closely with entrepreneurs. The market in Finland is small, and therefore, the bad news spread fast.

### **Option to abandon before the actual investment**

Peltola mentions that typically, options to abandon the potential investment are included in the letters of intent in the process of making an investment. He further highlighted that during the due diligence process of a potential target company, anything could come up, which may cause the PE firm to exercise the option to abandon. Usually, the costs of the due diligence process are shared between the buyer and the seller candidate.

Luoma adds that addition to the due diligence process, the potential investment may be abandoned if the target company is caught lying or any distrust even in smaller things because it loses the confidence of the company. Even before getting into the due diligence process or letters of intent, a PE firm has an obvious but vital right to abandon potential investment possibilities. As Westerlund says it is important also to know when not to invest in companies.

### **Option to abandon LP investors**

PE firm also has an option to abandon potential LP investors from investing in their funds if they do not fulfill their investor criteria. Pihlava mentions an example of foreign investors who could want to commit to a fund but only to be able to move investors' money to inside the EU and not necessarily even ever answering to the capital calls. As Peltola mentioned before, the best PE firms can choose their investors. Thus, these PE firms are likely to abandon investors that they do not like to have in their funds, and instead only accepting those who are right for their criteria. Some of this is enabled by law as the PE funds have to do proper know-your-customer (KYC) processes before accepting them to be investors of the fund. Proper KYC processes should protect the fund from money laundering and other illegal activities of their investors.

### 5.3.5 Option to Switch

Option to switch was the following option category to be discussed. An example of switching inputs to receive the same output was explained to clarify the meaning of this option. Interviewees well understood the point of this option, and findings show many types of switch options the PE industry has.

#### **Option to switch team or management**

PE firms, as majority owners, have a commonly exercised real option; option to switch team or management. Worth noting is that this option is only exercisable in majority investments when the PE investor has a controlling right over the company. Thus VC firms do not have a similar opportunity to switch the team to another. As Peltola says, the PE investor always has to consider if the management is right for the situation in hand. He also adds that the option to switch management is often used even though it may not be the actual purpose of the investment. Switching the management always depends on the situation of the entrepreneur and the skillset of the original management. Uotila says that they at Intera Partners switch management always in one way or another. He says that almost always, a new CEO and a new CFO are brought to the company, and the board of directors is strengthened. However, he mentions that exceptions exist. One good example is the CEO of Kamux, who is the founder of the whole company, and he has led the company from zero to over 500 M€ in revenue.

Westerlund estimates that management is switched in half of the cases, but he also highlights that the different situations when the management is changed; the management switch could be planned before making the investment, or it may be done only after recognizing the management is incapable of delivering results. In the latter case, PE firm has wasted valuable time of building value for their investment. However, as Westerlund says, it must be carefully considered if the management can be blamed for not delivering or if the value creation plan failed. Luoma mentions an example of a management switch that was done after recognizing that the current management is not able to perform. He says they found another smaller company with a better management team that they eventually merged into the original company and brought the team from the merging company to replace the underperforming management.

### **Option to switch output**

A PE investor may also have an option to switch output. Luoma provides an example of a company Mattiovi, which was capitalized to acquire another company's business from a bankruptcy estate. The previous company had a bad reputation in the industry, which enabled an output switch by buying the business to a new owner and branding it with its name even though producing the same products. The same products were able to provide higher returns to the company by basically just changing the name of the products.

### **Option to switch investment strategy or target return**

PE investors have an option to switch investment strategy as long as it is allowed in the LP agreement. However, the fund's strategy is often fairly strictly defined. Similarly, the target return could be changed or lowered if the circumstances do not allow the PE fund to achieve expected returns. Overall, the most critical outcome for investors is always the return, which is why lowering it may be more controversial than the other.

On a single investment level, investment strategy could also be switched to another. As Peltola mentions a changing value creation strategy could be done by selling the company in parts instead of growing it larger and creating value by building creating synergies. Thus, a company is a portfolio of different real options.

### **5.3.6 Growth Option**

Growth option or option to grow could be almost any type of investment that a company makes. As many interviewees mention, target companies always need to have some real options to grow in order to be profitable investments. Luoma says that they try to find new growth options in their target companies by pushing the management to find them, perceiving different possibilities and finding new business areas. Hence, driving the value of the growth option they have. The growth is exercised for the PE firm at the time of the exit, but until then the growth is bound in the company.

The interest of a PE firm is to build growth options into their target companies to have a better exit value. An excellent example of this is Intera Partners' investment in Delete Group, which was built from a merger of a couple of smaller companies. During Intera Partners' ownership, they bought additional companies and also expanded their business to Sweden at one location. This expansion to Sweden, even only in one location, was seemed to be an option to grow for the buyer and next owner of the firm, another PE firm. As Uotila says, without the initial relatively small expansion to Sweden the next PE firm may not have been necessarily interested in buying Delete Group.

Peltola also provides other important examples of growth options they created in Reima during their ownership. They started planning and making investments for future growth opportunities, which they were not able to exercise before selling the company to another PE firm. One growth option they started building was the vertical integration of the company which was partly done by replacing distributors with their own stores. Another growth option that they started to develop was the e-commerce store that provides a direct to consumer channel. The e-commerce store was opened very shortly after their exit of the company. These growth options made Reima a more attractive company for next owners. Peltola also adds that even though this may increase the exit value, it is also the right thing to do for long-term thinking and planning.

For a PE firm, a growth option can exist in a similar matter. A small investment in a new sector opens up a whole new world for PE investors. Luoma says Taaleri started its energy sector investments from small investments in wind power and has since expanded to solar investments as well after gaining some traction and knowledge of the first wind power investments. He also adds that this expansion was done country by country; first investing in Finland, then in Sweden and the U.S. These expansions in the industry and countries have provided them new bigger and larger partnerships that make new things possible again. Previous experience and doing different things, even on a small scale, making it possible to grow the business and expand to a bigger world. A bigger world may include a growing business to different industries, geographical locations, and with different partners.



### 5.3.7 Multiple Interacting Options

Multiple interacting options may have been the most difficult one for the interviewees to comprehend. They have a good reason as it may already be difficult to perceive single real options; it is far more challenging to perceive and comprehend the relations between different options. Uotila mentions that these combinations are difficult to interpret as a whole, which is why they are often analyzed separately. Multiple interacting options include different options thus it strongly overlaps with the other option categories. However, still a few good points in multiple interacting options were found in the interviews.

Even though multiple interacting options were hard to define, some good conversations arose related to this subject. Luoma mentions that multiple interacting options could be seen as a SWOT analysis of an investment that they are always doing before making investments. In this type of analysis risks and possibilities are listed and analyzed. Westerlund highlights a risk list as an essential aspect of making investments. He questions if risks are always really understood and considered or if they are only listed and mitigated. He says that often, the failed cases have been the ones with too many risks mitigated before the actual investment. On the other hand, no investment is perfect, and challenges are always present, so some risks need to be accepted.

On the other hand, Pihlava says that for them, this would be more of understanding the current market situation and acting accordingly. They are analyzing things like who is fundraising, how much money are they fundraising, where it should be raised, et cetera. He says that for them it is not really about recognizing options but instead reacting to changes. However, he also highlights that they are learning from LP investors' actions for example what type of funds and what kind of strategies are able raise funds. Planning for a next fund may have elements of analyzing multiple interacting options; fund strategy needs to be aligned with what LP investors want to invest in. Additionally, Peltola mentions binomial tree type of analysis of different scenarios are used to value companies and their value creation plans. In these types of analysis, multiple interacting options are tried to be perceived.

In addition to these previously mentioned findings, almost all interviewees found multiple interacting options relating mostly to LP relations. Uotila mentions LP relations are thought of

as an entity with different paths and options. Different LP investors open different possibilities and affect the appearance of the fund. Luoma says that a commitment from a well-known institutional investor gives an “approved stamp” and makes it easier to raise money from others.

Pihlava adds that they had a wish list of the best investors for their fund, but they were not in a position to choose the investors but rather take investors who were ready to invest. Peltola says for Vaaka Partners, choosing best-suited LPs for the fund was possible as they had “a happy problem” with more investors wanting to commit to the fund that they were able to take in. Peltola says they preferred pension funds as investors for them because they have a long-term view and make investments professionally. They are also enormous which enables them to possibly expand their investment to the next fund and therefore making the raising of the next fund easier. Funds of funds, on the other hand, are dependent on the raising of their funds and the profitability of their operations. Possible LPs are therefore compared to each other to get the best possible outcome for the fund and the PE firm.

### **5.3.8 Learning Option**

Lastly, a learning option was discussed. As well as many other option categories, this is overlapping with other option categories. Especially learning option overlaps with options to expand and growth options since they are both focused on growing and expanding which is often made possible by learning. The different learning options industry experts found in the interviews are presented next.

Options to learn can be divided into many different levels. As a PE firm does different types of investments, learning can happen at the personal and at the organizational level. Different types of investment can gain knowledge for the organization and the PE firm by learning about industry, internationalization, and strategy. This learning can happen at all these different levels. Peltola highlights that all type of learning is important no matter if it is industry, internationalization or strategy. However, it is worth noting that all experts highlighted that even if an investment includes options to learn, it is not made if it is not a profitable investment.

### **Option to learn as an organization**

Similarly, organizations learn from their actions through their personnel. The accumulated knowledge in the organization may open new possibilities for new types of projects, businesses or investments. This type of intangible capital of companies highly vital as it differentiates the company from its competitors. Westerlund questions if the learning helps and works in practice in PE firms over different strategies and different countries. As he says: “a good strategy is different from the implementation of the strategy.” He adds that as the CEO of Capman his job was to facilitate interactions in the right direction, so the organizational learning and organizational knowledge would benefit someone. There must be an efficient way to use and spread the learnings, knowledge, and information in a PE firm to fully benefit from them and use them to make better investments.

Pihlava mentions that for them at Vendep Capital, the most important thing in learning is their company portfolio. They use the knowledge and learnings gathered from their portfolio companies to help other portfolio companies. He adds that their older portfolio companies are already further down the path, so they are teaching the younger portfolio companies what to do. A good example could be a new practical tool that could be implemented in all their portfolio companies. The group of learning portfolio companies is the reason why they only invest in SaaS businesses. A couple other interviewees also mentioned that it is vital to recognize that they do not know everything, and in many cases, the people at their portfolio companies may have valuable information that they could use in other investments as well.

### **Option to learn about an industry**

Uotila mentions that an option to learn about an industry may arise when analyzing a possible investment. For example, they had a case where they analyzed a good investment idea that was in an ICT-sector thus bringing additional benefits for the PE firm by learning on the industry. He also highlights that if a PE firm is already invested in an industry, it is easier to make new investments to the same sector or its branches. Therefore, it is a good reason why, for example, they at Intera Partners have been actively invested in the construction industry and its branches.

By being invested in the industry, new investment opportunities arise as PE firms and their personnel get to know the right people and firms.

Peltola shares a similar view on learning about an industry. In addition to learning, PE firms also gather track records of doing such things, making it easier for them to get similar opportunities in the future. For example, they previously owned a company named Solita from which they spun off a SaaS business Evolta because it would not have achieved its real value as part of Solita. Peltola says that Evolta is still relatively small, but they are driving the growth of the company to be a profitable investment. Evolta provides them a learning option of gathering information about running a SaaS business as well as driving the growth of a spin-off company.

### **Option to learn about internationalization**

Uotila says a great view of an option to learn is internationalization. When a portfolio company has gone to a specific country, it is easier for other portfolio companies to go there as well. Each country may have different practices and cultures, which is why learning can be beneficial from different countries. Uotila says that this is one reason why many of their portfolio companies have extended their business to Sweden or Germany.

### **Option to learn about strategy**

Another vital learning aspect is to learn about different strategies PE firms can use in a target firm to create value. Uotila mentions the buy-and-build strategy that they have used multiple times as an example. He says that when they have done the same strategy many times, they already know how it should be done efficiently and profitably.

#### 5.4 The importance of different option types

Lastly, the interviewees were asked to evaluate the different option categories by their importance on scale 1-5, five being very important, and one being not at all important. Table 9 below shows the average answer for each option category. Figure 19 below shows the sum of values of this evaluation. The maximum value of each option category is 25 in the figure. Worth noting is that these categories are likely to be identified slightly differently by different interviewees even though in the interviews the meaning and purpose of them were explained. Also, new options for each category arose during the interviews which are why interviewees may have had different real options in mind for that category. All things considered, this comparison shows similar results that could be deducted from interviews as what are important option categories and what categories are not.

*Table 9. Average value (scale 1-5) of importance of different option categories*

Option category	Average answer
Option to defer	4.2
Learning option	4
Option to switch	4
Option to alter	3.6
Multiple interacting options	3.4
Growth option	3.2
Option to abandon	3.2
Staged Investment option	3

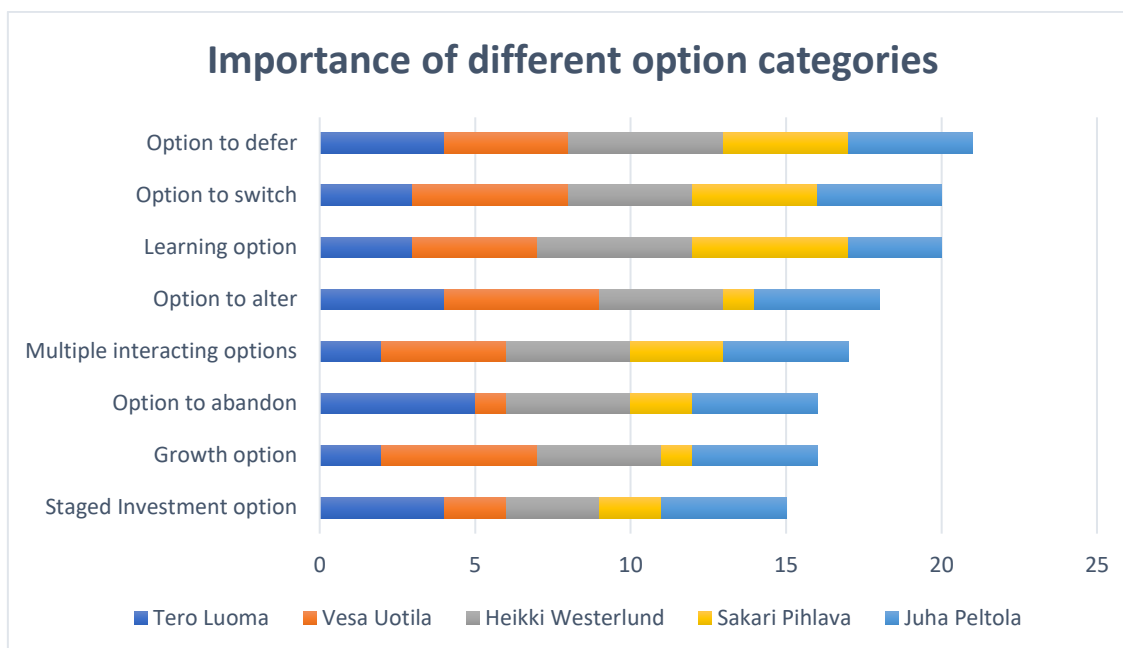


Figure 19. Importance of different option categories

Option to defer is seemed to be the most important category, which was predictable based on the discussions with the industry experts. Option to defer aroused more conversation and more brainstorming about different options than other option categories. Similarly, option to switch and learning option categories seemed to be important for a PE firm. As mentioned before, an option to alter was often seen more related to the operations of portfolio companies even though being also part of PE firms' actions. Surprisingly the category of complicated multiple interacting options was seemed next important. This may be that even though it is difficult to understand as a whole it is still seemed important in the eyes of PE firms.

Even more surprisingly, the rarely used option to abandon was equally important to growth option. Growth options may relate to more on the target company which is why its relative importance is low. On the other hand, an option to abandon had different views as it can be seen as an option to abandon possible investment and an option to abandon an on-going investment. The former of these is of course very important and continuously used when evaluating investments for the fund during its investment period. The latter, on the other hand, is challenging for a majority PE investor to exercise. These different options inside the option to abandon category cause the importance values of it to vary. Lastly, the least important of these option categories seemed to be the staging option category. As most of the interviewees were

from PE firms investing in more mature companies, this result does not come as a surprise. Staged investment options could be more used growth equity and VC type of investments.

### **5.5 The value of real options in PE**

Even though the values of real options may be challenging to quantify, it does not mean they are not valuable. Next, the actual values of different real options are demonstrated. An excellent practical example of the value of an option to defer closing of the fund is demonstrated by the Zoom IPO which Pihlava mentioned in the interview section before. Zoom's last private funding round was done in 2017 with a valuation of 1 billion USD, but only two years later the company IPO value was 9 billion USD. Investors were able to get their money back nine times the initial investment in two years in the last financing round. However, investors who were already previously invested in Zoom since the seed-round in 2011 benefitted from the increased valuation for IPO.

Next, a hypothetical situation is explained to prove the value of an option to defer the closing of the fund. A VC fund invested in Zoom in 2011 with the post-money valuation of six million euros. The VC fund has invested one million USD in the seed round, and there is no dilution over the financing rounds. The VC fund was established in 2007, and it had a life of 10 years. If the fund were to close in 2017 as planned, it would need to sell its shares of Zoom at the company valuation of one billion USD. The VC fund would get an excellent return of approximately 167 times of invested capital. However, if it had and it was to exercise the option to defer closing of the fund, the return would be 1500 times invested capital. The value of the option to defer closing of the fund and thus exiting a target company, in this case, would have been 1.3 billion USD.

A similar case would have been Intera Partners' case of Normek, which was one of the last investments of their first fund. The fund life extension enabled the exit price of the company to be higher than it would have been without deferring the closing of the fund. The following is speculation about how the case could have gone, but it is only a demonstration and not based on facts. Their first fund was established in 2007, and it was likely to have a 10-year life span, so it was supposed to be closed in 2017. However, the revenue of 2017 slightly decreased which

may have affected the valuation Normek. A Price-to-Sales ratio of iron and steel industry is somewhere around 0.5. With this ratio, the value of Normek would have been in 2017 31 million EUR, and in 2018 its revenues were slightly larger, so it could have been closer to 32.5 million EUR. Just by deferring the closing of the fund with one year, the fund could earn a 4.8 % better return than it would have earned without it. The option to defer closing of a fund is therefore highly valuable as this straightforward demonstration shows.

Another valuable real option is the option to defer the investment period. Typically, after the investment period, the management fees are calculated based on the actual capital invested in the fund (Gilligan & Wright, 2015, 57). Therefore, if a PE firm is not able to find enough investments, it may have to let go some of the capital committed. By extending the investment period, a PE firm has more time to make investments. For example, if it has 50 million EUR committed capital, but at the end of the investment period it has made investments only 45 million EUR. A PE firm could ask for its LPs investors for the right to defer the end of the investment period to make investments with the committed capital left. With 45 million EUR capital invested, the PE firm earns yearly management fee of 2 % which is 900 000 EUR per year. If it finds investments with the rest of 5 million EUR, the management fee would be 1 million EUR per. Therefore, the value of an option to defer investment period, in this case, would be 100 000 € per year, which turns into 500 000 € over the whole life of the fund when assuming a five-year investment period in a ten-year fund.

As the GP of a PE fund, the PE firm has the option to call capital to the fund when needed. However, some practitioners mention that some PE funds may use leverage in funds to further improve the IRR return of their LPs' investments. Leveraging a PE fund reduces the absolute returns. Leveraging is often done at the beginning of the fund, and the money is used to pay the management fees or even to make the first investments. A PE fund uses the option to call money as the guarantee for the debt. The option to call money thus has a substantial value depending on the loan arrangement it makes to leverage its fund. Worth noting is that leveraging a fund upfront increases the risk of the fund as well.

Another valuable real option is the option to stage investments. As Smit (2001) in his article states, staging investments in a buy-and-build strategy provides the PE investor a real option to



abandon in every stage if the planned strategy does not seem to be working like expected. By staging investments in a target company, a PE firm does not have to put all the capital into the target company right away, but instead over time when the money is needed. Staging investments may save much capital from a PE investor if the planned strategy is not working.

For example, if a PE firm knows that in order to get the planned value creation for their target company, they need to invest 300 million euros. If the PE firm puts all the money into the target company at the beginning of their relationship and the planned strategy does not seem to be working four years after the investment, the PE firm may have very well lost a lot of the invested capital. However, if they stage investment over the four years (e.g., 50 M€, 50 M€, 100 M€, 100 M€), they can look for hints if the strategy is working or not. If it seems not to be working, they can abandon the initial strategy and invest the planned capital somewhere else.

## **6 RESULTS AND DISCUSSIONS**

To understand and recognize real options in PE requires the knowledge of both terms. Real options were discussed in chapter 2, including option variations, different types of options, real option reasoning and real option valuation. In addition to this, different real option applications and the research related to those were mentioned before concluding the real option chapter by highlighting some issues that using real options may have.

PE was defined and discussed in chapter 3. A little background information about PE was discussed before mentioning the different stages or strategies of PE. Other strategies implemented by PE firms and the different exit strategies of their company investments were also discussed shortly in the chapter. The structures of PE firms and funds were introduced, and lastly, the performance of PE was discussed.

The subject of the research has gained only a limited amount of attention in the academic literature, as shown before in the state-of-the-art literature review section. However, previous literature had found a few important real options in PE firms or real options closely related to them. The real options found in the academic literature were discussed with the industry experts, and these findings were confirmed in the interviews. At the same time the point in the interviews was to find new real options in PE firms that may not have been recognized by the academic literature before. Next, the findings of this research are discussed in light of the research questions that were presented earlier.

### **6.1 Are real options used in private equity in practice?**

Based on the interviews with industry experts, real options seem to be used only a little in practice. Many professionals mention that even if subjects related to real options are discussed, the actual term is rarely used. Some of them mentioned real options are sometimes used in discussions, but mathematical calculations of their value are not done. Additionally, even if real options were to be talked about when planning a potential investment, they never seem to be part of the actual decision making of investing in a company. The use of real options in practice, therefore, remains relatively scarce.

This research is not the first one to recognize the little use of real options in practice. Often, the valuation of real options is thought to be too difficult to implement in practice, or it takes too much time. Similar to market traders that were pricing options before the Black & Scholes model, real options could be inherently evaluated with real option reasoning. With real option reasoning, an exact value of a real option is not necessarily that important if a decision-maker can reason the value an option or possibility brings for the company. These real options are often caused by the strategic actions of the management, and they may provide an important competitive advantage for a PE firm or its portfolio companies.

An important and easily implemented model to help to use of real options in practice is, for example, Barnett's (2008) attention-based view of real option reasoning, which was shortly introduced in chapter 2.3. Another practical model for using real options is the STAR model (strategic technology assessment review) (McGrath & MacMillan, 2000), which aims to come up the value of a technological real option. A more thorough explanation of the model was already discussed before in chapter 2.3 and chapter 2.5.

In addition to these models, the concept of real option reasoning is vital to understand. With real option reasoning, possibilities, that otherwise could not be noticed, are recognized, and they may provide significant value for a PE firm. Therefore, real option reasoning should be used, at least in discussions, if not as part of the valuation of companies. As Westerlund said in the interviews: "Easily one could come to the conclusion that PE investing as a whole is a combination of different real options. Parameters are constantly changing, so PE investor needs to be awake at all times." Real option reasoning as a way of thinking always keeps a PE investor awake and aware of the surrounding situation.

## 6.2 What type of real options exists in private equity firms?

Different real options were discussed according to different real option categories. Real options found in the academic literature were confirmed with industry experts, and additional real options were tried to find in PE firms. Real options in PE in practice were discussed before in chapter 5. Many different real options were found in PE firms. Some of the real options were already previously recognized in the academic literature, but many of them were only found from the interviews.

### 6.2.1 Options to defer in PE firms

The category of option to defer was seemed to be the most important, which is why it probably aroused the most conversation, and many different real options were found in this category. Eight different real options to defer were found in PE firms, of which four of them were previously recognized in the academic literature, and all of them were recognized to be found in practice. Table 10 below shows all options to defer found in this research.

Table 10. Options to defer in PE firms

	Academic literature	Interviews with industry experts
<i>Option to defer closing of the fund</i>	X	X
<i>Option to defer making the investment</i>	X	X
<i>Option to defer from LPs point of view</i>	X	X
<i>Option to defer investment period</i>	X	X
<i>Option to defer exit of a portfolio company</i>		X
<i>Option to defer calling capital</i>		X
<i>Option to defer additional financing of the company</i>		X
<i>Option to defer starting of the fund</i>		X

*Option to defer closing of the fund* was one that most all interviewees found to be true in practice as well as in the academic literature (Mathonet & Meyer, 2008, 265; Meyer, 2014, 238). The value of an option to defer the closing of the fund is discussed in the next part with practical examples. Other options recognized by both the academic literature and the interviewees were *option to defer making the investment* (Folta & Miller, 2002) and an *option to defer from LPs' point of view* (Mathoner & Meyer, 2008, 253-270). Similar to option to defer fund life, an *option to defer investment period* was recognized in the interviews but also by Meyer (2014, 238).

In addition to these three previously found real options, a few new real options to defer were found in the interviews. *Option to defer exit of a portfolio company* that can be exercised in respect of the fund life, thus sometimes provided by deferring the closing of a fund. *Option to defer calling capital* is provided for the GP by the LP agreements as it has the right to call the committed capital according to terms agreed on the agreements before starting the fund. Even though this real option was not found in the previous literature, it is clear and distinct from others. An example of the value of this real option is provided in the next section. *Option to defer additional financing of the company* seems to be used in practice to avoid waste money in the target companies. *Option to defer the starting of the fund* was mentioned by an interviewee as a strategy to optimize the returns for the capital committed in the fund.

### **6.2.2 Staged investment options in PE firms**

A total of five different staged investment options were found in this research (Table 11). A two of these, *option to stage investments to portfolio companies* and *LPs' option to stage investment in PE firms* were previously found by academic literature (Leisen, 2012; Krohmer et al., 2009; Smit, 2001). Smit's (2001) model for staging investments was discussed in chapter 4.2 and could easily be implemented in practice as well. *LPs' option to stage investments in PE firms* was recognized by Mathonet and Meyer (2008, 255-256) and by practitioners in the interviews.

Table 11. Staged investment options in PE firms

	Academic literature	Interviews with industry experts
<i>Option to stage investments to portfolio companies</i>	X	X
<i>LPs' option to stage investments in PE firms</i>	X	X
<i>Staging incentives in a target company</i>		X
<i>Option to stage financing type of investments</i>		X
<i>Option to stage investments throughout the investment period</i>		X

In addition to the two different staged investment options previously recognized in the academic literature, three new real options were found in this research. *Staging incentives in a target company* is often used to keep the management motivated to work towards the common goal. *Option to stage financing type of investments* relates to making all equity investments in target companies before leveraging the investments. A built-in real option in PE funds is the *option to stage investments throughout the investment period* and is often used unknowingly.

### 6.2.3 Options to alter in PE firms

Next, results for options to alter are shown. This category could be further divided into subcategories; e.g. option to expand, option to contract, and option to restart. Real options found in this category are shown in Table 12 below. A total of four different options to alter were recognized. An *option to expand PE firm's business* was recognized previously in the academic literature (Meyer, 2014, 242-243) and the practitioners in the interviews.

Table 12. Options to alter in PE firms

	Academic literature	Interviews with industry experts
<i>Option to expand PE firm's business</i>	X	X
<i>Option to expand the portfolio company</i>		X
<i>Option to contract</i>		X
<i>Option to alter</i>		X

*Option to expand the portfolio company* is a commonly recognized real option as PE firms often have an excellent opportunity to affect the management of their businesses, and thus expanding the business of the target company. *Option to contract* is difficult to use by PE firms as they are very committed to their portfolio companies. *Option to alter* as an overall term may relate to many things in the target company level as interviewees mention that PE firms have a right to change many parts of their portfolio companies as majority investors.

#### 6.2.4 Options to abandon in PE firms

A few real options to abandon in PE firms were recognized, of which only one was recognized by both the academic literature and the practitioners. Table 13 below shows all options to abandon found in this research. *Option to abandon an investment* was found in the academic literature and practice as well (Leisen, 2012). In practice, this option to abandon seems to be difficult to exercise for PE firms making majority investments, but it is easier to exercise for VC firms.

Table 13. Options to abandon in PE firms

	Academic literature	Interviews with industry experts
<i>Option to abandon an investment</i>	X	X
<i>Option to abandon before the actual investment</i>		X
<i>Option to abandon LP investors</i>		X

*Option to abandon before the actual investment* is often exercised in practice. This option to abandon is made possible by the clauses in the letter of intents, due diligence processes, or potential investment not fulfilling their investment objectives. Some practitioners mentioned the use of an *option to abandon LP investors* that is only available for the best PE firms.

### 6.2.5 Options to switch in PE firms

Three different options to switch were found in PE firms, of which one was found in both the academic literature and the interviews. Table 14 shows all real options to switch found in PE firms. *Option to switch investment strategy or target return* was found in the academic literature (Chen et al., 2011) and in practice where PE firms may exercise it during the value creation of a target company.

Table 14. Options to switch in PE firms

	Academic literature	Interviews with industry experts
<i>Option to switch investment strategy or target return</i>	X	X
<i>Option to switch team or management</i>		X
<i>Option to switch output</i>		X

In addition to *Option to switch team or management* was found in practice, and it is often exercised by PE firms in target companies. *Option to switch output* was sometimes used in practice by PE firms in their target companies.

### 6.2.6 Growth options in PE firms

*Growth option* itself is a self-exploratory and very distinct real option. Table 15 shows that *growth option* was found in the academic literature (Baldi, 2005) and the interviews of this research as well. Creating these growth options in target companies seem to be at the core of PE firms' actions. Many interviewees say that in addition to supporting the growth of a portfolio



company, they try to encourage the management and the team of the company to find and establish new growth options.

Table 15. Growth options in PE firms

	Academic literature	Interviews with industry experts
<i>Growth option</i>	X	X

### 6.2.7 Multiple interacting options in PE firms

*Multiple interacting options* are hard to define precisely. Table 16 shows how these options were recognized in practice and academic literature. In practice it seems that recognizing these types of multiple interacting options is done by using different practices. Most of the multiple interacting options seemed to be related to LP relations, in practice, and the academic literature (Liu & Yand, 2015; Meyer, 2014, 246). As many interviewees mention, LP relations are thought as a whole; what investors give credibility for the fund and how the fund looks outward.

Table 16. Multiple interacting options in PE firms

	Academic literature	Interviews with industry experts
<i>Multiple interacting options</i>	X	X

### 6.2.8 Learning options in PE firms

Lastly, different learning options are discussed. All learning options in PE firms are shown in Table 17. Firstly, learning could be divided into personal and organizational learning. For the focus of this research, the *option to learn as an organization* is more important. Learning options were not previously found in the academic literature in PE firms specifically.

Table 17. Learning options in PE firms

	Academic literature	Interviews with industry experts
<i>Option to learn as an organization</i>		X
<i>Option to learn about the industry</i>		X
<i>Option to learn about internationalization</i>		X
<i>Option to learn about strategy</i>		X

*Option to learn about the industry* was seemed highly useful in a few different cases. Especially the option to learn about ICT-sector seemed to be in the interest of many PE firms. An *option to learn about internationalization* was found to be very important for PE firms as different countries have different policies. An *option to learn about strategy* was recognized to be important for PE firms as they use different strategies in their investments to get a return for their investment.

### 6.2.9 Real options in different levels of Private Equity firms

As discussed in chapter 1.2, real options in PE firms exist in three different levels. These levels consist of the fund, portfolio company, and organization levels. The fund level real options are provided by the fund agreement(s) and its structures. Thus, these real options exist in PE firms only when they have funds that they operate. A PE firm investing from its own balance sheet does not have these real options. Real options in portfolio company level are related and closely connected to PE firm's current and potential portfolio companies. Thus, portfolio company level real options exist at the core of PE firms' operations. Organizational real options provide long-term value for PE firms, and they may distinguish them from their competitors.

Table 18 below shows all real options found in this research at each level. Some of these real options may overlap different levels depending on the viewpoint. However, in this division all real options are located only in the best-suited level, thus not in multiple levels even if they could be. Most of the real options found in PE firms seem to exist in portfolio company and organizational level whereas there are fewer real options at fund level. Worth noting is that many real options that are listed under other levels could also be mentioned under fund level,

e.g. option to alter and multiple interacting options. By recognizing real options in different levels of PE firms, they can better reason the use of them as they know which real options affect which part of the firm.

Table 18. Real options in different levels of PE firms

Fund level	Portfolio company level	Organization level
Option to defer closing of the fund	Option to defer making the investment	LPs' option to stage investments in PE firms
Option to defer from LPs point of view	Option to defer an exit of a portfolio company	Option to stage financing type of investments
Option to defer investment period	Option to defer additional financing of the company	Option to expand PE firm's business
Option to defer calling capital	Option to stage investments to portfolio companies	Option to abandon before the actual investment
Option to defer starting of the fund	Staging incentives in a portfolio company	Option to switch investment strategy or target return
Option to stage investments throughout the investment period	Option to expand the portfolio company	Multiple interacting options
Option to abandon LP investors	Option to contract	Option to learn as an organization
	Option to alter	Option to learn about an industry
	Option to abandon an investment	Option to learn about internationalization
	Option to switch team or management	Option learn about strategy
	Option to switch output	
	Growth option	

### **6.3 What is the value of the real options in private equity firms?**

The exact value of real options is difficult to evaluate, but they are important to recognize in any case. A few examples of real options in PE were shown before in chapter 5.5. Because many real options were found during the discussions with each interviewee, a simple comparison of the value of different real options could not be made. Instead, different real option categories were tried to be evaluated in terms of their importance to PE firms.

According to the interviewees, all real option categories seem to be at least somewhat important for them. Option to defer was the most important one followed closely by learning option and option to switch that were both seemed to be important for PE firms. Option to alter and multiple interacting options were in the middle their average scale value of 1-5 being 3.6 and 3.4. Growth option and option to abandon seemed to be slightly more important than a staged investment option. Further discussion and graphical presentation of the results was shown in chapter 5.3.

The actual values of real options vary depending on the situation. However, the few case examples shown before, demonstrate that options to defer, options to stage investments and options to expand can be valuable. Notably, the option to defer fund life is understandably valuable as it may significantly increase the profits of investments. Staging investment options may end up being valuable for PE firms as it may not increase earnings, but it will help to avoid catastrophic losses in PE firms' investments.

#### 6.4 Conclusions of the study

The lack of previous research on real options in PE called for this research to be done. The purpose of this study was to fill the gap in the academic literature and search for empirical support for the findings in academic literature. A thorough literature review acted as the basis of this study. The literature review was supplemented by five interviews with PE industry experts. After those findings of academic literature and the findings from practice were discussed together in the previous section.

This research answered to three separate but interrelated research questions. Firstly, the aim was to find how real options are used in practice in PE. The practical use of real options was discussed together with industry professionals, and these findings are solely based on their views. Real options seem not to be an active part of decision making in PE, and even if subjects related to them are discussed, the exact term of real option is rarely used. However, understanding the meaning of real options and the possibilities they provide is highly important for PE firms, which must be constantly aware of the current situation around them and their portfolio companies.

This research suggests the concept of real option reasoning to increase the use of real options in practice. A simple concept of real option reasoning helps PE firms to recognize opportunities effectively and use them at their advantage without a need for complex calculations. A couple of simple models of using real option reasoning in practice were discussed earlier in this chapter.

Secondly, the objective was to find what real options exist in PE firms. These options were categorized in different types of real options that were *option to defer*, *staged investment option*, *option to alter*, *option to abandon*, *option to switch*, *growth option*, *multiple interacting options*, and *learning option*. Each real option category may include many different real options inside of them. All different options found in this research were presented earlier in this chapter under their different categories.

Lastly, the values of these real options were tried to be found. As mentioned before, real options in PE are indirect, and their quantifiable value may be challenging to define. A few case examples of real option values were shown in the previous chapter. Real options often have some value, but it may be difficult to define. As the case examples show, the parameters and variables often change case by case, which is why there is no simple answer how to value them in what situations. At least two significant real options that may have a tremendous monetary value for a PE firm are the option to defer closing of the fund and option to defer investment period. With simple calculations the value of these real options can be shown.

For this research, only five interviews were done and all of them worked in the Finnish PE firm. The results may not be generalized to all PE firms around the world. However, the field of PE is international, thus the best practices and views spread fast around the world. The future research on the same subject could be done but extended with more interviews with industry professionals. This would give a broader view of the real options existing in PE firms and the industry. In future research, an analysis of the importance of different real options found and recognized in this research should be done, in addition to comparing the importance of the different types of options. This type of research would help to prove the value of real options in practice for PE firms and thus perhaps making the use of them more convenient and easier. Furthermore, future research providing practical tools and practices for using real options in PE firms would be needed, since it seems the use of them is relatively limited or at least not systematically organized. All in all, this research is a good opening study for real options in PE.

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