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Can European Unicorns Defend the High Valuations?

A challenge of the post-money valuation approach

Kristian Hansen Lomheim & Ola Thune Øritsland

Supervisor: Nataliya Gerasimova

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NORWEGIAN SCHOOL OF ECONOMICS

Abstract

We apply a DCF-based R-model on a sample of 12 European unicorns to show that post-money valuations overstate the fair value of VC-backed companies. At best, the initial result suggests that the majority of the sample is overvalued whereas some firms are slightly undervalued. The median overvaluation of the sample is 25%. When we increase the conservative cost of capital estimates with one percentage point, all firms are overvalued with a median overvaluation of 75% in the sample. Our results indicate that many of the firms will need an abnormal operational improvement toward steady state in addition to significantly outperform the peer group and industry forecasts in order to generate cash flows that are sufficient to defend the post-money valuation.

Preface

This thesis marks the end of our Master of Science in Economics and Business Administration at the Norwegian School of Economics (NHH). It is written as a part of our major in Financial Economics and counts for 30 ECTS.

We both found interest in Private Equity after taking the course "Venture Capital, Private Equity and IPOs". Combined with an interest in company valuations and having taken two courses on programming using R, we were interested in putting together all these competences. The thesis is inspired by a topic posted by Finans|Bergen in collaboration with the Norwegian private equity investor Argentum. We realised early on in the process that the chosen topic was a comprehensive work. However, we have been working hard during the semester and ended up with a final product that we are comfortable with. With that said, we would not have managed to carry out this study without the help and support from fellow colleagues, friends and family.

Finally, we would like to thank Stian Pedersen and Morten Bogaard in PwC Bergen for providing us with access to FactSet and other useful information. Aswath Damodaran and Will Gornall for answering technical questions. PitchBook for providing us with useful information and datasets. And last but not least, our supervisor, Nataliya Gerasimova, for the support and the constructive feedback throughout the semester.

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Kristian Hansen Lomheim

Ola Thune Øritsland

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List of Abbreviations

APV	Adjusted Present Value
ARPU	Average Return Per User
AR/VR	Augmented Reality and Virtual Reality
bn	Billion
CAGR	Compounded Annual Growth Rates
CapEx	Capital Expenditure
CAPM	Capital Asset Pricing Model
COI	Certificate of Incorporation
DCF	Discounted Cash Flow
EBIT	Earnings Before Interest & Tax
EBITA	Earnings Before Interest, Tax & Amortisation
EBITDA	Earnings Before Interest, Tax, Depreciation & Amortisation
EV	Enterprise Value
FCFE	Free Cash Flow to Equity
FCFF	Free Cash Flow to the Firm
IC	Invested Capital
IPO	Initial Public Offering
m	Million
MRP	Market Risk Premium
MVE	Market Value of Equity
NAV	Net Asset Value
NIBL	Net Interest-Bearing Liabilities
NOPAT	Net Operating Profit After Tax
NWC	Net Working Capital
P/B	Price-to-Book
P/E	Price-to-Earnings
PMV	Post-Money Valuation
pp	Percentage Point
PPE	Property, Plants & Equipment
ROV	Real Option Valuation
VC	Venture Capital
WACC	Weighted Average Cost of Capital

1. Introduction

Spotify, HelloFresh and Dropbox are just some of many start-ups that went public during the end of 2017 or beginning of 2018. Common to these is that they were considered to be a *unicorn*, or a venture-backed company with a reported valuation of more than $1 billion. The term unicorn was first introduced by Aileen Lee, the founder of Cowboy Ventures, in an article posted on TechCrunch (Lee, 2013). It is supposed to express the rarity of such high-valued firms, where only 0.07 per cent of all the software and internet start-ups since 2003 have managed to receive the ten-digit valuation.

Although unicorns were once considered to be rare, CB Insights (2018) reports a total of 233 unicorns as of April 2018. This is six times as many as the 39 reported by Aileen Lee in 2013 when she first introduced the term. It is difficult to explain the significant increase, and researchers have different opinions on the case. Some state that there is a bubble in the Venture Capital (VC) market, whereas others claim that the media overstate the fair value of the companies. Hence, some firms who are considered to be a unicorn have a true value below the $1bn threshold and should therefore lose the unicorn status.

1.1 Purpose & Background of the study

Due to lack of better alternatives, the reported value of a VC-backed company is usually based on the post-money valuation (PMV) approach. We investigate whether this approach overvalues the unicorns, with a focus on the European market. To do this, we apply the discounted cash flow (DCF) method to calculate the sample firms' value of equity. DCF is based on many assumptions and small changes in the input variables can affect the outcome significantly. In order to overcome some of these weaknesses and to increase the quality of the analysis, we develop a model with the help of the statistical programming language R. The model is based on the essence of the DCF method, in which we forecast the cash flows of the company, calculate a terminal value and discount it back to today's value. By including more than 30 input variables from the company's historical performance, the script simulates 100 revenue paths and uses different functions to forecast the key value drivers affecting the firm's cash flow. Examples of such value drivers are Net Working Capital (NWC), Cost of Capital and Operating Margin. In addition to a scenario analysis on revenues, we run the script on five different levels of operating margins in terminal year. Hence, the final output of the model is 500 valuations. By plotting these values against the PMV of the company, we can observe the

performance the company will need to achieve in steady state in order to defend the valuation presented in the media. Further, we perform an analysis of the firm's competitive advantage to determine a level of performance which we find to be realistic in steady state. This allows us to present an interval of valuations based on our assumption of revenue growth and operating margin. By comparing this interval with the valuation reported in the media, we get an indication of whether the PMV overvalues the companies or not. To further strengthen the analysis, we also include a relative valuation based on public peers.

The reason why we question the PMV is that the value it generates is solely based on the share class sold in the latest funding round. Hence, it prices all the shares outstanding in the company using the price paid by the latest investors. To illustrate with an example, consider a company that raises $100m in a new funding round. The new investors receive 5m shares, which corresponds to a share price of $20. Before the funding round, the company had 45m shares outstanding. By multiplying the total shares outstanding, which is now 50m, with the share price paid in the latest funding round of $20, we end up with a PMV of $1bn.

$$\underbrace{\$1\text{ billion}}_{\textit{Post-Money Valuation}} = \underbrace{\$20}_{\textit{Share price last funding round}} \times \underbrace{50\text{ million}}_{\textit{Total shares outstanding}} \quad (1)$$

The problem with this approach, however, is that the different share classes contain different features in the event of a liquidation. Preferred stocks, which are usually bought by VCs, can differ severely from the common stocks held by the founders. Hence, they should not be valued equally. The more features the investor receives, the more should he or she be required to pay for the share. This means that in theory, the entrepreneur can manipulate the valuation of the company by including additional downside protection and other features in the latest contract. The outstanding shares from previous funding rounds, which contain less features, will then be valued at an equal rate as the latest, which upward biases the total valuation of the company. In such cases, the valuation reported in the media overstate the fair value of the company. Gornall & Strebulaev (2017) find evidence that this is the case in the US They develop a model which allows them to value 135 unicorns based on public filings, or so-called Certificate of Incorporations (COI), and find that all are overvalued and some even significantly. By analysing the COIs issued from the latest funding round of the companies, which contain detailed information on all the share classes outstanding in the firm

including special features, they are able to value each share class separately.[1] Their findings indicate a clear trend that the preferred shares issued in later rounds contain more downside protection and upside potential than the common shares issued in earlier rounds.

1.2 Literature review

This study relates to different literature within the field of venture capital and valuation. However, few studies have been conducted with specific emphasis on unicorns and the PMV. A reason for this might be that the number of unicorns has rapidly increased first in recent years. To challenge the PMV approach, we use more traditional valuation methods and compare the outcome with the valuations reported in the media. Although the issue has been investigated in the American VC market, we are not familiar with any research that explicitly analyse European unicorns.

Gornall & Strebulaev (2017) is the most relevant literature to this study. By examining the contracts between the entrepreneur and the VC from US unicorns, they find a clear trend of increased presence of protection for the later round VCs. This suggests that the PMV overstates the true value of the company. Bartlett (2015) shares the same opinion, and concludes that unicorn valuations are unrealistic measures due to the liquidity preference. Entrepreneurs drive up the share price by increasing the VC's expected return, and get to enjoy the unicorn status. He even claims that the founders bargain for these valuations with the VCs. This view is further highlighted by Gompers, Gornall, Kaplan & Strebulaev (2017). They found that 91% of 514 respondents within the VC industry believe that unicorns are overvalued. Kramer, Patrick & Harper (2015) examine the contractual terms of 37 US unicorns, and find that downside protection is commonly provided to investors, but upside benefits are rarely used. Additionally, they find that 35% of the companies examined had a valuation between $1bn and $1.1bn, indicating that the founders negotiate specifically to attain unicorn-level valuations. Damodaran (2009) raises questions to established valuation techniques among VCs, such as the venture method, which he argues is flawed and should be replaced. He further gives recommendations on how to value companies early in the life cycle.

[1] We wanted to replicate Gornall & Strebulaev's model on European unicorns to examine whether this trend applies here as well. After some research, we realised that such COIs were impossible to obtain for companies registered in Europe

1.3 Structure of the thesis

This thesis proceeds as following. Chapter 2 presents some general background theory on venture capital, including trends in the European VC market, the financing rounds and how the contractual terms are structured. Chapter 3 is a brief description of different valuation methods, including pros and cons of applying them on high-growth firms. Chapter 4 is the data & methodology part, where we present the data sample and the sources we have used, in addition to a detailed explanation of the model and the relative valuation method. Chapter 5 presents three of our valuations (the rest are found in Appendix 2), followed by chapter 6 where we discuss our findings. The last section is a conclusion of the thesis.

2. Venture Capital

This chapter presents general theory on the VC industry. We start with a definition of the term, followed by an introduction to the financing rounds, contractual terms and trends in the European VC market.

2.1 Definition

According to Metrick & Yasuda (2011, p. 3), venture capital has five main characteristics. A Venture Capital firm (i) acts as a financial intermediary[2], (ii) invests in private companies[3], (iii) takes an active role in monitoring and helping the companies in its portfolio, (iv) has a primary goal to maximise its financial return by exiting investments through a sale or an initial public offering and (v) invests to fund the internal growth of companies.

2.2 Financing round

In general, the financing process in VC has several rounds. Before each round, the entrepreneur must negotiate with the VCs about the terms of the contract. Such negotiations are very time-consuming and economically costly. As a result, the VC and the entrepreneur wish to minimise the number of financing rounds. A typical way of doing so is for the VC to provide sufficient financing for the entrepreneur to reach some natural milestone. This way, the parties will always have new information when returning to the negotiation table. All of these financing rounds are referred to as Series, in which the first is Series A, the second Series B, and so on. Since the milestones will differ across companies and industries, both the number and the size of the financing rounds will differ correspondingly (Metrick & Yasuda 2011, p. 147).

2.3 Contractual terms

The contractual terms refer to special features with the objective to protect the investors. These terms are outlined in the COI[4]. Such additional terms in the COIs provide the investors with

[2] Takes the investors' capital and invests it directly in portfolio companies
[3] Portfolio companies are unlisted, i.e. not traded on a public exchange
[4] A legal document that forms a company's charter and provides the contractual relations between various classes of shareholders

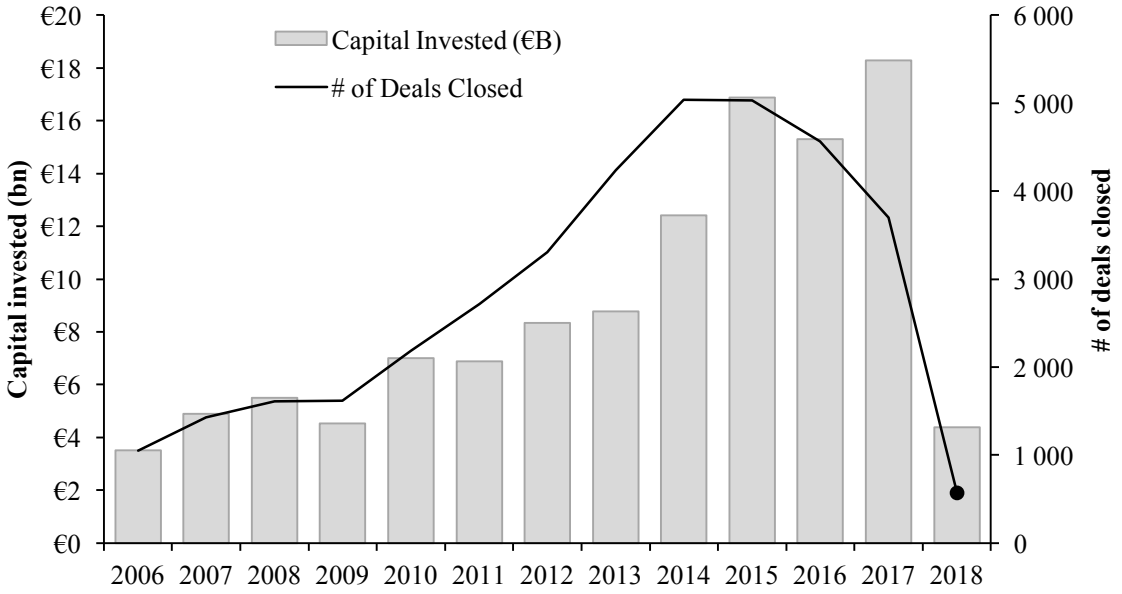
the possibility of enhanced return, much like option contracts (Blackie, Robinson & Williams, 2018). Below, we present some of the most common contractual terms.

Liquidation preference terms guarantee a pay-out to the investors in exits that do not trigger automatic conversion, such as liquidations or M&A. The most common multiple is 1x liquidation preference, which means that the investor is guaranteed a pay-out equal to the initial investment. A higher multiple thus increases overvaluation. A company's *option pool* refers to its unissued shares that are held aside for future option-based employee compensation. Since these options are just authorised and not issued, they do not impact cash flows and thus not the fair value of the company. Option pools are included in almost all financing rounds in the US VC market (Gornall & Strebulaev, 2017, p. 14). The most recent investor is generally *senior* to the remaining shareholders, meaning that her liquidation preference must be fulfilled before other investors receive their claims. Although the case in which the new investor is junior to other shareholders holding preferred equity is infrequent, overvaluation will still occur since junior preferred equity is senior to common equity. *Participation* terms give the investor who has not converted its shares a pay-out equal to the sum of the liquidation preference plus its converted pay-out. The implication is an increased value of preferred shares relative to common shares, which in turn increases overvaluation. *IPO ratchet* terms give the investor extra shares in IPOs where the share price is below a pre-agreed threshold. Such an IPO ratchet is expressed as a multiple. For example, if the IPO ratchet is 1.2x, the shareholder in the respective financing round is guaranteed a 20% return. An *automatic conversion exemption* exempts the investor from the automatic conversion provision which forces it to convert its shares in an IPO, even if converting reduces the pay-off. An exemption from converting the shares in a down-exit increases the value of the respective share class.

It is common to include these special terms in the COIs, and when present, Gornall and Strebulaev (2017) show that they lead to overvaluation when applying the PMV approach. When we calculate the value of equity by multiplying the latest shareholders' share price with total shares outstanding, we assume that all share classes have the same valuable features as the latest shareholders.

2.4 Trends in European VC market

Figure 2.1 – Capital invested and number of deals closed in the period 2006 to Q1 2018

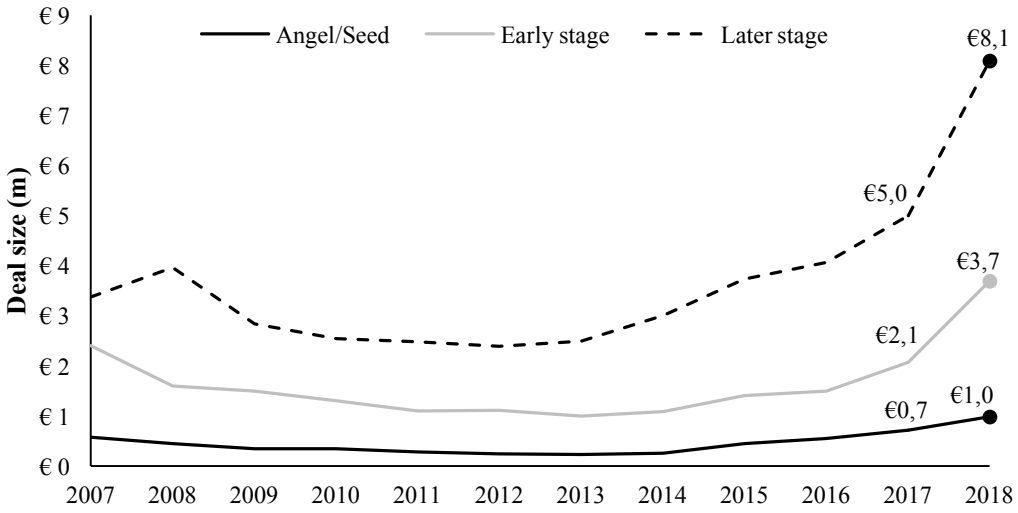


Source: Pitchbook, 2018a

Figure 2.1 illustrates the financing trends in the European VC market from 2006 to first quarter in 2018. We observe that capital invested in the market has increased over the past eight years, with a record high amount in 2017. Although the 2018 numbers are collected from the first quarter, the amount indicates that the market is on track to continue the high level of invested capital. We also observe a continuing downtrend for the number of deals closed, which is mainly led by a significant decline in first-time financings and rounds closed at the angel and seed level (Pitchbook, 2018a). The combination of the increased capital invested and the reduced number of deals closed indicates that the average deal size, or funding round, has increased significantly since 2013.

Figure 2.2 shows the median deal size (€m) by stage in Europe from 2007 to 2018. As indicated in the previous graph, the size of the average funding round has increased in the outlined period. This is consistent with the findings in Figure 2.2. While the increase in median deal size for angel/seed is hardly noticeable, the early stage and later stage deal size has increased significantly.

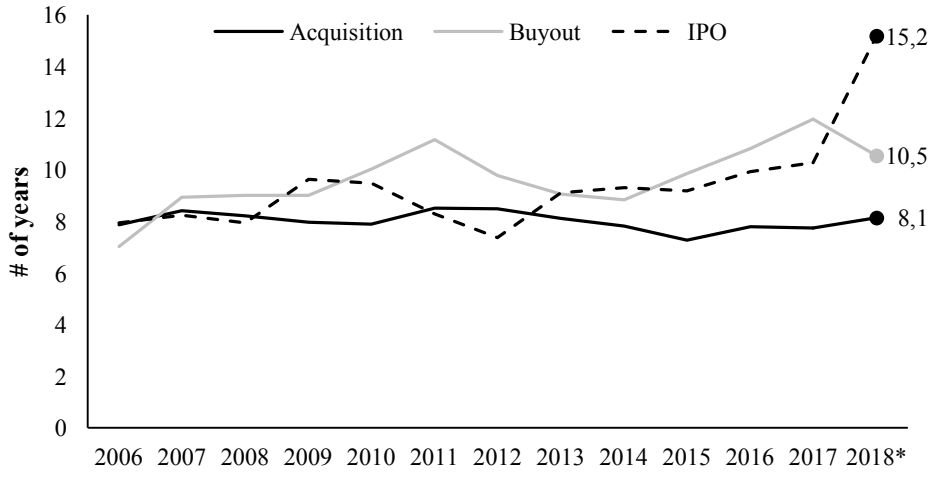
Figure 2.2 – Median deal size in the European VC market from 2007 to Q1 2018



Source: Pitchbook, 2018a

Figure 2.3 shows the median number of years from founding to an acquisition, IPO or a buyout in the period 2006-2018. While the median time to exit for acquisitions is relatively stable, the median time to IPO has increased from about 8 years in 2006 to 10 years in 2017. In 2018, the median time to IPO is even higher at about 15 years. However, we put less emphasis on this due to the low number of observations in Q1.

Figure 2.3 – Median time from founding to exit in the European VC market (2006-Q1 2018)



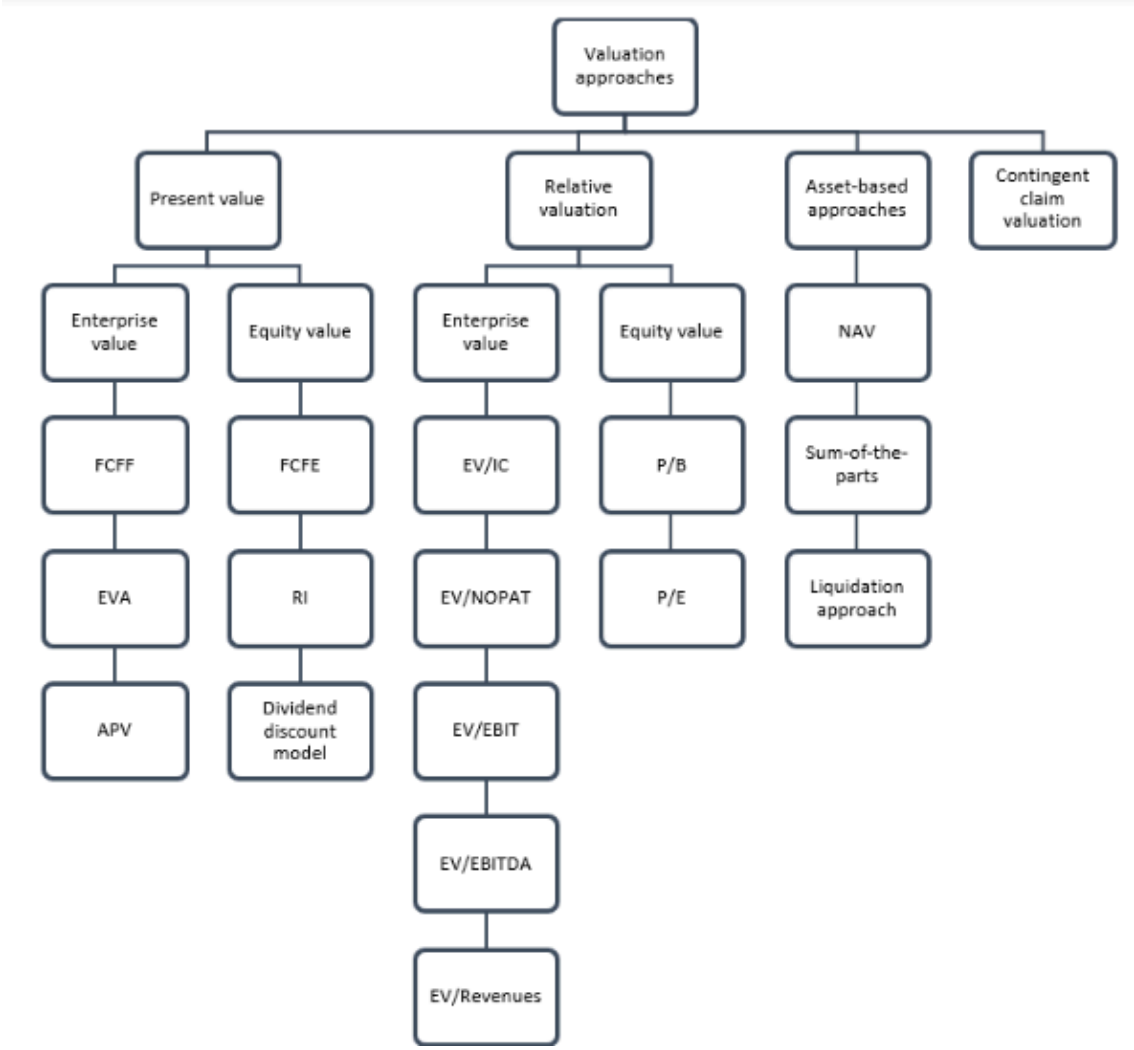
Source: Pitchbook (2018b)

In summary, the main trends in the European venture capital market is led by increased invested capital and a decreasing number of deals, implying an increased average deal size. The increase in invested capital seems to be led by a significant increase in the median deal size for later stage VC. The greater access to capital for large and mature VC-backed companies might explain why they stay private for a longer period. In addition, we register that the observed trends in the European VC market is in line with the trend of the global VC market.

3. Valuation methods – underlying theory and evaluation

The purpose of this chapter is to present the available valuation methods and to evaluate which techniques to apply to the issue of this thesis. The unicorns have in common that they are relatively young, little financial information are disclosed and many of them have significant operating losses. As a result, traditional valuation methods may not be applicable for the purpose. Petersen, Plenborg & Kinserdal (2017, p. 297) classify the methods to valuation into four main categories illustrated in Figure 3.1. These categories are further separated into enterprise value (EV) and equity value methods.

Figure 3.1 – Valuation methods



Source: Petersen, Plenborg & Kinserdal (2017, p. 298)

To evaluate each method, we use four attributes defined by Petersen, Plenborg & Kinserdal (2017, p. 299). We first remove the user attributes meant to evaluate whether it is a user-friendly method based on its level of complexity, access to data and time consumption. We remove these user attributes with the objective to perform as accurate a valuation as possible. Instead, we determine which of the methods that are feasible both in terms of access to data and whether it is applicable to typical VC portfolio companies. We quantify the remaining attributes with a score from one to three from a VC point of view. Finally, a total score is calculated for each of the valuation methods. The attributes are separated into (i) value attributes (precision and realistic assumptions) and (ii) user attributes (feasibility).

3.1 Present value methods

Present value methods refer to valuation techniques that estimate the intrinsic value of a firm based on a forecast of future cash flows, discounted using a factor that reflects the risk of the cash flows and the time value of money. Table 3.1 presents the different present value methods provided by Petersen, Plenborg & Kinserdal (2017) and our quantification of the value attributes.

Table 3.1 – Score card for present valuation methods

	Precision	Realistic assumptions	Feasible	Total score
Enterprise Value				
DCF (FCFF)	3	3	Yes	6
Excess return (EVA)	3	3	Yes	6
APV	3	3	No	-
Equity Value				
DCF (FCFF)	3	3	Yes	6
Excess return (RI)	3	3	Yes	6
Dividend discount model	3	3	No	-

Source: Petersen, Plenborg & Kinserdal, 2017 (Valuation methods), authors (Quantification)

3.1.1 An evaluation of the present value methods

Table 3.1 illustrates that the different present value methods are equally accurate in determining the intrinsic value of a firm. This is due to their theoretical equivalence, which implies that using the same input will yield identical value estimates. Since unicorns are high-growth companies, it is unlikely that any dividend payments will occur in the near future. The

Dividend Discount method is thus infeasible from a VC point of view. We further classify the Adjusted Present Value (APV) method as infeasible due to limited access to data. The main advantage of the APV method is that it enables the analyst to separately value the impact of the firm's tax shield. While this would be appropriate for a firm expected to have fluctuating levels of financial leverage, we have too little information on the companies in our sample to reliably make such estimates. Considering the low level of debt in VC-backed firms, the APV method would most likely yield similar results to the DCF Enterprise method, adding little value to the analysis.

After controlling for infeasible methods, we are left with the DCF method and the Excess Return method. The advantage of the Excess Return method is its ability to explicitly show when a firm's market value of equity deviates from its book value of equity. Although a beneficial feature, this method is less suitable when valuing loss-making firms.

Table 3.1 illustrates that both methods can be specified in two ways, *enterprise value* and *equity value*. Among the DCF methods, the difference is that the Enterprise (Equity) DCF discounts future cash flow to the firm (equity) using the risk to all investors (shareholders).[5] Since the portfolio companies have different equity claims and the use of debt is limited, it is more appropriate to value the business (Enterprise) rather than its equity directly (Damodaran, 2009, p. 57). We therefore present the Enterprise DCF as a favourable present value method.

3.1.2 Enterprise DCF

The Enterprise DCF method discounts free cash flow to the firm (FCFF), meaning the cash flow available to all investors, using WACC, or the blended cost of capital for all investor capital. The equity value is determined by subtracting the market value of net interest-bearing liabilities (NIBL) from the enterprise value (Koller, Goedhart & Wessels, 2015, p. 138-139).

Figure 3.2 – FCFF equation

	EBIT * (1 – Tax)
+	Depreciation
–	Capital Expenditure
–	Δ in Net Working Capital
=	**Free Cash Flow to the Firm (FCFF)**

Source: Koller, Goedhart & Wessels 2015, p. 170

[5] By investors, we mean equity holders, debt holders, and any other non-equity investors

Since we are valuing a firm's operations, we start with the after-tax EBIT. Second, we subtract non-cash operating expenses, such as depreciation. Finally, we deduct the investment in invested capital, meaning capital expenditures (CapEx) and any increase in net working capital.

The enterprise value is determined by discounting every year's FCFF into infinity, using WACC.[6] In the explicit forecast period *t,* the analyst is able to include value-added details in the FCFF calculations. As time increases, the firm's future will become more uncertain. When the terminal year *n* is reached, the analyst is no longer in a position to reliably estimate each item in the FCFF. Thus, the Gordon's growth model is applied to calculate the terminal value, assuming a constant growth *g* into infinity. Equation 2 defines the Enterprise DCF method as a two-stage model. The enterprise value thus becomes the sum of all discounted FCFFs in the explicit forecast period plus the discounted terminal value.

$$\text{Enterprise value}_0 = \sum_{t=1}^{n} \frac{\text{FCFF}_t}{(1+\text{WACC})^t} + \frac{\text{FCFF}_{n+1}}{\text{WACC}-g} \times \frac{1}{(1+\text{WACC})^n} \qquad (2)$$

To determine the value of equity, we subtract the market value of NIBL from the enterprise value, where NIBL is defined as a firm's interest-bearing (non-operating) liabilities net of its interest-bearing assets (typically cash and marketable securities). The rationale behind this is that the cash holdings follow an acquisition, which in turn can be used to repay debt.

3.2 Relative valuation

Relative valuations use multiples that rely on the relative pricing of some measure of peers' performance. Hence, it critically relies on the assumption that the peers included are truly comparable, meaning they share the same economic characteristics and outlook. In addition, the peers must have the same accounting policies and exclude non-recurring items in order to be truly comparable. Table 3.2 presents some of the most common multiples (Petersen, Plenborg & Kinserdal, 2017) including our quantification of the described attributes.

[6] Chapter 4 presents how the WACC is calculated

Table 3.2 – Score card for relative valuation methods

	Precision	Realistic assumptions	Feasible	Total score
Enterprise Value				
EV/IC	1	3	No	4
EV/NOPAT	2	3	No	5
EV/EBIT	2	2	No	4
EV/EBITDA	2	2	No	4
EV/EBITA	2	2	No	4
EV/Revenues	2	1	Yes	3
Equity Value				
P/B	1	1	Yes	2
P/E	1	1	No	2

Source: Petersen, Plenborg & Kinserdal, 2017 (Valuation methods), authors (Quantification)

3.2.1 An evaluation of the relative valuation methods

We exclude both of the equity multiples due to a low score on the value attributes, and because we want to value the business and not the equity of the firm directly due to wide differences in equity claims and debt in private firms (Damodaran 2009, p. 57). In addition, the Price-to-Earnings (P/E) ratio mixes capital structure and non-operating items with expectations of operating performance. The P/E multiple is therefore a less reliable guide to a company's relative value than EV multiples. The question remaining is thus which measure of operating profits to use in the denominator. Koller, Goedhart & Wessels (2015) suggest that NOPAT is the best measure when ignoring user attributes, such as time-consumption. This is because calculating NOPAT requires operating taxes, which is not a trivial task to identify. Therefore, if we believe taxes are relatively similar among the peers, EBITA serves as a good alternative. Since amortisation is non-cash, and unlike depreciation, the replacement of intangible assets is already incorporated through line items such as marketing and selling expenses, EBITA is preferred over EBIT. While practitioners have different opinions on this field, Koller, Goedhart & Wessels (2015, p. 360) suggest EBITA over EBITDA. The EBITDA practitioners argue that depreciation is a non-cash expense, reflecting sunk cost instead of future investments, and that the variation between company practices increases "further down" toward the bottom line. Koller, Goedhart & Wessels (2015, p. 360) further argue that in many industries, depreciation of existing assets is the accounting equivalent of setting aside the future capital expenditure that will be required to replace the assets. The earnings multiples are, however, often infeasible from a VC point of view since most companies have negative earnings. After removing infeasible and biased multiples, we are left with EV-to-Invested

Capital (EV/IC) and EV-to-Revenues (EV/Revenues). Although EV/IC might serve as a better multiple in terms of comparison, it is not commonly expressed in any database, nor is the invested capital of a firm. Further, it does not include any specific measure of profitability in the denominator. Calculating the peer group's invested capital would require reorganising each firm's balance sheet, which from a cost-benefit point of view would be very time-consuming. Although EV/Revenues has its weaknesses, it includes, in contrast to EV/IC, a performance measure in the denominator. Among the feasible methods, we thus end up with the EV/Revenues multiple as the preferred method.

3.2.2 EV/Revenues

EV/Revenues multiples, in general, have weaknesses when it comes to explaining company valuations. This is mainly due to the underlying assumption of identical EBITDA margins, depreciation and tax rate among the firms being compared (Petersen, Plenborg & Kinserdal, 2017). However, the multiple is useful as a last resort when analysing firms with negative earnings or in industries with highly volatile profit margins, where the companies are assumed to have similar profit margins over the long term (Koller, Goedhart & Wessels, 2015, p. 357-368).

3.3 Asset-based methods

Asset-based methods value the firm's equity by measuring the assets and liabilities. Table 3.3 presents each asset-based method (Petersen, Plenborg & Kinserdal, 2017) including our quantification of the value attributes.

Table 3.3 – Score card for asset-based valuation methods

	Precision	Realistic assumptions	Feasible	Total score
Net Asset Value (NAV)	1	2	No	3
Sum-of-the-parts	2	2	No	4
Liquidation value	1	2	No	3

Source: Petersen, Plenborg & Kinserdal, 2017 (Valuation methods), authors (Quantification)

3.3.1 An evaluation of the asset-based methods

The NAV method values the firm based on the market or fair value of its assets. This is typically applied in capital intensive industries, and is less suitable for the companies in our

sample, as the majority have most of its value in intangible assets[7]. Furthermore, the Sum-of-the-parts method is not particularly useful on VC firms. As mentioned, private firms, and start-ups in particular, generally disclose very little information. Hence, we will probably be short on necessary information in cases where it would be appropriate to value the business separately. Finally, the liquidation value is not a particularly useful valuation method as it values the business in a forced sales situation. Thus, the valuation implies the very bottom of any valuation the firm may have. Since the purpose of this paper is to investigate overvaluation, applying liquidation value as benchmark would introduce a severe bias. To summarize, neither of the asset-based methods serve as appropriate valuation methods from a VC's point of view, unless the VC is interested in knowing the worst possible outcome of the investment.

3.4 Contingent claim valuation

Contingent claim valuation methods measure the value of firms that share the same option characteristics. Table 3.4 presents two common valuation methods (Petersen, Plenborg & Kinserdal, 2017) including our quantification of the value attributes.

Table 3.4 – Score card for contingent claim valuation methods

	Precision	Realistic assumptions	Feasible	Total score
Real Option Valuation (ROV)	2	2	No	4
Contractual term valuation	3	2	No	5

Source: Petersen, Plenborg & Kinserdal, 2017 (Valuation methods), authors (Quantification)

3.4.1 Real Option Valuation (ROV)

Real options are created when costly decisions can be delayed (Metrick & Yasuda, 2011, p. 398). The ROV process consists of two parts, where the first is to identify the option. We separate between call and put options. A call is an option to delay a decision until further information is acquired, whereas a put can be the option to abandon a project if it turns out to be unprofitable. Options can have many different features, including a combination of different contractual terms. Common to all is that they add some flexibility to the firm. This

[7] This is in many cases internally developed and thus not necessarily recognized on the balance sheet

flexibility is valuable, and by valuing a company using real options, we include this flexibility which otherwise would have been ignored. The second part is to value the option, which can be done either by replication or risk-neutral valuation. While the ROV method has interesting features, it is not feasible without detailed company information that allows us to identify the option. Furthermore, if we were to identify an option, the chances are that sufficient details have been left out.

3.4.2 Contractual term valuation

With contractual term valuation, we refer to any valuation method that values the pay-off of the features given to VCs. Metrick & Yasuda (2011, p. 292) present methods on how to value such contractual terms individually, by modelling VC investment cash flows. Similarly, Gornall & Strebulaev (2017, p. 9) develop a contingent claims model, which uses the price of a VC-style financing round to identify the fair value of that company at the time of the specific round. The model is further applied on the contractual terms found in the COIs. By identifying the contractual terms in the COIs for the respective companies, they are able to model the pay-off to the shareholders in each share class, and thereby estimate the fair value of the company. This method would be highly relevant to apply on our sample, however, the contractual terms are as mentioned found in the COIs, which we are unable to obtain for European companies. While feasible to VCs with sufficient monetary resources, this becomes an infeasible method in our case.

3.5 Venture capital method

Appendix 5 includes an explanation of the VC method and the eight different steps in the valuation process. Damodaran (2009, p. 16) outlines four key shortcomings of the method. First, since the exit value is usually given through estimated earnings or revenues, he argues that the valuation goes from being a subject of serious estimation to a “bargaining game” between the existing owners and the new VCs. This is because the VC is incentivised to estimate lower earnings and revenues to push down the valuation, which in turn will give the VC a greater share of the firm, and opposite for the existing shareholders. Second, he argues that the VC method ignores an element of uncertainty. This is because the VC method cuts the forecast prematurely and applies the earnings or revenues measure at the end of this period. The multiple applied at this point is what the public comparables are trading at currently, and

not an estimate of what they are likely to trade at in the future. The third weakness refers to the target multiple of money. Since the target rate of return refers to the VC's cost of capital, it is rather a cost of equity (VCs invest equity) and should therefore only be applied to equity multiples, and not EV multiples. The target multiple of money also includes the likelihood of survival. Since this multiple of money is constant and does not change over time, the VC is implicitly assuming that the likelihood of survival remains unchanged as the firm move through the life cycle. The fourth shortcoming refers to the calculation of the PMV. Here, Damodaran (2009, p. 17) argues that new capital raised should not be added to the pre-money valuation[8] before knowing whether the capital stays in the firm to fund future investments. Thus, if the new capital finances existing shareholders' exit, this portion should not be added to the pre-money valuation.

3.6 Choice of valuation method

The valuation methods we find most feasible for the issue of this thesis are:

- Enterprise Discounted Cash Flow
- EV-to-Revenues multiple

Although the contractual term method is the most appropriate in a VC-entrepreneur relationship, the COIs are not publicly available for European unicorns. While theoretically equivalent to other present value methods, the Enterprise DCF method has user attributes that makes it favorable to apply on the companies in our sample. EV/Revenues is the only multiple possible to apply on high-growth firms with negative operating margins. While the analysis is primarily based on the Enterprise DCF method, the relative method is included as a supplement to the fundamental analysis

[8] Post-money valuation minus new capital raised

4. Data & Methodology

This chapter is divided into two sections. The first section describes the data sample and the main databases we use to gather information for the valuation process, in addition to the validity and reliability of the data and sources. The second part is a detailed explanation of how we analyse the data, with special emphasis on the R-model.

4.1 Data

4.1.1 Unicorn sample

CB Insights and TechCrunch both provide an updated list of global unicorns based on recent funding rounds. Although the lists should be updated on the basis of the same criterias, they differ slightly. We identify 21 European unicorns on TechCrunch (2018a) and 27 on CB Insights (2018). By merging the two samples, we end up with an initial sample of 30 companies from nine different countries. A detailed table of all the companies is provided in Appendix 1.

Table 4.1 – Unicorn sample

Company	Country	Industry	Founded	PMV (m)	Date of PMV
Spotify	Sweden	Consumer Internet	2006	$8,530	Jun 15
The Hut Group	United Kingdom	ecommerce	2004	$3,250	Aug 17
Klarna	Sweden	Fintech	2005	$2,500	Jul 17
Deliveroo	United Kingdom	On-demand	2013	$2,000	Sep 17
Transferwise	United Kingdom	Fintech	2010	$1,600	Nov 17
Oxford Nanopore	United Kingdom	Healthcare	2005	$1,580	Dec 16
Blippar	United Kingdom	AR/VR	2011	$1,550	Mar 15
FarFetch	United Kingdom	ecommerce	2008	$1,500	May 16
BrewDog	United Kingdom	Food and Beverage	2007	$1,250	Apr 17
Home24	Germany	ecommerce	2009	$1,000	Jun 15
Funding Circle	United Kingdom	Fintech	2010	$1,000	Apr 15
Improbable	United Kingdom	AR/VR	2012	$1,000	May 17

Source: Crunchbase

For each company, we control whether the information needed (timing and amount raised) from the specific financing round the PMV is based on is disclosed. We need to know the exact year of the PMV, and if this is not provided on Crunchbase, we exclude the company from the sample. This is the case for four companies. The problem with private companies is

the limited financial information available. Hence, we exclude companies where we cannot find sufficient historical data to perform a reliable valuation. This is the case for 14 companies. We thus end up with a sample of 12 European companies meeting the criteria of being a unicorn. Table 4.1 presents the final sample, including information on the home country, industry, year of founding, PMV and the date of the PMV.

4.1.2 Data sources

We use three different sources to collect historical financial data on the companies. The main source is FactSet, which consolidates financial information from hundreds of databases into a single platform. It provides financial statements, different key ratios and analytical applications, such as a search engine for peer groups. To reduce the possibility of data errors, we compare the information retrieved from FactSet with other sources. Orbis is a similar database to FactSet, and provides financial information on public and private businesses. For all companies, we confirm whether the information corresponds in the two databases. For the UK firms, we also apply a database called CompanyCheck, which is the UK's most used online business database. All information regarding the companies' financial statement has exclusively been collected from these three databases. By verifying that the information corresponds to other databases, we believe that the probability of any data error is limited.

Industry forecasts are mainly retrieved from Statista, which provides a database of consolidated market outlooks from various market reports and databases. For industries where relevant information is lacking, we use other sources such as news articles and market outlooks provided by for example BCG, KPMG and PwC. These sources are cited in the analysis of the respective company. When calculating the firm's cost of capital, we apply industry average ratios provided by Damodaran's database. The database consists of key ratios on thousands of public companies globally, and average ratios of 94 industries across six geographic areas. A final important source is Crunchbase, which is an online database for the start-up community, providing information on investors, founders, key personnel, funding rounds and other events. From this database, we mainly collect information regarding the funding rounds of the unicorns, in addition to general information on the company such as age, money raised, number of financing rounds etc.

4.2 Methodology

The objective of this thesis is to challenge the PMV, and examine whether it overstates the fair value of European unicorns. The problem with this approach is that it treats the common shares, usually held by employees and founders, equal to the preferred shares, usually purchased by VCs in later funding rounds. Preferred shares normally include several protection features, and should thus have a higher value than the common shares. The result is an overvaluation of the company. Our approach is to use more traditional valuation methods to estimate the value of the companies, based on assumptions of future performance. A significant deviation between our estimate and the PMV indicates that the reported value is overstated. The methods we apply are the discounted cash flow (DCF) method and relative valuation, respectively.

In order to overcome some of the challenges with the DCF method and to increase the quality of the analysis, we develop a model with the help of the statistical programming language R. This chapter is mainly an explanation of the model. We will describe the output it generates, and how we arrive at the valuations presented on each company, with special emphasis on the forecasting process. To further strengthen the analysis, we also perform a relative valuation as a supplement to this model. This approach is explained in the second part of this chapter.

4.2.1 R-model

The R-model is based on the essence of the DCF method, in which we forecast the cash flows of the company, calculate a terminal value and discount it back to today's value. By including more than 30 input variables from the company's historical performance, the script simulates 100 revenue paths and uses different functions to forecast the key value drivers affecting the firm's cash flow. Examples of such value drivers are Net Working Capital (NWC), Cost of Capital and Operating Margin. In addition to a scenario analysis on revenues, we run the script on five different levels of operating margins in terminal year. Hence, the final output of the model is 500 valuations. By plotting these values against the PMV of the company, we can observe the performance the company will need to achieve in steady state in order to defend the valuation presented in the media. The R-script is attached in Appendix 4.

Output of the model

To provide a better understanding of how the model works, we start by explaining the final output it generates. The value of the company is the sum of the discounted free cash flows the firm generates in the infinite future. We thus have to estimate the cash flows, calculate the terminal value and discount it back to today's value. The model does this 500 times, with 100 different scenarios on revenue growth and five different operating margins which we find realistic for the specific company.

FCFF-table

The company's free cash flow is the cash flow generated by the firm's core operations less any reinvestments (Koller, Goedhart & Wessels, 2015, p. 170). It thus represents the cash flow available to all investors after the relevant year end. Figure 4.1 illustrates how we define FCFF. We start with EBIT and deduct the effective corporate taxation. We then add back depreciation, because it is not really a cash outflow to the company despite it being included in the income statement. Finally, we subtract any reinvestments done by the company, which is defined as capital expenditure and change in net working capital.

Figure 4.1 – FCFF equation

	EBIT * (1 – Tax)
+	Depreciation
–	Capital Expenditure
–	Δ in Net Working Capital
=	**Free Cash Flow to the Firm (FCFF)**

Source: Koller, Goedhart & Wessels 2015, p. 170

For each of the 500 scenarios, the model generates something we call an FCFF-table. The table, which we illustrate in Table 4.2, is an example from the Swedish online payment service Klarna, where it ends up with an operating margin of 7% and a revenue of $1.47bn in terminal year. The top line represents the relevant revenue growth path for this specific scenario. The operating margin converges proportionally from the level in base year of 4.7% toward 7% at the end of the forecast period. We are now able to calculate EBIT. After adjusting for taxes, we end up with the first element of the equation in Figure 4.1 which is EBIT less tax.

Table 4.2 – Example of Klarna's FCFF table, in $m

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Revenue growth	19.0%	21.9%	20.0%	18.0%	16.2%	14.4%	12.6%	10.8%	9.1%	7.3%	5.5%	3.8%	2.0%
Revenues	**393**	**479**	**574**	**678**	**787**	**901**	**1014**	**1,124**	**1,226**	**1,316**	**1,389**	**1,441**	**1,470**
Operating margin	4.7%	4.9%	5.1%	5.3%	5.5%	5.7%	5.9%	6.0%	6.2%	6.4%	6.6%	6.8%	7.0%
EBIT	**18.6**	**23.4**	**29.2**	**35.8**	**43.0**	**51.0**	**59.3**	**67.9**	**76.4**	**84.5**	**91.9**	**98.1**	**102.9**
Taxes	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%	22%
EBIT * (1-t)	**14.5**	**18.3**	**22.8**	**27.9**	**33.6**	**39.7**	**46.3**	**53.0**	**59.6**	**65.9**	**71.7**	**76.5**	**80.3**
Capex	12.1	16.7	19.9	23.3	26.9	30.5	34.1	37.5	40.6	43.2	45.2	46.4	46.9
Depreciation	12.4	15.1	18.1	21.4	24.9	28.4	32.0	35.5	38.7	41.5	43.8	45.5	46.4
Δ NWC	19.7	52.5	58.0	62.4	65.3	66.9	66.4	63.4	57.9	49.8	39.2	26.5	12.3
FCFF	**(4.9)**	**(35.8)**	**(37.0)**	**(36.4)**	**(33.8)**	**(29.2)**	**(22.2)**	**(12.5)**	**(0.2)**	**14.5**	**31.1**	**49.0**	**67.4**
Discount rate	4.2%	4.1%	4.0%	4.0%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%
DCF	**(4.9)**	**(34.4)**	**(34.2)**	**(32.4)**	**(28.9)**	**(24.1)**	**(17.6)**	**(9.5)**	**(0.1)**	**10.3**	**21.2**	**32.1**	**42.5**

Source: R-model

Further, we forecast CapEx, depreciation and change in NWC. The forecasting process is explained later in this chapter. We are now able to calculate the free cash flows. To get the cash flows in present value terms, we discount the values with the use of the cost of capital or discount rate. The next step is to calculate the terminal value. We apply the Gordon growth formula,

$$TV = \frac{FCFF_t \times (1+g)}{(WACC - g)} \tag{3}$$

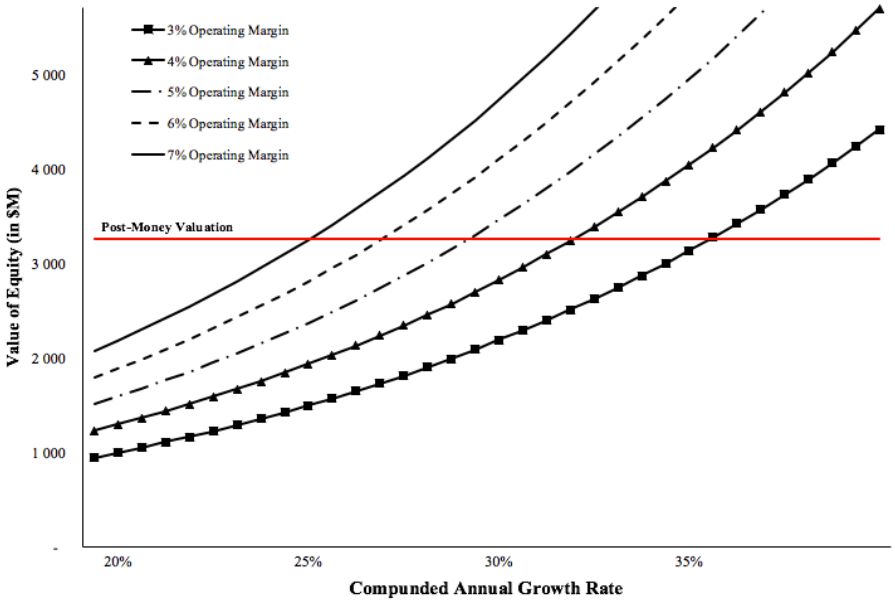
where $FCFF_t$ represents the last cash flow in the forecast period, g is the stable growth rate in steady state and $WACC$ is the stable cost of capital. By inserting the values from the example above, we end up with a terminal value of $2.26bn for Klarna in this specific scenario. The sum of the discounted cash flows equals -$75m. The sum of these two represents the company's enterprise value, which in this case is $2.19bn. But we cannot compare enterprise value with PMV, because the latter represents the value of the firm's equity. We thus need to subtract net debt in order to calculate the value of equity, which will make the numbers comparable. We have defined net debt as the firm's interest-bearing liabilities minus its interest-bearing assets. In other words, we subtract debt and other non-equity claims in order to arrive at the value of the cash flows to the equity holders. Klarna has a net debt of $83m, and the value of equity is therefore $2.11bn.

The script does this exact procedure for all of the 500 scenarios and stores each value of equity in a vector called *Values*.

Scenario plot

We finalise the script with a plot of all the values against the PMV of the respective company. This graph allows us to observe what level of revenues and operating margin the company will need to achieve in the end of the forecast period in order to defend the value stated in the media. Figure 4.2 is a plot of The Hut Group's 500 valuations.

Figure 4.2 – The Hut Group's valuation scenarios



Source: R-model

The five black lines represent the different operating margins. The red horizontal line marks the company's PMV. The y-axis is the value of the company and the x-axis represents different levels of Compounded Annual Growth Rates (CAGR). The CAGR of Klarna's scenario in Table 4.2 is 11.6% and is calculated as illustrated in Equation 4, where *t* is the last year of the forecast period, *BY* is Base Year and *n* is the length of the forecast period.

$$CAGR = \left(\frac{Revenue_t}{Revenue_{BY}}\right)^{\frac{1}{n}} - 1 = \left(\frac{\$1{,}469}{\$392}\right)^{\frac{1}{12}} - 1 = 11.6\,\% \qquad (4)$$

Input variables

The first section of the R-model is a collection of empty input variables which need to be filled with information on the specific company we are valuing. Examples of such input variables are what we use as base year, length of the forecast period, what growth stage we believe the company is in, industry data used to calculate cost of capital and financial information from

the firm's base year.[9] Based on this information, the script automatically forecasts the key value drivers. The script consists of many built-in forecasting functions which react differently depending on the input variables. For example, will the operating margin converge differently toward the preset level in steady state based on what growth stage the company is in. If the company is *high growth*, and the margin is significantly negative, the model assumes that the firm becomes profitable when it goes public before it gradually converges toward the margin we have included in the *OM vector* of possible realistic margins in steady state. The change in NWC is forecasted based on the trend we observe in the historical period, and either converges toward the industry average NWC or the mean of the historical observations. The input variables are thus critical for the outcome of the model, and in order to perform as accurate a valuation as possible, much effort should be put into the precision in the information included.

Forecasting

Forecasting is a complex process, but necessary since the company's valuation is based on future performance. An important aspect of forecasting is to locate the company's key value drivers. Petersen, Plenborg & Kinserdal (2017, p. 251) distinguish between a strategic and a financial value driver. The former is a strategic or key operational action performed by the firm with the objective to increase value. Hence, it is an action at one point in time which leads to value creation at a later stage. A financial value driver is a financial ratio or an absolute number that measures the actual financial performance. This section explains how we build our forecasting system to estimate future financial value drivers. We provide a detailed explanation of the process, and how the R-model reacts to the different input variables, before it finally generates the valuation scenarios of the firm. The estimation is done in accordance with relevant literature on valuation and forecasting. We start with one of the most important ones, namely revenues.

Revenues

The company's future revenues are one of the hardest parameters to estimate, and perhaps the most important one. It is the company's top line in the income statement and many items below are directly or indirectly affected by it. With a constant operating margin, higher revenues increases EBIT. As we explain later, we increase Property, Plants & Equipment (PPE) proportionally with the growth in revenues, which again affects the firm's CapEx and

[9] See line 1 - 103 in the R-script in Appendix 4 to get a complete overview of the input variables we have included

depreciation. Additionally, we forecast NWC as a ratio of revenue. If we look at the calculation of FCFF, we observe that all elements are directly affected by revenues which emphasises the importance of this item in the valuation process. This is also the reason why we do a scenario analysis on revenues.

A common method when forecasting revenues is to extend the current growth path the company is in, which is done by collecting historical data on revenue growth and continue this trend during the entire forecast period. This is a manageable exercise when valuing a mature company in steady state but becomes rather problematic for young firms and especially unicorns. Young firms are usually far from steady state, and previous growth observations, if present, are often highly volatile without a clear trend. Table 4.3 shows Spotify's revenue growth in the period between 2012-2016, which highlights the problem. It is difficult to recognise a clear trend where the annual growth rate has decreased from 996% to 52% in four years. Without detailed information on the company's future plans, it is difficult to predict a growth path from today's high level toward the continuing growth rate in steady state.

Table 4.3 – Spotify's recent performance

	2012	**2013**	**2014**	**2015**	**2016**
Revenues ($m)	94	1,030	1,313	2,118	3,224
Revenue growth	840%	996%	27%	61%	52%

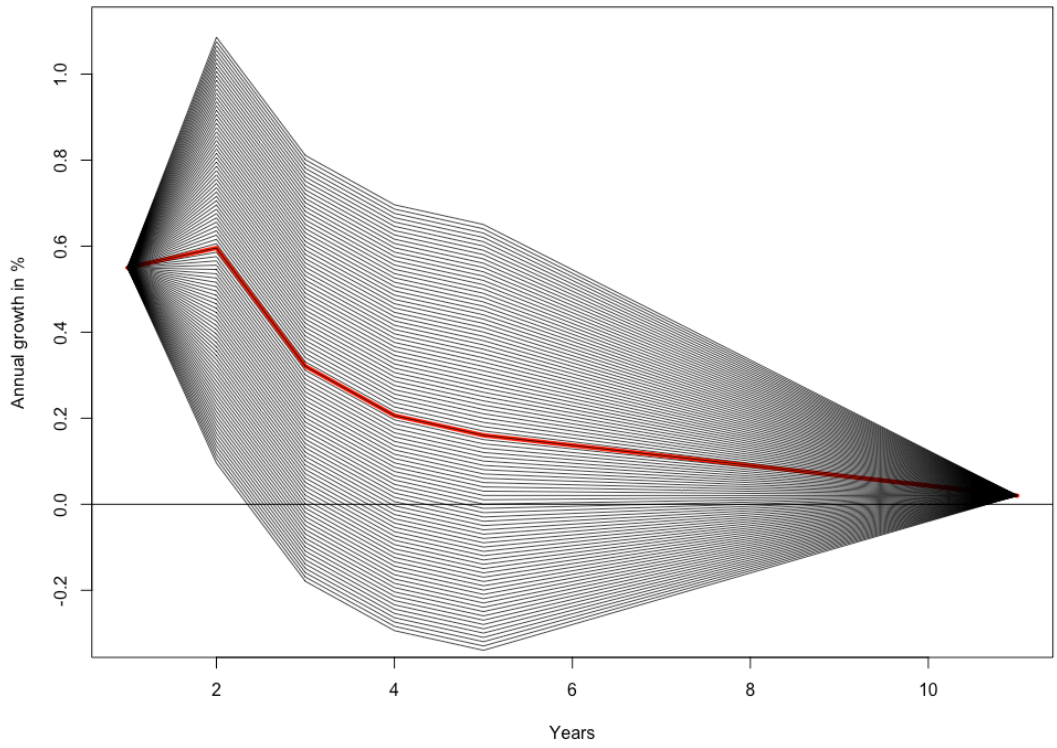
Source: FactSet

We can argue that the trend is decreasing, but like many other unicorns, Spotify operates in a young industry with high growth potential. Future revenues are thus depending on a combination of the market size and how the company handles competition. This is the idea behind the revenue forecast in the R-model. Based on the recent revenue growth of the company, the model produces 100 different paths between the growth level in base year and the 2% growth rate in terminal year. We illustrate this in Figure 4.3, which is a plot of Spotify's 100 revenue scenarios. The red line is the *base case scenario*, and represents a forecast of the size of the industry the company operates in. Statista is a database which provides such forecasts. Please note that the base case scenario is not the exact percentage growth of the market, but rather reflects the growth *path*. If the market is forecasted to grow from 10% to 12%, the percentage increase is 20%. The respective firm is then forecasted to grow with 20% in the same period. Hence, the red line reflects the relative growth of the market forecast. The

script produces 50 scenarios above the red line and 50 below. During the first five years, the scenario is either upward biased or downward biased, before it gradually converges toward the growth rate of 2% in the continuing period. Achieving a growth path above the red line means that the company performs better than the expected market growth through increased market share or revenues from other channels. In the case of Spotify, such channels can be income from advertisement or from a new segment. The opposite is the case for the scenarios below the red line, which can be a result of tougher competition and lower market share.

Some firms had a tremendous revenue growth in base year. When this is the case, the model assumes that the growth rate will decline proportionally toward the market growth in the year we expect the firm to go public, before it converges toward the continuing growth rate.

Figure 4.3 – Spotify's revenue growth scenarios



Source: Screenshot from R-studios

Operating Margin

Operating margin is the second value driver where the R-model performs a scenario analysis. We define the operating margin as EBIT divided on the firm's revenues. Since EBIT is the first element of the FCFF calculation, it is critical in the cash flow estimation and further the firm value. When forecasting the operating margin, we obtain different comparable margins

form the peer group in addition to the industry average from Damodaran's data set. Hence, we get an indication of what area the firm is likely to end up in. We fill in five different margins in a vector called *OM.terminal*, which the script applies in the valuation process. We can then observe what margin the firm will need, in combination with CAGR, in order to arrive at a valuation equivalent to PMV. We build a function which forecasts the path of the margin differently based on the growth stage we believe the firm is in. If the company is considered to be in either the low or medium growth stage, the margin converges proportionally between the level in base year and steady state. To illustrate with an example, consider a firm with a 2% margin in base year, which is expected to reach 12% in steady state. If the length of the forecast period is 10 years, the margin will increase with 1 percentage point (pp) annually until it reaches 12% in terminal year. If the company, on the other hand, is considered to be in high growth stage, it is common that the margin is highly negative. In some instances, it can be negative with 300%. If we gradually increased this toward e.g. 20% in steady state, the script assumes that the firm becomes profitable in the last year of the forecast period, which is not a realistic estimate. When this is the case, the model assumes that the firm becomes profitable when it goes public.[10] After this, the margin converges proportionally toward the level in steady state.

Tax rate

We use a reorganised balance sheet and income statement in which operating, non-operating and financing items are separated. Taxes are typically a combination of all three categories. To be consistent, and for valuation purposes, we are interested in the operating taxes. Given the low level of information disclosed from the companies in our sample, it is unlikely that any operating taxes can be reliably estimated. The statutory tax rate is available for the country where the firm is registered. This rate might, however, deviate from the effective tax rate for several reasons. For example, foreign operations in countries where tax rates are lower contribute to increase this deviation. We acknowledge the fact that applying the statutory tax rate introduces a bias to the analysis. However, with the limited information available, the statutory tax rate serves as a feasible alternative. The effect on firm value by applying a higher tax rate is marginal in our analysis.[11] Since we do not have comprehensive enough information on the companies in our sample, we are not able to retrieve the firms' tax loss carry forward, nor to estimate it based on previous years' losses. In order to reduce the downward bias that

[10] See cost of capital for estimation of a company's IPO date
[11] See chapter 6 - tornado chart for sensitivity analysis on tax rate

occurs, we assume that tax deductions, as a result of negative EBIT, is given the same year as the loss incurred.

Depreciation

Depreciation illustrates the loss in value of the fixed assets in the firm's balance sheet. It is considered as an expense in the income statement but is not really a cash outflow to the firm. Hence, it is added back to EBIT in the FCFF calculation, which is why we have to include it in the forecast process. According to Koller, Goedhart & Wessels (2015), the best way to estimate depreciation is to tie it to PPE. An alternative is to tie it to revenues, but depreciation will then increase with revenues regardless of whether any investments have been made. It will thus be more correct to tie it to tangible assets in the balance sheet, and depreciation will then increase proportionally with the increase in investments. Note that because we increase PPE proportionally with revenues in all our valuations, it does not matter whether we tie depreciation to PPE or revenues in this thesis. However, structuring it this way gives us the opportunity to estimate depreciation differently than revenue growth if we for some reason would believe in an abnormal increase or decrease in PPE. Due to lack of better alternatives, we decide to hold the depreciation/PPE ratio constant at a level equivalent to the mean of the three last observations available during the whole forecast period. Blippar, for instance, had a ratio of 36% in 2013, 59% in 2014 and 35% in 2015, with an average of 43%. If PPE is estimated to grow to $300m in 2020, depreciation will be $129m ($300m x 43%).

Capital Expenditure

CapEx equals investments in PPE less the book value of any PPE sold (Koller, Goedhart & Wessels, 2015). It can be calculated as the yearly change in PPE plus depreciation. Since we subtract the loss in value of the assets to PPE, depreciation should be added back in order to calculate total amount invested. We use the same estimate of PPE as explained in the previous paragraph. CapEx is therefore tied to revenue growth. This makes sense, as companies need to reinvest the old assets and invest in new assets to support the growth.

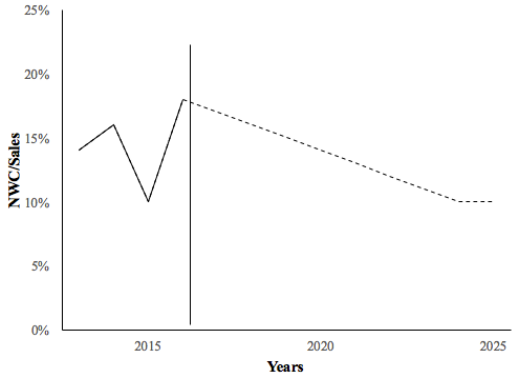
Net Working Capital

NWC, also referred to as operating working capital, is defined as the difference between a firm's operating current assets and its operating current liabilities. It represents the capital available in the short-term to run the business' operations (Koller, Goedhart & Wessels, p. 176). We identify the trend of the firms' five-year historical NWC/Revenues ratio. This trend is used as an input to a NWC function in the R-model, which determines the NWC ratio in the

forecast period. This section describes how the NWC function reacts to the different trend levels, including a plot of a fictive scenario for each trend level. The black bodied line illustrates the historical levels, whilst the dashed line is a plot of the function's output. The vertical abline represents the base year. We define four different trend scenarios: (i) no trend, (ii) flat trend, (iii) increasing trend, (iv) decreasing trend.

If the historical levels are fluctuating and shows no trend, the function start by using the base year's NWC/Revenues ratio before it later converges toward the industry mean. Since the historical observations fail at providing any indication on future levels, we decide to use the industry mean in this scenario instead of the historical average or last year's observation. Figure 4.4 illustrates the model's predictions in this scenario.

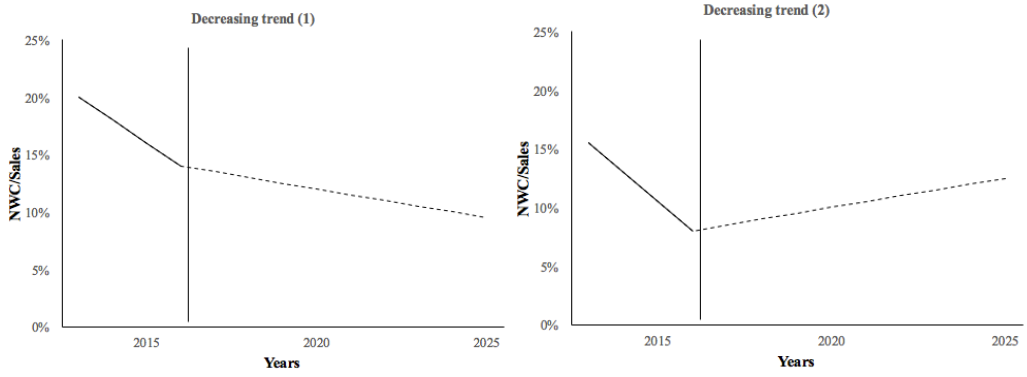
Figure 4.4 – Forecast of NWC/Revenues when historical levels show no trend



Source: R-model

If the trend is decreasing, and the base year's level is greater than the industry average, the function assumes that the trend will continue until it reaches the industry average (Figure 4.5 (1)). Further, if the trend is decreasing and the NWC ratio is below the industry average in base year, the function applies a conservative option, where it converges proportionally toward the five-year historical average for each year of the forecast period (Figure 4.5 (2)).

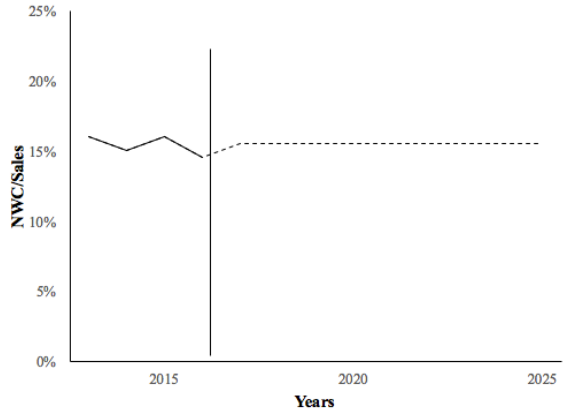
Figure 4.5 – Forecast of NWC/Revenues when historical levels show a decreasing trend



Source: R-model

In the scenarios where we observe a relatively flat trend, the function assumes that the historical average is a better predictor of future levels than the industry average. We expect stable levels to indicate that future fluctuations in NWC are less likely. However, if the industry average is lower than the historical average, a qualitative judgment will be made in order to avoid downward biased valuations. Figure 4.6 illustrates a plot of the function output with flat trend.

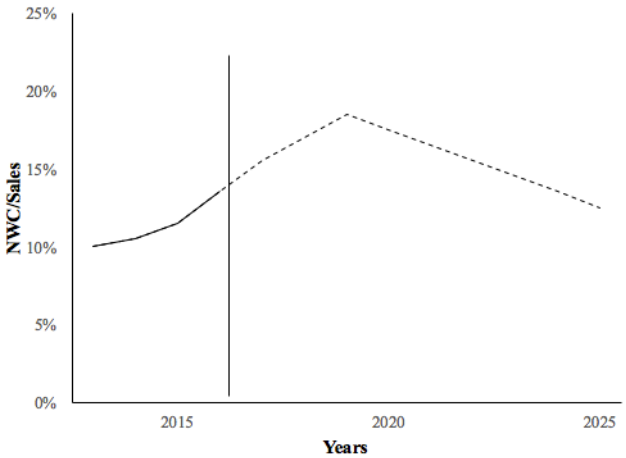
Figure 4.6 – Forecast of NWC/Revenues when historical levels show a flat trend



Source: R-model

If the NWC/Revenues ratio is increasing, the function calculates the average percentage increase over the past five years and forecasts the NWC ratio to grow at this rate for the first three years before it converges toward the industry average. This trend input, in particular, should be controlled by a qualitative evaluation. This is because an increase in NWC has negative impact on firm value, and we thus exercise this input with great caution. Figure 4.7 illustrates this scenario.

Figure 4.7 – Forecast of NWC/Revenues when historical levels show an increasing trend



Source: R-model

Cost of Capital

This section presents how the cost of capital is calculated, some estimation issues related to our sample and how we deal with these issues in the model. The WACC should reflect the rate of return that investors expect to earn from investing in the company and is therefore an appropriate discount rate for the free cash flow (Koller, Goedhart & Wessels, 2015, p. 30). We show the calculation of WACC in Equation 5, where *D/EV* is the target level of debt to enterprise value using market-based values, *E/EV* is the target level of equity to enterprise value using market-based values, *kd* is the cost of debt and *ke* is the cost of equity.

$$WACC = \frac{E}{EV} \times k_e + \frac{D}{EV} \times k_d \times (1 - Tax) \quad (5)$$

As mentioned, the WACC should reflect the rate of return for all investors. We should therefore include all the securities the firm has issued. For example, preferred stocks, which are usually issued for private companies, should be included. Since such information is undisclosed for the companies in our sample, the R-model assumes that the equity consists of common stock only.

Cost of debt:

Most of the firms in the sample do not have bond ratings reflecting its default risk. Since banks are likely to charge premiums, a synthetic rating based on selected ratios might be biased. We deal with this by using industry averages obtained from Damodaran's European sample on each industry. The average cost of debt is likely to be lower compared to the firm's actual cost of debt. However, we include this measure in the R-model, since a lower cost of debt implies a lower cost of capital, which in turn yields a higher valuation. This serves as a conservative measure which helps reduce the bias in the conclusion of this thesis.

Equity ratio:

The next issue is the financial leverage ratio. In private companies, neither the equity nor the debt is commonly traded in the market which implies that market values are unavailable. Among the few companies that have bonds traded in the market, this market value is likely to reflect a high-growth firm and will therefore deviate to a large degree from the target values. In such cases, the financial leverage ratio[12] is likely to have fluctuated historically and will

[12] I.e. in market values, or EV/D

usually continue to be fluctuating until the firm is in steady state. We therefore assume that today's level has low explanatory power on future levels, and apply the average market equity ratios for each industry implying that the firm's target financial leverage is equivalent to that of the industry. We obtain the industry average from Damodaran's sample on European firms within each industry (Damodaran, 2018).

Cost of equity:

The Capital Asset Pricing Model (CAPM) postulates that the expected rate of return on any security equals the risk-free rate plus the security's beta times the market risk premium (Koller, Goedhart & Wessels, 2015, p. 293). It is calculated as illustrated in Equation 6, where *rf* is the risk-free rate, β is security i's sensitivity to the market and $E(R_m)$ is the expected return of the market.

$$E(R_i) = rf + \beta(i) \times [E(R_m) - rf] \quad (6)$$

Risk-free rate:

A common method used to determine the risk-free rate is to apply the long-term government bond as a proxy for risk-free investments with a beta equal to zero. To create such a portfolio (with beta equal to zero) is in theory an appropriate approach, however, cumbersome and adds marginal quality to the risk assessment. The maturity of the government bond used should reflect the time of the cash flows. Thus, a theoretically sound approach would be to discount each year's cash flow with the corresponding maturity of the government bond. In addition, the government bond yields should be denominated in the same currency as the company's cash flow in order to be consistent with the inflation rate embedded in the cash flows. We therefore use the 10-year government bond rate in the country where the respective firm is based. For example, for the firms who generate cash flows denominated in Euro, we apply the 10-year German government bond rate, since it trades more frequently and has lower credit risk than bonds in other Eurozone countries. Government bonds with a maturity greater than ten years may match the cash flow stream better, but the illiquidity embedded in such bonds means that the prices and yield premiums may not reflect the current value (Koller, Goedhart & Wessels, 2015, p. 289).

Market risk premium:

The market risk premium (MRP) is the expected excess return of the market and is illustrated in the square brackets in Equation 6. We obtain an estimate of the MRP from KPMG (Weimer et al., 2018), Statista (2018a) and Market-risk-premia.com (2018).

Beta:

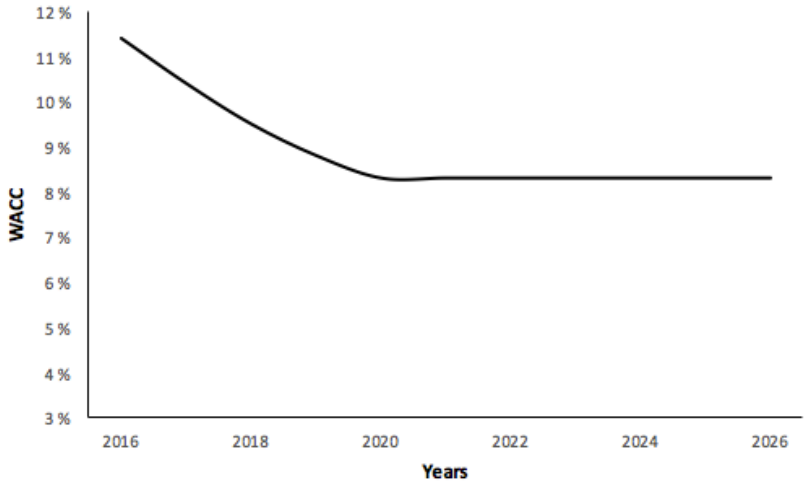
Koller, Goedhart & Wessels (2015) suggest not to use a purely mechanical approach but to base the betas on the industry peer median. We obtain average values from Damodaran's European sample. Since we already define the target financial leverage to be equal to the industry average, we can use the average levered beta as an input to the R-model. An issue is that CAPM assumes that the investors are fully diversified[13]. We explain how this is dealt with this in the next section.

Cost of Capital function and total beta:

In most cases, the VC is more heavily invested into specific industries and firms, and hence not likely to be fully diversified. We therefore use a total beta to adjust the investor's risk (beta) upwards by assuming that it has a given portion invested in the industry and the rest in the market. We calculate the total beta by dividing the market beta on the correlation between the shareholder's portfolio and the market. We obtain this data from Damodaran's database on European firms. The correlation between the shareholder's portfolio and the market is calculated in two steps. First, we assume that one portion is invested in the industry of the respective firm. This portion is then multiplied with the average correlation between the specific industry and the market. Second, the remaining portion is assumed invested in the market.[14] As an approximation for the investor's portion held in the industry, we use an input variable for the expected number of years until the company goes public. We estimate the years to IPO by using Gornall & Strabulaev's (2017) average time from the different funding rounds to exit in addition to public statements from company officials obtained from news articles and other publications. The function uses this input and assumes that the investor gradually becomes more diversified as the firm gets closer to a public listing. When an IPO takes place, the market beta is applied in the cost of equity equation. For example, in The Hut Group's case, we estimate that an IPO is likely to take place in 2020. The function then assumes that the investors are 80% diversified two years before the listing, 90% one year before, and 100% or fully diversified at the time of the listing. The Hut Group's WACC calculation is illustrated in Figure 4.8.

[13] I.e. the beta reflects the systematic or diversifiable risk only
[14] I.e. a perfect correlation with the market

Figure 4.8 – The Hut Group's WACC with expected IPO in 2020



Source: R-model

We acknowledge that further adjustments can be made when estimating a firm's cost of capital. For example, we disregard the illiquidity premium in the cost of equity calculation for the following two reasons. First, we do not know the size of the illiquidity premium. Due to lack of information needed to estimate this premium, we instead assume that it is to some extent offset by a control premium for the investors. Second, introducing such premiums inflates the cost of capital, which in turn decreases the valuation of the companies and increases the bias in the analysis. As an overall guideline, we stay at a rather conservative level when it comes to the valuation of the firms in the sample.[15]

Growth rate in continuing period

It is not uncommon that a firm's terminal value accounts for more than 90% of its market capitalisation (Damodaran, 2009, p. 10). The assumptions about a firm's characteristics in the continuing period may therefore have substantial impact on the valuation. The relative size of the terminal value (TV), and thus the impact of the continuing period assumptions, is in general even higher for young companies. This is because a typical young firm is likely to generate negative cash flows in the near future. Table 4.4 shows the size of each sample firm's TV relative to its estimated market value of equity (MVE).

[15] The cost of capital calculated in the R-model is therefore likely to be lower than the true WACC.

Table 4.4 – Terminal value as a percentage of estimated equity value

Company	TV/MVE	
	Min	*Max*
Spotify	99%	94%
The Hut Group	112%	108%
Klarna	119%	110%
Deliveroo	86%	89%
Transferwise	99%	108%
Oxford Nanopore	143%	133%
Blippar	107%	102%
FarFetch	112%	115%
BrewDog	98%	91%
Home24	138%	128%
Funding Circle	88%	87%
Improbable	81%	81%

Source: R-model

Min and max refers to the lowest and highest values in the valuation interval presented for each firm. We observe how critical the assumptions in the estimation of the TV are. For example, Oxford Nanopore Technologies' TV accounts for 143% of the estimated MVE. This can be explained by the nature of the firm's business which has significant R&D outlays that are likely to yield massive returns in the future. On average, we observe from our sample that the TV accounts for 115% to 116% of the equity value.

We apply a steady state growth rate of 2% as Petersen, Plenborg & Kinserdal (2017, p. 303) suggest. According to Damodaran (2016, p. 194), the growth rate in the continuing period cannot exceed the growth rate of the economy, since this would imply that the respective firm at some point in the future will grow to be larger than the economy. Hence, we interpret the estimated growth of the economy as an upper limit for the growth in the continuing period.

Table 4.5 – Risk-free rate as a proxy for nominal GDP growth

Risk-free rate	Nominal GDP growth
Expected inflation + Expected real interest rate	Expected inflation + Expected real growth

Source: Damodaran (2016)

Damodaran (2016, p. 195) suggests using the risk-free rate as a proxy for the nominal GDP growth. He argues that the real growth rate, in the long run, cannot be lower than the real

interest rate. In addition, he shows that the real growth rate, in the long run, can be higher than the real interest rate due to risk compensation. However, he also argues that this difference should get smaller as the economy matures and that the difference is likely to come from high-growth companies at the respective point in time. Therefore, if we assume that the proxy for risk-free rate that we apply in the cost of capital is "correct", using a higher terminal growth rate will introduce an upward bias in the valuations. This is because it leads to a relatively lower (higher) cost of capital (terminal growth rate). In the calculation of the cost of capital, we use the 10-year government bond rate as a proxy for the risk-free rate. Before applying the 2% terminal growth rate, we confirm that the 30-year government bond rate for the respective country is lower than 2%. This likely reduces the possibility of downward bias in the valuations.

Length of forecast period

A company achieves steady state when its cash flows grow at a constant rate (Koller, Goedhart & Wessels, 2015). This should be in the last year of the forecast period (terminal year), which is the year when we apply the terminal value formula. As discussed previously, unicorns often operate in new and young industries with high growth potential. It is thus difficult to predict when the company will end its high-growth period and enter steady state.

The general growth rate we use in terminal year is 2%. We therefore assume that the company enters steady state when the industry it operates in grows at a rate equivalent to the terminal growth rate. This may not be the case for all the companies. Some may continue to grow at a high rate after the industry growth has abated, but this will not sustain for a long period. We therefore use the forecast of the size of the industry to determine the starting year of the continuing period. In cases where we fail to obtain a forecast of the industry, or if we for some reason cannot use the information, the forecast period is set to 10 years.[16]

4.2.2 Relative valuation

Chapter 4 presented EV/Revenues as a feasible multiple to value young and private companies. This section explains how we apply the multiple, as well as some implications. The relative valuation consists of four steps:

[16] I.e. terminal year will be 10 years after base year

First, we collect the steady state revenues from two revenues scenarios generated by the R-model.[17] The scenarios reflect a good case and a base case, and are the same scenarios that generate the minimum and maximum values in the valuation interval. By using steady state revenues from the sample firms and multiples from peers who have reached steady state, we are consistent in dealing with the multiple's implicit assumption of equal expected growth.

Second, we identify a peer group using the database FactSet. The database provides an idea screening tool, where we can identify comparable companies with similar characteristics. We start by identifying companies with a related business description. We then break down the sample to companies with similar revenues and operating margin to that of the respective company in steady state. Finally, we do a qualitative analysis to ensure that the companies are in fact comparable. When the firms are identified, we collect the latest multiples available to the investors on the date of the PMV.

A few challenges arise when we compare different companies. One of them is accounting differences among the firms. Since the EV/Revenues multiple, in contrast to more traditional multiples, applies the top line instead of an earnings measure, this issue should be less critical. To reduce the bias, adjustments on accounting differences should be performed when feasible.[18] Another issue is whether to use public or private market multiples. We use public multiples since the sample firms are large companies who are expected to go public or to be acquired by a public company. In addition, public market multiples are up to date and accessible. That being said, they introduce an upward bias to the valuation, mainly through implying that investors are fully diversified and that the company being valued is equally liquid as that of the comparable. However, since the multiple is applied in steady state, the assumption of fully diversified investors is not unreasonable.

Third, we multiply the median multiple of the peer group with the two different revenue scenarios. In some cases, we qualitatively adjust the final multiple. For example, if one of the peers is more comparable, or we believe that the underlying assumptions of the multiple is violated.

From step three, we receive the EV of the firm in terminal year. The final step is to discount this back to the time of PMV, using the cost of capital retrieved from the R-model. To get the value of equity, we subtract for net debt.

[17] We use revenue scenarios from the R-model since the purpose of the relative valuation is to serve as a comparison to the DCF valuation

[18] Revenue recognition in particular

5. Analysis

In this chapter, we present the valuations of three of the 12 sample firms, namely Spotify, The Hut Group and BrewDog. This chapter provides a detailed explanation of what we have done to arrive at the specific valuation intervals for the three firms. For the nine remaining firms, a shortened analysis is included in Appendix 2. The three firms represent three very different industries. According to the initial result, The Hut Group is the most overvalued firm, whereas BrewDog is the most undervalued. Spotify has the highest PMV and is perhaps the most well-known company among the sample firms. The analysis in this chapter is structured as follows. We start with a general overview of the company and the recent performance, before we present the final valuation interval. Then we present the analysis behind this valuation interval and the input variables used in the R-model. Further, we present the relative valuation, which consist of a description of the peer group and the EV/Revenues valuation.

5.1 Spotify

The largest sample firm, according to PMV, is Spotify Technology. This is an online music streaming software company, headquartered in Stockholm, Sweden. It was founded in 2006. As of January 2018, Spotify has 70m paying subscribers (Statista, 2018b) which is an increase of 370% in three years. The latest funding round, which was Series G in November 2015, made Spotify reach a PMV of $8.53bn (Crunchbase, 2018a).

Table 5.1 – Spotify's recent performance

	2012	**2013**	**2014**	**2015**	**2016**
Revenues ($m)	94	1,030	1,313	2,118	3,224
Revenue growth	840%	996%	27%	61%	52%
EBIT ($m)	-70	-126	-200	-201	-278
Operating margin	-74.5%	-12.2%	-15.2%	-9.5%	-8.6%

Source: FactSet

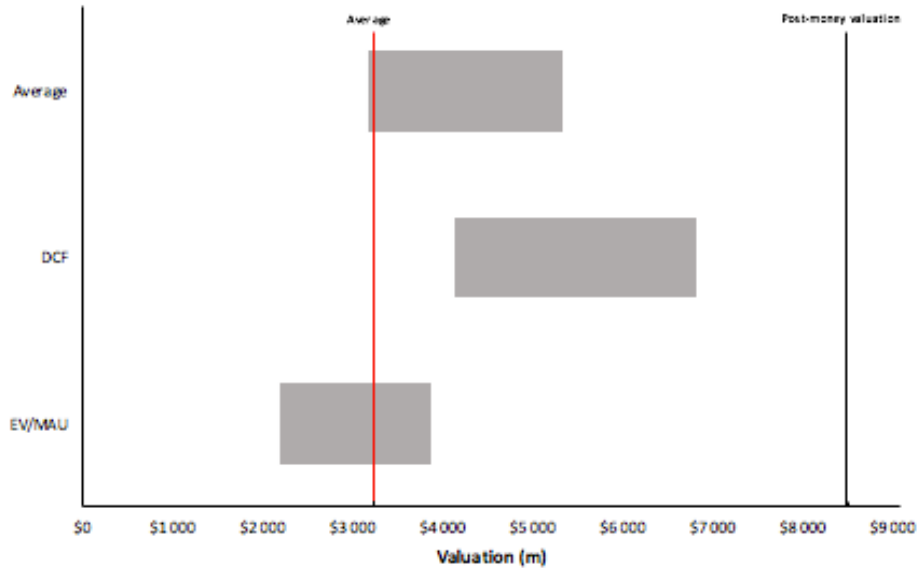
Table 5.1 illustrates the rapid revenue growth Spotify has had in the recent years. Although it reported revenues of $3.2bn in 2016, the firm has yet to gain positive results, due

to high royalty costs[19] (Christman, 2017). As of February 2018, the company has filed for a direct public offering (DPO)[20] within the next few months (Castillo, 2018).

5.1.1 Summary of the valuations

The DCF and the EV/MAU multiple[21] suggest valuations substantially lower than the PMV. Figure 5.1 illustrates the valuation intervals from the two methods and the PMV. The R-model generates a valuation interval between $4.1bn and $6.8bn. This implies an overvaluation between 25% and 106% compared to PMV. We use a CAGR of 16% and 21% as the lower and upper bound of the interval, and a margin of 6%.

Figure 5.1 – Football field illustration of Spotify's valuation intervals



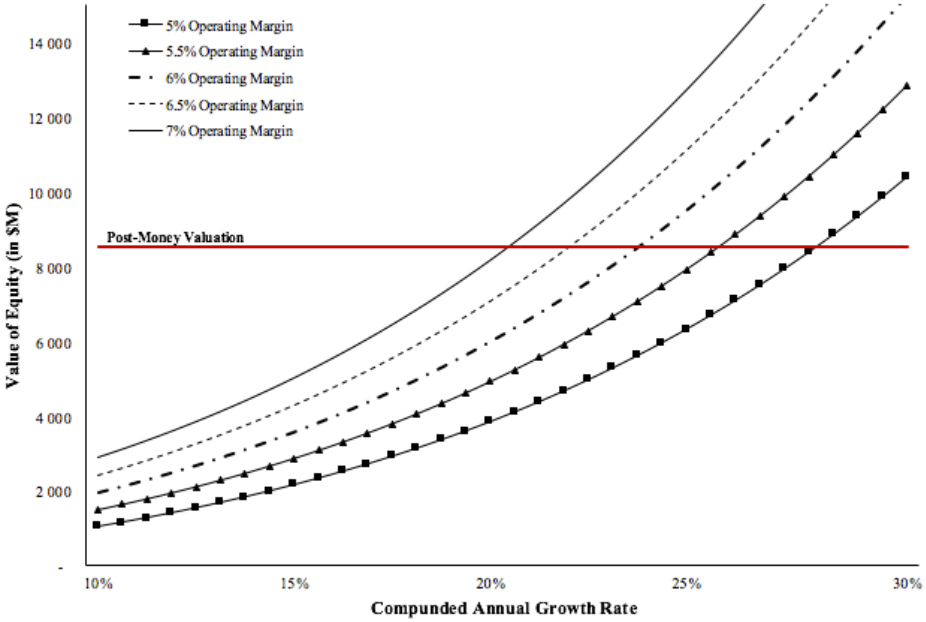
One of the reasons for the low valuation is Spotify's operating margin. The company has yet to show signs of operational profitability with a margin of -5.8% in 2018. The royalty fees, which are fixed fees based on how many times each song is played, are still the main contributor to the negative results. This is a critical issue that Spotify must deal with before positive margins can be realistic, which is why we doubt that Spotify will become profitable in the near future.

[19] Royalty costs are fees paid to artist and record labels
[20] See cost of capital section on p. 54 for an explanation of DPO
[21] Instead of EV/Revenues, we apply the EV-to-Monthly Active Users (EV/MAU) multiple. See section 5.1.3

5.1.2 R-model

This section presents the analysis behind the DCF valuation interval illustrated in Figure 5.1. We start with an analysis of the CAGR and operating margin, before we present the input variables used in the R-model. Figure 5.2 illustrates the 500 valuations generated by the model, based on the different scenarios on revenue growth paths and operating margins.

Figure 5.2 – Spotify's valuation scenarios



Source: R-model

CAGR:

We observe in Figure 5.2 that Spotify will need a high CAGR in order to defend the valuation of $8.53bn. Regardless of what operating margin Spotify manages to obtain (among the five included), no scenarios with a CAGR lower than 20% will give Spotify a value equal to or higher than the PMV. A CAGR of 20% corresponds to yearly revenues of $20bn in terminal year. This is an increase of 537% in the period between 2016 and 2026.

A common technique to use when forecasting the revenues of software companies and social media platforms is to estimate the increase in active users and how much money each user on average generates for the company. This is called Average Return Per User (ARPU). Spotify offers its users both a premium account and a free account. If the user does not upgrade to the premium account, it will be exposed to advertisements when listening to music. The premium users avoid this. Hence, Spotify has two ways of generating revenues; payments

from premium subscribers and income from advertising. Table 5.2 shows Spotify's ARPU for its total users and subscribers at the end of the past five years. Total users refer to both the subscribers and users with a free account.

Table 5.2 – Spotify's historical ARPU

	2012	2013	2014	2015	2016
Revenues (m)	$94	$1,030	$1,313	$2,118	$3,224
Total active users (m)	20	30	60	88	120
Subscribing users (m)	5	8	15	25	45
ARPU (Total users)	$5	$34	$22	$24	$27
ARPU (Subscribers)	$19	$129	$88	$85	$72

Source: Statista (2018b, 2018d)

We observe that the total users on average generated between $22-$27 annually in revenues over the past three years. The relatively constant number indicates that Spotify's revenues increase proportionally with its user base. Thus, we can forecast the amount of users Spotify will need in the terminal year in order to generate revenues sufficient to defend the high valuation, given that Spotify continues with the current business model. This is done in Table 5.3. Each line represents a scenario where the value of the company is close to the PMV. By dividing the revenues in terminal year on different levels of ARPU, we can calculate how many users Spotify will need in order to earn revenues sufficient to defend the valuation, given the different operating margins. The results indicate that Spotify will need between 733m-1.5bn users, depending on the ARPU and operating margin it manages to obtain.

Table 5.3 – Forecast of Spotify's users based on different ARPU

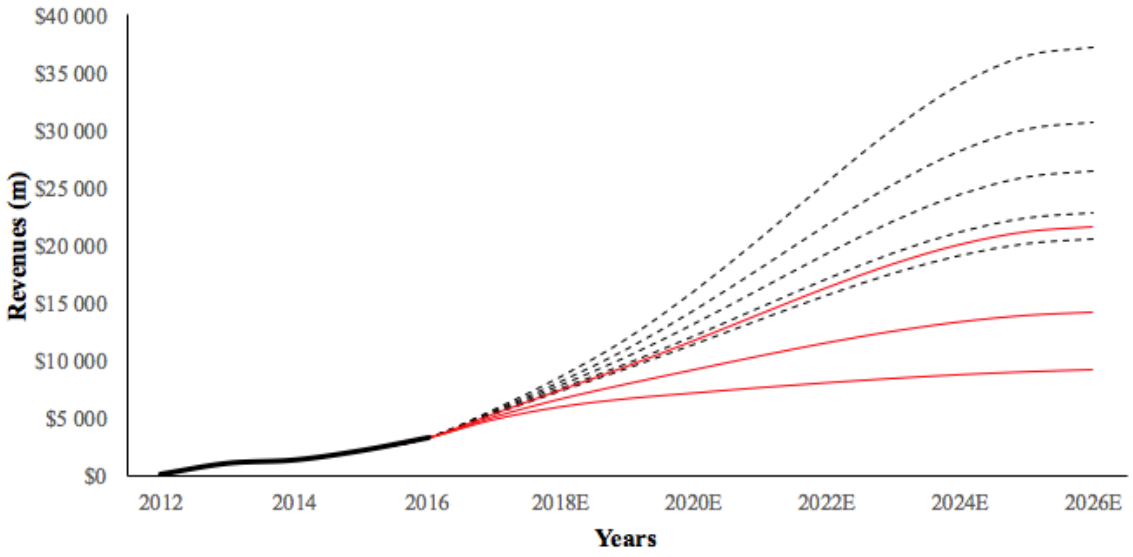
			Total users (m) given different ARPU		
Operating Margin	**Value ($m)**	**Revenues in Terminal Year ($b)**	**$24 ARPU**	**$26 ARPU**	**$28 ARPU**
5%	8,399	37.1	1,547	1,428	1,326
5.5%	8,380	30.6	1,276	1,178	1,093
6%	8,518	26.4	1,101	1,016	943
6.5%	8,427	22.7	947	874	812
7%	8,644	20.5	855	790	733

Source: R-model

As mentioned, Spotify has 70m premium subscribers and another 70m free users as of 2017. If the company reaches any of the levels of users illustrated in the Table 5.3, it will need an increase between 425%-1,000% in monthly active users (MAU). This sounds achievable,

given the historical growth since 2012 of 500% (Table 5.2). But it implies that Spotify manages to maintain this growth. This might be difficult considering that the growth in user base has decreased in recent years. A comparison with the total amount of internet users worldwide also highlights the issue. As of 2018, the number of internet users is 3.8bn (internetlivestats.com, n.d.). By extrapolating the growth path since 1995, we assume that this number will increase to approximately 5.5-6bn by 2026. The share of the total amount of internet users using Spotify actively will thus be between 15% and 30%, which is fairly high considering today's share of 3.7%.

Figure 5.3 – Spotify's revenue paths, realistic and high-valuation scenarios



Source: R-model

Figure 5.3 is a plot of the growth path in the five scenarios from Table 5.3 (dotted lines), the historical growth (bodied line), and three scenarios which we find to be realistic (red lines). The red lines represent the good case (upper), the base case (middle) and the bad case scenario (lower). Base case follows the expected growth path of the market. Good case and bad case are defined as base case +/- five percentage points CAGR. We observe that the good scenario is close to the two bottom scenarios yielding PMV, but the base case scenario is far below any of the five. Although we believe base case is the most realistic scenario, we keep the valuation conservative and use an interval from base case to good case. These two scenarios correspond to a CAGR between 16% and 21%, which implies that Spotify will have revenues between $14.2bn and $21.6bn in terminal year.

Operating margin:

The margins in the music streaming industry have historically been low. The main contributor to this is the high royalty costs the companies have to pay to the artists and label records. This cost is paid for each song played. Hence, the problem is that an increase in revenues, due to a larger user base, will increase the costs proportionally, which makes it is difficult to improve the margins in the industry. Moreover, the competition has increased due to many new firms entering the industry. Examples are Amazon who recently launched its new streaming service and Apple Music who has had a rapid growth in number of subscribers. Since many similar comparable services are a part of a larger corporation, such as Amazon and Apple, it is difficult to identify a peer group.

Pandora Music is an example of a publicly listed music streaming company. However, it is significantly smaller than Spotify both in terms of market capitalisation and revenues, and the operating margin is -23% (Financials morningstar, 2018). Netflix, although significantly larger, might serve as a better comparable in the coming years. It does not operate in the music streaming industry, but the business model is based on monthly subscription fees, and royalty fees are its main operating expense.

Netflix currently has an operating margin of 7.2%. We observe significantly positive operating margins on Domestic Streaming (36.2%), negative on International Streaming (-9.6%) and an average of 18.5% coming from streaming in general (Netflix, Inc, 2018). However, if we distribute *other operating expenses* relative to each segment's revenue contribution, we end up with an operating margin from streaming at 2%. If we assume that the royalty fees as a percentage of revenues are similar in the music industry and the movie industry, it looks challenging for Spotify to obtain a higher margin than Netflix. As a conservative measure, we apply 6% as operating margin in the valuation scenarios of Spotify.

With an operating margin of 6% and a CAGR from 16% to 21% (representing base case and good case), we end up with a valuation interval between $4.14bn and $6.81bn.

Input variables:

Growth stage

Spotify's latest financing round was Series G in 2015 (Crunchbase, 2018a). The company's revenue growth has stabilised in recent years, but is still at a relatively high level. We therefore set the variable company growth to *medium growth*.

Market size forecast

Statista (2018c) provides a market forecast of the music streaming industry. This is illustrated in Table 5.4, and the revenue scenarios are based on this forecast. We observe that the market was expected to grow rapidly in 2017 and 2018 before it decreases gradually toward 2% in 2025, which is equivalent to the terminal growth rate in the model. This suggests that Spotify is likely to reach steady state in 2025, but we forecast until 2026.

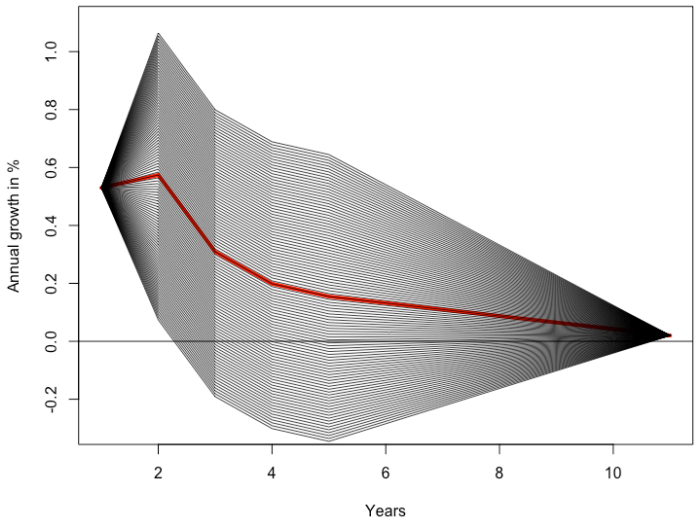
Table 5.4 – Music streaming market forecast

	2017E	**2018E**	**2019E**	**2020E**	**2021E**	**2022E**
Market size ($m)	8,368	9,574	10,450	11,187	11,837	12,411
Annual growth	26%	14%	9%	7%	6%	5%

Source: Statista (2018c)

Figure 5.4 is a plot of all the revenue scenarios for Spotify. All scenarios start with the growth in base year of 55% and end with growth of 2% in terminal year. The red line is the base case scenario which follows the forecasted growth path of the market. The other scenarios will either go up or down the first five years, before proportionally converging toward 2% in terminal year. In other words, all the scenarios above the red line are scenarios where Spotify

Figure 5.4 – Spotify's revenue scenarios



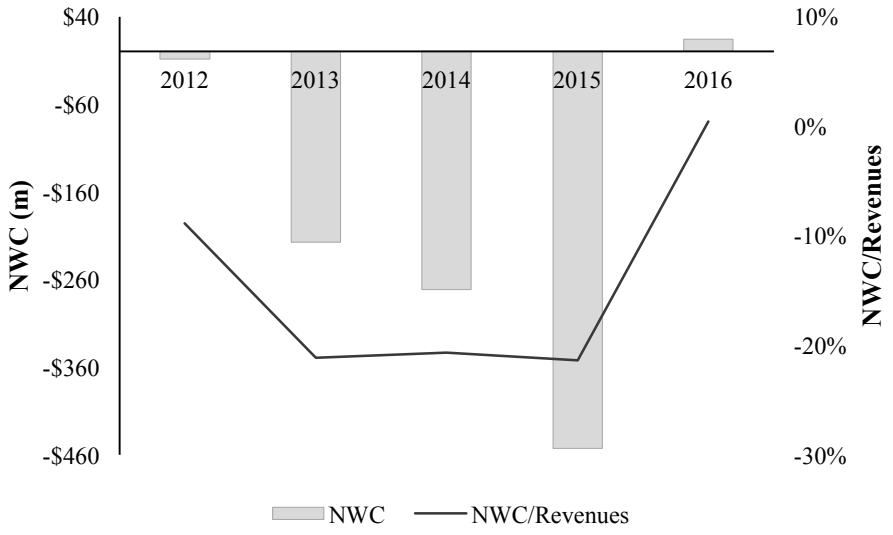
Source: Screenshot from R-studios

performs better than the market[22] and opposite for the scenarios below the red line. Some of the scenarios will result in Spotify having a larger turnover than the estimated size of the market. These reflect scenarios where the company penetrates other markets, like for example music production or movie streaming.

Net Working Capital

Figure 5.5 illustrates Spotify's NWC between 2012 and 2016. The NWC ratio fluctuates during this period, and we argue that the ratio shows no trend. The NWC function then assumes that next year's ratio equals the base year. For the remaining years, it converges toward the industry average at a proportional rate.

Figure 5.5 – Spotify's NWC and NWC ratio from 2012-2016



Source: FactSet

Depreciation

Since we are not able to obtain the depreciation in 2015 and 2016, we assume that the level in 2014 increases with the growth in PPE. The average ratio is then 17.5% between 2014 and 2016, which we hold constant during the whole forecast period.

Operating margins

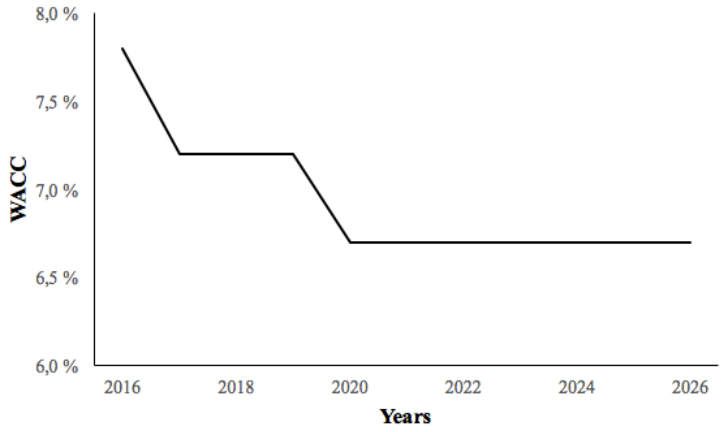
We include five operating margins in the OM vector, from 5% to 7% with an interval of 0.5 percentage points.[23]

[22] E.g. increased market share or income from advertising
[23] See the analysis on operating margin for the arguments behind this decision

Cost of Capital

We obtain the Swedish 10-year government bond rate from Bloomberg (2018b), currently trading at 0.81, which is used as a proxy for the *risk-free rate*. Further, we apply Statista's (2018a) estimate on the Swedish *market risk premium* at 6.8%. The industry levered *beta* of 0.9 is used to calculate the total beta. On April 4 2018, Spotify is registered to be listed on the New York Stock Exchange. Generally, the cost of capital function assumes that shareholders are fully diversified at the time of the public listing. However, Spotify's listing is a Direct Public Offering (DPO) instead of a traditional IPO. In a DPO, no new securities are issued, and the company underwrites its shares without help from a third party.[24] As a consequence, the function assumes that Spotify's shareholders are not fully diversified although the company is publicly listed. The gradual increase in the shareholders' diversification will therefore stay constant for two years after it reaches 90% in 2018. This is based on the assumption that few of the investors will sell their shares when the firm goes public. The result is a slightly higher cost of capital in the period 2016-2020.

Figure 5.6 – Spotify's cost of capital (WACC)



Source: R-model, Cost of capital function

The target *equity ratio* of 92% and the industry cost of debt at 4.7% is obtained from Damodaran's (2018) dataset in the industry entertainment software. The *tax rate* we use, is the Swedish statutory tax of 22%. Figure 5.6 illustrates the development of Spotify's cost of capital in the forecast period.

[24] E.g. investment banks, underwriter etc.

5.1.3 Relative valuation

Instead of the traditional EV/Revenues multiple, we apply the EV-to-Monthly Active Users (EV/MAU) ratio for Spotify. This multiple is frequently used as a comparison for user-based companies, such as social media platforms and subscription-based software companies.

EV/MAU:

The idea behind this multiple is to compare the amount paid for each user in similar transactions with the amount of users in the company being valued. MAU is the most common benchmark, but it is also feasible to look at daily active users or total registered users. An important issue is to make sure that the number of users in the ratio is captured from the same time period as the corresponding transaction.

Table 5.5 presents a list of related transactions from the music streaming industry and other user-based platforms. The music streaming industry is still relatively young, and few transactions have been completed so far. Spotify's main competitors Apple Music, Amazon Music and Google Play are divisions of larger IT-companies and have not been involved in any acquisitions or IPOs. Another music streaming service is Deezer, but it is still VC-backed. The Asian market leaders QQ Music, Kugou and Kuwo have merged under the control of Tencent in 2016 (Soo, 2016). Pandora is the only company identified which has gone public. It was listed in 2011 with an IPO value of $2.6bn and had at the time 36m subscribing users (TechCrunch, 2011). This is equivalent to an EV/MAU ratio of $72.2. In other words, the investors were at the time of the listing willing to pay $72.2 for each user holding a premium account. Aspiro, which is the mother company of the music streaming platform Tidal, was acquired by the American rap-artist Jay-Z in 2015 for $56m (The Guardian, 2015). The company reported to have 500,000 users at the time of the acquisition, which equals an EV/MAU ratio of $112. We compare these numbers with Spotify's user base at the time of the PMV (June 2015), which according to a press release from the Spotify team corresponds to 20m (Spotify, 2015). Both of these comparable ratios yield a very low EV on Spotify of $2.2bn and $1.4bn, respectively. Adjusted for net debt, we get a value of equity of $2.57bn and $1.77bn, which are far below the PMV of $8.53bn. The average multiple yields an EV of $1.84bn and a value of equity of $2.21. This can either be a result of an undervaluation or that Spotify's users are more worth than Pandora's and Tidal's.

Table 5.5 – Comparable transactions on EV/MAU

Company	Acquired by	Date	Amount (m)	MAU (m)	EV/MAU
Music streaming:					
Aspiro (Tidal)	Panther Project	Jan 15	$56	0.5	112
Pandora	IPO	Dec 11	$2,600	36	72.2
Average					**92.1**
Other:					
LinkedIn	Microsoft	Jul 16	$26,000	450	57.8
Instagram	Facebook	Apr 12	$1,000	30	33.3
YouTube	Google	Oct 06	$1,600	50	32
WhatsApp	Facebook	Feb 14	$19,000	450	42.2
Skype	Microsoft	Oct 11	$8,500	124	68.5
Average					**46.8**

Source: TechCrunch (2018b), Yeung (2016), Bright et al. (2011), Carlson (2012), Sorkin & Peters (2006), Rao (2011), The Guardian, (2015)

We also include five major transactions of well-known user-based companies. We do not put too much emphasis on this result, due to the difference in the product they offer. However, both Spotify and the acquired companies included in the list are user-based platforms with high influence in the modern society and on its users. Hence, we assume that the deviation between the value of the users is minimal. The MAU included here are total users, and we therefore compare the user base with Spotify's total MAU and not just subscribers. According to Spotify, this corresponded to 75m in June 2015 (Spotify, 2015). When we apply the average multiple from Table 5.5 on 75m users, we end up with an EV of $3.5bn and a value of equity of $3.87bn.

5.2 The Hut Group

The Hut Group Ltd. (THG) owns and operates websites that sell fast-moving consumer goods direct to the consumer via in-house technology and its operating platform, specifically focused on health and beauty. The company was founded in 2004 and is based in the UK. In August 2017, THG reached its PMV of $3.25bn, after a financing round with Old Mutual Global Investors (Crunchbase, 2018b).

Table 5.6 – THG's recent performance

	2012	2013	2014	2015	2016
Revenues ($m)	248	304	387	494	617
Revenue growth	13%	23%	27%	28%	25%
EBIT ($m)	2.7	8.2	13	26.4	20.4
Operating margin	1.1%	2.7%	3.4%	5.3%	3.3%

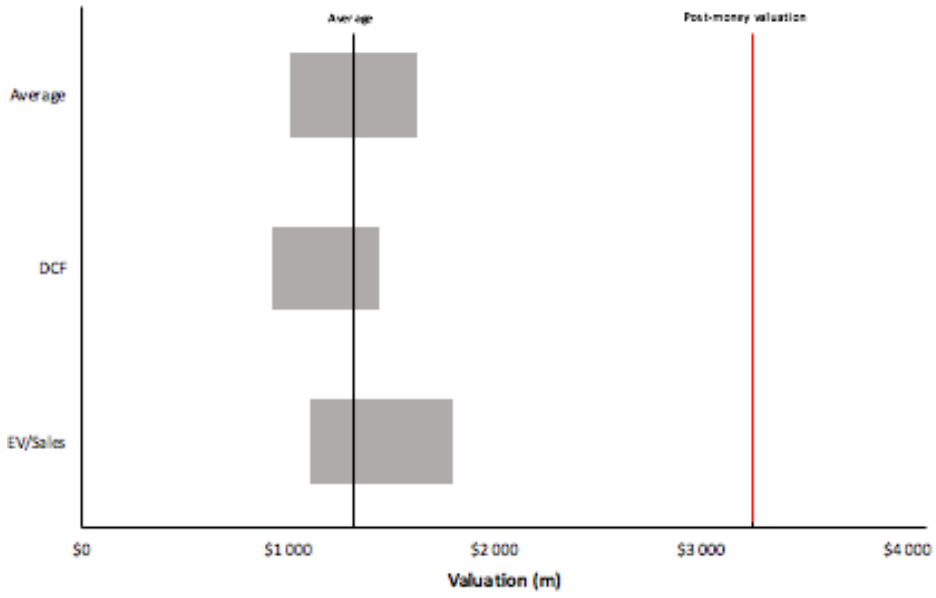
Source: FactSet

5.2.1 Summary of the valuations

The DCF and the EV/Revenues multiple suggest valuations substantially lower than the PMV. Figure 5.7 illustrates the valuation intervals from the two methods and the PMV. The R-model generates a valuation interval between $0.93bn and $1.45bn. This implies an overvaluation between 125% and 251% compared to PMV. We use a CAGR of 11.8% and 16.8% as the lower and upper bound of the interval, and a margin of 8%. Although we put more emphasis on the result of the R-model, we observe that the relative valuation yields fairly similar results.

A reason for the low valuations is that the growth in revenues seems to start declining too early, and it will be challenging to reach the level needed to defend the valuation of $3.25bn. Moreover, the margin is low and seems to have stabilised between 3% and 4%. We argue that the company can improve this to 8% in steady state, but the level of margin and revenues will not generate cash flows sufficient to defend the high valuation.

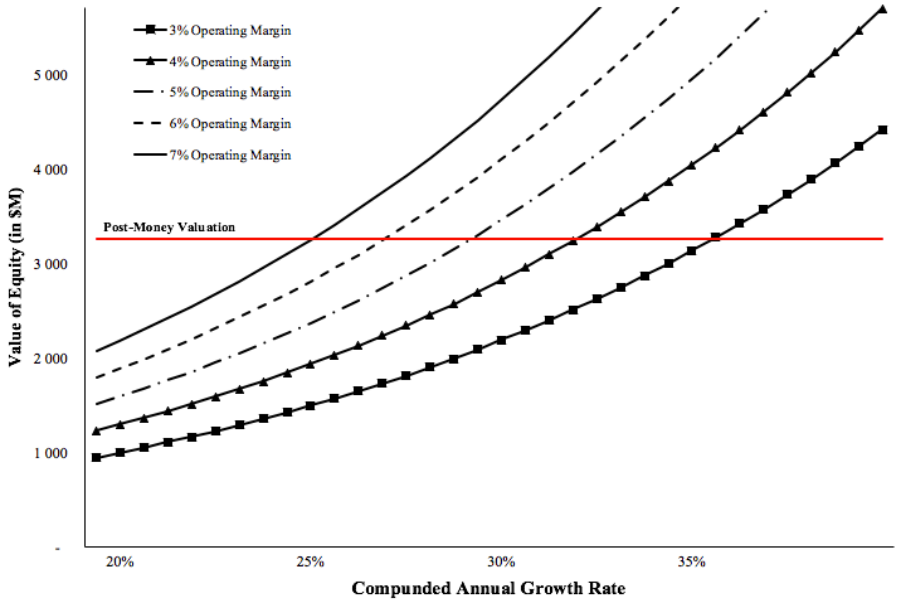
Figure 5.7 – Football field illustration of THG's valuation intervals



5.2.2 R-model

This section presents the analysis behind the DCF valuation interval illustrated in Figure 5.7. We start with an analysis of the CAGR and operating margin before we present the input variables used in the R-model. Figure 5.8 illustrates the 500 valuations generated by the model, based on the different scenarios on revenue growth paths and operating margins.

Figure 5.8 – THG's valuation scenarios



Source: R-model

CAGR:

Given the margins we include in the OM vector, the firm will need a CAGR between 25% and 35% to achieve cash flows high enough to receive a valuation close to the PMV. THG´s current operating margin is 3%, and we observe that the firm would need a massive improvement toward 2026.

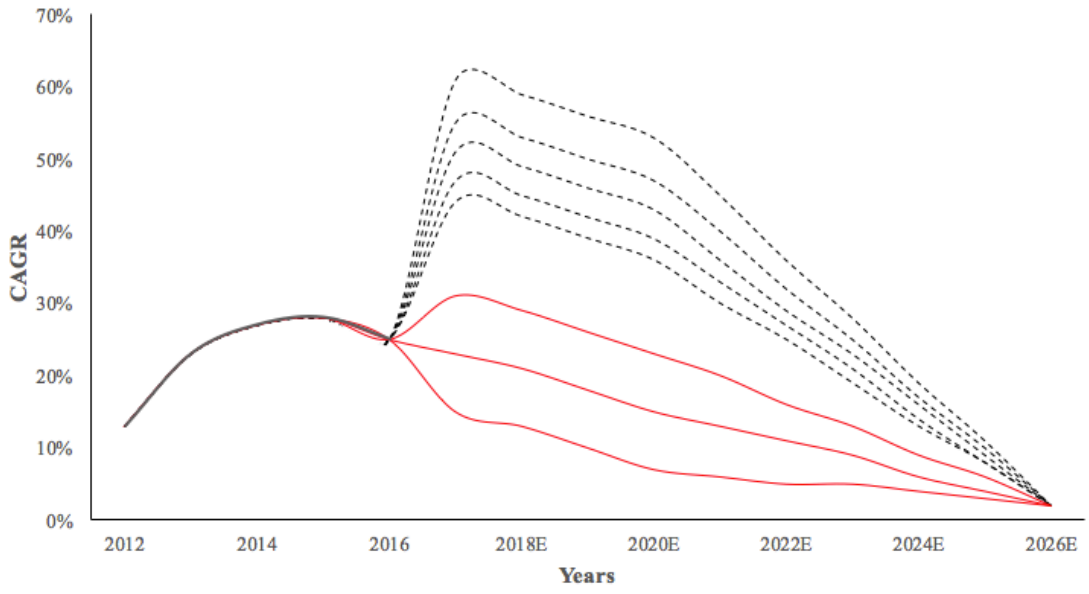
Table 5.7 – Summary of THG's scenarios yielding PMV

Operating Margin	Value of Equity ($m)	Revenues terminal year ($m)	CAGR	Growth in revenues
5%	3,269	12,576	35%	1,938%
6%	3,230	9,592	32%	1,455%
7%	3,297	7,965	29%	1,191%
8%	3,237	6,585	27%	967%
9%	3,241	5,692	25%	823%

Source: R-model

Table 5.7 is a summary of five scenarios where THG achieves a valuation close to the PMV. If it manages to increase the operating margin with two percentage points, it will need a CAGR of 35% in the forecast period and revenues of $12.6bn in terminal year. This is a 1,938% increase compared to the $617m it reported in 2016. The bottom scenario is more realistic, and to achieve this it will need a relatively lower CAGR of 25%, or revenues in terminal year of $5.7bn. This corresponds to an increase of 823%. However, the drawback is that it will need to increase the operating margin with 6 pp from today's level of 3% to 9% in terminal year. This requires a significant improvement in the operations and it is far beyond the average margin in the online retail industry of approximately 3% (Damodaran, 2018). However, considering the fact that THG is offering premium products, it is fair to assume that the margin will be higher than the industry average.

Figure 5.9 – THG's revenue paths, realistic and high-valuation scenarios



Source: R-model

Figure 5.9 illustrates the growth THG will need compared to the revenue growth it has reported in prior years. The dotted lines represent the five scenarios presented in Table 5.7. The black line between 2012 and 2016 represents the historical growth for THG. The total growth in this period was 149%. The red lines represent the good case (upper), the base case (middle) and the bad case scenario (lower). Base case follows the expected growth path of the market. Good case and bad case are defined as base case +/- five percentage points CAGR.

THG's recent performance suggests that it has entered a low-growth stage. Hence, the most likely scenario would be a continuation of the historical growth path it has had, which

the base case scenario represents. In this scenario, the recent growth rate will decrease proportionally until it reaches 2% in terminal year. The revenues in terminal year will in this scenario be $1.9bn, which corresponds to an increase of 211%. Compared to the other sample firms, this is a moderate growth in a 10-year perspective. However, it is still a reasonable estimate if THG continues the current operational performance. The upper red line represents a more optimistic scenario, where THG manages to acquire some attractive online retail companies. The result is that THG experiences an abnormal boost in revenues during the next five years until it reaches the steady growth rate. The revenues in terminal year will in this scenario be approximately $2.9bn, which is an increase of 383%. The latter scenario indicates that we are wrong about THG's growth stage, and that it is still in the medium-growth stage. The bottom red line is a scenario where THG's relative growth declines compared to the forecasted market growth and its current growth path. This can for example be the case if THG is unsuccessful in acquiring suitable companies to its platform. The CAGR in this case is 7%, and revenues in terminal year is equivalent to $1.2bn. However, we do not find this scenario to be very realistic considering the growth profile of the industry THG operates in.

Although we believe base case is the most realistic scenario, we keep the valuation conservative and use an interval from base case to good case. These two scenarios correspond to a CAGR between 11.8% and 16.8%, which implies that THG will have revenues between $1.89bn and $2.93bn in terminal year.

Operating margin:

We use two benchmarks when assessing THG's operating margin in terminal year. Damodaran's average for online retail industry and a peer group we identify in FactSet. The company's current operating margin is 3.3%. The average operating margin among European online retailers is according to Damodaran (2018) almost equivalent to THG's, at 3.4%. The company's products are in the higher-end segment compared to the average online retail firm, and it is therefore charging a higher premium to its customers. Hence, we assume that its operating margin will increase in the explicit forecast period. From the peer group, we observe relatively low operating margins, where B2W Companhia Digital has the highest margin of 4.6%. We choose an interval from 5% to 9% in the OM vector. By defining the interval above the peers' operating margins, we assume it to be conservative. The upper bound of 9% is relatively high compared to the benchmarks discussed. However, this might be realised if THG is successful in acquiring suitable firms to its platform, achieving economies of scale. We use 8% as THG's operating margin in the valuation interval.

In summary, with an operating margin of 8% and a CAGR from 11.8% to 16.8%, we end up with a valuation interval between $0.93bn and $1.45bn for THG. The lower bound of the interval suggests that THG is not considered a unicorn.

Input variables:

Growth stage

THG had a Series D financing round in 2010 (Crunchbase, 2018b). This suggests that the company is at a mature stage in its funding cycle. Moreover, the revenue growth has stabilised around 25% the last four years. We therefore set the input variable for company growth to *low growth*.

Table 5.8 – Fashion industry market forecast

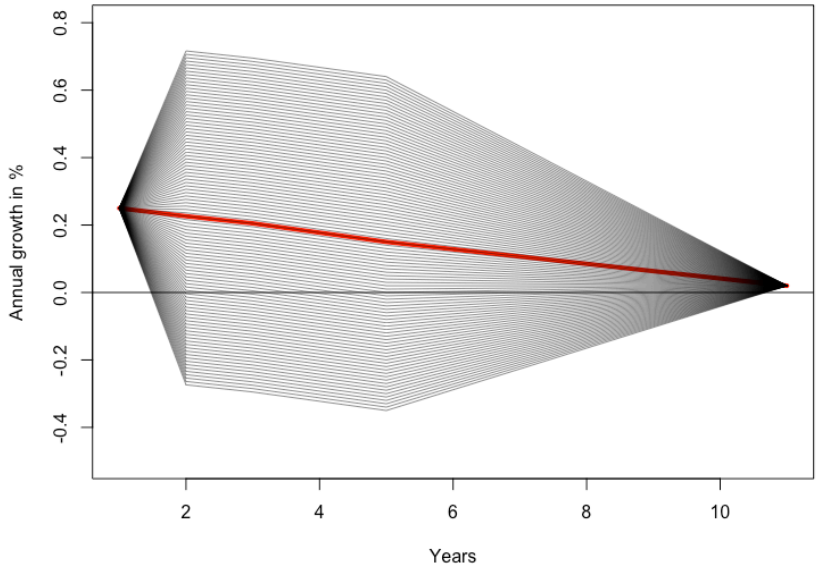
	2017E	2018E	2019E	2020E	2021E	2022E
Market size ($bn)	548	638	729	816	896	968
Annual growth	18%	16%	14%	12%	10%	8%

Source: Statista (2018e)

Market size forecast

Statista (2018e) provides a forecast of different segments in the ecommerce industry. We use the fashion segment as this is closest to THG's products, which is illustrated in Table 5.8. The growth path suggests that the fashion industry will be reaching a 2% growth rate in 2026, which is why we set the length of the forecast period to ten years.

Figure 5.10 – THG's revenue scenarios



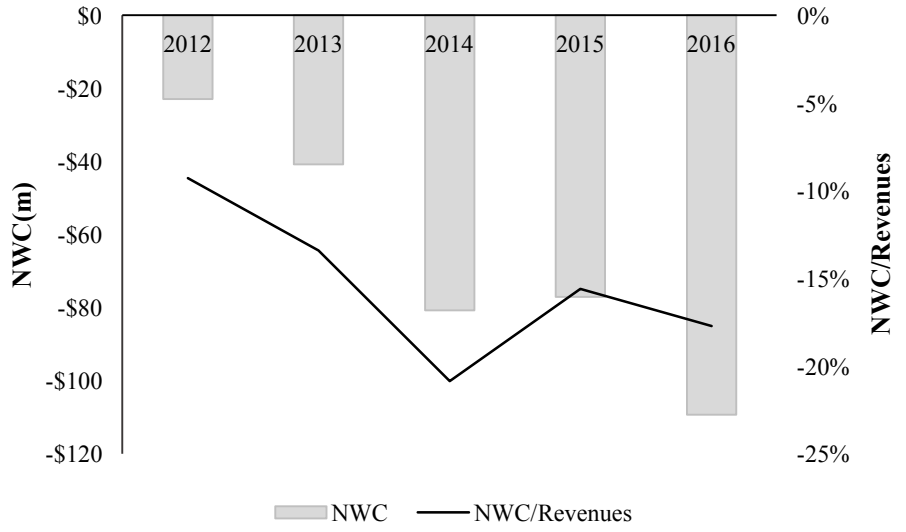
Source: R-studios

Since we believe the company is in a low-growth stage, the base case of the revenue scenarios is based on the forecasted growth of this sector. The red line in Figure 5.10 illustrates this path.

Net Working Capital

We collect an industry average NWC ratio of 2.25% from Damodaran's database. Figure 5.11 shows that THG's NWC ratio is at a decreasing trend. In 2016, it was at negative 18%, which is far below the industry average. The function therefore assumes that historical levels of the ratio are better predictors of the future NWC. As a result, it will go proportionally toward the five-year average. Moreover, we observe an improvement in the company's operational efficiency through a decreasing NWC. A continuation of this trend would increase valuations, but we believe such an improvement is unlikely to continue over a longer period.

Figure 5.11 – THG's NWC and NWC ratio from 2012-2016



Source: FactSet

Depreciation

The Depreciation/PPE ratio has decreased from 25% to 4% in the period 2014-2016. The average ratio was 13.5%. Hence, we hold the ratio constant at this rate during the whole forecast period.

Operating margins

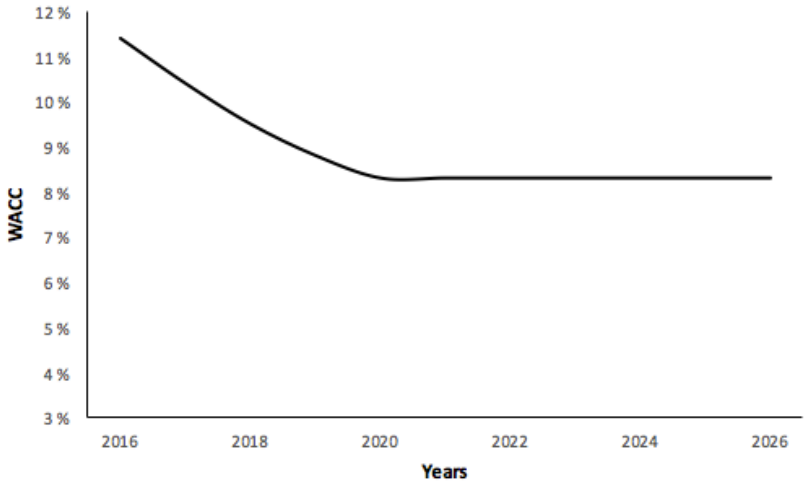
THG had an operating margin of 3.3% in base year. Since the firm is relatively mature, we assume the worst case scenario of the operating margin interval to be slightly above today's

margin. The average operating margin in the online retail industry is approximately 3%. Since THG operates in the premium end of this industry, we define the upper level as 9%, or 3x the industry average. Thus, we include five scenarios ranging from 5% to 9%, with one percentage point interval.

Cost of Capital

We use the UK 10-year government bond rate from Bloomberg (2018c), currently trading at 1.48%, as a proxy for THG's *risk-free rate*. Further, we obtain market Market-risk-premia.com's (2018) estimate on the implied UK MRP at 5.44%. THG had its latest venture financing round in 2010 and has yet to IPO. The company has already had two private equity financing rounds, in addition to two rounds of debt financing. Its latest financing round was $630m additional debt in October 2017, indicating that a near IPO is less likely. Given THG's relatively mature stage in the funding cycle and the latest debt rounds, we believe that a listing in two years (2020) is a reasonable estimate. According to the R-model, investors will be fully diversified from this date, and a market *beta* of 1.34 is applied. We further obtain a target equity ratio of 91% and cost of debt of 4.74% from Damodaran's (2018) dataset. The *tax rate* we apply is the UK statutory tax rate of 20%. Figure 5.12 illustrates the development of THG's cost of capital in the forecast period.

Figure 5.12 – THG's cost of capital (WACC)



Source: R-model

5.2.3 Relative valuation

Peer group:

Table 5.9 shows THG's public peer group. The firms included are mainly ecommerce companies, with a similar platform as THG's. Although these are the closest comparables we are able to identify, we observe some differences in the business operations and the margins. Due to the low margins, the multiples will downward bias the valuation. To reduce this bias, we instead apply the average multiple which is slightly higher than the median. The average multiple from the peer group is 1.4.

Table 5.9 – THG's peer group and EV/Revenues ratios

Company	EV/Revenues
Netalouge Technologies plc.	1.5
Intrasoft Technologies Ltd.	0.5
B2W Companhia Digital	0.7
Channeladvisor Corporation	2.7
Average	**1.4**

Source: FactSet

EV/Revenues:

Table 5.10 shows the relative valuation of THG in the two scenarios representing the upper and lower bound of the valuation interval. The revenues presented are the revenues the R-model generates for the company in terminal year. The scenarios yield an overvaluation of 194% and 81% of the reported PMV.

Table 5.10 – Relative valuation of THG, in $million

	Base case	Good case
Revenues (2026)	1,889	2,916
EV/Revenues	1.4	1.4
Implies EV (Aug 17)	1,272	1,963
Net Debt	165	165
Value of Equity	1,107	1,799

Source: FactSet, R-model

5.3 BrewDog

BrewDog is a Scottish beer brewery, producing premium craft beers. As of March 2017, it exported its products to 60 different countries and has opened 49 BrewDog bars worldwide (Brewdog, 2017). It was founded in 2007, and is thus considered a relatively mature start-up. However, as Table 5.11 illustrates, BrewDog is still at a high growth level and has delivered impressive margins since 2012, ranging between 5%-14%.

Table 5.11 – BrewDog's recent performance

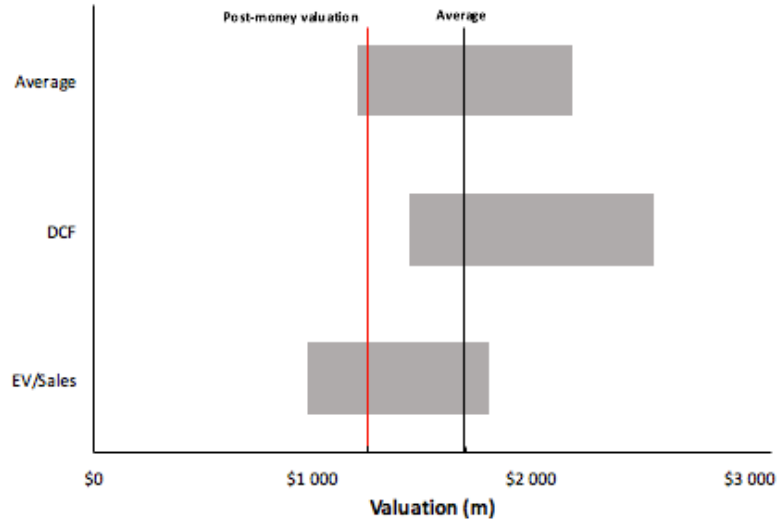
	2012	2013	2014	2015	2016
Revenues ($m)	17	30.3	46.5	66.8	88.8
Revenue growth	85%	78%	53%	44%	33%
EBIT ($m)	0.8	4.1	6	4.7	5.4
Operating margin	5%	14%	13%	7%	6%

Source: FactSet

5.3.1 Summary of the valuations

The DCF and the EV/Revenues multiple suggest valuations above PMV. Figure 5.13 illustrates the valuation intervals from the two methods and the PMV. The R-model generates a valuation interval between $1.44bn and $2.56bn. This implies an *undervaluation* between 13% and 51% compared to the PMV of $1.25bn. We use a CAGR of 17.8% and 22.8% as the lower and upper bound of the interval, and a margin of 13%. The relative valuation yields a slightly lower result with a valuation between $0.98bn and $1.81bn.

Figure 5.13 – Football field illustration of BrewDog's valuation intervals



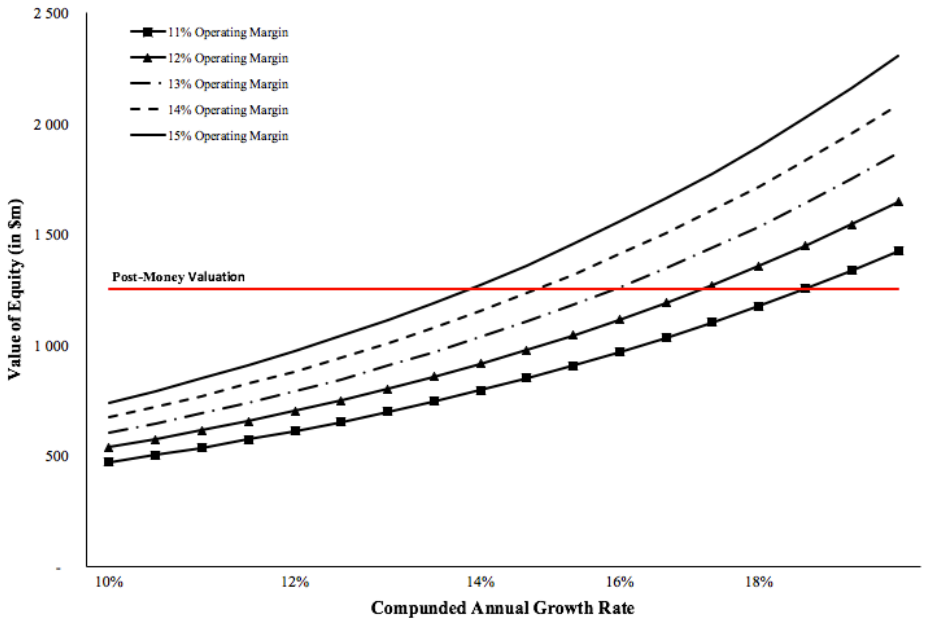
Source: R-model

The reason for the high valuation is BrewDog's promising financial prospect. It is the only sample firm not considered to be a technology firm. It has been profitable in five consecutive years since 2012 and is likely to reach the $100m threshold in revenues in the near future. Hence, BrewDog's historical performance clearly stands out from the other sample firms, which is the main contributor to the high valuation.

5.3.2 R-model

This section presents the analysis behind the DCF valuation interval illustrated in Figure 5.13. We start with an analysis of the CAGR and operating margin, before we present the input variables used in the R-model. Figure 5.14 illustrates the 500 valuations generated by the model, based on the different scenarios on revenue growth paths and operating margins.

Figure 5.14 – BrewDog's valuation scenarios



Source: R-model

CAGR:

BrewDog's historical performance indicates a promising future. The results from the R-model suggest that the company would need a CAGR between 15% and 19% to defend the PMV, given the margins we have included in the OM vector. Considering the bright forecasts of the craft beer industry, this growth is well within what we believe is achievable for the firm. Table 5.12 is a summary of five scenarios where different levels of CAGR and operating margins

provide a valuation close to the one presented in the media. It suggests that BrewDog will need an increase in revenues between 594%-1,030%, depending on the margin it achieves.

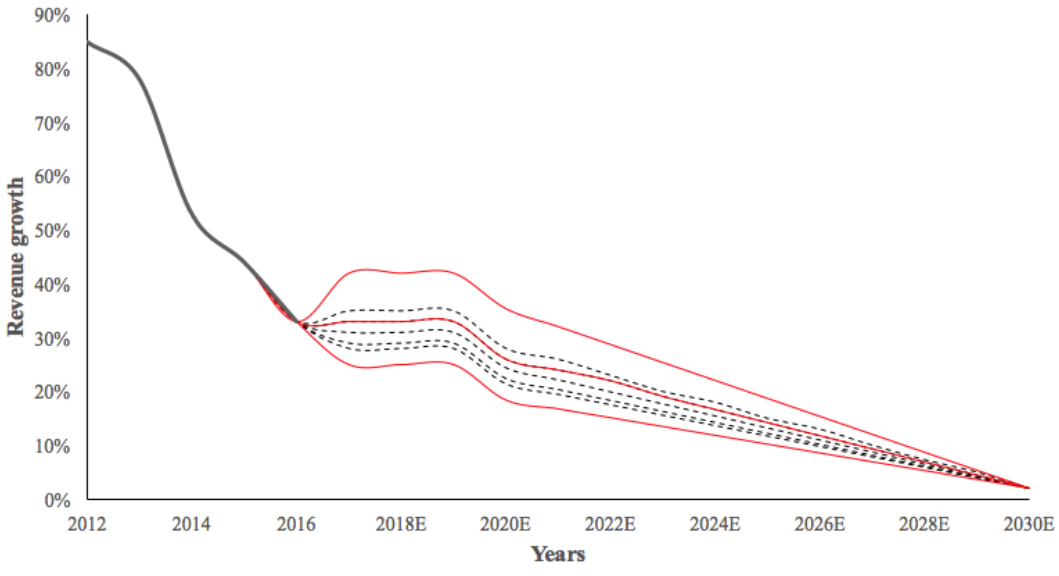
Table 5.12 – Summary of BrewDog's scenarios yielding PMV

Operating Margin	Value of Equity ($m)	Revenues terminal year ($m)	CAGR	Growth in revenues
11%	1,252	1,006	18.9%	1,030%
12%	1,269	878	17.8%	887%
13%	1,260	764	16.6%	758%
14%	1,231	664	15.5%	646%
15%	1,271	618	14.9%	594%

Source: R-model

The base case scenario, which illustrates the forecasted growth path of the craft beer industry, has a CAGR equivalent to 17.8%. This is between the upper and lower boundary of the annual growth rates in Table 5.12, which highlights that the scenarios in the table are realistic if BrewDog grows with the market. We also illustrate this in Figure 5.15, which is a plot of the growth path in the five scenarios (dotted lines), the historical growth (bodied line), and three scenarios which we find to be realistic (red lines). The red lines represent the good

Figure 5.15 – BrewDog's revenue paths, realistic and high-valuation scenarios



Source: R-model

case (upper), the base case (middle) and the bad case scenario (lower). Good case and bad case are defined as base case +/- five percentage points CAGR. We observe that the base case scenario has the exact same growth path as the second scenario in Table 5.12. This means that

BrewDog's valuation should be exactly equivalent to the PMV if it continues with its present business model and grow at the same pace as the market, and at the same time achieves an operating margin in steady state of 12%.

Figure 5.15 also illustrates a continuation of the recent growth of the company. Hence, BrewDog's valuation should not deviate too much from PMV of $1.25bn if it manages to obtain a growth path close to the forecasted market growth.

Operating margins:

The industry average operating margin for the alcohol beverage industry is 22.65% (Damodaran, 2018). However, the sample mainly consists of importers or producers of wine and liquor rather than beer products. We thus have to apply comparable margins from the peer group. We identify three craft beer companies, all listed on North-American stock exchanges. These are Boston Craft Beer Company, Brick Brewing and Craft Beer Alliance, with operating margins of 13%, 13% and 2%, respectively. BrewDog has already become profitable, with a margin of 6%. Considering this, and the high growth forecast of the industry, we exclude the lowest value from the sample. Boston Beer Company is perhaps the best comparable of the three. In 2016, it reported revenues of $863m, which is close to the level we believe BrewDog will end up with in steady state. Similar to BrewDog, its focus is solely on premium craft beer products. It was founded in 1984, and went public in 1995, which indicates that the company has reached steady state. We thus assume that BrewDog can end up with a margin similar to Boston Beer Company's at around 13%.

In summary, with an operating margin of 13% and a CAGR from 17.8% to 22.8%, we end up with a valuation interval between $1.44bn and $2.56bn for BrewDog.

Input variables:

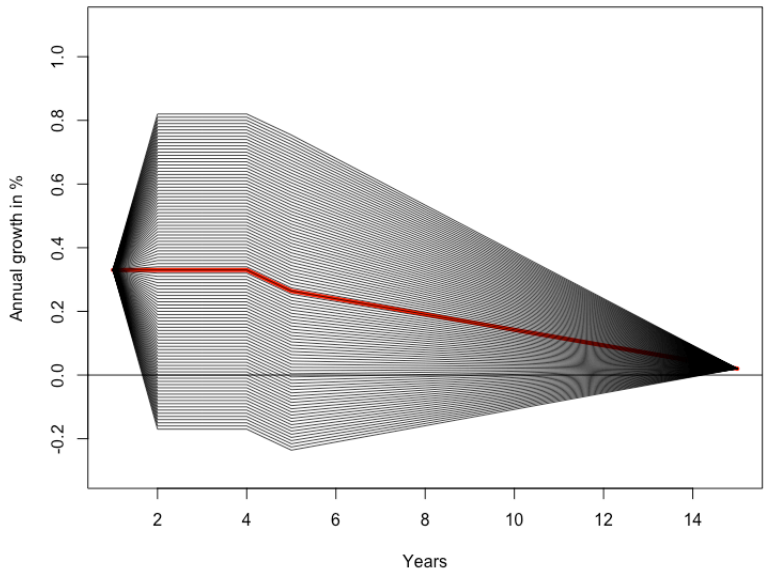
Growth stage

BrewDog's equity is raised through crowdfunding and one VC round. According to its own website, the company had in 2017 a total of 70,000 shareholders across the world (Brewdog, 2018a). The crowdfunding has provided Brewdog with more than $70m. From the VC round (April 2017), it was able to raise another $124m which gave the company a PMV of $1.25bn. Since a substantial share of financing is through crowdfunding, it is difficult to determine whether it is mature in its funding cycle. However, considering the maturity of the company and the recent growth in revenues, we set the variable company growth to medium.

Market size forecast

BrewDog belongs to the beer industry, which is by far the oldest sector in the sample. Numbers from Statista (2018f) suggest that the industry size is going to remain unchanged until 2021, which sounds like a reasonable assumption considering its maturity. BrewDog, however, is a craft beer brewery, producing premium beer products. It is difficult to find exact numbers on the size of this specific market, but the segment was forecasted to represent 12% of the total beer market in 2017 and it has experienced double digit growth in recent years (Daniels, 2017). The market was, according to a report from Deloitte (2017), estimated to be worth $85bn in 2015 and is forecasted to be worth $500bn by 2025 which corresponds to a CAGR of 19.5% in the period. We thus set the market growth to 25% in 2017-2020, before it gradually declines toward 2% in 2030. The red line in Figure 5.16 illustrates the growth path of this base case scenario. Considering the high growth toward 2025, we set the forecast period to 14 years.

Figure 5.16 – BrewDog's revenue scenarios

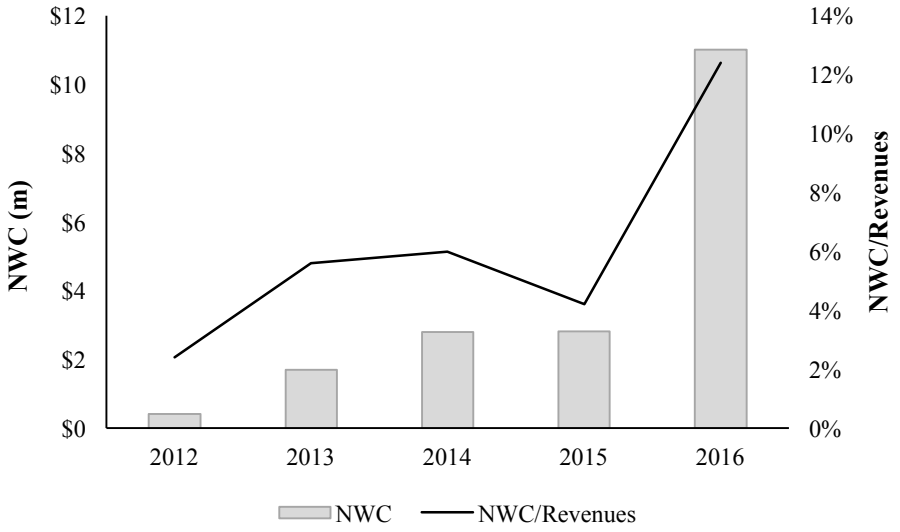


Source: R-model

Net Working Capital

Figure 5.17 shows BrewDog's NWC from 2012 to base year in 2016. We observe that the trend was relatively flat in the period 2012-2015, before it significantly increased in 2016. Hence, we can argue for both a flat and an increasing trend. The industry average ratio is 6.7% (Damodaran, 2018), but the firms in the sample are mostly wine and liquor producers and importers. Hence, the industry average ratio may be misleading, and we set the trend to *Flat* instead of *Increasing*. The ratio then converges toward the average historical trend instead of the industry average ratio.

Figure 5.17 – BrewDog's NWC and NWC ratio from 2012-2016



Source: FactSet

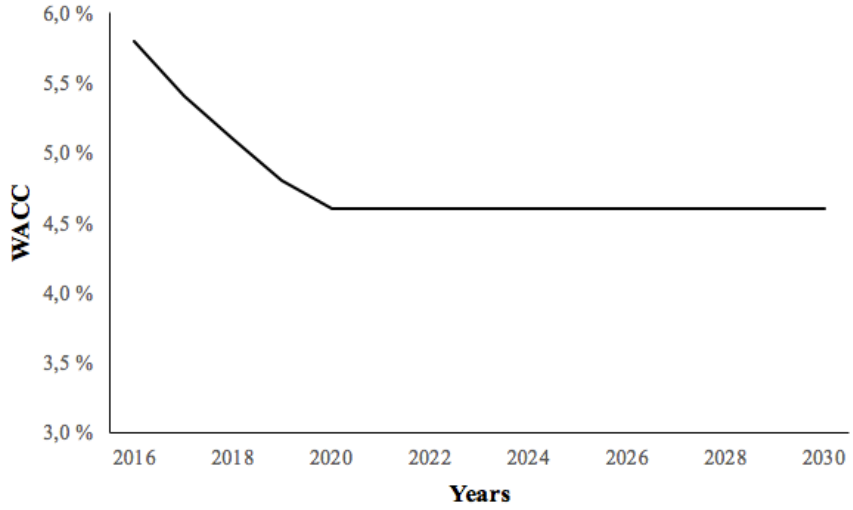
Depreciation

The depreciation/PPE ratio has been fairly constant at approximately 5% between 2014 and 2016. The mean of the observations is 4.75%, which is the ratio we use during the whole forecast period.

Cost of Capital

As a proxy for BrewDog's *risk-free rate*, we apply the UK 10-year government bond rate, currently trading at 1.48% (Bloomberg 2018c). We further use the implied *MRP* of 5.44% from Market-risk-premia.com (2018). As mentioned, a large share of BrewDog's equity has been financed through crowdfunding. The company has established a funding campaign called *Equity for punks*, where it promises to open a bar or brewery in a country or city if the funding from this specific location surpasses a prespecified milestone (Brewdog, 2018b). This indicates that the company is not likely to go public in the near future. The co-founders confirmed in 2017 that an IPO is planned within the next five years, but not within the next 12-18 months (Key, 2017). We thus set the years to IPO variable to four years. We further obtain industry data from Damodaran's dataset (2018) which gives us a target *equity ratio* of 71.5% and a *cost of debt* equal to 4.4%. The *tax rate* we apply is the UK statutory tax rate of 20%. Figure 5.18 shows the output from the cost of capital function.

Figure 5.18 – BrewDog's cost of capital (WACC)



Source: R-model

Operating margins

The operating margin vector is ranging between 11% to 15% with an interval of 1 pp.[25]

5.3.3 Relative valuation

Peer group:

Table 5.13 shows the peer group with the corresponding EV/Revenues ratios at the time of the PMV. The PMV of BrewDog was conducted in April 2017, and we thus use the last observation which was in December 2016. Few craft beer breweries have been listed on any stock exchanges so far. From the initial peer group identified, we exclude companies that are clearly not in steady state and where we fail to find historical EV/Revenues ratios at the specific time of the PMV. The final result is the three companies listed in the table, with a median ratio is 2.17.

Table 5.13 – BrewDog's peer group and EV/Revenues ratios

Company	EV/Revenues
Boston Craft Beer Company	2.22
Brick Brewing	2.17
Craft Beer Alliance	0.90
Average	**2.17**

Source: FactSet

[25] See analysis of operating margin for arguments behind this decision

EV/Revenues:

Table 5.14 presents the final result of the relative valuation when applying the good and base case scenario on the median ratio of the peer group. We apply steady state revenues in 2030 generated from the R-model, as we believe the companies we identify have reached this stage. By multiplying the revenues with the median ratio and discounting it, we receive an implied enterprise value of BrewDog in December 2016. Finally, we subtract for net debt and end up with a suggested value of equity for each scenario. We observe that the valuation yields a value interval between $0.97bn in base case and $1.81bn in the good case.

Table 5.14 – Relative valuation of BrewDog, in $million

	Base case	**Good case**
Revenues (2030)	879	1,604
EV/Revenues	2.17	2.17
Implied EV (Dec 16)	1,011	1,845
Net Debt	37.3	37.3
Value of Equity	**974**	**1,808**

Source: FactSet

6. Findings

Table 6.1 presents the overall result of the 12 valuations. The initial result is the average of the valuation interval from the R-model presented under each company analysis. Δ Value is the percentage of how much PMV overvalues or undervalues (negative sign) the company in comparison to our estimates. As we have highlighted, the assumptions in the forecasting process are based on conservative estimates. We show that valuations are most sensitive to changes in WACC[26], which is perhaps the most conservative assumption. We therefore interpret the initial results with caution, and introduce a sensitivity analysis on this value driver. To illustrate the effect of a higher cost of capital on the firm value, we include the initial result plus 1 pp increase in WACC (column 5 and 6 of Table 6.1). We observe that five of the 12 sample firms are undervalued in the conservative analysis. When we increase WACC with 1 pp, all valuations fall below PMV, and the median overvaluation increases with 50 pp. In the following sections, we discuss the initial result and the WACC sensitivity. The last part of this chapter is an analysis of similar characteristics among the companies.

Table 6.1 – Overall results from R-model, in $million

		Initial result		*Initial result +1 pp WACC*	
Company	**PMV**	**Valuation**	**Δ Value**	**Valuation**	**Δ Value**
Spotify	8,530	5,477	56%	3,683	132%
The Hut Group	3,250	1,186	174%	944	244%
Klarna	2,500	3,150	-21%	1,738	44%
Deliveroo	2,000	1,255	59%	1,006	99%
Transferwise	1,600	2,090	-23%	1,394	15%
Oxford Nanopore	1,580	916	72%	567	179%
Blippar	1,550	2,000	-23%	1,341	16%
Farfetch	1,500	1,805	-17%	1,419	6%
BrewDog	1,250	2,000	-38%	1,174	6%
Funding Circle	1,000	710	41%	422	137%
Home24	1,000	394	154%	279	259%
Improbable	1,000	913	10%	666	50%
Average			**37%**		**99%**
Median			**25%**		**75%**

Source: R-model

[26] See section on *initial result with WACC sensitivity*

6.1 Initial result

We observe that seven firms are overvalued in the initial result. Five firms are overvalued with more than 50%, whereof two are significantly overvalued with more than 100%. The average and median overvaluation is 37% and 25%, respectively. An interesting observation is that four of the 12 firms are valued below the $1bn threshold, implying that they lose the unicorn status. This corresponds to one third of the sample firms. Among these four, three has a PMV of exactly $1bn.

Five firms have an average valuation above PMV, suggesting that PMV in fact understates our estimates of the firm value. Brewdog is the most undervalued company, where our valuation implies that PMV underestimates the firm value with 38%

It is the only company in the sample who is not a technology firm, and has, despite its young age, been profitable for five years. The craft beer industry is forecasted to continue its rapid growth, and the company has many competitive advantages. This highlights the opportunities the company has in reaching the performance required to defend the PMV.

6.2 Initial result with WACC sensitivity

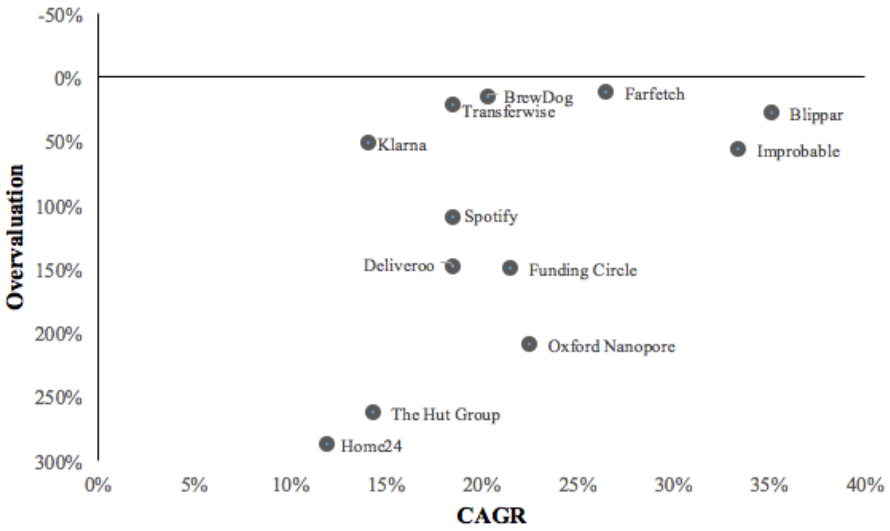
As we highlighted, we need to interpret the initial result with caution. Our assumptions are made with conservative estimates and changes in cost of capital have significant impact on firm value. To show this, we include the initial result with a 1 pp increase in WACC, illustrated in column 5 and 6 in Table 6.1.

We observe that by increasing cost of capital with 1 pp, all firms are valued below their respective PMV. The average overvaluation increases from 37% to 99%, whereas the median increases from 25% to 75%. THG falls below the $1bn threshold, and five firms lose the unicorn status in total which corresponds to 42% of the sample. Moreover, seven firms are overvalued with 50% or more, whereof five are significantly overvalued with more than 100%. Hence, an increase in the cost of capital estimates has a substantial effect on the initial result.

In Figure 6.1, we plot the degree of overvaluation against the corresponding average CAGR used in the valuation interval. The horizontal axis represents PMV. Note that the y-axis is in reverse order, so that the companies who are valued lower than PMV are below the horizontal axis and opposite. All firms are under the PMV axis. The companies who are overvalued the most have the lowest expected CAGR, but we do not observe a significant pattern between the expected growth rate and degree of overvaluation, suggesting that other

factors have an influential impact as well. For example, Klarna has a similar CAGR to Home24 and THG but a valuation closer to PMV. This is due to the different level of risk between these firms. Klarna and THG have similar financial prospects, but Klarna has a substantially lower

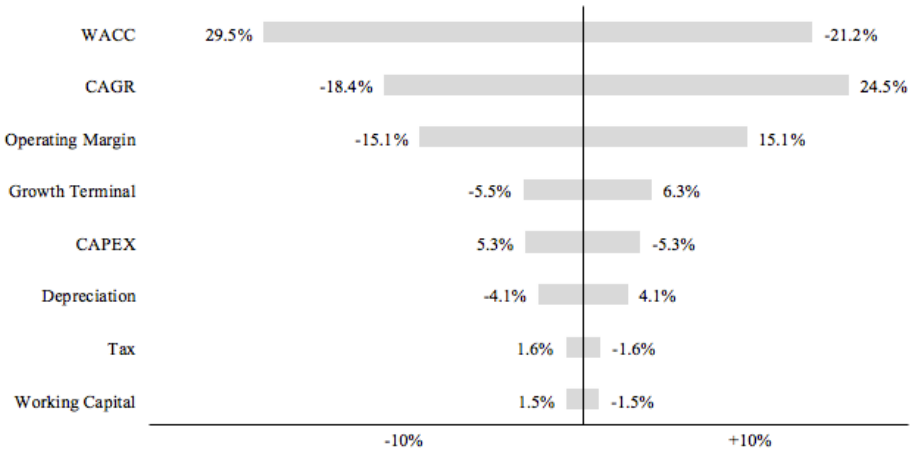
Figure 6.1 – Plot of CAGR and overvaluation with a 1 pp increase in WACC



Source: R-model

cost of capital. Berg & Gider (2016) find evidence that banks are less risky because the assets are well-diversified. Banks are exposed to all different kinds of industries and have therefore a higher leverage than other companies. The low asset risk makes it cheap for banks to have high leverage which results in lower cost of capital. Hence, we assume that the risk is lower for holding securities in Klarna than in THG. This difference in risk level, which is reflected by the cost of capital, is the factor with the greatest impact on firm value. This is why we consider different levels of WACC before making a final conclusion. We illustrate the sensitivity on firm value with a 10% change of key value drivers in Figure 6.2. We calculate the average impact on firm value for all the companies in the sample when changing the value driver input accordingly. The bars on the left side of the vertical axis show the effect on firm value with a 10% decline, and on the right side they illustrate the impact of a 10% increase. A decline or increase affects the value differently for the different value drivers. For example, will an increase in the terminal growth rate from 2% to 2.2% increase the firm value, whereas an increase in tax rate from 20% to 22% result in a lower firm value. As we observe, firm value is most sensitive to WACC. A 10% increase in WACC results in a 21.2% decrease in firm value, whereas a 10% decrease increases firm value by 29.5%.

Figure 6.2 – Tornado chart of key value drivers' sensitivity on firm value



Source: R-model

Table 6.2 presents how different levels of increase in WACC affect firm value and the degree of overvaluation in comparison to PMV. By increasing WACC with 0.5 pp, the firm value declines with 19% and the overvaluation increases with 33 pp on average. To illustrate with an example, by increasing Spotify's WACC from 6.7% to 7.2%, the firm value declines from $5.5bn to $4.5bn which equals -18%, and the overvaluation increases from 66% to 103%, which is a rise of 38 pp. In this scenario, BrewDog is the only firm which is not considered as overvalued. Klarna, Transferwise, Farfetch and Blippar goes from being undervalued to overvalued. If we increase WACC with 1 pp, the firms loose on average one third of its value and the overvaluation increases with 62 pp. In this scenario, all firms are considered to be overvalued, which is the outcome illustrated in Figure 6.1. A 2 pp increase in WACC removes one half of the firm value while overvaluation increases with 153%.

Table 6.2 – Average sensitivity on firm value for different levels of WACC increase

	+0.5%	**+1%**	**+1.5%**	**+2%**
Δ Firm Value	-19%	-32%	-43%	-51%
Δ Overvaluation (pp)	33%	62%	105%	153%

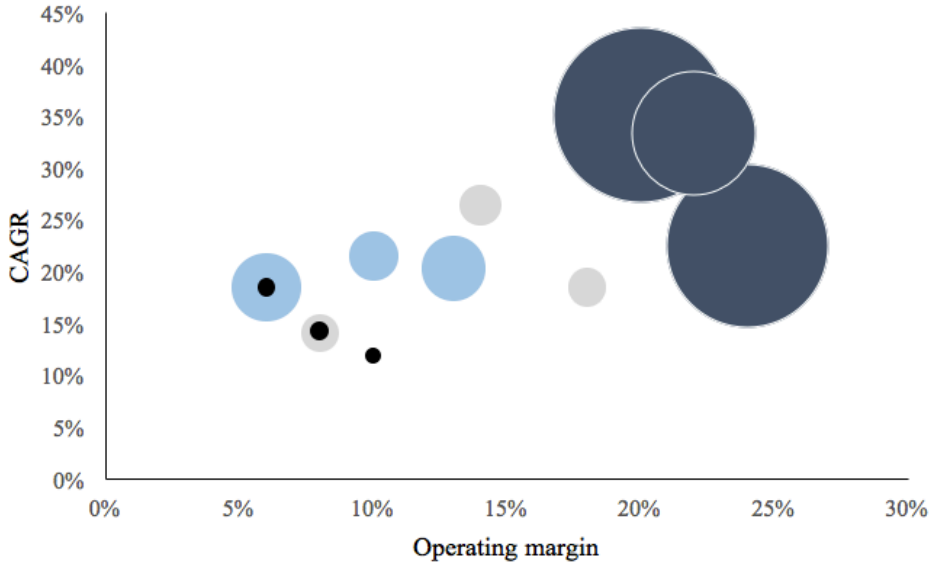
Source: R-model

6.3 EV/Revenues groups

Further, we divide the sample firms into different groups based on similar factors. This allows us to identify what attributes they share and potential reasons for the difference in overvaluation.[27]

The first analysis is a separation on the EV/Revenues multiple. As we explained in Chapter 3, this multiple has significant weaknesses because it assumes identical EBITDA margin among the firms. It is, however, the most appropriate multiple when valuing high growth start-ups. Only three of the sample firms have become profitable in base year, which means that it cannot say anything about the current operating margin. Hence, we interpret a high EV/Revenues ratio as expectations of future growth opportunities in revenues and opposite for a low ratio. When calculating the EV/Revenues ratio, we divide our valuations on the revenues in base year. Appendix 3 provides a detailed table of the four groups and corresponding financials. Group 1 is the three firms with the lowest EV/Revenues ratios. These are Spotify, The Hut Group and Home24, and the ratios are ranging between 1.5 and 1.9. Group 2 consists of Klarna, Deliveroo and Farfetch, and have ratios ranging between 7.9 and 8.8. Group 3 is Transferwise, BrewDog and Funding Circle and have multiples ranging between 13.2 and 25.1, whereas the last group is the three companies with the highest multiples, ranging between 92.7 and 163.9. These are Oxford Nanopore, Blippar and Improbable.

Figure 6.3 – Plot of EV/Revenues groups based on CAGR and Operating Margin



Source: R-model

[27] Due to a limited sample size, we should interpret these results with caution

Figure 6.3 is a plot of the companies' estimated CAGR and operating margin, where the firms in the same group share the same colour. The size of the circles illustrates the EV/Revenues multiple. We cannot observe a clear pattern between group 2 and 3. In fact, group 2 is expected to achieve higher margins and revenue growth on average compared to group 3, although our interpretation of the EV/Revenues multiple suggests the opposite.

We can, however, observe a clear distinction between group 1 and 4. Group 4, which has the highest EV/Revenues multiple, is clearly expected to obtain a higher margin and CAGR than the firms with the lowest multiple. Two of the firms in group 1, The Hut Group and Home24, are the companies we believe have the highest degree of overvaluation. They are also expected to obtain a lower margin in terminal year and CAGR in the forecast period. Other observations from Appendix 3 is that the companies in group 1 (lowest EV/Revenues) have raised more equity in their previous VC rounds, have acquired more companies, and are older (more years between founding date and date of PMV) compared to the other groups. The opposite is the case for group 4, which has acquired fewer firms, have raised less money in their VC rounds and are younger. An interesting observation is that two of the three firms in group 4 are among the firms who are valued closest to PMV, as opposed to the firms in group 1 which are by far the most overvalued ones. Hence, the firms who have realised most of its growth potential (low EV/Revenues and expected CAGR) are those who are overvalued the most, whereas the firms with most potential are those who are valued closest to PMV (high EV/Revenues and expected CAGR). There is no clear trend on the level of profitability in base year, except that two of the firms in group 4 have a highly negative operating margin, which is consistent with its age, growth potential of the industry (mainly AR/VR), number of acquisitions and money raised.

6.4 Industry groups

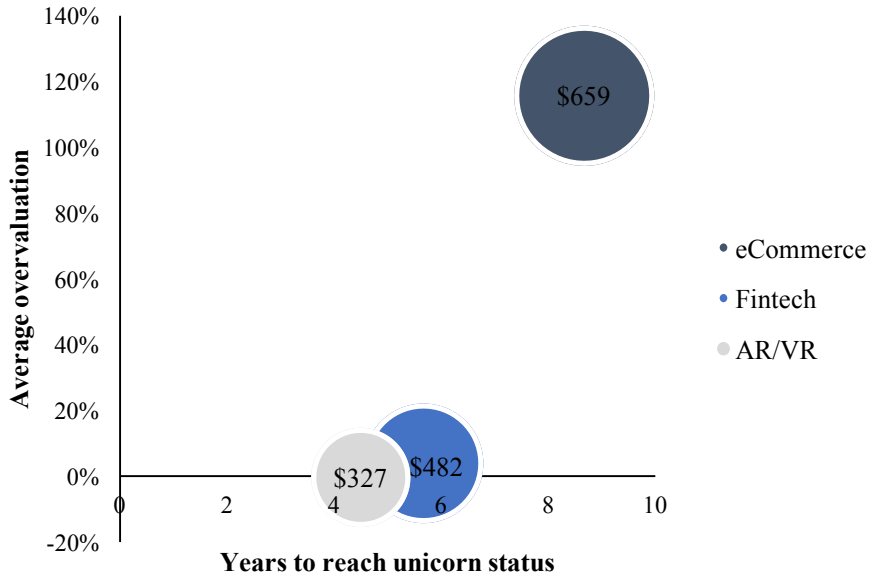
In the analysis, we include industries that have two or more companies.[28] From the data, and the given restrictions, we end up analysing three industries; ecommerce, Fintech and AR/VR.[29]

We observe in Figure 6.4 that the companies in the ecommerce industry are significantly overvalued, while Fintech and AR/VR are priced fairly close to PMV on average. In the Fintech industry, both Klarna and Transferwise are undervalued. However, this is

[28] Here again, due to a limited sample size of 2-3 companies in each group, we should interpret these results with caution)
[29] Ecommerce consits of The Hut Group, Home24 and Farfetch. Fintech consists of Klarna, Transferwise and FundingCircle. AR/VR consists of Improbable and Blippar

moderated by Funding Circle's low valuation. As indicated by the size of each circle, the ecommerce companies also have a larger amount of capital raised. They use 9 years on average from founding to reach a $1bn valuation, compared to Fintech and AR/VR at 6 and 5 years, respectively.

Figure 6.4 – Industry findings



Source: R-model & Crunchbase (2018)

7. Conclusion

In this thesis, we challenge the post-money valuation (PMV) approach with an emphasis on European unicorns. The method assumes that common shares, usually held by owners and employees, have the same value as preferred shares, commonly purchased by VCs in later rounds. Hence, it likely overstates the fair value of the firms. We use a sample of 12 European unicorns and value them with the help of a DCF-based model developed in the statistical programming language R. A clear deviation between the reported value and our estimated valuations indicates that PMV misprices the firm.

Based on our findings, we conclude that the PMV overstates the fair value of the European unicorn sample. At best, the initial result suggests that most companies are overvalued whereas some are slightly undervalued. The median overvaluation of the sample is 25%. When we increase the conservative cost of capital estimates with one percentage point, the result suggests that all firms are overvalued, with a median overvaluation of 75%. Our valuations indicate that European unicorns will need an abnormal operational improvement toward steady state in addition to significantly outperform the peer group and industry forecasts in order to generate cash flows that are sufficient to defend the PMV. This is the case for all the sample firms, which indicates that the PMV overstates the fair value of unicorns.

The thesis has some notable limitations. The conclusion is substantially affected by lack of key financial information on unicorns. We should therefore be careful when generalising the results to the whole European unicorn market. The sample is limited and is not randomly collected. We value only the firms who have disclosed sufficient financial information, and hence are likely to have less incentives to hide manipulation of firm value. However, the disclosure of financial information is not solely a result of managerial decisions, but also of differences in corporate regulations between countries. Furthermore, our valuations are based on many assumptions of future performance. To strengthen the results, we keep the estimates conservative. However, we cannot say with certainty that our estimates represent the upper boundary of how the company can perform in steady state.

Without the COIs between the entrepreneur and the VC, we cannot observe whether the preferred shares issued contain an excessive amount of upside protection in Europe, as Gornall & Strebulaev (2017) claim is the case in the US. For future research papers, it can be interesting to value European unicorns with a contingent claim method to observe whether the value of the pay-off structure between the different share classes reflect the PMV.

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Appendix

Appendix 1 – List of European Unicorns

Company	PMV (bn)	Country	Industry
Spotify	$8.53	Sweden	Consumer Internet
Global Switch	$6.02	United Kingdom	Computer Hardware & Services
Auto1 Group	$3.54	Germany	ecommerce/Marketplace
Otto Bock HealthCare	$3.50	Germany	Healthcare
The Hut Group	$3.25	United Kingdom	ecommerce
BGL Group	$3	United Kingdom	Fintech
Klarna	$2.50	Sweden	Fintech
VistaJet	$2.50	Malta	On-demand
Adyen	$2.30	Netherlands	Fintech
NuCom Group	$2.20	Germany	Management & Strategy Consulting
Deliveroo	$2	United Kingdom	On-demand
benevolent.ai	$1.85	United Kingdom	Healthcare
CureVac	$1.65	Germany	Healthcare
TransferWise	$1.60	United Kingdom	Fintech
BlaBlaCar	$1.60	France	Transportation
Oxford Nanopore	$1.55	United Kingdom	Healthcare
Farfetch	$1.50	United Kingdom	ecommerce/Marketplace
Blippar	$1.50	United Kingdom	AR/VR
BrewDog	$1.25	United Kingdom	Food & Beverages
ACORN OakNorth	$1.20	United Kingdom	Fintech
Global Fashion Group	$1.10	Luxembourg	ecommerce/Marketplace
OVH	$1.10	France	Big Data
Radius Payments Solutions	$1.07	United Kingdom	Internet Software & Services
Avaloq Group	$1.01	Switzerland	Fintech
Funding Circle	$1	United Kingdom	Fintech
AVAST Software	$1	Czech Republic	Cybersecurity
letgo	$1	Netherlands	ecommerce/Marketplace
MindMaze	$1	Switzerland	AR/VR
Home24	$1	Germany	ecommerce
Improbable	$1	United Kingdom	AR/VR

Appendix 2 – Analysis and valuations

Blippar Valuation

Blippar specialises in augmented reality, artificial intelligence and vision computer technology. It has developed a mobile application, where the user can use its camera to identify real life objects. In mid-2016, more than 65m users in 170 different countries were using their app (CNBC, 2016). Blippar was founded in 2011, and has had three VC-backed funding rounds since. In early 2015, it raised $45m which gave the firm a PMV of $1.55bn (Crunchbase, 2018d). Blippar's revenues are still very low and it has yet to become profitable, as we illustrate in the historical performance table. The company is, however, operating in a very young industry with great potential, and most if its value thus reflects future growth potential.

Historical performance:

	2012	2013	2014	2015
Revenues ($m)	1.5	5	7	12.2
Revenue growth	524%	235%	39%	75%
EBIT ($m)	-0.2	0.2	7.8	-37.5
Operating Margin	-12%	3%	-111%	-307%

R-model

Input variables:

General		Cost of Capital			
Post-money valuation ($m)	1,500				
Company growth	High	Tax rate	20%	Market beta	0.8
Trend in NWC ratio[1]	No trend	Risk-free rate	1.48%	Industry market correlation	16.2%
Depreciation/PPE[2]	43%	Market risk premium	5.44%	Equity ratio	93.4%
Operating Margin vector	14% - 22% á 2%	Years to IPO[3]	6	Cost of debt	4.73%
Net Debt ($m)	-45.7				

Forecasted Cost of Capital:

	2015	2016	2017	2018	2019	2020	2021-2030
WACC	9.7%	8.6%	7.7%	7%	6.5%	6%	5.7%

Market size forecast:[4]

	2016E	2017E	2020E	2025E	2030E
Market size ($bn)	7.6	18.2	80	569	1,384
CAGR (since 2015)	69%	101%	78%	62%	47%

Comments:

[1] Historical ratio in the period 2011-2015: -8.5%, 11.7%, 34.5%, 20.7%, 2.4%

[2] Historical ratio in the period 2013-2015: 36%, 59%, 35%

[3] We have not found any information suggesting that Blippar is considering an IPO in the near future. The financials also suggest that it is unlikely to happen anytime soon. According to Gornall & Strebulaev (2018), the average time between the fourth VC-backed financing round and exit is 3.9 years. Blippar's last funding round was their third, which means that it is likely to be more than four years until exit. We thus set the *years to ipo* variable to six years.

[4] Blippar operates in a very young industry, with high growth potential. According to BCC research (2016), the Augmented- and Virtual Reality (AR/VR) industry was valued at $4.2bn in 2015, but is according to Citi GPS (2016) expected to skyrocket toward 2025 as we illustrate in the market size forecast table. The industry is forecasted to grow from $4.2bn in 2015 to $80bn in 2020, $569bn in 2025 and $1.4 trillion in 2030. This is equivalent to a CAGR of 47% in the period between 2015 and 2030. We observe that the CAGR is declining after 2017, which indicates that the industry will stabilise around 2030. The CAGR between 2025 and 2030 is only 19% compared to 78% between 2015 and 2020. Hence, we assume that Blippar will reach a steady state in 2030, and set the length of the forecast period to 15 years.

Analysis:

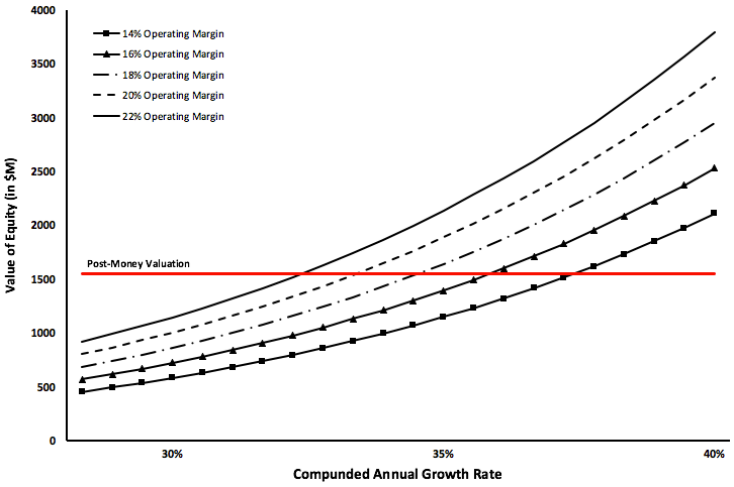

Figure A2.1 – Blippar's valuation scenarios

Operating Margin: In 2015, Blippar had an operating margin of -307%. It is especially difficult to predict the margin this company will achieve in steady state, due to the AR industry still being very young. We cannot locate any listed companies approaching steady state which solely develops AR technology. Large tech corporates such as Google, Microsoft, Facebook and Amazon are entering the industry, and acquires the smaller start-ups developing AR/VR technology (CB Insights Research, 2017). This prevents listings of the providers. The only benchmark we have of operating margin is Damodaran's data on industry average. Blippar is developing an augmented reality application for smartphones. We thus use the margin of the Software (system and application) industry of 20% as the main benchmark. Although Blippar's apps differ from the ones in this sample, we believe that a similar margin is a fair estimate. We therefore assume that Blippar will achieve an operating margin of 20% in steady state.

Operating Margin	Value of Equity (m)	Revenues terminal year (m)	CAGR	Growth in revenues
14%	$1,512	$1,382	37%	11,228%
16%	$1,597	$1,225	36%	9,941%
18%	$1,531	$1,020	34%	8,261%
20%	$1,538	$901	33%	7,285%
22%	$1,519	$795	32%	6,416%

Table A2.1 – Summary of Blippar's scenarios yielding PMV

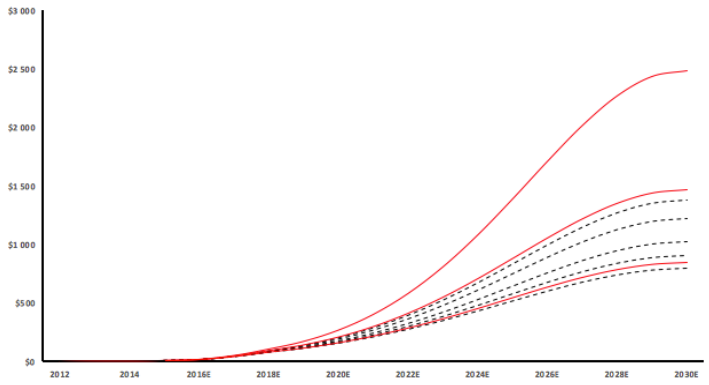

Figure A2.2 – Blippar's revenue paths, realistic and high-valuation scenarios

CAGR: In 2015, Blippar earned just above $12m in revenues. This indicates that the firm needs to grow at high pace in the future in order to defend the valuation. The market size forecast shows that the AR/VR industry is expected to increase from $4.2bn in 2015 to $1.4tr in 2030. The high expected growth of the industry increases Blippar's probability of generating significant growth. The outcome of the R-model, as we illustrate in figure A2.1, suggests that Blippar will need a high CAGR to defend the PMV. Depending on the margin it manages to achieve in terminal year, it will need an annual revenue growth between 32%-37% in the whole forecast period.

Table A2.1 is a summary of five scenarios where the value of equity is close to the PMV. The five scenarios require revenues in terminal year between $795m and $1.4bn, which equals a total growth in the forecast period between 6,416% and 11,228%. The corresponding CAGRs are ranging between 32%-37%, which is a tremendous increase in a 15-year period. However, the CAGR in the AR/VR industry is estimated to be 47% between 2015-2030. This is 10 pp above the scenario with the lowest operating margin as illustrated in table A2.1. This suggests that the increase is feasible if Blippar manages to maintain its current market position.

Figure A2.2 is a plot of the growth path in the five scenarios from table A2.1 (dotted lines), the historical growth (bodied line), and three scenarios which we find to be realistic (red lines). The red lines represent the good case (upper), the base case (middle) and the bad case scenario (lower). Base case follows the expected growth path of the market and has a CAGR of 37.6%. Good case and bad case are defined as base case +/- five percentage points CAGR. The CAGR of the base case scenario is lower than the one market forecast because the revenue growth scenarios generated by the model only follows the market growth during the first five years of the forecast period, before it gradually converges toward 2% in terminal year. Hence, the CAGR of base case, which is 37.6%, is lower than the CAGR of the market forecast of 47%. We believe the good case is less realistic, because the competition is expected to be tight with many large tech corporations entering the market. Hence, we do not believe that Blippar will perform better than the forecasted market growth. Instead, we believe that the revenue growth will be between the good case with a CAGR of 37.6% and the bad case with a CAGR of 32.6%, which corresponds to revenues in terminal year between $0.85bn and $1.5bn.

Blippar will need a significant improvement in its operations and business model in order to achieve such levels of revenues by 2030. This is illustrated by ARPU of the application it provides. As mentioned, Blippar has claimed that more than 160m were using the app (CNBC, 2016). It has barely started generating any income, and reported revenues of $12.2m in 2015. If we divide this number on 160m users, we find that ARPU is $0.08. This is fairly low, and it looks like an implausible task for Blippar to earn the level of revenues it needs in terminal year in order to defend the PMV. Digi-Capital, which provides forecasts of the AR/VR industry, expects that 300m will use a mobile augmented reality software by 2017, 800m by 2019 and 1.8bn by 2021 (Digi-Capital, 2017). The corresponding revenues generated by the softwares are $4bn in 2017, $27bn in 2019 and $65bn in 2021. This equals an ARPU of $13, $34 and $36. This again illustrates the significant challenges Blippar is facing. However, if it manages to achieve an ARPU equivalent to the industry average of approximately $35, it will only need a user base of between 24m and 42m in 2030. A large decline in user base from today's level of 160m is reasonable when Blippar starts charging a fee for using the application. By applying the base case and bad case scenario and an operating margin of 20%, we end up with a valuation interval of Blippar between $1.4bn and $2.6bn.

Relative valuation

Due to lack of good comparable firms in the AR/VR industry, we decide not to conduct any relative valuation on Blippar.

Summary

All numbers in $m	Value min	Value max
DCF	1,400	2,600
Multiple	na	na
Post-money valuation	1,500	
Average valuation	2,000	

To finalise Blippar, we conclude that the company was not overvalued in 2015, if we believe in the assumptions from this analysis. With an interval in revenue growth between the forecasted CAGR of the AR/VR industry and the forecast of the industry minus 5%, and an operating margin of 20%, Blippar's value using DCF falls in the area between $1.4bn-$2.6bn. The challenge Blippar will face is the high entry of large tech corporations such as Facebook, Google, Microsoft etc., which are likely to capture a large share of the market. Additionally, Blippar is not generating any money on its users yet and it will need to improve its business model in order to do so.

Transferwise Valuation

Transferwise is an Estonian-developed and UK-based Fintech start-up, founded in 2010 (Crunchbase, 2018f). It provides a P2P Money Transfer service, where it matches a requested outgoing transfer from one country with a requested incoming transfer from the same country. This way, the money does not have to cross the border, which reduces both the transfer time and the costs.

We manage only to obtain Transferwise's revenues for the past three years. The numbers in the historical performance table indicate that the firm is still in a high-growth stage. The revenues have grown rapidly since 2015, where the corresponding operating margin has been highly negative. However, the result from 2017 was close to break-even, which indicates that the operations will become profitable from 2018. Transferwise's latest funding round gave the firm a PMV of $1.6bn.

Historical performance:

	2015	2016	2017
Revenues ($m)	14.4	40.1	83.4
Revenue growth	-	179%	108%
EBIT ($m)	-16.5	-25	-0.07
Operating Margin	-115%	-62%	-0.1%

R-model

Input variables:

General		Cost of Capital			
Post-money valuation ($m)	1,600				
Company growth	High	Tax rate	20%	Market beta	0.94
Trend in NWC ratio[1]	Flat	Risk-free rate	1.48%	Industry market correlation	21.23%
Depreciation/PPE[2]	10.4%	Market risk premium	5.5%	Equity ratio	14.8%
Operating Margin vector	5% - 9% á 1%	Years to IPO[3]	3	Cost of debt	4.43%
Net Debt ($m)	0				

Forecasted Cost of Capital:

	2017	2018	2019	2020-2029
WACC	4.24%	4.15%	4.07%	4.00%

Market size forecast:[4]

	2016	2017E-2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E
Market size ($bn)	1.2	1.7	1.8	1.9	2.0	2.1	2.1	2.2	2.3	2.3
Annual growth	-	7%	6%	5.5%	5%	4.5%	4%	3.5%	3%	2%

Comments:

[1] Historical ratio in the period 2015-2017: -107.5%, -65.3%, -41.7% - The trend is increasing, but we cannot find any data on the average industry ratio. Hence, we set the trend in the NWC ratio to flat.

[2] Historical ratio in the period 2015-2017: 0%, 12.5%, 18.8%

[3] We do not find any information which suggests that Transferwise is considering an IPO in the near future. This is supported by the company's recent financials. The CEO of Transferwise has denied that an IPO is planned, but confirms that a listing is a potential outcome in the future (CNBC, 2018). According to Gornall & Strebulaev (2018), the average time between the sixth VC-backed financing round and exit is 3.5 years, which strengthens the assumption that an IPO is unlikely in the near future. Hence, we set the years to IPO variable to 3 years.

[4] A specific market outlook for Transferwise is difficult to obtain since it operates in the money transfer industry, which is a mature and steady sector. Transferwise is, with the help of new technology, trying to outperform the traditional service of the banks when it comes to international money transfers. In contrast to banks that provide a more expensive and time-consuming service, many Fintech companies utilises peer-to-peer technology and is expected to capture a large market share in the future (TransferWise, 2015). The future of international money transfers will be influenced by competition from different technologies. Blockchain technology is on the rise, and it is reasonable to assume that the larger banks will develop technology to keep up with the progress of the sector. We thus use the forecast of global payment revenues as a proxy when determining the length of the forecast period. BCG estimates a growth from $1.2bn to $2.1bn in the period between 2016-2026, with a CAGR of 7% between 2016-2021 and 5% between 2021-2026 (Global Payments, 2017). We therefore set the market growth to 7% between 2017-2021, before it gradually declines toward 2% in 2029. This is equivalent to a forecast period of 12 years.

Analysis:

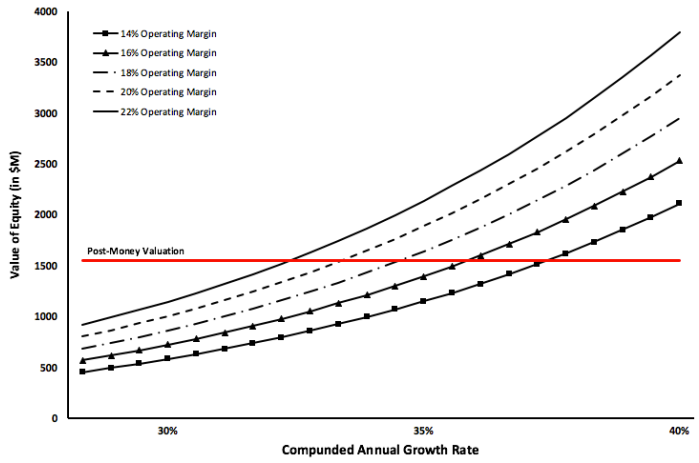

Figure A2.3 – Transferwise's valuation scenarios

Operating Margin: The presentation of Transferwise's peer group is in the relative valuation. Few Fintech corporations that provide a money transfer service have been listed on a stock exchange, and none appear to be in steady state. Thus, we use Moneygram and Western Union as benchmarks when determining operating margin for the sector in terminal year. None of the firms have released its annual report for 2017, but if we look into the reports for 2016 we find that the operating margin was 5.9% for Moneygram and 8.9% for Western Union (Moneygram International Inc., 2017 & Connecting Cross Borders, 2017). We thus set the interval between 5%, which is 1 pp lower than Moneygram's margin, and 9% which is equivalent to Western Unions'. Both Moneygram and Western Union are more traditional providers, offering a service similar to a money transfer in normal banks, which means that its service is more time-consuming and expensive (TransferWise, 2015). Hence, it is reasonable to assume that the margin will be lower if the fees are lower. We do not find any evidence

Operating Margin	Value of Equity (m)	Revenues terminal year (m)	CAGR	Growth in revenues
14%	$1,512	$1,382	37%	11,228%
16%	$1,597	$1,225	36%	9,941%
18%	$1,531	$1,020	34%	8,261%
20%	$1,538	$901	33%	7,285%
22%	$1,519	$795	32%	6,416%

Table A2.2 – Summary of Transferwise's scenarios yielding PMV

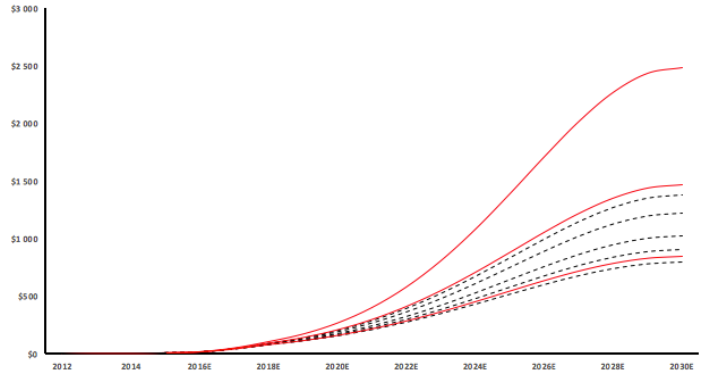

Figure A2.4 – Transferwise's revenue paths, realistic and high-valuation scenarios

that the cost level for Fintech providers are lower than for the traditional providers. We therefore use Moneygram's margin as our main benchmark and assume that Transferwise will end up with an operating margin close to 6% in steady state.

CAGR: Figure A2.3 illustrates that regardless of what operating margin Transferwise ends up with, it will only need a moderate growth in revenues toward 2029 in order to defend PMV. This is also illustrated in Table A2.2. The table is a summary of five scenarios where the R-model generates a valuation close to PMV. We observe that the revenues in terminal year are ranging between $385m and $560m, depending on the margin it manages to achieve, with a corresponding growth in the forecast period between 362% and 571%. This is well within what we believe is realistic for a company with a financial prospect like Transferwise. In 2018, Transferwise is expected to exceed $100m in revenues and become profitable, only eight years after it first started its operations.

It is considered to be the fourth best remittance company worldwide, behind Western Union, Moneygram and Ria (Business Insider, 2016), and is considered as one of the most promising tech start-ups in Europe (Kahn, 2017). Transferwise is thus one of the market leaders in the segment and the most promising provider of international money transfers, and it is reasonable to assume that it will at least maintain its current market position and grow equally with the path of the market. The global Peer-to-Peer Money Transfer segment is according to Statista (2018h) amounting to $97bn in 2018 and is expected to increase to $178bn by 2022, with a corresponding CAGR of 16.5%. This highlights the likelihood that Transferwise can end up with a CAGR equal the ones illustrated in table A2.2. To amplify this further, we look at a plot of the growth paths of the different revenue scenarios as illustrated in figure A2.4.

The dotted lines represent the revenue paths of the five scenarios in table A2.2. The upper dotted line is the revenue path of the scenario with a margin of 5% which yields PMV and the bottom dotted line is the revenue path of the scenario with a margin of 9%. The red lines represent the base case, good case and bad case scenario for Transferwise. Base case represents the middle path in the revenue scenarios generated by the R-model and illustrates the growth of the market with a CAGR equivalent to 16%. The good case has a CAGR equal to base case plus 5 pp and the bad case has a CAGR of base case minus 5 pp. We observe that the scenarios which yield PMV from table A2.2 are gathered around the base case scenario following the expected market growth. This indicates that Transferwise is fairly valued if it maintains its current market position.

Based on this, we believe that Transferwise will end up with a revenue growth path between the base case and good case scenario, with a corresponding CAGR between 16% and 21%. The main challenge it is facing its competition, both in terms of new entrants and technology. Blockchain technology is on the rise, and is by some economists expected to be the future of the money transfer industry. However, Moneygram is already testing the technology of the cryptocurrency Ripple (Fortune, 2018), and Transferwise is likely to do the same if the technology turns out to be as promising as some claims. To conclude this section, the R-model values Transferwise between $1.59bn and $2.59, when using a margin of 6% and a CAGR between 16% and 21%.

Relative valuation

Peer group:

Company	EV/Revenues
MoneyGram	1.08
Western Union	1.98
OFC	2.17
Median	**1.98**

We obtain the peer group from FXcompared (2016), where they present 22 companies operating in the international money transfer industry. Only five of the 22 firms are listed on a stock exchange. Further, we exclude PayPal because we believe its business model and size is too different from Transferwise. I-Remit is the only Fintech start-up listed on a stock exchange, but it is still far from steady state which makes it incomparable. Hence, we end up with MoneyGram, Western Union and OFX. MoneyGram and Western Union's ratios are from December 2017, whereas OFX' ratio is from September 2017. Transferwise received its last PMV in mid-November 2017.

Valuation

Numbers in $m	Value min	Value max
Revenues (2029)	495	806
EV/Revenues	1.98	1.98
Implied EV (Dec 2017)	607	988
Net Debt	0	0
Value of Equity	**607**	**988**

We observe that the corresponding EV/Revenues ratios are relatively similar for the three firms. By multiplying the revenues Transferwise is forecasted to obtain in terminal year with the corresponding median EV/Revenues ratio from the peer group and discounting it back to 2017 values, we end up with a valuation of $607m in base case and $988 in good case. Both these values are very low compared to PMV and the values obtained from the R-model. The result suggests that Transferwise is not considered as a unicorn.

Summary

Numbers in $m	Value min	Value max
DCF	1,590	2,590
Multiple	607	988
Post-money valuation	1,600	
Average valuation	**1,440**	

We observe that Transferwise's average valuation of $1.44bn is fairly close to the PMV of $1.6bn. We put more emphasis on the R-model, which clearly suggests that the firm was not overvalued. Hence, if Transferwise manages to obtain or slightly improve its current market position in the expanding industry, the R-model suggests that Transferwise is not overvalued.

Klarna Valuation

Klarna is a Swedish bank, founded in 2005. It provides financial services such as digital payment solutions for online retailers, debt collection and credit payment. It has more than 1,400 employees and 60m customers from 14 different countries (Klarna Norge, 2018). Klarna managed to secure a banking license in 2017, and according to Financial Times (2017), it is looking at offering European customers services such as bank cards and salary accounts, in addition to seeking for future expansion in the US.

During its latest financing round (in July 2017), Klarna raised $225m which resulted in a PMV of $2.5bn (Crunchbase, 2018g). The table below illustrates Klarna's recent development in revenues and EBIT. We can observe that the revenue growth has stabilised between 15%-20% and the operating margin at around 5%. Considering the fact that it currently operates in 14 countries, we believe that the company has a high potential and growth opportunities. In addition, its services are strongly dependent on the ecommerce industry, which is estimated to continue to grow at a high pace in the future.

Historical performance:

	2011	2012	2013	2014	2015	2016
Revenues ($m)	109	181	245	283	328	392
Revenue growth	106%	66%	35%	16%	16%	19%
EBIT ($m)	10	4.9	10.4	13.1	20.2	18.6
Operating Margin	9.2%	2.7%	4.2%	4.6%	6.1%	4.7%

R-model

Input variables:

General		Cost of Capital			
Post-money valuation	$2.5bn				
Company growth	Medium	Tax rate	22%	Market beta	0.94
Trend in NWC ratio[1]	Flat	Risk-free rate	0.81	Industry market correlation	32.4%
Depreciation/PPE[2]	8.2%	Market risk premium	6.8%	Equity ratio	14.8%
Operating Margin vector	5% - 9% á 1%	Years to IPO[3]	4	Cost of debt	4.43%
Net Debt ($m)	83.3				

Forecasted Cost of Capital:

	2016	2017	2018	2019	2020-2028
WACC	4.36%	4.25%	4.16%	4.07%	4.01%

Market size forecast:[4]

	2017	2018	2019	2020	2021
Market size ($bn)	2,290	2,774	3,305	3,879	4,479
Annual growth	23%	21%	19%	17%	15%

Comments:

[1] Historical ratio in the period 2012-2016: 64%, 53%, 48%, 69%, 63%. The trend is relatively flat inn a 5-year perspective.

[2] Historical ratio in the period 2014-2016: 7.3%, 8.4%, 8.9%

[3] Klarna's CEO Mr. Siemiatkowski, says to the Financial Times (2017) that Klarna is not considering an IPO anytime soon. Furthermore, the Swedish newspaper Veckans Affärer (2018) have sources that a near IPO is likely to occur, arguing that one of the lead investors Sequoia is looking to exit its 2010 investment. We therefore believe a public listing is fair to assume in 2020.

[4] Klarna belongs to the banking or financial service industry, however, we base the revenue forecast on the ecommerce industry. This is because it provides services toward the digital payment industry, and it is thus highly dependent on online purchases and the development of the online retail sector. If the ecommerce market size increases, more customers are likely to use Klarna's payment services. And if the company maintains its current market share it is reasonable to assume that it will grow at the same pace as the market, which is the base case for the revenue scenario forecast. The table illustrates Statista's (2018e) forecast of the ecommerce market from 2016-2021. We can observe that the growth is decreasing with 2 pp annually, and the market will reach a stable growth of 2% in 2028 if this trend continues. This is also the reason why we choose a 12-year length of the forecast period.

Analysis:

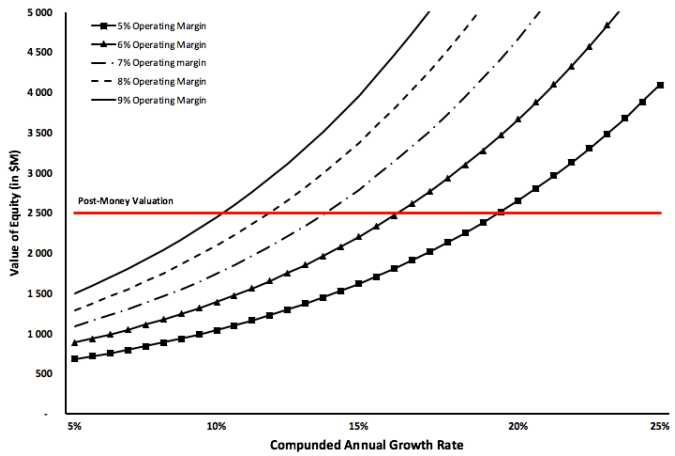

Figure A2.5 – Klarna's valuation scenarios

Operating Margin: As shown in the historical performance table, Klarna had an operating margin of 4% in 2016, with historical levels ranging from 2.7% to 9.2%, and a median of 4.65%. According to Damodaran, the industry average in financial services is 6.39%. From our peer group, we observe that Keyware Technologies NV and Paynova AB have EBIT margins of -83% and 6%, respectively. The third comparable, First Data Corp. provides services on a far broader scale than the current scope of Klarna and generated revenues of $12bn in 2017, (i.e. 4.8x Klarna's revenues in good case). We end up with a benchmark from the peer group of 6%. Klarna's historical high EBIT margin of 9.2% seems to be due to "one-time" events. Considering its expansion plans and development over the past year, we believe a normalised operating margin of 8% is within range. We include the upper bound of our analysis at 9% in the following valuations.

Operating Margin	Value of Equity ($m)	Revenues terminal year ($m)	CAGR	Growth in revenues
5%	2,512	3,309	19%	742%
6%	2,467	2,295	16%	484%
7%	2,480	1,784	13%	354%
8%	2,505	1,470	12%	274%
9%	2,444	1,206	10%	207%

Table A2.3 – Summary of Klarna's scenarios yielding PMV

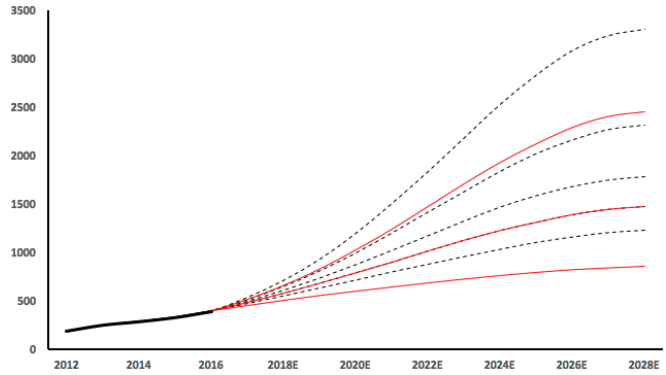

Figure A2.6 – Klarna's realistic and PMV revenue scenarios

CAGR: The scenarios presented in table A2.3 demonstrate that Klarna needs a fairly low revenue growth in the forecast period in order to achieve a value equivalent to PMV. The firm's valuations differ from most of the other companies in the sample due to the low WACC generated from the model. This is because we have defined Klarna as a financial service, and the industry average debt ratio is high for companies in this sector. The cost of debt is in general at a low level, which further results in a low cost of capital. Berg and Gider (2016) find evidence that banks are less risky because the assets are well-diversified. Banks are exposed to all different kinds of industries and therefore have a higher leverage than other companies. The low asset risk makes it cheap for banks to have high leverage which results in lower cost of capital. Hence, we stick with the low WACC for Klarna.

We observe that Klarna would need to achieve a CAGR between 10%-19% in the forecast period in order to receive a value of approximately $2.5bn. Depending on the operating margin it manages to obtain, the total growth rate varies between 207%-742%, which is well within what we believe is realistic for a young company like Klarna. The dotted lines in figure A2.6 are the revenue growth paths as shown in Table A2.3. The red lines represent the base case (middle), base case +5 pp CAGR (top) and base case -5 pp CAGR (bottom).

The fourth scenario in table A2.3 (8% operating margin) has exactly the same growth path as the base case scenario. This means that if Klarna manages to maintain its position in the market and obtain a margin of 8% in terminal year, which we have already discussed as the most likely scenario, it will generate cash flows high enough to defend the PMV. If Klarna, on the other hand, improves its market position (through increased market share or expansion to other markets), it will have a better growth path than the base case scenario (illustrated by the top red line). A 5 pp increase in CAGR compared to the base case scenario yields a valuation equivalent to $3.8bn given an operating margin of 8%. The worst case scenario value the company at $1.4bn, but we do not find this realistic considering its opportunities to expand to further markets. Conclusively, the interval of the R-model values Klarna between $2.4bn and $3.8bn with an operating margin in terminal year of 8%.

Relative valuation

Peer group:

Company	EV/Revenues
First Data Corporation	3.10
Keyware Technologies NV	2.27
Paynova AB	6.63
Median	**3.10**

We obtain the multiples from December 2016, in order to better reflect available information on peers at the time of the PMV. The firm Paynova AB has significantly negative earnings and a relatively high multiple, suggesting that it has high growth opportunities embedded in its multiple. The median of the sample removes parts of this effect.

Valuation

Numbers in $m	Value min	Value max
Revenues (2028)	1,470	2,476
EV/Revenues	3.10	3.10
Implied EV (July 2017)	2,997	5,047
Net Debt	83.3	83.3
Value of Equity	**2,913**	**4,964**

We include two scenarios in the relative valuation, where the base case revenue scenario (min) equals the market growth from the R-model. The other scenario (max) is base case + 5 pp CAGR over the forecast period. As described, we assume Klarna to be in steady state in twelve years. We thus apply revenues from 2028 in the relative valuation.

The EV we end up with after multiplying the steady state revenues with the 2016 multiple is discounted back to July 2017 using the cost of capital accounted for above. Both the base case and the + 5 pp CAGR, values Klarna at 15% and 97% higher than PMV, respectively.

Summary

Numbers in $m	Value min	Value max
DCF	2,400	3,800
Multiple	2,913	4,964
Post-money valuation	2,500	
Average valuation	**3,519**	

We observe that both the DCF and multiple intervals are above PMV, suggesting that Klarna is undervalued. Reasons for the high valuation are promising financials, good market outlooks for both the online payment and the ecommerce industry and a modest competitive landscape. Klarna will therefore need a moderation of revenue growth in the forecast period in order to defend PMV.

Deliveroo Valuation

Deliveroo is a British online food delivery company, founded in 2013. From its last funding round, in September 2017, the company received a PMV of $2bn (Crunchbase, 2018h). It operates in more than 100 cities worldwide, and works with more than 8,000 partner restaurants (deliveroo.co.uk, 2018). Despite the fact that it has only operated for four years, it has managed to achieve a high level of revenues as the historical performance table below illustrates. From 2015 to 2016, the revenues grew with 595% to $159m. It is still far from profitable, with an operating margin of -110%, but we observe a significant improvement compared to 2015.

Historical performance:

	2013	2014	2015	2016
Revenues ($m)	na	na	26.7	158,8
Revenue growth	na	na	na	595%
EBIT ($m)	na	na	-44.5	-174.1
Operating Margin	na	na	-167%	-110%

R-model

Input variables:

General		Cost of Capital			
Post-money valuation ($m)	2,000				
Company growth	High	Tax rate	20%	Market beta	1.34
Trend in NWC ratio[1]	Flat	Risk-free rate	1.48%	Industry market correlation	19.4%
Depreciation/PPE[2]	23.6%	Market risk premium	5.4%	Equity ratio	90.9%
Operating Margin vector	2% - 10% á 2%	Years to IPO[3]	4	Cost of debt	4.73%
Net Debt ($m)	-221.2				

Forecasted Cost of Capital:

	2016	2017	2018	2018	2019-2028
WACC	11.4%	10.4%	9.53%	8.8%	8.3%

Market size forecast:[4]

	2017-2021	2022	2023	2024	2025	2026	2027	2028
Annual growth	32%	25%	20%	15%	12%	10%	5%	2%

Comments:

[1] Historical ratio in the period 2015-2016: -35%, -22%. The number of observations is too limited to determine a trend. We therefore set the trend to flat

[2] Historical ratio in the period 2015-2016: 10.9%, 36.4%

[3] According to Morningstar (2018), Deliveroo stated in February 2018 that it is considering a listing in either London or New York within the next 12-18 months. Hence, the company will try to go public in 2019 or 2020. We thus assume 4 years to IPO from base year, which is 2016.

[4] According to a market forecast on the online food delivery industry, provided by Businesswire (2018), the market is expected to grow at a 32% CAGR until 2021. We therefore set the market growth to 32% in this period and assume that the growth will converge toward a 2% growth in 2028.

Analysis:

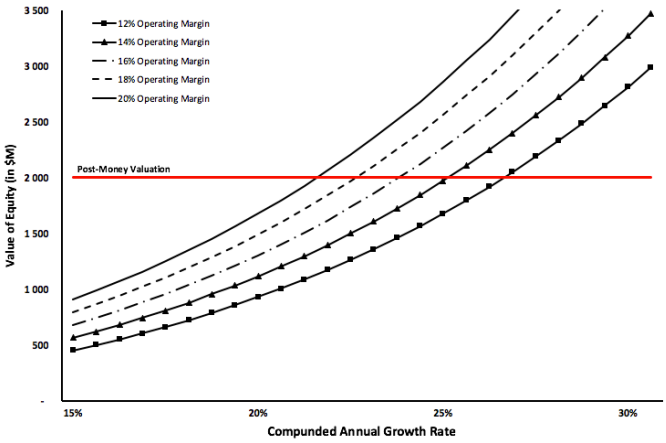

Figure A2.7 – Deliveroo's valuation scenarios

Operating Margin	Value of Equity ($m)	Revenues terminal year ($m)	CAGR	Growth in revenues
12%	2,050	2,679	26.5%	1,587%
14%	1,972	2,262	24.8%	1,324%
16%	1,986	2,016	23.6%	1,170%
18%	1,968	1,796	22.4%	1,031%
20%	2,060	1,693	21.8%	966%

Table A2.4 – Summary of Deliveroo's scenarios yielding PMV

Operating Margin: Deliveroo's operating margin has been highly negative at -167% and -110% in 2015 and 2016, respectively. Hence, it is difficult to estimate any future margins based on these observations. In the overview of the peer group we have gathered in the relative valuation section further down, we find Just Eat and GrubHub to be the most suitable comparable firms. In 2016, they had a margin of 19% and 17%, respectively. Both firms are more than 15 years old, and their recent revenue growth indicates that they are closer to steady state. We believe that this is an achievable margin for Deliveroo, and assume that the margin in steady state will be close to the two comparable firms, at 18%.

CAGR: As figure A2.7 illustrates, Deliveroo will need a CAGR in revenues between 22% and 26% in order to defend the valuation of $2bn, depending on the operating margin it manages to achieve in steady state. This is a significant increase, given its current level of revenues of $159m. It is further highlighted in table A2.4, which is a summary of five scenarios where its value of equity is close to the PMV. Depending on the margin, it will need revenues in terminal year between $1.69bn and $2.68bn, which equals a revenue growth between 966% and 1,587% and a corresponding CAGR between 21.8%-26.5%. In comparison, Just Eat and GrubHub had revenues of approximately 700m in 2017, which is far less than the level of revenues Deliveroo will need.

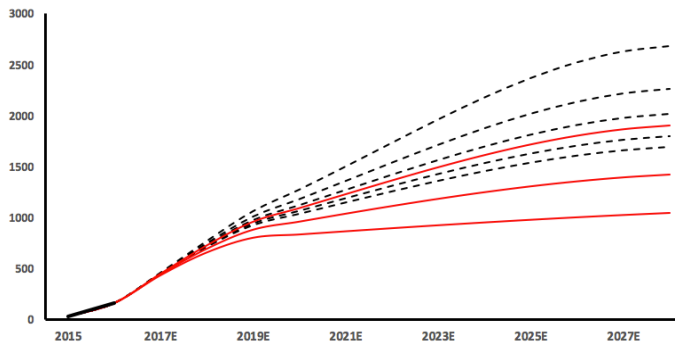

Figure A2.8 – Deliveroo's revenue paths, realistic and high-valuation scenarios

Figure A2.8 illustrates the revenue path of the five scenarios in table A2.4 (dotted lines), where the upper line is the scenario with an OM of 12% and the bottom line has an OM of 20%. The red line represents a good case (upper line), a base case (middle line) and a bad case (bottom line), which we believe are more realistic for Deliveroo. The base case is the growth path of the forecast of the online food delivery industry, which has a CAGR of 20%. The good case has a CAGR of base case plus 3 pp, and the bad case is equivalent to base case minus 3 pp. Due to the very high competition in this specific industry, we believe a fair assumption is that Deliveroo will remain in its current market position and grow equivalent with the market. Hence, we believe that its revenue growth path lies between a CAGR of 17% and 20%. Given this input on revenue growth and a margin of 18%, the model values Deliveroo between $1.02bn and $1.49bn.

Relative valuation

Peer Group

Company	EV/Revenues
Just Eat	9.2
GrubHub	9
Delivery Hero	11.8
Takeaway.com	12.7
Median	**10.5**

The table to the left presents Deliveroo's peer group with the corresponding EV/Revenues ratio. The financing round which Deliveroo's PMV is based on, found place in September 2017. Hence, we use the EV/Revenues observation closest to this date, which is December 2017. Few online food delivery companies have been listed on any stock exchanges yet, but we manage to obtain four. All the ratios are relatively high, which may indicate that investors believe in further growth opportunities for the companies. Looking into the financials of the firms, Just Eat and GrubHub stand out with an exceptional margin and high revenues. Delivery Hero and Takeaway.com have a significant negative margin and a level of revenues closer to what Deliveroo had in 2016.

Valuation

It does not make sense to apply the steady state revenues of Deliveroo on the EV/Revenues of any of the companies in the peer group due to the high ratios which implies that the investors assume significant growth opportunities. When Deliveroo enters steady state, it is assumed to grow at a steady rate of 2% into infinity. When applying relative valuation, the growth profile should be relatively equal in order to make the valuation as accurate as possible. Hence, we will not apply any relative valuation on Deliveroo.

Summary

All numbers in $m	Value min	Value max
DCF	1,019	1,489
Multiple	na	na
Post-money valuation	2,000	
Average valuation	**1,254**	

To summarise the analysis of Deliveroo, it had already in 2016 relatively high revenues but a highly negative operating margin. The R-model suggests that the revenues will need to have a CAGR between 21.8%-26.5% in order to defend the PMV, depending on the margin it manages to achieve in steady state. This is a significant increase, and the revenues the company will need in terminal year is approximately three times as high as the revenues of its largest competitors in 2017. The industry is estimated to grow at a 20% CAGR in the forecast period, which is what we believe is the best case scenario for Deliveroo given the high competition in the industry. With an operating margin of 18% and a CAGR between 17% and 20%, we end up with a value between $1.02bn and $1.49bn. This implies that PMV overstates the valuation from the R-model with 34% to 96%.

Farfetch Ltd. Valuation

Farfetch operates an ecommerce website that unites about 400 independent high-end fashion boutiques, offering an inspirational shopping experience to fashion-forward consumers. The boutiques, which offer clothing, shoes, bags, accessories, jewelry and beauty products, are carefully selected for their forward-thinking attitude, unique approach to merchandising and diversity of brands. Unlike typical retailers, Farfetch does not own the inventory it sells, but rather serves as a conduit for brands and boutiques. Thus, it can avoid inventory costs as well as the complicated task of predicting consumer needs (Hirsch, 2018). Farfetch serves women, men, and kids. The company was founded in 2007 and is based in London, United Kingdom. After its Series F funding round in May 2016, the firm's PMV was $1.51bn. (Crunchbase, 2018i).

Historical performance:

	2013	2014	2015	2016
Revenues ($m)	36.8	86.3	133.1	204.2
Revenue growth	94%	134%	54%	53%
EBIT ($m)	-10.1	-6.7	-40.5	-45.2
Operating Margin	-27.3%	-7.7%	-30.4%	-22.1%

R-model

Input variables:

General		Cost of Capital			
Post-money valuation ($m)	1,510				
Company growth	Medium	Tax rate	20%	Market beta	1.34
Trend in NWC[1]	Decreasing	Risk-free rate	1.48%	Industry market correlation	0.194
Depreciation/PPE[2]	18.3%	Market risk premium	5.4%	Equity ratio	90.91%
Operating Margin vector	10% - 18% á 2%	Years to IPO[3]	4	Cost of debt	4.73%
Net Debt ($m)	174.4				

Forecasted Cost of Capital:

	2016	2017	2018	2019	2020	2021	2022-2026
WACC	11.4%	10.4%	9.5%	8.8%	8.3%	8.3%	8.3%

Market size forecast:[4]

	2017E	2018E	2019E	2022E	2026E
Market size ($bn)	417	481	545	713	825
CAGR (since 2015)	17%	16.2%	15.3%	12.3%	8.8%

Comments:

[1] Historical ratio in the period 2012-2016: 10%, 3%, -14%, -34%, -23%. Shows a decreasing trend over the 5-year historical period.
[2] Historical ratio in the period 2014-2016: 32.1%, 2.3%, 20.7%
[3] Farfetch's latest Series funding round was Series F in May 2016. Later on, it has had two funding rounds up until June 2017. In addition, several sources say that Farfetch is "interviewing bankers for its New York IPO" (Hirsch, 2018). We therefore believe it is fair to assume a public listing of the firm within two years, i.e. in 2020
[4] Statista (2018e) provides us with a market forecast for the global retail ecommerce sales. We further break down this forecast to only looking at fashion ecommerce sales.

Analysis:

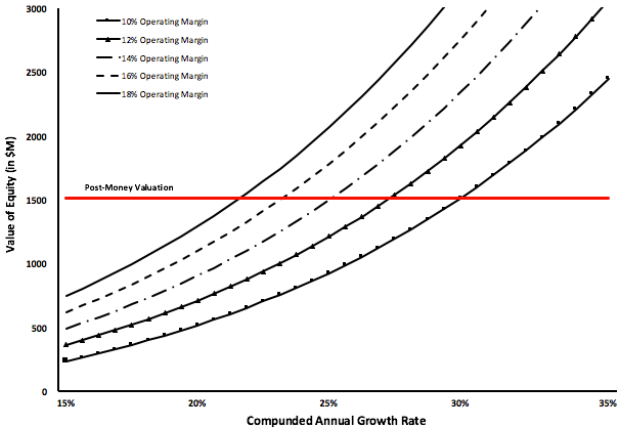

Figure A2.9 – Farfetch's valuation scenarios

Operating Margin	Value of Equity ($m)	Revenues terminal year ($m)	CAGR	Growth in revenues
10%	1,507	2,710	29.5%	1,228%
12%	1,535	2,243	27.1%	1,000%
14%	1,495	1,848	24.6%	806%
16%	1,494	1,593	22.8%	681%
18%	1,548	1,440	21.6%	606%

Table A2.5 – Summary of Farfetch's scenarios yielding PMV

Operating Margin: We observe an average operating margin of 3.3% in the online retail industry (Damodaran, 2018). Moreover, from the peer group, Arezzo Industria has the highest operating margin of 12.5%. It is hard to find any true public comparable for Farfetch, however, we argue that the products it offers are slightly more high-end than that of the identified public peers. In the high-end clothing industry, it is fair to assume that margins are greater. As a result, until the boutiques establish a similar marketplace themselves, Farfetch may deliver solid operating margins. This is probably one of Farfetch's greatest threats as it is currently serving a relatively unpenetrated market. We define an interval of which we believe covers the realistic scenarios for Farfetch in the coming years. The lower bound is at 10%, which we argue might be the case if the big brands enter the "marketplace" business that Farfetch is currently capturing a lot of customers in. Margins will therefore tighten since the competition increases. The upper bound is assumed to be at 18% margin. This is significantly above the both the peer group and the industry average, as we believe a good scenario may be due to lower competition, greater bargaining power to its suppliers and customers, giving Farfetch a greater portion of the high margins in this industry. In the further analysis of Farfetch, we assume an operating margin in terminal year of 14% to be conceivable.

CAGR: Table A2.5 is a summary of five scenarios where Farfetch achieves a valuation close to the PMV. Given the operating margins included in the model, the firm will need a CAGR between 21.6% and 29.5% to achieve cash flows high enough to receive a valuation equivalent to that of PMV.

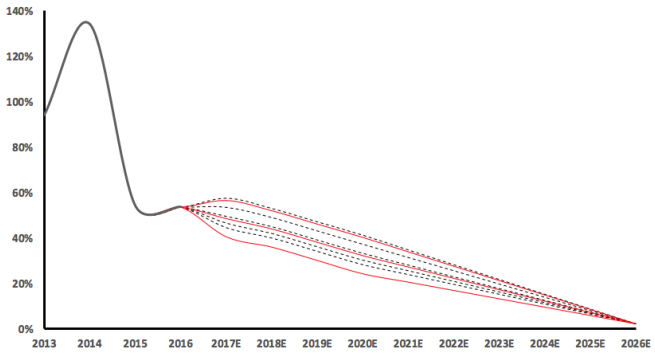

Figure A2.10 - Farfetch's revenue paths, realistic and high-valuation scenarios.

Farfetch´s current margin is -22.14%, and we observe that the firm will need to turnaround its business operations within the next few years in order to arrive at the high valuation.

If the firm manages to increase its operating margin from current levels to 10%, it will need a CAGR of 29.5% in the forecast period and revenues of $2.71bn in the continuing period. This is equivalent to an increase of 1,228% in revenues, compared to the $204.2m it earned in 2016. The bottom scenario is more realistic in terms of revenue growth. To achieve this, Farfetch will need a CAGR of 21.6% and revenues in terminal year of $1.44bn (equivalent to an increase of 606% compared to base year revenues). However, in this scenario the company needs to increase its operating margin from today's levels of -22.14% to 18% in terminal year.

Figure A2.10 is a plot of the growth path in the five scenarios from table A2.5 (dotted lines), the historical growth (bodied line), and three scenarios which we find to be realistic (red lines). The historical growth rate had a peak in 2014, before it declined significantly the year after. The revenue growth curve is relatively flat in the period 2015-2016, indicating that revenue growth has stabilised. The three red lines represent a good, a poor and a base case scenario which we find to be realistic given the company's recent growth and business model. The middle line represents the base case, and the increase is equivalent to a CAGR of 24%. The two other lines have a CAGR of +/- 5 pp relative to the base case scenario. Considering that Farfetch is in a medium-growth stage in the funding cycle, the most likely scenario would be a continuation of the recent growth path it has had, which we illustrate by the middle red line. In this scenario, the recent growth rate will decrease proportionally until it reaches 2%, which is the growth rate we believe Farfetch will have in the continuing period. The revenues in terminal year will in this scenario be $1.76bn, equivalent to a total increase of 76%. We believe this is a reasonable estimate if Farfetch continues to maintain its well-positioned platform in a relatively unpenetrated market.

The upper red line represents a more optimistic scenario, where Farfetch manages to gain better bargaining power toward its suppliers, in addition to a fairly low to moderate competitive development in the market. The result would be that Farfetch experiences an abnormal boost in revenues during the next five years until it reaches a steady growth rate of 2% in the continuing period. The revenues in terminal year will in this scenario be approximately $2.6bn, which is equivalent to an increase of 1,176%.

The bottom red line shows a scenario where Farfetch's relative growth declines compared to the forecasted market growth and its current growth path. This can be a result of increased competition, for example if the large brands initiate a vertical integration and builds its own platforms. The CAGR in this case is 19%, and revenues in terminal year are equivalent to $1.16bn. However, we do not find this scenario very realistic considering the growth profile of the ecommerce industry.

The R-model generates valuations for the base case and good case scenario at $1.4bn and $2.2bn, respectively. While the base case scenario postulates that PMV *overvalues* the company by 7%, the good case implies an undervaluation of 32%.

Relative valuation

Peer group:

Company	**EV/Revenues**
Arezzo Industria	1.6
Asos Plc.	2.5
Boozt AB	1.9
Koovs Plc.	1.1
YOOX Net-a-porter	4.9
Zalando SE	2.7
Median	**2.2**

We identify a set of public peers, based on its business description, which we use in the relative valuation of Farfetch. We exclude companies with significant growth opportunities in their valuations. However, some of the multiples have a more moderate portion of future growth opportunities embedded in the valuations. The median multiple should reduce some of this bias.

Valuation

Numbers in $m	**Value min**	**Value max**
Revenues (2026)	1,759	2,606
EV/Revenues	2.2	2.2
Implied EV (May 2016)	2,043	3,027
Net Debt	174.4	174.4
Value of Equity	1,869	2,852

Since companies with high growth opportunities embedded in their valuations are excluded, we apply steady state revenues to value Farfetch. The revenue scenarios are equivalent to the ones presented in the R-model. The implied EV we end up with, is further discounted at the company's cost of capital to the date of the PMV. We arrive at the value of equity by subtracting the company's net debt. The results from the relative valuation indicate that PMV is *undervaluing* Farfetch with 19% and 47% in the base case and good case, respectively.

Summary

Numbers in $m	**Value min**	**Value max**
DCF	1,408	2,214
Multiple	1,869	2,852
Post-money valuation	1,510	
Average valuation	**2,086**	

Based on our analysis, PMV seems to be undervaluing Farfetch. If the base case scenario in the R-model reflects the future, the PMV is fairly correct in valuing Farfetch. The good case, on the other hand, indicates that PMV undervalues the company.

Funding Circle Ltd. Valuation

Funding Circle operates an online marketplace for small business loan lenders and seekers. The company's marketplace allows investors to directly lend their money to small and medium sized businesses worldwide. Its marketplace offers unsecured and secured loans to grow business, get working capital, cover one-off business costs, buy an asset, develop a property, and get a commercial mortgage. The company was incorporated in 2009 and is based in London, UK. Its Series B funding round in April 2015 gave Funding Circle a PMV of $1bn (Crunchbase, 2018j)

Historical performance:

	2013	2014	2015	2016
Revenues ($m)	8.3	19.5	36.4	53.6
Revenue growth	173%	134%	86%	47%
EBIT ($m)	-6.7	-17.7	-26.9	-18.5
Operating Margin	-80.3%	-90.8%	-73.9%	-34.5%

R-model

Input variables:

General		Cost of Capital			
Post-money valuation ($m)	1,000				
Company growth	Medium	Tax rate	20%	Market beta	1.6
Trend in NWC ratio[1]	Flat	Risk-free rate	1.48%	Industry market correlation	32.36%
Depreciation/PPE[2]	36.1%	Market risk premium	5.4%	Equity ratio	18.58%
Operating Margin vector	8% - 12% á 1%	Years to IPO[3]	2	Cost of debt	4.43%
Net Debt ($m)	4.5				

Forecasted Cost of Capital:

	2016	2017	2018	2019	2020	2021	2022-2026
WACC	5.0%	4.9%	4.8%	4.8%	4.8%	4.8%	4.8%

Market size forecast:[4]

	2017E	2018E	2020E	2022E	2026E
Market size ($bn)	3,252	4,226	5,983	7,775	9,708
CAGR (since 2015)	30%	30%	24%	21%	14%

Comments:

[1] Historical ratio in the period 2012-2016: -2.1%, -5.8%, -5.7%, -0.6%, -3.1%. The ratio has limited fluctuations and is assumed to be flat.

[2] Historical ratio in the period 2014-2016: 50.7%, 14.8%, 42.7%

[3] According to SkyNews (2018), Funding Circle has initiated the process to go public. We set the IPO variable to 2, which implies a public listing in 2018.

[4] Statista (2018i) provides us with a market forecast of the transaction value in the worldwide Fintech market. We can further break down the forecast to only looking at "Alternative Financing" and "Alternative Lending". We use this forecast as a proxy for the real market growth of open banking marketplaces similar to that of Funding Circle.

Analysis:

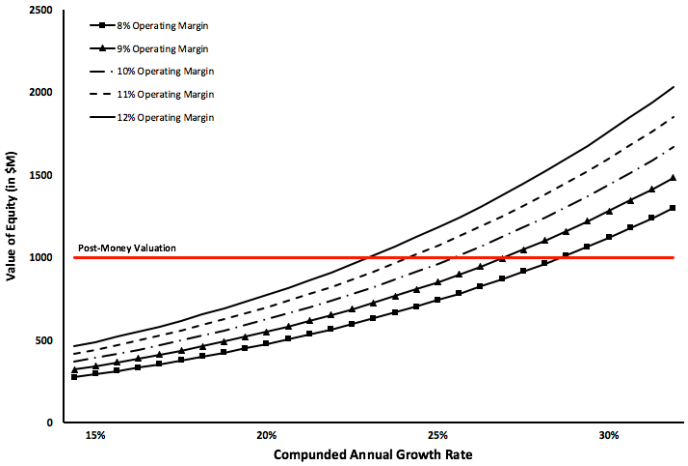

Figure A2.11 – Funding Circle's valuation scenarios

Operating Margin	Value of Equity ($m)	Revenues terminal year ($m)	CAGR	Growth in revenues
8%	1,012	677	28.9%	1,162%
9%	1,046	616	27.6%	1,048%
10%	1,011	533	25.8%	894%
11%	1,016	483	24.6%	802%
12%	1,009	438	23.4%	717%

Table A2.6 – Summary of Farfetch's scenarios yielding PMV

Operating Margin: From Damodaran's sample on banking and financial services, we observe an average operating margin ranging between 0.7% and 6.39%. The company's public peer group shows operating margins ranging from -4.26% to 9.6%. Funding Circle has an operating margin of -34.5% in its base year. In the R-model, we include an interval going from 8% to 12%. Out of the companies included in the public peer group, LendingTree might serve as the best comparable when discussing steady state margins. The company currently has a margin of 9.6% and serve as a decent benchmark for what Funding Circle might expect as an operating margin in steady state. We thus use 10% as the base case scenario for Funding Circle's operating margin in the terminal year.

CAGR: Given the operating margins we have included as realistic scenarios in the model, the firm will need a CAGR between 23.4% and 28.9% to achieve cash flows high enough to have a valuation equivalent to the PMV.

Table A2.6 is a summary of five scenarios where Funding Circle achieves a valuation close to the PMV. If the firm manages to increase their operating margin from base year of -34.5% to 8%, it will need a CAGR of 28.9% in the forecast period and revenues of $677m in the continuing period. This is equivalent to an increase of 1,162%, compared to the $53.6m it earned in 2016. The bottom scenario is more realistic in terms of revenue growth, and to achieve this they will "only" need a CAGR of 23.4% and revenues in terminal year of $438m. This is an increase of 717%. The drawback here, however, is that the company will need to increase its operating margin from base year's level of -35.5% to 12% in terminal year. Such a scenario might be

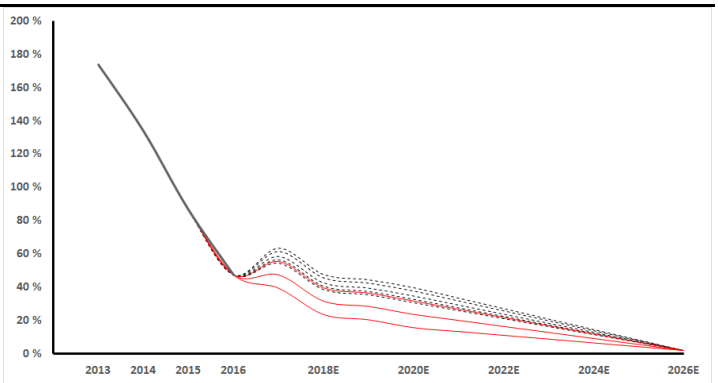

Figure A2.12 – Funding Circle's revenue paths, realistic and high-valuation scenarios.

realistic if the competitive environment in the business develops at a relatively low pace.

The dotted lines in figure A2.12, represent the revenue paths of the five scenarios in table A2.6. The upper dotted line is the revenue path of the scenario with a margin of 12% which yields PMV and the bottom dotted line is the revenue path of the scenario with a margin of 8%. The red lines represent the base case, good case and bad case scenario for the company.

The base case represents the red line in figure A2.12 (revenue scenario figure). The good case has a CAGR equal base case plus 5 pp and the bad case has a CAGR of base case minus 5 pp. We believe Funding Circle will end up with a revenue growth path between the base case and good case scenario, with a corresponding CAGR between 19% and 24%. The company is obviously challenging the established banks. The large banks have significant resources and a lot of effort is invested to deal with the increased competition. Furthermore, other alternative "banks" may establish as open banking and PSD2 just were put into effect. This gives companies like Funding Circle an advantage toward the larger banks which is why we believe a revenues boost as illustrated in figure A2.12 is fair. However, the threat oflarge resource investments from the large and established banks, as well as lower barriers to entry (due to PSD2), justifies the lower growth paths. To conclude, the R-model values Funding Circle between $556m and $864m, when using a margin of 10% and a CAGR between 19% and 24%.

Relative valuation

Peer group:

Company	**EV/Revenues**
LendingClub Corp.	1.8
LendingTree, Inc.	2.7
On Deck Capital, Inc.	8.4
Median	**2.7**

There are already some companies that have similar business models to that of Funding Circle, however with different platforms. The listed peers have different similarities to Funding Circle. A critical assumption in the multiple is the operating margin of the comparable. As we observe, the median multiple is equal to that of LendingTree. Since LendingTree's operating margin is the one closest to what we might expect of Funding Circle in steady state, we believe the median multiple serves as a fair option.

Valuation

Numbers in $m	**Value min**	**Value max**
Revenues (2026)	307	464
EV/Revenues	2.7	2.7
Implied EV (Apr. 2015)	478	723
Net Debt	4.5	4.5
Value of Equity	**473**	**719**

Since companies with high growth opportunities embedded in their valuations are excluded, we apply steady state revenues to value Funding Circle. The revenue scenarios are equivalent to the ones presented in the R-model. The implied EV we end up with, is further discounted at the company's cost of capital to the date of the PMV. We arrive at the value of equity by subtracting the company's net debt. The result indicates that PMV overvalues Funding Circle by 111% and 39% in the base case and good case, respectively

Summary

Numbers in $m	**Value min**	**Value max**
DCF	556	864
Multiple	473	719
Post-money valuation	1,000	
Average valuation	**653**	

Based on our analysis, PMV seems to be overvaluing Funding Circle. The results from the R-model indicate that PMV overvalues Funding Circle somewhere between 16% and 80%.

Home24 Valuation

Home24 is an online platform that enables consumers to find and purchase home furniture and household products. It is Europe's largest online furniture store with more than 150,000 products from over 800 manufacturers. The product range includes a unique selection of furniture items, lamps and living accessories. Home24 was founded in 2009 and is based in Berlin, Germany (Crunchbase, 2018c).

Historical performance:

	2013	2014	2015	2016
Revenues ($m)	125.5	213.6	261.8	270.6
Revenue growth	54%	70%	23%	3%
EBIT ($m)	-52.4	-78.7	-89.7	-63.7
Operating Margin	-41.7%	-36.9%	-34.3%	-23.5%

R-model

Input variables:

General		Cost of Capital			
Post-money valuation ($m)	1,185				
Company growth	Low	Tax rate	30%	Market beta	1.34
Trend in NWC ratio[1]	Decreasing	Risk-free rate	0.49%	Industry market correlation	19.4%
Depreciation/PPE[2]	32.4%	Market risk premium	6.22%	Equity ratio	90.91%
Operating Margin vector	7% - 11% á 1%	Years to IPO[3]	2	Cost of debt	4.73%
Net Debt ($m)	-39.7				

Forecasted Cost of Capital:

	2016	2017	2018	2019	2020	2021	2022-2026
WACC	9.8%	9.0%	8.3%	8.3%	8.3%	8.3%	8.3%

Market size forecast:[4]

	2017E	2018E	2020E	2022E	2026E
Market size ($bn)	225	259	329	395	479
CAGR (since 2016)	16%	15.3%	14%	12.5%	9.4%

Comments:

[1] Historical ratio in the period 2012-2016: -2.7%, -8.8%, -17.6%, -5.8%, -7.4%. The trend can also be argued to show no trend. We use Decreasing in order to give a conservative measure.

[2] Historical ratio in the period 2014-2016: 62.6%, 10.6%, 24%

[3] According to sources of Reuters (2018), Home24 is said to go public in the summer 2018. We therefore set the IPO variable to 2 years.

[4] Home24 operates in the ecommerce business. Statista (2018e) provides us with a market forecast for the global retail ecommerce sales. We use a forecast which looks at the Furniture & Appliances segment.

Analysis:

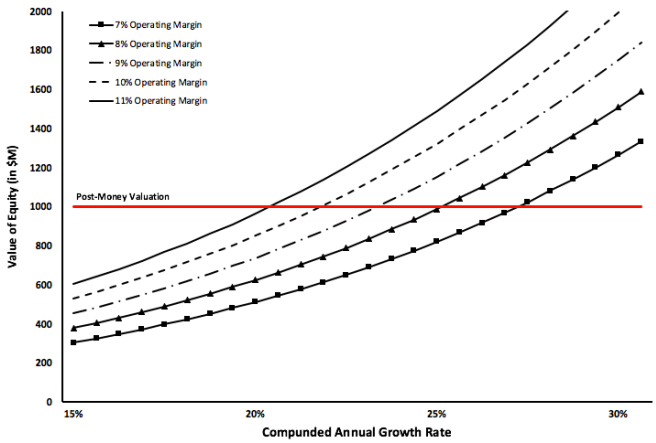

Figure A2.13 – Home24's valuation scenarios

Operating Margin	Value of Equity ($m)	Revenues terminal year ($m)	CAGR	Growth in revenues
7%	1,021	3,056	27.4%	1,029%
8%	1,041	2,644	25.6%	877%
9%	1,034	2,281	23.8%	743%
10%	1,006	1,962	21.9%	625%
11%	1,018	1,772	20.7%	555%

Table A2.7 – Summary of Home24's scenarios yielding PMV

Operating Margin: We observe an average operating margin of 3.3% in the online retail industry (Damodaran, 2018). Home24's closest peer Wayfair, has an operating margin of -4.71%. Furthermore, Home24's operating margin was -23.55% in the base year. In the R-model, we include an interval of operating margin scenarios going from 7% to 11%. This is above both the peer group and the industry average operating margin. We also observe that the average margin in physical stores serving the Home Furnishing market is approximately 7%. We believe it is fair to include a higher upside in Home24's good case, because it is built on a well-developed online platform, which in turn may result in higher efficiency potential in the long run. Home24's path to profitability might take time, however, in the long run we believe an operating margin of 10% is conceivable. This margin is included as a scenario in the valuations from the R-model.

CAGR: Given the operating margins we include the R-model, the firm will need a CAGR between 21% and 29% to achieve cash flows high enough to have a valuation equivalent to the PMV.

Table A2.7 shows a summary of five scenarios in which Home24 achieves a valuation close to the PMV. If the firm manages to increase its operating margin from base year levels of -23.55% to 7%, it will need a CAGR of 27.4% in the forecast period, or revenues of $3.1bn in the continuing period. This is equivalent to an increase of 1,029%, compared to the $270.7m it earned in 2016. The bottom scenario is more realistic in terms of revenue growth, and to achieve this the company needs a CAGR of 20.7%, or revenues in terminal year of $1.77bn. This is an increase of 555%. In this scenario, however, the company will need to increase its operating margin from base year levels of -23.55% to 11% in terminal year. This will require a significant improvement in the operations and is far beyond the both the average industry operating margin and that of the peers'. Such a scenario may be realistic if Home24 manages to establish a strong position toward its suppliers and customers by gaining sustainability in its competitive advantage.

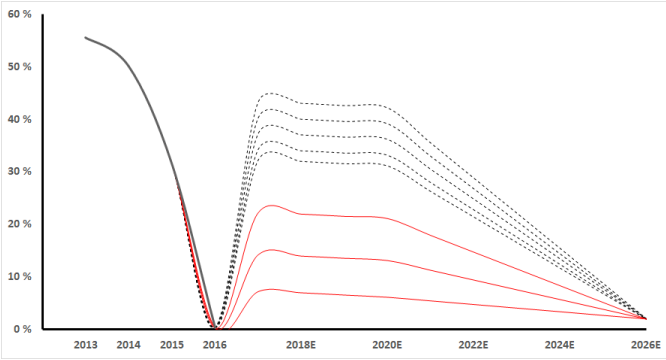

Figure A2.14 – Home24's revenue paths, realistic and high-valuation scenarios.

Figure A2.14 illustrates the growth Home24 will need compared to the revenue growth it has had in prior years. The dotted lines represent the five scenarios presented in table A2.6. The black line between 2012 and 2016 represents the recent growth for Home24, which is a total growth in of 232%. After its peak in 2013, the historical growth has declined significantly. However, the growth has not stagnated completely, and we believe it will increase in the near future. The three red lines represent a good, a poor and a base case scenario which we find to be realistic given the company's recent growth and business model.

In the middle line scenario, or the base case, we use a CAGR in revenues equal to that of the forecasted market growth of 9.4%. The two remaining lines have a CAGR of +/- 5 pp relative to the base case scenario. Considering that Home24 is in a low-growth stage in the funding cycle, both the middle line and the lowest red line are fair and realistic growth paths. What separates the two scenarios are the growth in the near future. The base case and the bad case represent a CAGR of 9.4% and 4.4%, respectively. We interpret this as a fairly moderate growth, however, given the recent significant decline in revenue growth it is reasonable to say that the two scenarios are realistic. The upper red line represents a more optimistic scenario, in which Home24 manages to grow its platform sustainably and establish a strong position with a sustainable competitive advantage. The result would be that Home24 experiences an abnormal boost in revenues during the next five years until it reaches a steady growth rate of 2% in the continuing period. The revenues in terminal year will in this scenario be approximately $993.5m, which is equivalent to an increase of 285%. The bottom red line reflects a scenario where Home24's relative growth declines compared to the forecasted market growth but increases slightly relative to its current growth path. This can be a result of increased competition, for example if the large brands initiate a vertical integration and builds its own platforms. The CAGR in this case is 4.4%, and revenues in terminal year are $416.1. The valuations generated by the R-model in the base case and good case scenario are at $292.4m and $495.9m, respectively. This implies that the PMV *overvalues* the firm by 305% in the base case and 139% in the good case.

Relative valuation

Peer group:

Company	**EV/Revenues**
Wayfair, Inc.	1.3
Median	**1.3**

We identify one public peer that is comparable to Home24. This company, Wayfair, had a multiple of 0.94 and 1.63 in December 2014 and 2015, respectively. To make the valuation comparable to that of the PMV, which is reported in June 2015, we use the available multiples on this date. We further assume that an EV/Revenues using Last Twelve Months (LTM) Sales was available and approximate this multiple by taking the average from 2014 and 2015. This approximation returns an EV/Revenues of 1.3.

Valuation

Numbers in $m	**Value min**	**Value max**
Revenues (2026)	632	994
EV/Revenues	1.3	1.3
Implied EV (June 2015)	325	510
Net Debt	-39.7	-39.7
Value of Equity	**364**	**550**

Since companies with high growth opportunities embedded in their valuations are excluded, we apply steady state revenues to value Home24. The revenue scenarios are equivalent to the ones presented in the R-model. The implied EV we end up with, is further discounted at the company's cost of capital to the date of the PMV. We arrive at the value of equity by subtracting the company's net debt. The result indicates that PMV overvalues Home24 by 225% and 115% in the base case and good case, respectively.

Summary

Numbers in $m	**Value min**	**Value max**
DCF	292.4	495.9
Multiple	364	550
Post-money valuation	1,185	
Average valuation	**426**	

Based on our analysis, the PMV seems to be overvaluing Home24. An average of the different valuation methods and scenarios implies that the PMV overvalues the firm by 178%. The results from the R-model indicate that PMV overvalues Funding Circle somewhere between 139% and 305%.

Improbable Worlds Ltd. Valuation

Improbable develops an operating system that allows developers to build simulated worlds. It offers solutions for application in various fields including gaming, biology, economics, defence, urban planning, transportation and disease prevention (Bloomberg, 2018d). The company was founded in 2012 and is based in London, UK. Its Series B funding round in May 2017 gave Improbable a PMV of $1,002m (Crunchbase, 2018k).

Historical performance:

	2015	2016	2017
Revenues ($m)	na	0.1	11
Revenue growth	na	na	10,433%
EBIT ($m)	na	-12.7	-10.5
Operating Margin	na	-12,065%	-95%

R-model

Input variables:

General		Cost of Capital			
Post-money valuation ($m)	1,002				
Company growth	High	Tax rate	20%	Market beta	0.8
Trend in NWC ratio[1]	No trend	Risk-free rate	1.48%	Industry market correlation	16.16%
Depreciation/PPE[2]	3.61%	Market risk premium	5.4%	Equity ratio	93.38%
Operating Margin vector	20% - 24% á 1%	Years to IPO[3]	4	Cost of debt	4.73%
Net Debt ($m)	-121.2				

Forecasted Cost of Capital:

	2017	2018	2019	2020	2021	2022	2023-2029
WACC	7.70%	7.02%	6.48%	6.04%	5.67%	5.67%	5.67%

Market size forecast:[4]

	2017	2020E	2025E	2030E
Market size ($bn)	18.2	80	569	1,384
CAGR (since 2015)	101%	78%	62%	47%

Comments:

[1] Historical ratio in the period 2016-2017: -4 299%, -6%. The number of observations is too low to determine a trend. We use *no trend* to return a conservative measure.

[2] Historical ratio in the period 2015-2017: 2.25%, 2.36%, 6.22%

[3] Based on average time to exit since founding, we estimate that Improbable will go public within 4-6 years. We strive to generate a conservative measure, which is why we use 4 years as input.

[4] Improbable operates in a very young industry, with high growth potential. According to BCC Research (2016), the Augmented and Virtual Reality (AR/AR) industry was valued at $4.2bn in 2015, but is according to Citi Bank expected to skyrocket toward 2025 as illustrated in the market size forecast table (Citi GPS, 2016). The industry is forecasted to grow from $4.2bn in 2015 to $80bn in 2020, $569bn in 2025 and $1.4 trillion in 2030. This corresponds to a CAGR of 47% in the period between 2015 and 2030. We observe that the CAGR is declining after 2017, which indicates that the industry will stabilise around 2030. The CAGR between 2025 and 2030 is only 19% compared to 78% between 2015 and 2020. Hence, we assume that Improbable will reach a steady state in 2030, and set the length of the forecast period to 15 years.

Analysis:

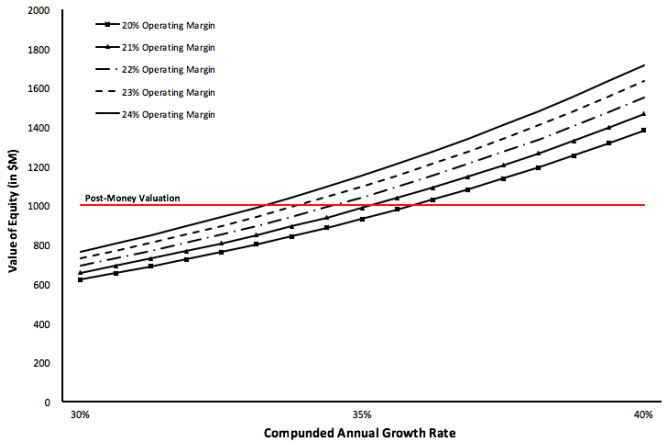

Figure A2.15 – Improbable's valuation scenarios

Operating Margin	Value of Equity ($m)	Revenues terminal year ($m)	CAGR	Growth in revenues
20%	1,029	458	26.4%	4,049%
21%	1,037	435	35.8%	3,840%
22%	990	391	34.6%	3,442%
23%	991	371	34.0%	3,261%
24%	989	351	33.4%	3,079%

Table A2.8 – Summary of scenarios yielding PMV

Operating Margin: According to Damodaran (2018), the average operating margin in the Software (systems) industry is 20%. The public peer group we identify shows negative margins, with an average of -11.6%. In base year, Improbable was far from profitable with an operating margin of -95%. Due to the negative margins in the peer group, we use the industry average as the main benchmark and use an interval from 20% to 24% in terminal year. The upper limit reflects a scenario where Improbable's platform/systems continually develop and deliver systems that outperforms the market. In such a scenario, heavy R&D spending becomes more efficient and continually successful. In the lower limit, Improbable is still delivering successful platform systems but competition is increasing, which results in lower margins. We believe an operating margin of 22% is conceivable, which is what we use as input in the valuation interval.

CAGR: Given the operating margins we include in the operating margin interval, the firm will need a CAGR between 33.4% and 36.4% in the forecast period to defend the PMV.

Table A2.8 is a summary of five scenarios where Improbable achieves a valuation close to PMV. If the firm manages to increase the margin in base year of -95% to 20%, it will need a CAGR of 36.4% in the forecast period and revenues of $458m in the continuing period. This equals an increase of 4,049%, compared to the $11.04m it reported in 2016. The bottom scenario is more realistic in terms of revenue growth. To achieve this, it will need a CAGR of 33.4% and revenues in terminal year of $351m. This is an increase of 3,079%. The drawback, however, is that it will need to improve the margin from -95%

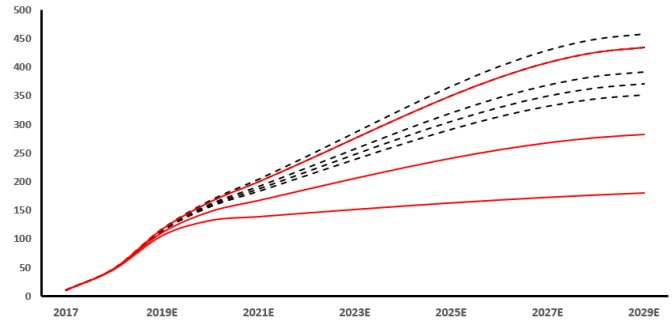

Figure A2.16 – Improbable's revenue paths, realistic and high-valuation scenarios.

in base year to 24% in terminal year. This is significantly higher than the industry average, and to achieve this requires a serious improvement in the operations. Such a scenario might be realistic if Improbable manages to continually develop the software, and perhaps through building add-on technologies to its system.

Figure A2.16 illustrates the growth Improbable will need compared to the revenue growth it has had in prior years. The dotted lines represent the five scenarios presented in table A2.8. The three red lines represent a good, a bad and a base case scenario which we find to be realistic given the company's recent growth and business model.

The middle red line represents base case, and has a CAGR of 31%. The two other lines have a CAGR of +/- 5 pp relative to the base case scenario. The upper red line represents a more optimistic scenario, where Improbable manages to grow the platform sustainably and establish a strong position with a persistent competitive advantage. The result is that Improbable experiences a significantly high revenue growth during the next five years until it reaches a steady growth rate of 2% in the continuing period. The revenues in terminal year will in this scenario be approximately $435m, which equals an increase of3,838%. The bottom red line illustrates a scenario where Improbable's revenue growth is sound for the next few years before it stagnates. In this scenario, we argue that new entrants in the market develops systems that offers a viable alternative to Improbable's. The CAGR in this case is 26%, and revenues in terminal year are $180m.

With an operating margin of 22% and a CAGR from 31% to 36% (representing base case and good case), we end up with a valuation interval between $730m and $1,095m. These valuations imply that PMV *overvalues* the firm by 37% in the base case and *undervalues* the firm by 9% in the good case.

Relative valuation

Peer group:

Company	**EV/Revenues**
Silicon Studio Corp.	1.26
Simigon Ltd.	1.02
Median	**1.14**

The firms in the peer group deliver similar systems as Improbable. A critical assumption for using EV/Revenues is that the comparable company should have similar margins. In Improbable's case, the listed peers have significant negative margins. As a result, the multiples are downward biased. We therefore qualitatively adjust it and apply a multiple of 2.

Valuation

Numbers in $m	**Value min**	**Value max**
Revenues (2029E)	283	435
EV/Revenues	2	2
Implied EV (May 2017)	281	432
Net Debt	-121.2	-121.2
Value of Equity	**402**	**554**

We use the good and base case revenue scenarios generated by the R-model. The implied EV we end up with is further discounted at the company's cost of capital to the date of the PMV. Further, we subtract for net debt and end up with a valuation interval between $402m and $554m, which implies that PMV overvalues Improbable with 81% and 149% in good case and base case, respectively.

Summary

Numbers in $m	**Value min**	**Value max**
DCF	730	1,095
Multiple	402	554
Post-money valuation	1,002	
Average valuation	**695**	

Based on our analysis, PMV seems to be overvaluing Improbable. We apply a margin of 22% and a CAGR interval from 31% to 36% in the R-model, which generates a valuation interval between $730m and $1,095m.

Oxford Nanopore Technologies Ltd. Valuation

Oxford Nanopore Technologies develops and commercialises nanopore-based electronic systems for analysis of single molecules. The company offers MinION, a portable device for molecular analyses based on nanopore technology which is adaptable for the analysis of DNA, RNA, proteins, and small molecules; PromethION, a tablet-sized benchtop instrument that provides real-time data streaming; and GridION system for molecular sensing applications. The company's devices are used in scientific research, personalised medicine, crop science, and security and defence applications. The company was founded in 2005 and is based in Oxford, UK. Its latest funding round was in March 2018, which valued Oxford Nanopore Technologies at $2bn (Crunchbase, 2018e). However, since the financial statements from 2017 is not yet available, we analyse its PMV from December 2016 at $1.58bn.

Historical performance:

	2013	2014	2015	2016
Revenues ($m)	na	0.25	1.4	6.46
Revenue growth	na	na	451%	362%
EBIT ($m)	-45.2	-69.2	-67.6	-87.7
Operating Margin	na	-27,279%	-4,832%	-1,356%

R-model

Input variables:

General		Cost of Capital			
Post-money valuation ($m)	1,580				
Company growth	High	Tax rate	20%	Market beta	0.92
Trend in NWC ratio[1]	Decreasing	Risk-free rate	1.48%	Industry market correlation	17.98%
Depreciation/PPE[2]	48.2%	Market risk premium	5.4%	Equity ratio	89.89%
Operating Margin vector	20% - 28% á 2%	Years to IPO[3]	6	Cost of debt	4.43%
Net Debt ($m)	-77.9				

Forecasted Cost of Capital:

	2016	2017	2018	2019	2020	2021	2022-2028
WACC	10.5%	9.25%	8.3%	7.6%	7%	6.5%	6.1%

Market size forecast:[4]

	2017E	2018E	2020E	2025E	2028E
Market size ($bn)	403	425	473	596	645
CAGR (since 2016)	4%	4.8%	5.1%	4.9%	4.3%

Comments:

[1] Historical ratio in the period 2011-2016: 31 044%, 18 146%, 24 532%, 24 105%, 4 849%, 1 486%

[2] Historical ratio in the period 2014-2016: 53.1%, 53%, 38.5%

[3] As of 2018, the company has not disclosed any plans of an IPO, but some articles in the media mention this as a potential event in the near future. Oxford Nanopore has had a fair amount of financing rounds and seems to have good access to financing. We believe an IPO in 2022 is a fair assumption.

[4] Oxford Nanopore operates in the medical technology business. Statista (2017g) provides market forecast for the worldwide medical technology industry's sales.

Analysis:

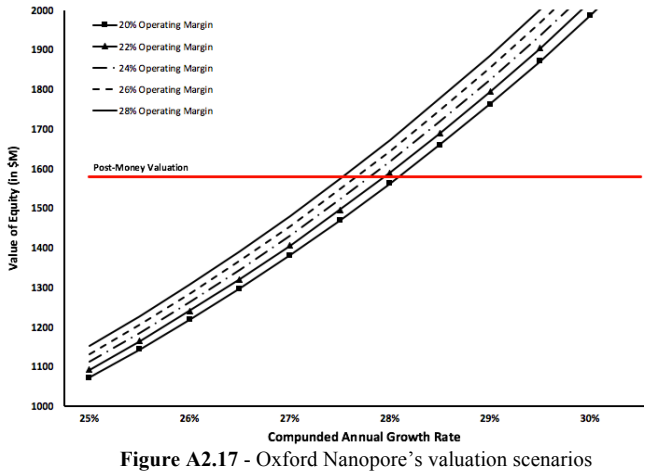

Figure A2.17 - Oxford Nanopore's valuation scenarios

Operating Margin	Value of Equity ($m)	Revenues terminal year ($m)	CAGR	Growth in revenues
20%	1,562	118	28%	1,727%
22%	1,589	118	28%	1,727%
24%	1,520	119	27.5%	1,742%
26%	1,547	119	27.5%	1,742%
28%	1,573	119	27.5%	1,742%

Table A2.9 – Summary of scenarios yielding PMV

Operating Margin: The industry average operating margin for Healthcare Technology and Information sector is 12.19% (Damodaran, 2018). One of Oxford Nanopore's comparables, Illumina Inc., reported in 2016 a margin of 22.8%. It is not uncommon for companies in this industry to have significantly high operating margins due to few real substitutes in the market. We observe in figure A2.17 that the valuation is less sensitive to the terminal operating margin. Hence, we put more emphasis on the CAGR analysis. Oxford Nanopore's current margin is negative with 1,356%, and we observe that the firm would need a massive improvement toward 2028 in order to arrive at PMV. However, R&D costs are starting to stabilise, and the item "Other Operating Expenses" is at an all-time high. We assume that Oxford Nanopore will reach a margin close to Illumina at 24% in terminal year.

CAGR: Given the operating margin interval we include in the R-model, the firm will need a CAGR between 27% and 28% to achieve cash flows high enough defend PMV. Due to this short interval, the issue of Oxford Nanopore is a question of whether a 27% CAGR is realistic.

Table A2.9 is a summary of five scenarios where Oxford Nanopore achieves a valuation close to the PMV. If the firm manages to increase its margin from current levels of -1,356% to 24%, it will need a CAGR of 27.5% in the forecast period and revenues of $119m in the continuing period. This corresponds to an increase of 1,742%, compared to the $6.5m it reported in 2016.

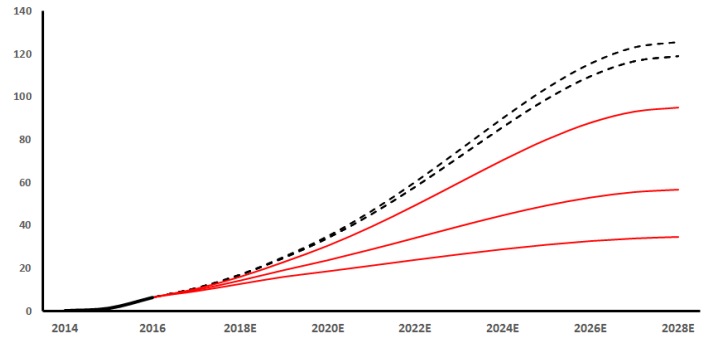

Figure A2.18 - ONT's revenue paths, realistic and high-valuation scenarios.

Figure A2.18 illustrates the growth Oxford Nanopore needs compared to the revenue growth it had in prior years. The dotted lines represent the five scenarios presented in table A2.9. Since the company's valuation to a large extent is determined by its revenue growth, these five scenarios will overlap and be shown as two scenarios in the graph. In the period 2014-2016 (black line), the revenues increased with 2,448%.

The three red lines represent a good, a bad and a base case scenario which we find to be realistic given the company's recent growth and business model. In the middle line scenario, or the base case, we normally use a CAGR equivalent to the expected market growth of 4.8%. However, the market is relatively mature and gives little insight to what might be a sensible base case for Oxford Nanopore. Instead of 4.3%, we apply a CAGR of 20% as a base case, reflecting a continuing ability to capture market share.

The two other red lines have a CAGR equal to base case +/- 5 pp. The fact that Oxford Nanopore is in a high-growth stage in the funding cycle makes it harder to forecast its CAGR. We believe that base case is the most realistic scenario. Here, the recent growth rate will decrease proportionally until it reaches 2% in the continuing period. The revenues in terminal year will in this scenario be $56.6m. This is a total increase of 777% compared to base year. We find this to be a reasonable estimate if Oxford Nanopore maintains its market-leading systems, and no substitutable system develops in the near future. The upper red line represents a more optimistic scenario, where the company manages to harvest the potential benefits from its ongoing R&D spending. The revenues in terminal year will in this scenario be approximately $95.2m, which is 68% higher than in base case. This corresponds to an increase of 1,373% from base year. The bottom red line reflects a scenario where the company's relative growth declines compared base case and its current growth path. In this case, Oxford Nanopore is met by higher competition in the market and struggles with lagging behind on its R&D program relative to its competitors. The CAGR in this case is 15%, and revenues in terminal year equal $34.8m. However, we do not find this scenario very realistic considering the company's currently sustainable market position.

With an operating margin of 24% and a CAGR from 20% to 25% (representing base case and good case), we end up with a valuation interval between $652m and $1.18bn.

Relative valuation

Peer group:

Company	**EV/Revenues**
Illumina, Inc.	7.7
Pacific Biosciences of California	3.3
Median	**5.5**

Based on Oxford Nanopore Technologies' products and other firm-specific characteristics, we identify two comparable firms. Pacific Biosciences is currently returning a negative EBIT. An underlying assumption when using EV/Revenues is that the operating margins are equal.

Valuation

The multiples violate the assumptions of the EV/Revenues multiple to such an extent that we decide not to conduct any relative valuation on Oxford Nanopore Technologies.

Summary

All numbers in $m	**Value min**	**Value max**
DCF	652	1,180
Multiple	Na	Na
Post-money valuation	1,580	
Average valuation	**635**	

When applying a margin of 24% and a CAGR of 20% and 25%, the R-model generates a valuation interval between $652m and $1.18bn, suggesting that PMV overvalues the firm with 34% to 142%.

The Hut Group Valuation

The Hut Group Ltd. (THG) owns and operates websites that sell fast-moving consumer goods direct to the consumer via in-house technology and its operating platform, specifically focused on health and beauty. The company was founded in 2004 and is based in the UK. In August 2017, THG reached its PMV of $3.25bn, after a financing round with Old Mutual Global Investors (Crunchbase, 2018b).

Historical performance:

	2012	2013	2014	2015	2016
Revenues ($m)	248	304	387	494	617
Revenue growth	13%	23%	27%	28%	25%
EBIT ($m)	2.7	8.2	13	26.4	20.4
Operating Margin	1.1%	2.7%	3.4%	5.3%	3.3%

R-model

Input variables:

General		Cost of Capital			
Post-money valuation ($m)	3,250				
Company growth	Low	Tax rate	20%	Market beta	1.34
Trend in NWC ratio[1]	Decreasing	Risk-free rate	1.48%	Industry market correlation	19.4%
Depreciation/PPE[2]	13.6%	Market risk premium	5.4%	Equity ratio	90.91%
Operating Margin vector	5% - 9% á 1%	Years to IPO[3]	4	Cost of debt	4.73%
Net Debt ($m)	164.7				

Forecasted Cost of Capital:

	2016E	2017E	2018E	2019E	2020E-2026E
WACC	11.4%	10.4%	9.5%	8.8%	8.3%

Market size forecast:[4]

	2017E	2018E	2019E	2020E	2021E	2022E
Market size ($bn)	548	638	729	816	896	968
CAGR (since 2016)	18%	16%	14%	12%	10%	8%

Comments:

[1] Historical ratio in the period 2011-2016: -9%, -13%, -21%, -16%, -18%

[2] Historical ratio in the period 2014-2016: 25%, 11.7%, 4.11%

[3] THG had its latest venture financing round in 2010 and has yet to IPO. The company has already had two private equity financing rounds, in addition to two rounds of debt financing. Its latest financing round was $630m additional debt in October 2017, indicating that a near IPO is less likely. Given THG's relatively mature stage in the funding cycle and the latest debt rounds, we believe that a listing in two years (2020) is a reasonable estimate.

[4] Statista (2018e) provides a forecast of different segments in the ecommerce industry. We use the fashion segment as this is closest to THG's products. The growth path suggests that the fashion industry will be reaching a 2% growth rate in 2026, which is why we set the length of the forecast period to ten years.

Analysis:

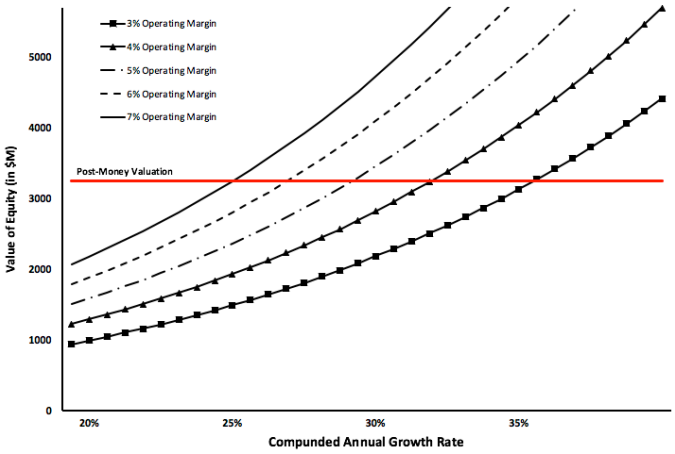

Figure A2.19 – THG's valuation scenarios

Operating Margin	Value of Equity ($m)	Revenues terminal year ($m)	CAGR	Growth in revenue
5%	3,269	12,576	35%	1,938%
6%	3,230	9,592	32%	1,455%
7%	3,297	7,965	29%	1,191%
8%	3,237	6,585	27%	967%
9%	3,241	5,692	25%	823%

Table A2.10 – Summary of scenarios yielding PMV

Operating Margin: We use two benchmarks when assessing THG's operating margin in terminal year. Damodaran's average for online retail industry and a peer group we identify in FactSet. The company's current operating margin is 3.3%. The average operating margin among European online retailers is according to Damodaran (2018) almost equivalent to THG's, at 3.4%. The company's products are in the higher-end segment compared to the average online retail firm, and it is therefore charging a higher premium to its customers. Hence, we assume that its operating margin will increase in the explicit forecast period. From the peer group, we observe relatively low operating margins, where B2W Companhia Digital has the highest margin of 4.6%. We choose an interval from 5% to 9% in the OM vector. By defining the interval above the peers' operating margins, we assume it to be conservative. The upper bound of 9% is relatively high compared to the benchmarks discussed. However, this might be realised if THG is successful in acquiring suitable firms to its platform, achieving economies of scale. We use 8% as THG's operating margin in the valuation interval.

CAGR: Given the margins we include in the OM vector, the firm will need a CAGR between 25% and 35% to achieve cash flows high enough to receive a valuation close to the PMV. THG´s current operating margin is 3%, and we observe that the firm would need a massive improvement toward 2026.

Table A2.10 is a summary of five scenarios where THG achieves a valuation close to the PMV. If it manages to increase the operating margin with two percentage points, it will need a CAGR of 35% in the forecast period and

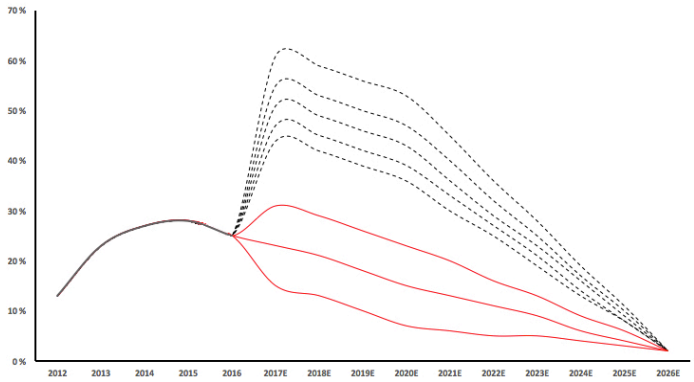

Figure A2.20 – THG's revenue paths, realistic and high-valuation scenarios.

revenues of $12.6bn in terminal year. This is a 1,938% increase compared to the $617m it reported in 2016. The bottom scenario is more realistic, and to achieve this it will need a relatively lower CAGR of 25%, or revenues in terminal year of $5.7bn. This corresponds to an increase of 823%. However, the drawback is that it will need to increase the operating margin with 6 pp from today's level of 3% to 9% in terminal year. This requires a significant improvement in the operations and it is far beyond the average margin in the online retail industry of approximately 3% (Damodaran, 2018). However, considering the fact that THG is offering premium products, it is fair to assume that the margin will be higher than the industry average.

Figure A2.20 illustrates the growth THG will need compared to the revenue growth it has reported in prior years. The dotted lines represent the five scenarios presented in table A2.10. The black line between 2012 and 2016 represents the historical growth for THG. The total growth in this period was 149%. The red lines represent the good case (upper), the base case (middle) and the bad case scenario (lower). Base case follows the expected growth path of the market. Good case and bad case are defined as base case +/- five percentage points CAGR.

THG's recent performance suggests that it has entered a low-growth stage. Hence, the most likely scenario would be a continuation of the historical growth path it has had, which the base case scenario represents. In this scenario, the recent growth rate will decrease proportionally until it reaches 2% in terminal year. The revenues in terminal year will in this scenario be $1.9bn, which corresponds to an increase of 211%. Compared to the other sample firms, this is a moderate growth in a 10-year perspective. However, it is still a reasonable estimate if THG continues the current operational performance. The upper red line represents a more optimistic scenario, where THG manages to acquire some attractive online retail companies. The result is that THG experiences an abnormal boost in revenues during the next five years until it reaches the steady growth rate. The revenues in terminal year will in this scenario be approximately $2.9bn, which is an increase of 383%. The latter scenario indicates that we are wrong about THG's growth stage, and that it is still in the medium-growth stage. The bottom red line is a scenario where THG's relative growth declines compared to the forecasted market growth and its current growth path. This can for example be the case if THG is unsuccessful in acquiring suitable companies to its platform. The CAGR in this case is 7%, and revenues in terminal year is equivalent to $1.2bn. However, we do not find this scenario very realistic considering the growth profile of the industry THG operates in.

Although we believe base case is the most realistic scenario, we keep the valuation conservative and use an interval from base case to good case. These two scenarios correspond to a CAGR between 11.8% and 16.8%, which implies that THG will have revenues between $1.89bn and $2.93bn in terminal year. With an operating margin of 8% and a CAGR from 11.8% to 16.8%, we end up with a valuation interval between $0.93bn and $1.45bn for THG. The lower bound of the interval suggest that THG is not considered a unicorn.

Relative valuation

Peer group:

Company	EV/Revenues
B2W Companhia Digital	0.67
Channeladvisor Corporation	2.74
Zhongzing Shenyang Commercial Building Group	1.38
Netalogue Technologies	1.52
Intrasfort Technologies Ltd.	0.46
Average	**1.40**

The firms included in THG's peer group are mainly ecommerce companies, with a similar platform as THG's. Although these are the closest comparable companies we are able to identify, we observe some differences in the business operations and the margins. Due to the low margins, the multiples will downward bias the valuation. To reduce this bias, we instead apply the average multiple which is slightly higher than the median. The average multiple from the peer group is 1.4.

Valuation

All numbers in $m	Value min	Value max
Revenues (2026)	1,889	2,916
EV/Revenues	1.38	1.38
Implied EV (Aug 2017)	1,272	1,963
Net Debt	164.7	164.7
Value of Equity	**1,107**	**1,799**

The table to the left shows the relative valuation of THG in the two scenarios representing the upper and lower bound of the valuation interval. The revenues presented are the revenues the R-model generates for the company in terminal year. The scenarios yield an overvaluation of 194% and 81% of the reported PMV.

Summary

All numbers in $m	Value min	Value max
DCF	926	1,446
Multiple	1,107	1,799
Post-money valuation	3,250	
Average valuation	**1,320**	

The DCF and the EV/Revenues multiple suggest valuations substantially lower than the PMV. The R-model generates a valuation interval between $0.93bn and $1.45bn, which implies an overvaluation between 125% and 251% compared to PMV. We use a CAGR of 11.8% and 16.8% as the lower and upper bound of the interval, and a margin of 8%. Although we put more emphasis on the result of the R-model, we observe that the relative valuation yields fairly similar results.

A reason for the low valuations is that the growth in revenues seems to start declining too early, and it will be challenging to reach the level needed to defend the valuation of $3.25bn. Moreover, the margin is low and seems to have stabilised between 3% and 4%. We argue that the company can improve this to 8% in steady state, but the level of margin and revenues will not generate cash flows sufficient to defend the high valuation.

Spotify Valuation

The largest sample firm, according to PMV, is Spotify Technology. This is an online music streaming software, headquartered in Stockholm, Sweden. It was founded in 2006. As of January 2018, Spotify has 70m paying subscribers (Statista, 2018b) which is an increase of 370% in three years. The latest funding round, which was Series G in November 2015, made Spotify reach a PMV of $8.53bn (Crunchbase, 2018a).

Spotify has had a rapid growth in revenues in the recent years. Although it reported revenues of $3.2bn in 2016, the firm has yet to gain positive results, due to high royalty costs (Christman, 2017). As of February 2018, the company has filed for a direct public offering (DPO) within the next few months (Castillo, 2018).

Historical performance:

	2012	2013	2014	2015	2016
Revenues ($m)	94	1,030	1,313	2,118	3,224
Revenue growth	840%	996%	27%	61%	52%
EBIT ($m)	-70	-126	-200	-201	-278
Operating Margin	-74.5%	-12.2%	-15.2%	-9.5%	-8.6%

R-model

Input variables:

General		Cost of Capital			
Post-money valuation ($m)	8,530				
Company growth	Medium	Tax rate	22%	Market beta	0.9
Trend in NWC ratio[1]	No trend	Risk-free rate	0.8%	Industry market correlation	15.86%
Depreciation/PPE[2]	17.6%	Market risk premium	6.8%	Equity ratio	91.9%
Operating Margin vector	5% - 7% á 0.5%	Years to IPO[3]	2	Cost of debt	4.73%
Net Debt ($m)	370.5				

Forecasted Cost of Capital:

	2016	2017	2018	2019	2020-2026
WACC	7.8%	7.2%	7.2%	7.2%	6.7%

Market size forecast:[4]

	2017E	2018E	2019E	2020E	2021E	2022E
Market size ($m)	8,368	9,574	10,450	11,187	11,837	12,411
CAGR (since 2016)	26%	14%	9%	7%	6%	5%

Comments:

[1] Historical ratio in the period 2012-2016: -8.9%, -21.1%, -20.7%, -21.4%, -0.5%

[2] Historical ratio in the period 2014-2016: 17.5%, 17.6%, 17.7%

[3] On April 4 2018, Spotify is registered to be listed on the New York Stock Exchange. Generally, the cost of capital function assumes that shareholders are fully diversified at the time of the public listing. However, Spotify's listing is a Direct Public Offering (DPO) instead of a traditional IPO. In a DPO, no new securities are issued and the company self-underwrites its shares without help from a third party. As a consequence, the function assumes that Spotify's shareholders are not fully diversified although the company is publicly listed. The gradual increase in the shareholders' diversification will therefore stay constant for two years after it reaches 90% in 2018. This is based on the assumption that few of the investors will sell their shares when the firm goes public. The result is a slightly higher cost of capital in the period 2016-2020.

[4] Statista (2018c) provides a market forecast of the music streaming industry. The market was expected to grow rapidly in 2017 and 2018 before it decreases gradually toward 2% in 2025, which is equivalent to the terminal growth rate in the model. This suggests that Spotify is likely to reach steady state in 2025, but we forecast until 2026.

Analysis:

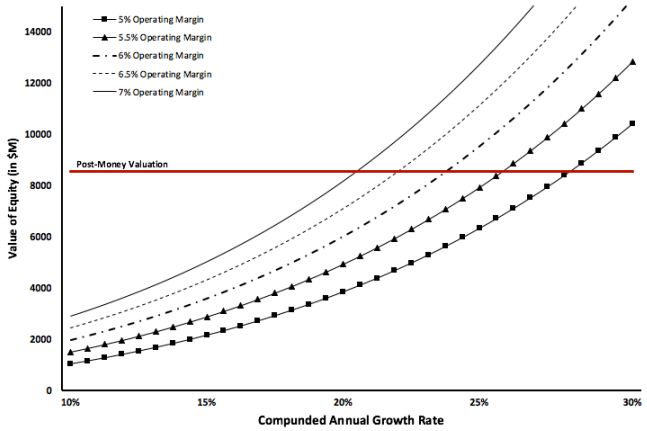

Figure A2.21 – Spotify's valuation scenarios

	2012	2013	2014	2015	2016
Revenues ($m)	94	1,030	1,313	2,118	3,224
Total Active Users (m)	20	30	60	88	120
Subscribing Users (m)	5	8	15	25	45
ARPU Total Users ($)	5	34	22	24	27
ARPU Subscribers ($)	19	129	88	85	72

Table A2.11 – Spotify's historical ARPU

Operating Margin: The margins in the music streaming industry has historically been low. The main contributor to this is the high royalty costs the companies have to pay to the artists and label records. This cost is paid for each song played. Hence, the problem is that an increase in revenues, due to a larger user base, will increase the costs proportionally, which makes it is difficult to improve the margins in the industry. Moreover, the competition has increased due to many new firms entering the industry. Examples are Amazon who recently launched its new streaming service and Apple Music who has had a rapid growth in number of subscribers. Since many similar comparable services are a part of a larger corporation, such as Amazon and Apple, it is difficult to identify a peer group.

Pandora Music is an example of a publicly listed music streaming company. However, it is significantly smaller than Spotify both in terms of market capitalisation and revenues, and the operating margin is -23% (Financials morningstar, 2018). Netflix, although significantly larger, might serve as a better comparable in the coming years. It does not operate in the music streaming industry, but the business model is based on monthly subscription fees, and royalty fees are its main operating expense.

Netflix currently has an operating margin of 7.2%. We observe significantly positive operating margins on Domestic Streaming (36.2%), negative on International Streaming (-9.6%) and an average of 18.5% coming from streaming in general (Netflix, Inc, 2018). However, if we distribute *other*

Operating Margin	Value of Equity ($m)	Revenues terminal year ($bn)	$24 ARPU	$26 ARPU	$28 ARPU
5%	8,399	37.1	1,547	1,428	1,326
5.5%	8,380	30.6	1,276	1,178	1,093
6%	8,518	26.4	1,101	1,016	943
6.5%	8,427	22.7	947	874	812
7%	8,644	20.5	855	790	733

Table A2.12 – Spotify's forecasted ARPU

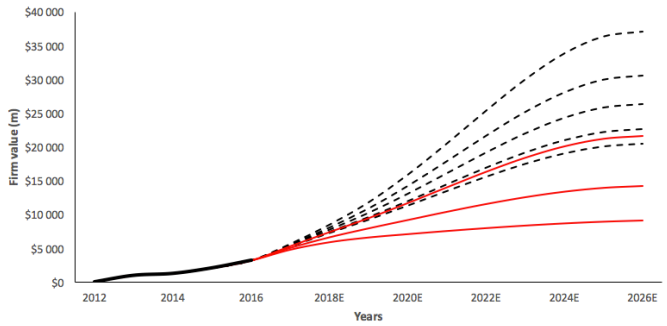

Figure A2.22 – Spotify's THG's revenue paths, realistic and high-valuation scenarios.

operating expenses relative to each segment's revenues contribution, we end up with an operating margin from streaming at 2%. If we assume that the royalty fees as a percentage of revenues are similar in the music industry and the movie industry, it looks challenging for Spotify to obtain a higher margin than Netflix. As a conservative measure, we apply 6% as operating margin in the valuation scenarios of Spotify.

CAGR: We observe in figure A2.21 that Spotify will need a high CAGR in order to defend the valuation of $8.53bn. Regardless of what operating margin Spotify manages to obtain (among the five included), no scenarios with a CAGR lower than 20% will give Spotify a value equal to or higher than the PMV. A CAGR of 20% corresponds to a yearly revenue of $20bn in terminal year. This is an increase of 537% in the period between 2016 and 2026.

A common technique to use when forecasting the revenues of software companies and social media platforms is to estimate the increase in active users and how much money each user on average generates for the company. This is called Average Return Per User (ARPU). Spotify offers its users both a premium account and a free account. If the user does not upgrade to the premium account, it will be exposed to advertisements when listening to music. The premium users avoid this. Hence, Spotify has two ways of generating revenues; payments from premium subscribers and income from advertising. Table A2.11 shows Spotify's ARPU for its total users and subscribers at the end of the past five years. Total users refer to both the subscribers and users with a free account.

We observe that the total users on average generated between $22-$27 annually in revenues over the past three years. The relatively constant number indicates that Spotify's revenues increases proportionally with its user base. Thus, we can forecast the amount of users Spotify will need in the terminal year in order to generate revenues sufficient to defend the high valuation, given that Spotify continues with the current business model. This is done in table A2.12. Each line represents a scenario where the value of the company is close to the PMV. By dividing the revenues in terminal year on different levels of ARPU, we can calculate how many users Spotify will need in order to earn revenues sufficient to defend the valuation, given the different operating margins. The results indicate that Spotify will need between 733m-1.5bn users, depending on the ARPU and operating margin it manages to obtain.

As mentioned, Spotify has 70m premium subscribers and another 70m free users as of 2017. If the company were to reach any of the levels of users illustrated in the table A2.12, it would need an increase between 425%-1,000% in monthly active users (MAU). This sounds achievable, given the historical growth since 2012 of 500%. But it implies that Spotify manages to maintain this growth. This might be difficult considering that the growth in user base has decreased in recent years. A comparison with the total amount of internet users worldwide also highlights the issue. As of 2018, the number of internet users is 3.8bn (internetlivestats.com, n.d.). By extrapolating the growth path since 1995, we assume that this number will increase to approximately 5.5-6bn by 2026. The share of the total amount of internet users using Spotify actively will thus be between 15% - 30%, which is fairly high considering today's share of 3.7%.

Figure A2.22 is a plot of the growth path in the five scenarios from table A2.12 (dotted lines), the historical growth (bodied line), and three scenarios which we find to be realistic (red lines). The red lines represent the good case (upper), the base case (middle) and the bad case scenario (lower). Base case follows the expected growth path of the market. Good case and bad case are defined as base case +/- five percentage points CAGR. We observe that the good scenario is close to the two bottom scenarios yielding PMV, but the base case scenario is far below any of the five. Although we believe base case is the most realistic scenario, we keep the valuation conservative and use an interval from base case to good case. These two scenarios correspond to a CAGR between 16% and 21%, which implies that Spotify will have revenues between $14.2bn and $21.6bn in terminal year.

With an operating margin of 6% and a CAGR from 16% to 21% (representing base case and good case), we end up with a valuation interval between $4.14bn and $6.81bn.

EV/MAU valuation

Company	Acquired by	Date	Amount ($m)	MAU (m)	EV/ MAU
Music Streaming:					
Aspiro (Tidal)	Panther Project	Jan 15	56	0.5	112
Pandora	IPO	Dec 11	2,600	36	72.2
Average					**92.1**
Other:					
LinkedIn	Microsoft	Jul 16	26,000	450	57.8
Instagram	Facebook	Apr 12	1,000	30	33.3
YouTube	Google	Oct 06	1,600	50	32.0
WhatsApp	Facebook	Feb 14	19,000	450	42.2
Skype	Microsoft	Oct 11	8,500	124	68.5
Average					**46.8**

Table A2.13 – Comparable transactions on EV/MAU

The idea behind this multiple is to compare the amount paid for each user in similar transactions with the amount of users in the company being valued. MAU is the most common benchmark, but it is also feasible to look at daily active users or total registered users. An important issue is to make sure that the number of users in the ratio is captured from the same time period as the corresponding transaction.

Table A2.13 presents a list of related transactions from the music streaming industry and other user-based platforms. The music streaming industry is still relatively young, and few transactions have been completed so far. Spotify's main competitors Apple Music, Amazon Music and Google Play are divisions of larger IT-companies and have not been involved in any acquisitions or IPOs. Another music streaming service is Deezer, but it is still VC-backed. The Asian market leaders QQ Music, Kugou and Kuwo have merged under the control of Tencent in 2016 (Soo, 2016). Pandora is the only company identified which has gone public. It was listed in 2011 with an IPO value of $2.6bn, and had at the time 36m subscribing users (TechCrunch, 2011). This is equivalent to an EV/MAU ratio of $72.2. In other words, the investors were at the time of the listing willing to pay $72.2 for each user holding a premium account. Aspiro, which is the mother company of the music streaming

platform Tidal, was acquired by the American rap-artist Jay-Z in 2015 for $56m (The Guardian, 2015). The company reported to have 500,000 users at the time of the acquisition, which equals an EV/MAU ratio of $112. We compare these numbers with Spotify's user base at the time of the PMV (June 2015), which according to a press release from the Spotify team corresponds to 20m (Spotify, 2015). Both of these comparable ratios yield a very low EV on Spotify of $2.2bn and $1.4bn, respectively. Adjusted for net debt, we get a value of equity of $2.57bn and $1.77bn, which are far below the PMV of $8.53bn. The average multiple yields an EV of $1.84bn and a value of equity of $2.21. This can either be a result of an undervaluation or that Spotify's users are more worth than Pandora's and Tidal's.

We also include five major transactions of well-known user-based companies. We do not put too much emphasis on this result, due to the difference in the product they offer. However, both Spotify and the acquired companies included in the list are user-based platforms with high influence in the modern society and on its users. Hence, we assume that the deviation between the value of the users is minimal. The MAU included here are total users, and we therefore compare the user base with Spotify's total MAU and not just subscribers. According to Spotify, this corresponded to 75m in June 2015 (Spotify, 2015). When we apply the average multiple from Table A2.13 on 75m users, we end up with an EV of $3.5bn and a value of equity of $3.87bn.

Summary

All numbers in $m	**Value min**	**Value max**
DCF	4,140	6,810
Multiple	1,840	2,210
Post-money valuation	8,530	
Average valuation	**3,750**	

The DCF and the EV/MAU multiple suggest valuations substantially lower than the PMV. The R-model generates a valuation interval between $4.1bn and $6.8bn. This implies an overvaluation between 25% and 106% compared to PMV. We use a CAGR of 16% and 21% as the lower and upper bound of the interval, and a margin of 6%.

One of the reasons for the low valuation is Spotify's operating margin. The company has yet to show signs of operational profitability with a margin of -5.8% in 2018. The royalty fees, which are fixed fees based on how many times each song is played, are still the main contributor to the negative results. This is a critical issue that Spotify must deal with before positive margins can be realistic, which is why we doubt that Spotify will become profitable in the near future.

BrewDog Valuation

BrewDog is a Scottish beer brewery, producing premium craft beers. As of March 2017, it exported its products to 60 different countries and has opened 49 BrewDog bars worldwide (Brewdog, 2017). It was founded in 2007, and is thus considered a relatively mature start-up. However, as the historical performance table illustrates, BrewDog is still at a high growth level and has delivered impressive margins since 2012, ranging between 5%-14%.

Historical performance:

	2012	2013	2014	2015	2016
Revenues ($m)	17	30.3	46.5	66.8	88.8
Revenue growth	85%	78%	53%	44%	33%
EBIT ($m)	0.8	4.1	6	4.7	5.4
Operating Margin	5%	14%	13%	7%	6%

R-model

Input variables:

General		Cost of Capital			
Post-money valuation ($m)	1,250				
Company growth	Medium	Tax rate	20%	Market beta	0.66
Trend in NWC[1]	Flat	Risk-free rate	1.48%	Industry market correlation	23.4%
Depreciation/PPE[2]	4.8%	Market risk premium	5.4%	Equity ratio	71.5%
Operating Margin vector	11% - 15% á 1%	Years to IPO[3]	4	Cost of debt	4.43%
Net Debt ($m)	75.6				

Forecasted Cost of Capital:

	2016	2017	2018	2019	2020-2030
WACC	5.8%	5.4%	5.1%	4.8%	4.6%

Market size forecast:[4]

	2017-2020E	2022E	2025E	2028E	2030E
Annual growth	25%	18%	14%	8%	2%

Comments:

[1] Historical ratio in the period 2011-2016: 15.2%, 2.4%, 5.6%, 6%, 4.2%, 12.4%

[2] Historical ratio in the period 2014-2016: 5%, 4.5%, 4.8%

[3] The market was, according to a report from Deloitte (2017), estimated to be worth $85bn in 2015 and is forecasted to be worth $500bn by 2025 which corresponds to a CAGR of 19.5% in the period. We thus set the market growth to 25% in 2017-2020, before it gradually declines toward 2% in 2030.

[4] The co-founders confirmed in 2017 that an IPO is planned within the next five years, but not within the next 12-18 months (Key, 2017). We thus set the years to IPO variable to four years.

Analysis:

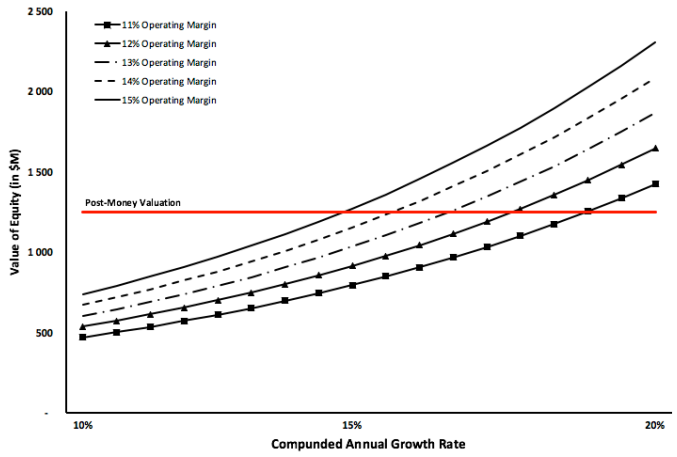

Figure A2.23 – BrewDog's valuation scenarios

Operating Margin	Value of Equity ($m)	Revenues terminal year ($m)	CAGR	Growth in revenue
11%	1,252	1,006	18.9%	1,030%
12%	1,269	878	17.8%	887%
13%	1,260	764	16.6%	758%
14%	1,231	664	15.5%	646%
15%	1,271	618	14.9%	594%

Table A2.14 – Summary of scenarios yielding PMV

Operating Margin: The industry average operating margin for the alcohol beverage industry is 22.65% (Damodaran, 2018). However, the sample mainly consists of importers or producers of wine and liquor rather than beer products. We thus have to apply comparable margins from the peer group. We identify three craft beer companies, all listed on North-American stock exchanges. These are Boston Craft Beer Company, Brick Brewing and Craft Beer Alliance, with operating margins of 13%, 13% and 2%, respectively. BrewDog has already become profitable, with a margin of 6%. Considering this, and the high growth forecast of the industry, we exclude the lowest value from the sample. Boston Beer Company is perhaps the best comparable of the three. In 2016, it reported revenues of $863m, which is close to the level we believe BrewDog will end up with in steady state. Similar to BrewDog, its focus is solely on premium craft beer products. It was founded in 1984, and went public in 1995, which indicates that the company has reached steady state. We thus assume that BrewDog can end up with a margin similar to Boston Beer Company's at around 13%.

CAGR: BrewDog's historical performance indicates a promising future. The results from the R-model suggest that the company would need a CAGR between 15% and 19% to defend the PMV, given the margins we have included in the OM vector. Considering the bright forecasts of the craft beer industry, this growth is well within what we believe is achievable for the firm. Table A2.14 is a summary of five scenarios where different levels of CAGR and operating margins provide a valuation close to the one presented in the media. It suggests that BrewDog will need an increase in revenue between 594%-1,030%, depending on the margin it achieves.

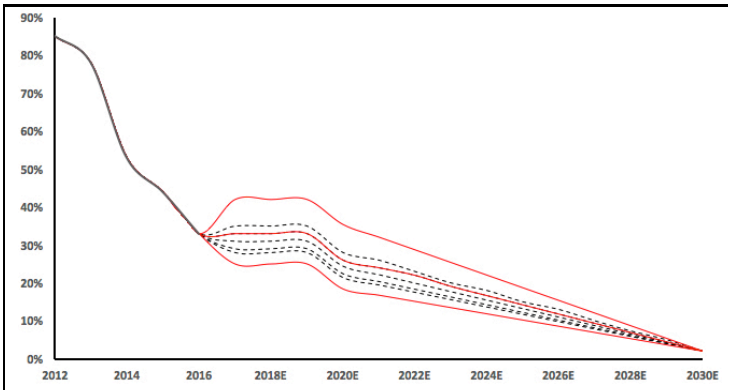

Figure A2.24 – BrewDog's revenue paths, realistic and high-valuation scenarios.

The base case scenario, which illustrates the forecasted growth path of the craft beer industry, has a CAGR equivalent to 17.8%. This is between the upper and lower boundary of the annual growth rates in table A2.14, which highlights that the scenarios in the table are realistic if BrewDog grows with the market. We also illustrate this in figure A2.24, which is a plot of the growth path in the five scenarios (dotted lines), the historical growth (bodied line), and three scenarios which we find to be realistic (red lines). The red lines represent the good case (upper), the base case (middle) and the bad case scenario (lower). Good case and bad case are defined as base case +/- five percentage points CAGR. We observe that the base case scenario has the exact same growth path as the second scenario in table A2.14. This means that BrewDog's valuation should be exactly equivalent to the PMV if it continues with its present business model and grow at the same pace as the market, and at the same time achieves an operating margin in steady state of 12%.

Figure A2.24 also illustrates a continuation of the recent growth of the company. Hence, BrewDog's valuation should not deviate too much from PMV of $1.25bn if it manages to obtain a growth path close to the forecasted market growth.

In summary, with an operating margin of 13% and a CAGR from 17.8% to 22.8%, we end up with a valuation interval between $1.44bn and $2.56bn for BrewDog.

Relative valuation

Peer group:

Company	**EV/Revenues**
Boston Craft Beer Company	2.22
Brick Brewing	2.17
Craft Beer Alliance	0.90
Median	**2.17**

The PMV of BrewDog was conducted in April 2017, and we thus use the last observation which was in December 2016. Few craft beer breweries have been listed on any stock exchanges so far. From the initial peer group identified, we exclude companies that are clearly not in steady state and where we fail to find historical EV/Revenues ratios at the specific time of the PMV. The final result is the three companies listed in the table, with a median ratio is 2.17.

Valuation

All numbers in $m	**Value min**	**Value max**
Revenues (2030)	879	1,604
EV/Revenues	2.17	2.17
Implied EV (Dec 2016)	1,011	1,845
Net Debt	37.3	37.3
Value of Equity	**974**	**1,808**

We apply steady state revenues in 2030 generated from the R-model, as we believe the companies we identify have reached this stage. By multiplying the revenues with the median ratio and discounting it, we receive an implied enterprise value of BrewDog in December 2016. Finally, we subtract for net debt and end up with a suggested value of equity for each scenario. We observe that the valuation yields a value interval between $0.97bn in base case and $1.81bn in the good case.

Summary

All numbers in $m	**Value min**	**Value max**
DCF	1,440	2,560
Multiple	974	1,808
Post-money valuation	1,250	
Average valuation	**1,696**	

The DCF and the EV/Revenues multiple suggest valuations above PMV. The R-model generates a valuation interval between $1.44bn and $2.56bn. This implies an *undervaluation* between 13% and 51% compared to the PMV of $1.25bn. We use a CAGR of 17.8% and 22.8% as the lower and upper bound of the interval, and a margin of 13%. The relative valuation yields a slightly lower result with a valuation between $0.98bn and $1.81bn.

The reason for the high valuation is BrewDog's promising financial prospect. It is the only sample firm not considered to be a technology firm. It has been profitable in five consecutive years since 2012, and is likely to reach the $100m threshold in revenues in the near future. Hence, BrewDog's historical performance clearly stands out from the other sample firms, which is the main contributor to the high valuation.

Appendix 3 – EV/Revenues Groups

	EV/ Revenues	Over-valuation	CAGR	OM Terminal	Years Since Founded	# of Acquis-itions	# of Equity Rounds	Money Raised ($m)	OM Base Year
Group 1:									
Home24	1.5	66%	11.9%	10%	6	2	4	155	-24%
Spotify	1.7	188%	18.5%	6%	9	13	19	2,700	-8.6%
The Hut Group	1.9	172%	14.3%	8%	13	12	3	1,100	3.3%
Group 2:									
Deliveroo	7.9	-17%	18.5%	18%	4	1	9	859	-110%
Klarna	8.0	65%	14.1%	8%	12	3	12	636	4,7%
Farfetch	8.8	-13%	26.5%	14%	8	2	8	721	-22%
Group 3:									
Funding Circle	13.2	-19%	21.5%	10%	5	3	7	413	-35%
BrewDog	22.5	-32%	20.3%	13%	10	1	9	336	6%
Transferwise	25.1	48%	18.5%	6%	7	0	7	396	-0.1%
Group 4:									
Improbable	82.7	88%	33.4%	22%	5	0	4	554	-95%
Oxford Nanopore	141.8	-15%	22.5%	24%	11	0	13	507	-1,356%
Blippar	163.9	14%	35.1%	20%	4	2	3	99	-307%
Average									
Group 1	1.7	142%	8%	15%	9	9	9	1,319	-10%
Group 2	8.3	12%	13%	20%	8	2	10	739	-42%
Group 3	20.3	-1%	10%	20%	7	1	8	382	-10%
Group 4	129.5	29%	22%	30%	7	1	7	387	-586%
Median									
Group 1	1.7	172%	14%	8%	9	12	4	1,100	-9%
Group 2	8.0	-13%	19%	14%	8	2	9	722	-22%
Group 3	22.5	-19%	20%	10%	7	1	7	396	0%
Group 4	141.8	14%	33%	22%	5	0	4	507	-307%

Appendix 4 – R-Model

```
#############################################################
#                                                           #
#           R-Model FOR SCENARIO VALUATION OF               #
#                   UNICORNS USING DCF                      #
#                                                           #
#                   Company: xxxxxx                         #
#                                                           #
#############################################################

rm(list = ls())

#######################################
#                                     #
#           Input Variables           #
#                                     #
#######################################

## General input:
base.year <-              # Base Year
y.steady.state <-         # Years until steady state/length of forecast period
tax <-                    # Tax Rate
growth.rate <-            # Growth rate in terminal year
net.debt <-               # Net debt
post.money.valuation <-   # Post money valuation from the media
PPE <-                    # Property, Plant & Equipment in Base Year

## Cost of Capital input:
l.beta <-                 # Levered Market Beta
ind.cor <-                # Industry average correlation with the market
mrp <-                    # Market Risk Premium
rf <-                     # Risk-free rate
e.a <-                    # Industry equity ratio
kd <-  * (1-tax)          # After-tax cost of debt
years.to.ipo <-           # Years to IPO

## Fill in company growth (H, M or L) - H if it is still in high growth fase,
M if it is starting to stabilize, L if it has stabilized
H = "higrowth"            # Increase capex as revenue increases, converges toward industry mean
M = "mid_higrowth"        # Increases with revenue in year 1 -> Converges toward industry mean
L = "low_higrowth"        # Converges toward industry mean at a faster pace

company.growth <-         # H, M or L

## Vector of historic percentage regenue growth
hist.growth <- c()        #Historic percentage revenue growth

## Vector of forecasted market growth (Base year and forecasted years):
market.growth <- c()

## Working Capital input
WC <-                     # Working Capital in base year
industry.wc <-            # Industry NWC/Revenues. Not needed if Trend is F
hist.wc <- c()            # Historical Net Working Capital/Revenues (as many as possible):

# Fill in WC trend (N, F, I, D):
N = 'No trend'
F = 'Flat'
I = 'Increasing trend'
D = 'Decreasing trend'

Wc.trend <-

# Sequence of possible Operating Margins in Terminal (5 different OMs):
```

```
OM.terminal <- seq()

## Input for depreciation:
hist.PPE <- c()   # Vector of PPE last 3 years
hist.dep <- c()   # Vector of depreciation last 3 years

mean.dep.ratio <- mean(hist.dep/hist.PPE) # Calculate depreciation/PPE ratio

#####################################
#                                   #
#         Create FCFF Table         #
#                                   #
#####################################

years <- c(seq(base.year,base.year+y.steady.state,1)) # Vector of years in forecast period

## Create FCFF data frame:
FCFF <- as.data.frame(matrix(NA,12,length(years)))
colnames(FCFF) <- years
rownames(FCFF) <- c("Revenue growth", "Revenue", "Operating (EBIT) Margin", "EBIT", "Taxes",
             "EBIT(1-t)", "CapEx", "Depreciation", "Change WC", "FCFF", "Discount rate", "DCF")

#####################################
#                                   #
#           Input variables         #
#         Financials Base Year      #
#                                   #
#####################################

FCFF[1,1]  <-      # Revenue growth
FCFF[2,1]  <-      # Revenue in base year
FCFF[3,1]  <-      # Operating margin
FCFF[4,1]  <-      # EBIT
FCFF[5,]   <- tax  # Tax
FCFF[6,1]  <- FCFF[4,1]*(1-FCFF[5,1]) # Deduct tax from EBIT
FCFF[7,1]  <-      # CapEx
FCFF[8,1]  <-      # Depreciation
FCFF[9,1]  <-      # Change WC
FCFF[10,1] <- FCFF[6,1]-FCFF[7,1]+FCFF[8,1]-FCFF[9,1] # Calculate FCFF
FCFF[12,1] <- 0


#####################################
#                                   #
#    Scenarios of Revenue Growth    #
#                                   #
#####################################

## Function for creating the base case revenue scenario:
Base.revenue.growth <- function(growth.base.year) {

  # For Medium or Low growth firms:
  if(company.growth == M | company.growth == L ) {
    relative.growth <- (market.growth[-1]/market.growth[-length(market.growth)])-1
    base.growth <- c(growth.base.year)

    for(i in 1:4) {
      base.growth[i+1] <- (relative.growth[i]+1)*base.growth[i]
    }

    growth.diff <- (base.growth[5]-0.02)/(y.steady.state-4)

    for(i in 5:(y.steady.state)) {
      base.growth[i+1] <- base.growth[i]-growth.diff
    }
  }
```

```
129.
130.   # For High growth firms:
131.   if(company.growth==H) {
132.     revenue.growth.trend <- (hist.growth[-1]-hist.growth[-length(hist.growth)])/hist.growth[-
    length(hist.growth)]
133.     r.trend <- mean(revenue.growth.trend)
134.
135.     base.growth <- c(growth.base.year)
136.     for(i in 1:3) {
137.       base.growth[i+1] <- (1+r.trend)*base.growth[i]
138.     }
139.
140.     growth.diff <- (base.growth[4]-0.02)/(y.steady.state-3)
141.
142.     for(i in 4:(y.steady.state)) {
143.       base.growth[i+1] <- base.growth[i]-growth.diff
144.     }
145.   }
146.   return(base.growth)
147. }
148.
149. ## Function for simulating 50 scenarios above and 50 scenarios below base scenario:
150. Revenue.path.scenarios <- function(company.growth, growth.base.year) {
151.
152.   base.scenario.row <- 50
153.
154.   revenue.scenario <- as.data.frame(matrix(NA, 100, ncol(FCFF)))
155.   colnames(revenue.scenario) <- years
156.   revenue.scenario[base.scenario.row, ] <- Base.revenue.growth(growth.base.year)
157.   revenue.scenario[,ncol(revenue.scenario)] <- 0.02
158.   revenue.scenario[,1] <- FCFF[1,1]
159.
160.   for(i in 1:base.scenario.row) {
161.     revenue.scenario[i,2:5] <- revenue.scenario[base.scenario.row,2:5] + (base.scenario.row-
    i)/100
162.     growth.diff <- (revenue.scenario[i,5]-0.02)/(ncol(revenue.scenario)-5)
163.     for(j in 6:ncol(revenue.scenario)) {
164.       revenue.scenario[i,j] <- revenue.scenario[i,j-1] - growth.diff
165.     }
166.   }
167.
168.   for(i in base.scenario.row:100) {
169.     revenue.scenario[i,2:5] <- revenue.scenario[base.scenario.row,2:5] + (base.scenario.row-
    i)/100
170.     growth.diff <- (revenue.scenario[i,5]-0.02)/(ncol(revenue.scenario)-5)
171.     for(j in 6:ncol(revenue.scenario)) {
172.       revenue.scenario[i,j] <- revenue.scenario[i,j-1] - growth.diff
173.     }
174.   }
175.   return(revenue.scenario)
176. }
177.
178. ## Generate 100 revenue scenarios and store them in data frame revenue.scenarios
179. revenue.scenario <- as.data.frame(Revenue.path.scenarios(company.growth, FCFF[1,1]))
180.
181. ## Plotting revenue scenarios:
182. base.scenario.row <- 50
183. plot(as.numeric(revenue.scenario[base.scenario.row,]), ylim = c(-0.3,1.1), type="l",
184.      col = "red", lwd = 4, ylab = "Annual growth in %", xlab = "Years")
185. for(i in 1:100) {
186.   lines(as.numeric(revenue.scenario[i,]), lwd = 0.8)
187. }
188. abline(h = 0)
189.
190.
191. ######################################
```

```
#                                    #
#     Operating Margin function      #
#                                    #
######################################

## Function for forecasting the operating margin:
OM.function <- function(growth, om.terminal) {

  # For Medium or Low growth firms:
  OM = c(FCFF[3,1])
  if(growth == M | growth == L) {

    OM.diff <- (om.terminal-FCFF[3,1])/y.steady.state

    for (i in 2:(y.steady.state+1)) {
      OM[i] = OM[i-1] + OM.diff
    }
  }

  # For High growth firms:
  if(growth == H) {
    for(i in 2:(years.to.ipo+1)) {
      OM[i] = OM[i-1] - FCFF[3,1]/years.to.ipo
    }
    for(i in (years.to.ipo+2):(y.steady.state+1)) {
      OM[i] = OM[i-1] + om.terminal/(y.steady.state - years.to.ipo)
    }
  }
  return(OM)
}

######################################
#                                    #
#     Create tables for storing      #
#                                    #
######################################

## Create a dataframe called Values to store the valuation from the 500 scenarios
Values <- as.data.frame(matrix(NA, length(OM.terminal),nrow(revenue.scenario)))
rownames(Values) <- OM.terminal

## Create a table called CAGR to store the different Compounded Annual Growth Rates
CAGR <- as.data.frame(matrix(NA, length(OM.terminal), nrow(revenue.scenario)))
rownames(CAGR) <- OM.terminal


######################################
#                                    #
#    Net Working Capital Function    #
#                                    #
######################################

## Create a dataframe to store the NWC
table.wc <- data.frame(matrix(data=NA, nrow = ncol(FCFF), 1))
colnames(table.wc) = c("wc.ratio")

## Calculations
mean.wc = mean(hist.wc) # Mean historic working capital
table.wc$wc.ratio = c()

i.trend = (hist.wc[-1]-hist.wc[-length(hist.wc)])/abs(hist.wc[-length(hist.wc)])
  # Calculate trend/historic change in NWC
i.mean = mean(i.trend) # Calculate mean of the historic NWC


## Net Working Capital Function
```

```
Wc <- function (trend) {

  # If historical levels shows no trend or is decreasing (and greater than industry average)
  if (trend==N | trend==D & hist.wc[length(hist.wc)]>industry.wc) {
    table.wc$wc.ratio[1] = hist.wc[length(hist.wc)]
    for (i in 2:(nrow(table.wc)-1)) {
      table.wc$wc.ratio[i] <- table.wc$wc.ratio[i-
1] - ((hist.wc[length(hist.wc)] - industry.wc) / (y.steady.state))
    }
    table.wc$wc.ratio[nrow(table.wc)] = industry.wc
  }

  # If increasing trend
  if (trend==I) {
    table.wc$wc.ratio[1] = hist.wc[length(hist.wc)]

    for(i in 2:(nrow(table.wc) - 8)) {
      table.wc$wc.ratio[i] = table.wc$wc.ratio[i-1] + abs(table.wc$wc.ratio[i-1]*i.mean)
    }
    for (i in (nrow(table.wc) - 7):(nrow(table.wc))) {
      table.wc$wc.ratio[i] = table.wc$wc.ratio[i-1] - ((table.wc[nrow(table.wc)-
8,1] - industry.wc) / 8)
    }
  }

  # If decreasing and lower than industry average
  if (trend==F | trend==D & hist.wc[length(hist.wc)] < industry.wc) {
    table.wc$wc.ratio[1] = hist.wc[length(hist.wc)]
    for (i in 2:nrow(table.wc) ) {
      table.wc$wc.ratio[i] = table.wc$wc.ratio[i-
1] - ((hist.wc[length(hist.wc)] - mean(hist.wc))/(y.steady.state))
    }
  }

  return(table.wc$wc.ratio)
}


#####################################
#                                   #
#      Discount rate function       #
#                                   #
#####################################

## Build a matrix for calculation of cost of capital and name columns and rows
table <-  data.frame(matrix(data=NA, nrow = ncol(FCFF), 7))
colnames(table) = c( "unlev_mkt_beta", "shareholder_div", "industry_cor", "cor_market",
"tot_beta_vc", "ke",  "wacc")


## Function for Shareholders' level of diversification
div = c()
years = nrow(table)

Diversification <- function(years.to.ipo) {

  div[1] = 1-years.to.ipo/10

  for (i in 1:years.to.ipo) {
    div[i+1] = div[i] + ((1 - div[1])/years.to.ipo)
  }
  for (i in (years.to.ipo+1):(nrow(table)-1)) {
    div[i+1] = 1.00
  }

  return(div)
```

```
}

## Insert the firm's last funding round in function and add to the column
table$shareholder_div = Diversification(years.to.ipo)

## Variable input from Damodaran's database
table$unlev_mkt_beta = l.beta   # Levered Market Beta
table$industry_cor = ind.cor    # Industry average correlation with the market

## Calculations
table$cor_market = (1 * table$shareholder_div) + ((1 - table$shareholder_div) * table$industry_cor
)
table$tot_beta_vc = table$unlev_mkt_beta/table$cor_market
table$ke = rf + (table$tot_beta_vc * mrp)
table$wacc = (table$ke * e.a)  + (kd * (1-e.a))

#####################################
#                                   #
#              DCF loop             #
#                                   #
#####################################

## Loop running 500 times, valuing the firm with different input of key value drivers
## Stores the valuation for each scenario in the data frame Value
for(j in 1:length(OM.terminal)) {

  for(i in 1:nrow(revenue.scenario)) {
    FCFF[1,2:ncol(FCFF)] <- revenue.scenario[i,2:ncol(FCFF)]  # Revenue growth
    FCFF[3,] <- OM.function(company.growth, OM.terminal[j])   # Operating Margin

    for(k in 1:y.steady.state) {
      FCFF[2,k+1] <- FCFF[2,k] * (1 + FCFF[1,k+1])            # Revenue
      FCFF[4,k+1] <- FCFF[2,k+1]*FCFF[3,k+1]                  # EBIT (Revenue * OM)
      FCFF[6,k+1] <- FCFF[4,k+1]*(1 - FCFF[5,k+1])            # EBIT(1-t)
      PPE[k+1] <- (FCFF[1,k+1] + 1) * PPE[k]                  # PPE
      FCFF[8,k+1] <- mean.dep.ratio * PPE[k+1]                # Depreciation
      FCFF[7,k+1] <- PPE[k+1]-PPE[k]+FCFF[8,k+1]              # CAPEX
    }

    # Calculate WC from the function (input trend in WC)
    WC <- Wc(Wc.trend)*FCFF[2, ]                              # Working Capital
    FCFF[9,-1] <- diff(as.numeric(WC))                        # Change in Working Capital

    # Caculate the WACC (input last SERIES round)
    FCFF[11,] <- table$wacc                                   # Cost of Capital

    for(k in 1:y.steady.state) {
      FCFF[10,k+1] <- FCFF[6,k+1]+FCFF[8,k+1]-FCFF[7,k+1]-FCFF[9,k+1]   # FCFF
      FCFF[12,k+1] <- FCFF[10,k+1]/(1+FCFF[11,k+1])^k                   # DCF
    }

    value.DCF <- sum(FCFF[12,2:ncol(FCFF)])     # Sum of Discounted Cash Flows
    terminal.value <- FCFF[12,ncol(FCFF)]*(1+growth.rate)/(FCFF[11,ncol(FCFF)]-
growth.rate) # Terminal Value
    Values[j,i] <- value.DCF + terminal.value - net.debt # EV - Net debt = Value of Equity
    CAGR[j,i] <- ((FCFF[2,ncol(FCFF)]/FCFF[2,1])^(1/y.steady.state))-1
  }
}


#####################################
#                                   #
#           Plot scenarios          #
#                                   #
#####################################

```

```
colnames(Values) <- CAGR[1,]
CAGR <- c(CAGR[1,])

plot(CAGR,Values[5,], type = "l", ylim = c(0, 5000), xlim = c(0, 0.5), ylab = "Value in $M")
lines(CAGR,Values[4,], lty = 2)
lines(CAGR,Values[3,], lty = 10)
lines(CAGR,Values[2,], lty = 2, lwd = 2)
lines(CAGR,Values[1,], lty = 10, lwd = 2)

abline(h=post.money.valuation) # Horizontal line on post-money valuation

```

Appendix 5 – The VC method

Metrick & Yasuda (2011, p. 178) postulate that the VC method is the most common valuation strategy used by venture capitalists. There are many different venture methods and this appendix presents the standard VC method.

First, the dollar amount for the **required investment** is decided. Then, the investor estimates an **exit valuation**, which refers to the expected value of the firm at the time of a successful exit[30]. Third, a **target multiple of money** in a successful exit is determined. This multiple is often a function of the VC's cost of capital, probability of a successful exit and the number of years to an exit. An **expected retention percentage** is then calculated. This percentage describes how much of its initial (proposed) ownership the investor will retain if new shares are issued in the future. We can now calculate the total valuation of the firm in present values:

$$Total\ valuation = Exit\ valuation \times \frac{Retention}{Target\ multiple}$$

The VC can now calculate he or she's proposed ownership percentage today, and thus value its part of the firm. By comparing with the initial investment made, the VC will now know whether the investment should be carried out[31].

While modified versions of the standard venture capital method exists, the investment recommendations will be the same when using the same inputs. The most important input in a VC valuation is the exit value, the second step in the VC method. To estimate exit values, a wide range of techniques are employed, in which the two main approaches are relative and absolute valuation. We elaborate further on such valuation techniques in chapter 3.

[30] i.e. an IPO or a competitive sale
[31] i.e. whether the NPV is greater than the initial outlay