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Can prevailing SaaS valuations be explained by the Rule of 40 metric, and is a score of 40% the boundary for desirable performance?

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Abstract

With a sample of 69 companies, we conduct a regression analysis on how prevailing valuations of Software-as-a-Service (SaaS) companies can be explained by different compositions of the Rule of 40 metric; an alternative metric that has emerged for such companies. Additionally, the study examines whether firms that outperform the Rule of 40 are valued higher, as a consequence of desirable performance, than those that do not. The Rule of 40 is used by practitioners in valuation work but its effectiveness and explanatory value have been excluded from existing academic literature, and our study attempts to fill this research gap. We propose and conclude that the Rule of 40 metric indeed has a positive correlation with a SaaS firm's valuation, thus our findings are in line with those from practitioners. Furthermore, we find that the forward-looking sales growth + free cash flow margin is the Rule of 40 composition with the highest explanatory value; supporting a majority of the precedent literature. Finally, we cannot conclude that firms that score above 40% are valued significantly higher than those that do not and hence present a contradicting conclusion to the existing literature.

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1. Introduction

1.1 Background

2020 was a year unlike another; the Covid-19 pandemic and subsequent lockdowns and other countermeasures imposed by governments influenced every industry across the globe. Trends such as work-from-home, video conferencing, online shopping, digital payment methods, and video streaming have become the new normal. To adapt to these trends, organisations have been required to shift from on-premise enterprise infrastructure to the cloud (Redeye, 2020). This increasing shift to digitisation has created tailwinds for technology and software companies according to Jaiswal (2020), and the equity capital markets have deeply acknowledged this. In 2020, the tech-heavy Nasdaq index gained 43% compared to other major stock market indices such as the DJIA and S&P 500 that returned merely 6.3% and 15.4%, respectively, in the same period (Jaiswal, 2020). However, this paradigm shift, moving from on-premise enterprise infrastructure to the cloud, has been expected by the market for several years; the sector's aggregate revenues have grown faster than any other during the last ten years, and the Nasdaq index has outperformed the S&P 500 index for 11 out of the last 13 years (Nasdaq, 2020, p. 15; Nasdaq Global Indexes MarketInsite, 2021). Firms have understood the importance of utilising intangible assets (e.g. software) to remain competitive, and today a larger share of investments in the U.S. is dedicated to such assets in comparison to investments in tangible assets (KPMG & Lloyd's, 2020; Mauboussin & Callahan, 2020).

Analysing the earnings of listed companies, the percent of companies in the Russell 3000 with negative earnings have increased from around 5% in 1980 to approximately 38% in 2020 (Mauboussin & Callahan, 2021). Moreover, according to a report from Bank of America Merrill Lynch (2019) around 60-70% of companies going public are unprofitable on both an EBITDA and earnings basis (Strauss, 2019). The valuation approaches to such unprofitable companies have historically been based on adaptation/abandonment options or limited liability, and have assumed that these companies are in financial or operational distress and hence face liquidation (Darrough & Ye, 2007). However, Darrough and Ye find that the unprofitability primarily stems from expensed R&D investment activities that depress current earnings, and that the balance sheet does not capture the knowledge-based and intangible "hidden" assets. They argue that such company activities or assets are expected to add future value to the firm, and hence these companies are still able to fetch high market valuations albeit not justified by current earnings and/or book values. Thus, Darrough and Ye mean that the aforesaid valuation approaches are typically not applicable to these companies. However, valuing young and high-growth companies with intangible assets is more cumbersome than valuing mature, stable, and cash flow generating companies with a long and stable history (Damodaran, 2013). Standard frameworks used to estimate cash flows, growth rates, and discount rates are less applicable due to these firms' characteristics or the result is unrealistic, as follows it is more complex to value them (Damodaran, 2009a). The earnings quality of listed firms has declined over time and is negatively associated with intangible intensity, and the arisen accounting mismatch following increased intangible investments (compared to how tangible investments are treated) have resulted in today's reported earnings being less useful than historically (Srivastava, 2014). To value a company, an analyst has to estimate the firm's future earnings. The amount and the return on investment is an important component for such assessment, and only if the return on investment is greater than the cost of capital, the present value of growth is positive (Mauboussin & Callahan, 2014). Hence, as investments in intangibles have migrated from the balance sheet to the income statement and constitute a larger share of capital expenditures, Mauboussin and Callahan (2020) henceforth argue that an analyst has to make manual adjustments to the financial statements to understand the firm's "true" earnings.

The technology and software industry is one of those affected by this valuation puzzle as it is characterized by several of the underlying causes to the valuation challenges, including *inter alia* (Damodaran, 2009b; McKinsey & Company Inc. et al., 2016):

- Young companies with limited historical financial figures;
- Experienced high growth with promising outlooks;
- A high share of intangible investments and assets; and/or,
- Volatile earning and profitability metrics

Damodaran (2001) defines these companies as (1) those that deliver technology-based or -oriented products, hardware, and/or software; and (2) those that use technology to deliver products and/or services that are delivered in a more conventional way. The sub-category within technology and software of main relevance to this study is SaaS, and includes companies that provide a service including delivering and maintaining a software. SaaS is a new, emerging sub-sector to the fast-growing software sector, and the number of firms is steadily increasing (ARK Invest, 2020).

A valuation can be facilitated by determining in which stage of the life cycle a firm is currently within; Damodaran (2009b, p. 8) categorises it in the five sequential stages (1) Start-up or idea companies; (2) Young growth; (3) Mature growth; (4) Mature; and (5) Decline. We argue that the SaaS sector, in aggregate, is either at the end of the 'Young growth' cycle, or the beginning of the 'Mature growth' cycle. This "transition" cycle is characterised by (1) high revenue growth and negative/low earnings; or (2) increased size of revenues together with high growth and the business model's scalability enables improved profitability. The source of value is primarily attributable to future growth, and hence it becomes more burdensome to conduct an accurate company valuation (Damodaran, 2009b). To expedite the complexity of valuing SaaS firms, due to their financial and operational characteristics, new methods serving as substitutes/complements to conventional valuation methods (e.g. discounted cash flows and typical compositions of the trading multiples) have emerged and are being used by investment analysts. One concept is the Rule of 40 metric that represents the sum of a company's growth and margin percentage; stating that there is a trade-off between the two (Feld, 2015). An analyst can use a firm's Rule of 40 metric and benchmark how it operationally performs compared to other firms with similar characteristics. To further assess the valuation of the firm, trading multiples (usually enterprise-value-to-sales or enterprise-value-to-gross-profit) of peers can be compared and set in relation to each firm's Rule of 40 metric. By doing so, the analyst can examine what the "fair" market value of the firm should be given its operational performance and the valuation of comparable firms, and hence determine if it is under- or overvalued.

1.2 Purpose of the study and contribution

This study intends to evaluate if the Rule of 40 metric can explain the prevailing SaaS market valuations, analysing whether or not a positive correlation can be established between the two. Based on this, we will also review the different Rule of 40 compositions. Moreover, we will analyse if performance above the 40% boundary results in a higher valuation compared to firms not achieving the target. The subject is of interest to both practitioners and academics; the former have embraced the metric and use it to benchmark operational performance and assess valuations relative to comparable SaaS firms by linear regression models. As current academic literature on the subject is scarce (to the best of our knowledge, no published literature has examined the Rule of 40 metric in company valuations), there is a need for research on the effectiveness of Rule of 40 for valuing these firms. From a broader perspective, our study thereby contributes to existing company valuation literature. With regards to the Rule of 40 metric, we provide practitioners with insights to whether or not it is prudent to include the metric in valuations, and if a score of 40% marks the boundary for desirable performance that subsequently is acknowledged and rewarded by the stock market. This underpins our wish to address this gap and provide an initial view of the subject. Henceforth, we aim to answer the following research question:

Can prevailing SaaS valuations be explained by the Rule of 40 metric, and is a score of 40% the boundary for desirable performance?

1.3 Research boundaries

The analyses are based on SaaS companies retrieved from selected industry experts and the GP Bullhound SaaS company index, and a total of 80 companies were initially collected. All companies are listed on the NYSE or Nasdaq exchange, except for the Swedish company Sinch which is listed on Nasdaq Stockholm. However, Sinch, among others, is excluded from the sample following implementing the research boundaries as described in sections 3.1 and 3.2, and lastly, 69 companies are analysed. As the firms are listed on either NYSE or Nasdaq, this requires high and demanding regulatory requirements on *inter alia* financial reporting for each company, and hence the financial data retrieved for the data set is deemed to be correct. Furthermore, as all companies are listed on the same exchanges this entails that they comply with the United States' Financial Accounting Standards Board's set of standards, also known as the Generally Accepted Accounting Principles (GAAP). As such, the data set will not be affected by different accounting principles (Bolling, 2006).

1.4 Disposition

The study is split into six chapters. Chapter 2 provides an overview of technology and SaaS companies, and their characteristics. Moreover, conventional and alternative company valuation methods are described, and the complexities when valuing technology and SaaS companies are discussed. In chapter 3, the data and methodology used in the study is presented. Chapter 4 describes the data set and the regression results. In chapter 5, the regression results are analysed and discussed. Finally, we present our conclusion and suggestions for future research in chapter 6.

2. Theoretical framework

This chapter intends to provide an overview of the theoretical frameworks deemed relevant for this study. Initially, an introduction to and the characteristics of technology and SaaS companies is presented, together with the implications from conducting intangible investments. Thereafter, the conventional company valuation methods are introduced and subsequent anomalies with regards to technology and SaaS companies are discussed. Finally, this section presents the study's hypotheses, and subsequently the justification and background for these.

2.1 An introduction to technology and SaaS firms

There are several definitions of technology companies in the academic literature, and this study will use the following definition of technology companies (Damodaran, 2001):

- Companies that deliver technology-based or -oriented products, hardware, and/or software; and
- Companies that use technology to deliver products and/or services that are delivered in a more conventional way before

SaaS is a sub-category to the technology sector, and describes software deployed in the cloud and billed on a subscription basis. The sector has gained popularity in recent years and the number of such companies on the equity capital markets has increased significantly, and the annual venture capital investment in software has increased from USD 7 billion (2009) to USD 44 billion (2019) on the U.S. market (ARK Invest, 2020). The pricing model of these companies creates stability, predictability, high margins, and a lower business risk due to the recurring revenue element and scalable business model, and are some of the underlying factors to why investors have a high interest in the sector (Redeye, 2020). Moreover, Redeye argues that the ability to upsell to existing clients and hence increase the lifetime value of a customer is viewed as more attractive by investors than the one-time-purchase model as software companies had in the past. The large growth experienced in the sector has from a supply perspective been enabled by cloud computing, better access to human capital, and high levels of venture capital and private equity dry powder to scale up faster (ARK Invest, 2020). Additionally, ARK Invest attributes the simultaneous increase in customer demand follows the need to digitise industries and utilise software applications to streamline operations.

To develop, market, and sell the software, companies need to conduct investments and due to the nature of the investment, it is considered as *intangible*. Enache and Srivastava (2018) describes this as:

> Intangible investments … are outlays that lack physical substance but produce future benefits. Many of these investments are evident in areas other than research and development (R&D) and advertising, such as strategy, market research, customer and social relationships, computerized data and software development, and human capital. They improve organizational knowledge and create capabilities that help determine a firm's long-term performance (p. 1).

Such investments typically present themselves in the selling, general, and administrative expenditure (SG&A). Although it entails a future value accretive element, GAAP requires SG&A to be expensed immediately and not capitalised on the balance sheet and hence differs from how investments in tangible assets are treated according to GAAP (Banker et al., 2011; PwC, 2021). In 1974, the Financial Accounting Standards Board (FASB) reasoned "there is normally a high degree of uncertainty about the future benefits of individual research and development projects", and "a direct relationship between research and development costs and specific future revenue generally has not been demonstrated" (p. 12). Compared to the century when FASB made its statement, intangibles now account for a larger share of investments than tangible investments; thus it could be argued that the accounting principles are outdated (Mauboussin & Callahan, 2020). Nonetheless, this results in that a SaaS company's earnings, which is largely dependent on its intangible assets and further developing, marketing, and selling its software, is, in general, more negatively affected compared to other sectors. Although other sectors also invest in intangible assets, they are also required to invest in tangible assets (e.g. a sawmill or production facilities) which typically are capitalised on the balance sheet (and in general, SaaS firms do not need substantial tangible investments). As such, tangible assets do not depress earnings to the same extent as intangible assets, as the former is depreciated over its useful life (PwC, 2021). When the SaaS firm instead enters the cycle of 'Mature growth', as described by Damodaran (2009b, p. 8), the SaaS business model allows for high profitability as the costs of maintaining and hosting a software is low, but at the expense of further growth (Redeye, 2020).

When analysing a SaaS company, a common reference is usually made to the trade-off between growth and profitability, and the ability to easily "switch" between the two. This states that a company either focuses on (1) high profitability with reduced growth outlooks; or (2) high growth through increasing e.g. marketing and sales efforts, and hence profitability decreases (KPMG, 2016). The underlying operational fundamentals are that the cost of growing equals the customer acquisition cost (i.e. the expenses of marketing your product to a customer, subsequently targeting this customer for sales efforts, and thereafter onboarding them to your software). However, as the SaaS pricing model targets a long customer relationship, the customer lifetime value takes a longer time to realize (KPMG, 2016).

2.2 Conventional company valuation methods

This segment will describe and provide an overview of the most common company valuation methods. In essence, as stated by Gupta and Roos (2001), the value of a firm is based upon its ability to generate cash flows, and the corresponding risks and uncertainties linked to said cash flows. By examination of existing equity valuation literature, the sentiment is that two main approaches to valuation exist: fundamental equity valuation and market-based valuation. (Pinto, Robinson & Stowe, 2018; Bancel & Mittoo, 2014; Becker, 1996). Furthermore, precedent literature on what investment analysts prefer supports this statement; the discounted cash flow (DCF) and valuation multiples are perceived as the most important methods (Mukhlynina & Nyborg, 2016). However, the DCF entails some limitations on technical applicability according to the analysts and results in a broadened use of valuation multiples and "subjective judgement of whether the market price 'feels right'" (Imam et al., 2008, p. 1). Moreover, these findings are also supported by the updated work of Imam et al. (2013), and papers from Bancel and Mittoo (2014) and Demirakos et al. (2004).

2.2.1 Discounted cash flow valuation

DCF valuation is favoured by many practitioners and academics since it relies solely on the flow of cash in and out of the company, rather than on accounting-based earnings (McKinsey & Company Inc. et al., 2005). As Rappaport (1999, p. 15) says, "Remember, cash is a fact, profit is an opinion". By discounting future cash flows at the weighted average cost of capital (WACC), the latter defined in eq. 2.1 in appendix 2.1, the intrinsic value of a firm represents the present value of all future cash flows. Cash flows in this context refer to a firm's free cash flow (FCF); corresponding to net income, adjusted for non-cash expenses, changes in working capital, and capital expenditures. Consequently, many assumptions and estimates regarding future financial performance are required when performing a DCF valuation. FCF generated in time period t are discounted at a rate of $(1 + WACC)^t$ to derive the net present value (NPV) of the future cash flows. Normally, the forecasting period ranges between 5-10 years. In addition to summarizing the NPV of the FCFs during the forecasting period, one has to determine the terminal value at the end of the horizon. Investment analysts typically forecast the terminal value by using a valuation multiple approach, often based on the last forecasted year's EBITDA multiplied by an exit multiple (Berk & DeMarzo, 2016; Gompers, 1998).

2.2.2 Trading multiples

In contrast to the intrinsic DCF valuation, trading multiples is a relative valuation method based on the notion that firms with comparable characteristics (e.g. sector, geography, size) are valued similarly in the market. As such, the method assumes an efficient market and that the valuation reflects a company's fundamentals or intrinsic value (Bancel & Mittoo, 2014). In accordance with Penman (2003), a multiple can be defined as the ratio of a market price variable to a particular value driver of a firm. In other words, the numerator constitutes a measure of size, commonly market value or enterprise value, in relation to an operational metric in the denominator. By nature of definition, a wide variety of plausible multiples exists. Pinto et al. (2018) found, through a qualitative study on 1,980 investment professionals' approaches to investment assessments, that 92.8% used market-based multiples. The multiples most frequently used by this share of respondents were found to be price-to-earnings (88.1%) and enterprise value-based multiples (76.7%). Of these, forecasted net income and EBITDA were the most widely used operational metrics in the denominator, respectively (Pinto et al, 2018). Berk and DeMarzo (2016) also describe that firms with large tangible assets can be evaluated on the price-to-book multiple, and that specific industries can embrace certain alternative multiples (e.g. enterprise-value-per- subscriber in the cable TV industry). The findings of Pinto et al. and Fernández (2001) further suggest that the usage of trading multiples often served benchmarking and "sanity-checking" purposes in conjunction with an intrinsic valuation method such as the DCF. Relating specifically to technology and/or fast-growing companies, Roosenboom and Thomas (2007) also found that the multiples approach is more commonly used for this sector in conjunction with IPOs.

2.3 Anomalies with the conventional company valuation methods on SaaS firms

In the previous section, an overview of the most frequently used traditional valuation methodologies was described. This section will detail common issues prevailing when applying the aforementioned approaches to firms displaying certain complex-to-value characteristics, oftentimes found among young and fast-growing SaaS companies. Moreover, the preferred valuation method also depends on where in the life cycle stage a firm is positioned, and a discussion around this complexity is made (Trichkova & Kanaryan, 2015; Damodaran 2009b).

2.3.1 Discounted cash flow valuation

When performing an intrinsic DCF valuation on a SaaS company, several issues might arise. Firstly, young firms lack historical financials, making it hard to form sound estimates regarding future performance. Additionally, it poses issues with determining whether recent financial performance is sustainable long-term, or merely a one-off event positively influenced by e.g. favorable macro or industry trends (Damodaran, 2009a). As evidenced, a common characteristic among SaaS firms is the trade-off between growth and profitability. The riskiness of such a firm's cash flows is inherently higher, by virtue of no financial track record.

Uncertain estimates will affect the DCF model as it ultimately impacts the firm's free cash flow, and errors in this stage can have a vast impact on overall valuation. The work of Cogliati et al. (2010), Mumtaz and Smith (2015), as well as Purnanandam and Swaminathan (2004), found *inter alia* that analysts tend to be too optimistic and overestimate the cash flows of listed firms and hence the forecasted value is too high. Moreover, high-growth firms often display large cash outflows related to achieving said growth (Damodaran, 2009b). However, this typically relates to R&D and SG&A spending rather than expenses primarily related to instant revenue generation. As an effect, Damodaran finds that firms with limited historical financials and/or profitability are difficult to forecast.

Yet another challenging aspect with determining the value of these firms when using a DCF relates to the discount rate. As per eq. 2.1, the WACC is influenced by several factors, one being the capital structure of the firm. McKinsey and Company Inc. et al. (2005) states that for companies whose debt-to-value mix is expected to change, valuation approaches based on the WACC are more difficult to apply. As firms grow in size and maturity, the capital structure will presumably change, resulting in subsequent effects on the WACC making the underlying assumptions less reliable, ultimately affecting the DCF applicability.

For companies characterized by high growth, future cash flows carry more weight, considering a larger portion of the value is expected to materialize in the future. This is particularly the case for technology and SaaS companies that generate negative cash flows in the near-term, following growth-related investments, but are forecasted to be cash-flow positive in the future. Consequently, more value stems from the terminal value at the end of the forecasting period, increasing sensitivity to value from fluctuations in discount rate (McKinsey & Company Inc. et al., 2005). Moreover, to determine the terminal value an analyst has to estimate two additional components (in addition to choosing the appropriate discount rate); the estimated earnings at the terminal date, and the appropriate exit multiple. Gompers (1998) finds that this is particularly complex for “highly innovative ventures that operate in new or emerging industries”.

2.3.2 Trading multiples

Previous section highlighted the notion that trading multiples is a relative approach, and that a firm is analysed in relation to comparable companies to determine what the fair market value is. An important fundamental to such analysis is concluding the appropriate peer set (Damodaran, 2009b). Unless the underlying economic drivers and outlook for growth and investments are alike, the methodology becomes less useful. Moreover, assessing the quality of earnings is important as the accounting principals between peers can differ and make them uncomparable, hence the valuation process becomes increasingly complex. However, if it is a large enough peer group that is categorised in sub-sectors, it could provide insights to the analysis as well by presenting that one sub-sector is valued significantly differently than another.

Damodaran’s (2009b, p. 8) framework of a firm’s life cycles can be utilised for both adding further granularity to an analysis, and a tool for choosing appropriate comparable firms. With the trading multiples valuation approach, a company should be analysed in relation to peers in the same life cycle given the differences in growth and profitability between different life cycles; an enterprise-value-to-sales ratio is less useful to use between a fast-growing start-up firm and a mature company operating in a steady state. However, the complexity and problem with this valuation approach still exist as you are significantly delimited in determining appropriate benchmarks.

2.4 An alternative metric: the Rule of 40

As concluded thus far, several complexities might arise when applying traditional valuation methods to companies displaying characteristics commonly found among SaaS firms. Morgan Stanley (2018) elaborates further and states "the software universe is quickly shifting toward Software-as-a-Service subscription models, but conventional valuation metrics may be hiding the true potential of companies in this rapidly growing group". A metric that has gained vast popularity in regards to assessing the financial profile of SaaS firms and benchmark operational performance is the "Rule of 40" (Bain, 2018). The origins date back to 2015 when venture capitalist, author and entrepreneur Brad Feld published his work "The Rule of 40 for a Healthy SaaS Company". As such, it is a recently established metric and stems from private equity SaaS investors.

By combining a measure of growth and one of margin, such that *growth rate + operating margin ≥ 40%,* the Rule of 40 aims to describe the trade-off between growth and profitability that these firms face. To elaborate, it is based on the notion that growth and profitability are interlinked, and states that as long as the aggregate combination exceeds 40%, the SaaS company is achieving a desirable performance (Bain, 2018). However, KPMG (2016) states that investors in the SaaS space attach a premium to growth, thereby indicating that high growth at the expense of profitability is more favorable than high margins with depressed growth. The investment firm Norwest Venture Partners (2019) agrees with KPMG and finds that sales growth is of higher importance than profitability; sales growth compounds and EBITDA profitability does not. They have henceforth modified the metric to triple the weighting on sales growth compared to profitability. Although literature on this topic is scarce, the metric has been adopted by several large SaaS firms and is being used to track operational performance.[1] Moreover, Bain (2018) have found that investors acknowledge and favor software companies that outperform the Rule of 40; their enterprise-value-to-sales multiple is twice as high compared to peers that fail to fulfil the rule, and have returned up to 15% more than the S&P 500.[2] However, no clear consensus exists on what the "best"

[1] U.S. listed large-cap companies using the metric include, but is not limited to, Ringcentral, Crowdstrike, Nasdaq, Okta, Blackbaud, Cadence Design Systems, Coupa Software, LivePerson and mdf commerce

[2] Please note that Bain does not provide a reference to what period this was measured for, and which companies are included in the analysis

components to the Rule of 40 metric is. Kellogg (2017, 2019), Battery Ventures (2019), Piper Jaffray (2019), Latka (2020), GP Bullhound (2021) as well as Epstein and Harder (2016) suggest that sales growth and free cash flow (FCF) margin is the most suitable for listed companies. Additionally, Bain (2018) and Raymond James (2021) use sales growth combined with EBITDA margin.

What combination to use can also depend on factors specific to the SaaS company itself (Feld, 2015; Murray, 2018). Although several authors (Feld, 2015; Bain, 2018; Murray, 2018; Norwest Venture Partners, 2019; Raymond James, 2021) argue that EBITDA is the preferred margin metric, as it represents a proxy for cash flows, some underlying operational characteristics might cause EBITDA to render an inaccurate picture (Feld, 2015). For instance, firms hosting its software solution in-house vis-à-vis those using a cloud-based model are presumably subject to e.g. larger investments in equipment and higher debt (Feld, 2015). In such a case, FCF margin might yield a better comparison among firms as it includes the investment in the tangible assets and debt servicing into account. Murray (2018) however argues that EBITDA represents the better margin metric, by nature, as it adjusts for e.g. debt interest costs and changes in accounting- and tax principles. As evidenced, no unequivocal definition of the metric is agreed upon among academics and practitioners, albeit growth is seemingly the most important component. An overview of existing views can be found in table 2.1 below.

Table 2.1 - Overview of Rule of 40 publications and components used

	Growth metric	**Profitability metric**	
Author(s)	Sales growth	EBITDA margin	FCF margin
Feld (2015)	✓	✓*	✓*
KPMG (2016)	✓		✓
Epstein & Harder (2016)	✓		✓
Kellogg (2017)	✓		✓
Bain (2018)	✓	✓	
Murray (2018)	✓	✓	
Kellogg (2019)	✓		✓
Norwest Venture Partners (2019)	✓	✓	
Battery Ventures (2019)	✓		✓
Piper Jaffray (2019)	✓		✓
Latka (2020)	✓		✓
GP Bullhound (2021)	✓		✓
Raymond James (2021)	✓	✓	

*Note: * States that both margins (EBITDA- and FCF margin) are viable options as profitability metric, but is situational and dependent on operational characteristics.*

Finally, several publications also include linear regression analysis to benchmark the Rule of

40 metric against company valuation. Namely, Epstein and Harder (2016), Kellogg (2017, 2019), Norwest Venture Partners (2019), Piper Jaffray (2019) as well as GP Bullhound (2021) use the enterprise-value-to-sales multiple as the dependent variable in the regression analysis. However, contrasting opinions prevail, with Sleeper (n.d.) pointing to flaws with the aforementioned multiple as a valuation indicator for SaaS firms, further suggesting that enterprise-value-to-gross-profit is the superior multiple.

2.5 Hypotheses development

Based on prior literature, four main themes underpinning our three hypotheses have been identified and are elaborated below:

1. The SaaS sector is yet in a young life cycle characterised by high revenue growth with negative/low profitability, and the majority of firm value reside in future performance. Hence, estimation issues arise which could lead to unreliable results from a DCF as well as making the commonly used trading multiples enterprise-value-to-EBITDA and price-to-earnings impractical to use (as the denominator is negative/low). However, we acknowledge that the DCF is superior, but similar to trading multiples function in valuation, the Rule of 40 can be used to sanity-check results.
2. The SaaS business model entails a trade-off between growth and profitability, and literature suggests that it is fairly easy to switch between the two. Rule of 40 includes this trade-off and allows for benchmarking between SaaS firms that prioritise differently, hence the metric should allow for better insights (and thus higher explanatory power) than e.g. multiples based on EBITDA or net income.
3. Industry experts view 40% (calculated through Rule of 40) as the threshold for desirable performance, and thus firms that satisfy the limit should be valued higher than firms that do not as it is a “sign of quality”.
4. Although investments in intangible assets constitute the majority of a SaaS firm’s capital expenditures, tangible investments could arise following e.g. the decision of hosting the firm’s software solution in-house compared to using a cloud-based model. As such, FCF margin should entail a stronger correlation than the EBITDA margin, as the latter does not account for tangible investments. Furthermore, forward-looking financials should be more efficient than historical figures as a firm is valued based on its future cash flows.

To conclude the above, we envisage that a firm's Rule of 40 score is positively correlated with its valuation; i.e. the higher the Rule of 40 score is, the higher that firm's valuation is. Additionally, we expect that FCF margin is a better profitability metric than EBITDA margin over a large peer set as it accounts for potential differences in business model (e.g. hosting a software solution in-house vis-à-vis using a cloud-based model). Finally, if a firm satisfies specifically the 40% threshold, we believe that firm is valued higher than firms that do not perform above this limit. Hence our three formal null hypotheses are:

> *$H_0$1: There is no positive correlation between Rule of 40 and a SaaS firm's valuation*
>
> *$H_0$2: The forward-looking sales growth + FCF margin is not the best indicator of a SaaS firm's valuation*
>
> *$H_0$3: SaaS firms that satisfy the 40% threshold are not valued higher than those SaaS firms with a Rule of 40 score below the boundary*

3. Data and methodology

In this chapter, initially the study's data sample and data collection process is presented. Moreover, the methodology is described and the linear regression model to test our hypothesis is outlined.

3.1 Company selection

The companies examined were initially based on a list of the 50 largest US-listed SaaS companies from Sonders (2021). Sonders have defined SaaS companies as those with more than 65% of sales attributed to recurring payments for cloud-based software. This sample was compared and complemented with the constituents of the GP Bullhound (2021) SaaS company index. This increases the aggregate number of companies to 80, and an overview of the companies is available in appendix 3.1, together with the source. According to its website, GP Bullhound is a leading technology advisory and investment firm, providing transaction advice and capital to the world's entrepreneurs and founders. Taking their sector expertise and insights to the SaaS company landscape into consideration, we deem their sample as reliable. Unfortunately, there is no joint classification for SaaS companies through either the Global Industry Classification Standards (GICS) or Industrial Classification Benchmark, and hence the company selection could not be extended by using these sources. Moreover, we exclude companies that have been listed on the New York Stock Exchange (NYSE) or Nasdaq for less than one year (i.e. IPO in May 2020 or later) to adjust for the potential impact that lockups and/or similar agreements could have on stock liquidity and thus stock performance (Brav & Gompers, 2003).

Precedent academic literature on the subject is unfortunately scarce, hence no comparison to our company selection can be made in reference to this. Although there are numerous non-peer reviewed reports and articles on the subject, they lack transparency to what companies have been included in their analyses. As such, our sample could not be further extended by utilising these sources.

3.2 Data selection

All of the study's data sample was collected 4 May, 2021 from the FactSet database which is a provider of financial information and comprises more than 1,000 data items on companies worldwide and is retrieved from respective company's filings. The financial information is available on both an annual and interim basis, as well as intraday data to relevant metrics (e.g. market capitalisation). Furthermore, FactSet compiles estimates on future financial performance of companies from more than 800 leading research firms and investment banks across 55 countries (FactSet, 2021). Moreover, we have manually validated selected financial metrics for a number of companies by comparing those retrieved from FactSet with those published by the company. Furthermore, the sub-industry, as defined by the GICS, was retrieved through FactSet to control that the securities ticker was correct, and a sub-industry similar to e.g. Application Software or Systems Software was deemed as legitimate.

The financial metrics retrieved for the data set includes (1) Enterprise value (EV); (2) Sales; (3) Earnings before interest, taxes, depreciation and amortisation (EBITDA); (4) Operating cash flow (OCF); and (5) Capital expenditures (Capex). Furthermore, *OCF - Capex* is used as a proxy to calculate the Free cash flow to the firm (FCF). The EV is as per 4 May, 2021, i.e. based on the firm's share price this date. Remaining four financial metrics are collected for the trailing twelve months (TTM) and the next trailing twelve months (NTM), each defined as one period. We collect sales for the second-to-last trailing twelve months (TTM -1 year) to calculate the TTM growth. NTM figures are based on estimates from research firms and investment banks via FactSet's database. We include forward-looking financials as a firm's share price shall reflect the and be justified through expected free cash flows generated by the firm in future periods (Mauboussin & Callahan; 2020); hence we aim to capture developments that the market have included in today's share price but can't be justified solely through historical financial figures. In table 3.1, the described sample exclusions are summarised.

Table 3.1 - A summary of exclusions

Selection criterias	Removed	Remaining
Full sample list	-	80
Missing complete historical financial data	3	77
Financial estimates missing	1	76
IPO on or later than May 2020	7	69
Total	**11**	**69**

The following metrics have thereafter been included in the analysis (1) Sales growth; (2) EBITDA margin; (3) FCF margin; and the valuation metrics (4) EV / TTM sales; and (5) EV / TTM gross profit (GP), and are defined in table 3.2. Growth is defined as the increase in the selected metric over a period, e.g. between NTM and TTM. Moreover, margins are defined as the selected metric in relation to sales in the same period.

Table 3.2 - Definitions of respective financial metric

Financial metric	Definition
Sales growth	Growth in a firm's *Net sales* during a one-year period. $Sales\ growth_t = \frac{Net\ sales_t}{Net\ sales_{t-1}} - 1$
EBITDA margin	EBITDA is calculated as *Operating income* + *Depreciation* + *Amortization* + *Depletion*, and set in relation to *Net sales*. $EBITDA\ margin_t = \frac{(Operating\ income + Depreciation + Amortization + Depletion)_t}{Net\ sales\ _t}$
FCF margin	*Free cash flow* represents the *Operating cash flow - Capital expenditures*, and set in relation to *Net sales*. $FCF\ margin_t = \frac{(Operating\ cash\ flow - Capital\ expenditures)_t}{Net\ sales\ _t}$
EV / TTM sales	*Enterprise value* defined as *Market capitalisation* + *Net interest bearing debt* + *Preferred stock* + *Minority interest*, and set in relation to *TTM Net sales.*
EV / TTM GP	*Enterprise value* defined as *Market capitalisation* + *Net interest bearing debt* + *Preferred stock* + *Minority interest*, and set in relation to *TTM GP.*

3.3 Methodology

The purpose of this study is to evaluate the potential correlation between the valuation and Rule of 40 metric of a SaaS firm, in which the valuation is the dependent variable. To explain such correlation, linear regression is used as a research method to isolate the Rule of 40 metric's relative explanatory power. Additionally, by introducing a dummy variable for the achievement of Rule of 40, we examine if satisfying the 40% threshold results in a higher valuation compared to firms that do not fulfil the target.

As described in previous segments of the thesis, academic literature examining our and/or similar research questions is scarce. There are however several reports from investment firms, consultants, industry experts and investment banks that describe their approach to valuing SaaS firms, of which all "practitioners", in a valuation context, use a linear regression model to determine the SaaS firm's valuation or provide an insight to prevailing industry valuations. As such, with the support of these authors, we can conclude that the linear regression model is the methodology used for valuation purposes, when the Rule of 40 metric is included.

3.4 Variables

3.4.1 Dependent variables

Based on our literature review, we have found strong support for enterprise-value-to-sales being the most widely used valuation metric in Rule of 40 SaaS benchmarking, thus forming the dependent variable *V1*. Additionally, based on the work of Sleeper (n.d.), describing the advantages of enterprise-value-to-gross-profit for SaaS companies, dependent variable *V2* has been formed and included in the analysis.

3.4.2 Independent variables

G1 refers to the sales growth during a one-year period; *M1* represents the EBITDA-margin in the specified period *i*; *M2* measures the FCF-margin in the specified period *i*. Moreover, each of *G1, M1* and *M2* are defined for the TTM- and NTM-period; TTM is referred to as *A,* and NTM as *B* in the last letter in respective of the three former variable definitions (e.g. *G1A* and *M2B*). Accordingly, there are two variations for each of *G1, M1* and *M2*.

In accordance with table 2.1, there are two different Rule of 40 combinations; *Sales growth + EBITDA margin,* and *Sales growth + FCF margin*. On the basis of this, and in combination with the backward- and forward-looking financials, we can define the first model's independent variables.

For testing our third hypothesis, we construct the dummy variable *Ro40_SX*. If the 40% threshold is achieved by a firm, the variable returns the value 1, otherwise it is 0.

Finally, all independent and dependent variables are further defined and presented in appendix 3.2.

3.5 Linear regression model

To examine the Rule of 40 metric's explanatory power for a SaaS firm's valuation, a linear regression analysis is used. As such, we test for the significance and correlation the independent variable(s) has on the dependent variable(s). The initial regression for Model 1 (and the main model) is presented in eq. 3.1. below.

$$V_j = \beta_0 + \beta_1 Ro40_{k,i} + \varepsilon \tag{3.1}$$

where:

V_j = Valuation metric j
$Ro40_{k,j}$ = Rule of 40 for the combination k in the specified period i

Furthermore, we establish eq. 3.2 in which the dummy variable *Ro40_SX* is included, and is presented below.

$$V_j = \beta_0 + \beta_1 Ro40_{k,i} + \beta_2 Ro40\_SX + \varepsilon \tag{3.2}$$

4. Empirics and analysis

In chapter 4, an overview of the data set is presented and discussed, as well as the subsequent analysis. First, an overview of the data set is outlined, followed by the initial OLS regression results. Thereafter, two robustness tests and its results are outlined, in which heteroskedasticity and outliers is tested for through a Breusch-Pagan and winsorizing test, respectively.

4.1 Descriptive statistics

In table 4.1, descriptive statistics of the valuation, growth, margin and Rule of 40 metrics of SaaS firms used in our analysis are presented. For each variable, 69 data points are collected. The average enterprise value in the data set is USD 26.4 billion, and close to all of the SaaS companies have a positive sales growth on a TTM- and NTM-basis. Furthermore, we note that SaaS companies tend to prioritise growth over profitability, with the mean TTM EBITDA- and TTM FCF margin equalling 1.1% and 9.4%, respectively, whereas the TTM sales growth averaged 31.7%. These figures correspond well to Damodaran's framework of a firm's life cycles and our view that a SaaS firm is placed between the cycle of 'Young growth' and 'Mature growth'; revenues are in high growth and profitability is low/negative. Moreover, the descriptive statistics also support the theory that there is a trade-off between growth and profitability; the firm with the highest NTM EBITDA margin (49%) have a growth lower than the average NTM sales growth (23%), whilst the firm with the highest NTM sales growth (114%) has an NTM EBITDA margin of 5%.

Table 4.1 - Descriptive statistics

Item	Obs.	Mean	Median	Std. dev.	1st quart.	3rd quart.	Min.	Max.
EV (USDbn)	69	26.4	10.7	43.8	3.8	23.1	0.3	236.8
G1A	69	0.317	0.254	0.412	0.141	0.350	-0.093	3.258
G1B	69	0.287	0.255	0.198	0.150	0.358	-0.053	1.135
M1A	69	0.011	0.001	0.214	-0.156	0.137	-0.346	0.739
M1B	69	0.145	0.115	0.152	0.022	0.270	-0.105	0.492
M2A	69	0.094	0.095	0.170	-0.040	0.207	-0.361	0.525
M2B	69	0.116	0.092	0.130	0.024	0.214	-0.175	0.391
V1	69	17.062	15.016	12.910	6.806	23.800	1.801	60.289
V2	69	26.761	21.907	20.810	9.849	35.465	2.784	95.450
G1A+M1A	69	0.329	0.251	0.469	0.110	0.411	-0.348	3.568
G1A+M2A	69	0.411	0.349	0.478	0.262	0.475	-0.164	3.783
G1B+M1B	69	0.432	0.406	0.218	0.290	0.588	-0.011	1.182
G1B+M2B	69	0.403	0.387	0.217	0.270	0.496	-0.053	1.146

4.2 OLS regression results

The OLS regression results for the combinations of dependent and independent variables are presented in table 4.2, and represents our first model. 7 out of 8 independent variables are significant on a 1% significance level. Moreover, the two highest R-squared values in the regression are for the independent variable *G1B+M2B* in relation to the dependent variables *V2* and *V1*, respectively. This means that the independent variable explains 31.7% and 27.6% for *V2* and *V1*, respectively. Moreover, comparing the Rule of 40 based on *FCF margin* and *EBITDA margin*, we note throughout the regression that *FCF margin* have a higher explanatory power (if compared in relation to the same dependent variable and with the same financial period, e.g. *G1A+M1A* versus *G1A+M2A*). Furthermore, the coefficient of the independent variable *G1B+M1B* equals 31.2 and 53.9 for the dependent variables *V1* and *V2*, respectively. Additionally, it can be found that the coefficient value is lower for the independent variables based on historical financial figures compared to those based on forward-looking financial figures. The opposite relation is found for the intercept in the regression model, with this in general being higher for those regressions based on a backward-looking independent variable compared to such regressions with a forward-looking independent variable.

Table 4.2 - OLS regression results (model 1)

Dep. var.	Indep. var	Obs.	Multiple R	R-squared	Intercept	Coef.	St. err.	t-value	p-value	Lower 95%	Upper 95%	Sig.
V1	*G1A+M1A*	69	0.304	0.092	14.311	8.372	3.206	2.611	0.011	1.973	14.772	**
V1	*G1A+M2A*	69	0.367	0.134	12.999	9.894	3.067	3.227	0.002	3.773	16.015	***
V1	*G1B+M1B*	69	0.421	0.177	6.269	24.968	6.572	3.799	0.000	11.851	38.085	***
V1	*G1B+M2B*	69	0.525	0.276	4.482	31.204	6.172	5.056	0.000	18.884	43.524	***
V2	*G1A+M1A*	69	0.326	0.106	22.002	14.481	5.128	2.824	0.006	4.245	24.716	***
V2	*G1A+M2A*	69	0.368	0.135	20.195	15.988	4.941	3.236	0.002	6.125	25.851	***
V2	*G1B+M1B*	69	0.475	0.226	7.127	45.418	10.277	4.420	0.000	24.906	65.931	***
V2	*G1B+M2B*	69	0.563	0.317	5.044	53.866	9.667	5.572	0.000	34.571	73.161	***

*Note: *** p<0.01, ** p<0.05, *p<0.1*

In table 4.3, a summary of the regression results is presented. We note that all independent variables possess a higher R-squared value for the dependent variables *V2* compared to *V1*, i.e. the independent variables explain *V2* to a larger extent than *V1*. Additionally, the Rule of 40 metric with *FCF margin* as profitability indicator has the two highest R-squared values in relation to both *V1* and *V2*.

Table 4.3 - Summary regression results (model 1)

Indep. var.	R-squared (V1)	R-squared (V2)
G1A+M1A	0.092	**0.106**
G1A+M2A	0.134	**0.135**
G1B+M1B	0.177	**0.226**
G1B+M2B	0.276	**0.317**

Note: text in bold represents the independent variable with the highest R-squared value for each of the two dependent variables V1 and V2.

Indep. var.	R-squared (V1)	R-squared (V2)
G1A+M1A	0.092	0.106
G1A+M2A	0.134	0.135
G1B+M1B	0.177	0.226
G1B+M2B	0.276	0.317

Note: the darker the colouring for an independent variable in each of the columns, the higher the R-squared value versus other independent variables for the specific dependent variable.

For Model 2 we have introduced the dummy variable *Ro40_SX* to assess whether a firm with "satisfactory" performance is valued higher than firms with performance below the Rule of 40 threshold. Moreover, from Model 1 we could find that the independent variables possessed greater explanatory power for *V2* than *V1*; hence we will focus solely on describing *V2* in Model 2. In table 4.4, the OLS regression results for model 2 are presented. We note that *Analysis 1, 2, 3* and *4* are statistically significant at a 1% significance level, i.e. when the coefficients are analysed together. However, the model fails to reject the null hypothesis for the independent variable *Ro40_SX* except in *Analysis 2* when it can be rejected at a 10% significance level. Furthermore, the R-squared values are higher than in *Model 1*, and the adjusted R-squared values range from 0.086 to 0.299. Moreover, the coefficient value for the independent variable *Ro40_SX* differs between *Analysis 1 & 3* and *Analysis 2 & 4*; the former returns a negative coefficient whereas the latter describes a positive coefficient. This implies that a firm satisfying the 40% threshold, with the *EBITDA margin* as profitability indicator, are, all else equal, valued lower than if they do not satisfy the threshold. The opposite relation is found when Rule of 40 includes *FCF margin* as profitability indicator; the coefficient is positive and hence a firm that satisfies the 40% boundary is, all else equal, valued higher.

Table 4.4 - OLS regression results (model 2)

Analysis 1							
V2	Coef.	St. err.	t-value	p-value	Lower 95%	Upper 95%	Sig.
G1A+M1A	16.974	6.201	2.737	0.008	4.593	29.356	***
Ro40_SX	-4.736	6.571	-0.721	0.474	-17.855	8.383	
R-squared		0.113		Number of observations		69	
F-test		4.218		Prob > F		0.019	
Adjusted R-squared		0.086					

Analysis 2							
V2	Coef.	St. err.	t-value	p-value	Lower 95%	Upper 95%	Sig.
G1A+M2A	10.654	5.583	1.908	0.061	-0.493	21.802	*
Ro40_SX	10.605	5.517	1.922	0.059	-0.411	21.621	*
R-squared		0.181		Number of observations		69	
F-test		7.292		Prob > F		0.001	
Adjusted R-squared		0.156					

Analysis 3							
V2	Coef.	St. err.	t-value	p-value	Lower 95%	Upper 95%	Sig.
G1B+M1B	56.087	16.791	3.340	0.001	22.563	89.612	***
Ro40_SX	-5.846	7.264	-0.805	0.424	-20.349	8.657	
R-squared		0.233		Number of observations		69	
F-test		10.039		Prob > F		0.000	
Adjusted R-squared		0.210					

Analysis 4							
V2	Coef.	St. err.	t-value	p-value	Lower 95%	Upper 95%	Sig.
G1B+M2B	48.134	14.715	3.271	0.002	18.756	77.513	***
Ro40_SX	3.324	6.406	0.519	0.606	-9.466	16.114	
R-squared		0.319		Number of observations		69	
F-test		15.491		Prob > F		0.000	
Adjusted R-squared		0.299					

*Note: *** p<0.01, ** p<0.05, *p<0.1*

4.3 Additional tests of robustness

4.3.1 Analysing outliers by winsorizing

As the number of observations in our sample is relatively low (*n = 69*), it has been noted by *inter alia* Gujarati (2002) that outliers can have a large impact on the regression results. To prevent such an issue, we winsorize our data set consisting of the four independent variables for the dependent variable *V2* to analyse if regression results are further improved on the core data. Winsorizing adjusts outliers to the set percentile means that the outliers are not excluded from the data set, but rather adjusted to fit the model better. The R-squared results for the four independent variables at different levels of winsorizing are presented in table 4.5. From this we note that the change in R-squared is seen at the 1.0% level for all independent variables. The companies adjusted at 1.0% and considered as outliers based on TTM-figures are Splunk and Zoom Video Communications, and on NTM-figures it is Castlight Health and Square.

Table 4.5 - R-squared values for *V2* post winsorizing (model 1)

Independent variable	Percentile winsorized				
	0.0%	1.0%	2.5%	5.0%	10.0%
G1A+M1A	0.106	0.156	0.172	0.165	0.108
G1A+M2A	0.135	0.218	0.257	0.254	0.224
G1B+M1B	0.226	0.235	0.235	0.232	0.228
G1B+M2B	0.317	0.329	0.332	0.326	0.317

Note: the R-squared values presented are based on regressions between the mentioned independent variable and the dependent variable V2

4.3.2 Testing for heteroskedasticity

One of the assumptions for OLS regression is a constant variance of the error term, i.e. that the error term is homoskedastic. The opposite is heteroskedasticity and means that the conditional variance is not constant. We examine if the dependent variable *V2* in model 1 is subject to heteroskedasticity by conducting a Breush-Pagan test, and form the null hypothesis that the error term has constant variance. We fail to reject the null hypothesis in *Test 1* and *Test 2*, but can reject the null hypothesis at a 5% significance level in *Test 3* and *Test 4*. Thus, the Breush-Pagan test indicates that the error term could be heteroskedastic for *Test 3* and *4*.

Table 4.6 - Breush-Pagan test (model 1)

	Observations
Test 1 H_0: Constant variance Dependent variable: *V2* Independent variable: *G1A+M1A*	 *chi2(1) = 1.266* *Prob > chi2 = 0.261*
Test 2 H_0: Constant variance Dependent variable: *V2* Independent variable: *G1A+M2A*	 *chi2(1) = 2.270* *Prob > chi2 = 0.132*
Test 3 H_0: Constant variance Dependent variable: *V2* Independent variable: *G1B+M1B*	 *chi2(1) = 4.171* *Prob > chi2 = 0.041*
Test 4 H_0: Constant variance Dependent variable: *V2* Independent variable: *G1B+M2B*	 *chi2(1) = 4.406* *Prob > chi2 = 0.036*

5. Discussion of results

In this chapter we analyse and discuss our findings, and how these relate to the literature overview. Initially, we present the regression results with regards to our first and second hypotheses as these are interlinked to some extent. Thereafter, we analyse whether or not the 40% score is a boundary for a firm's desirable performance and hence are valued higher than others. Finally, we discuss the outliers in the data set and potential implications on our analysis.

5.1 Hypothesis 1

The regression results from Model 1 allow us to reject our first null hypothesis on a 5% significance level for all variations of dependent and independent variables. Additionally, the only combination that does not allow for rejection on a 1% significance level is the dependent variable *V1* and the independent variable *G1A+M1A*. Furthermore, there is a positive coefficient across all independent variables, ranging from 8.4 to 31.2 for *V1* and from 14.5 to 53.9 for *V2*, supporting that the correlation is positive. Hence we can conclude that there is a statistically significant positive correlation between a SaaS firm's valuation and Rule of 40. However, the linear relationships' strength differs between the conducted analyses - multiple R is 0.563 for the independent variable *G1B+M2B* in relation to the dependent variable *V2,* but only 0.304 for the independent variable *G1A+M1A* in relation to the dependent variable *V1* - and thus our conclusions are not unilateral throughout the different variations of independent and dependent variables. Moreover, we acknowledge that we could find indications of heteroskedasticity for both forward-looking independent variables *G1B+M1B* and *G1B+M2B* for the dependent variable *V2*, which could imply that our stated p-values are lower than they should be. However, the two independent variables *G1A+M1A* and *G1A+M2A* for the dependent variable *V2* had p-values below 1% and did not show indications of heteroskedasticity. Furthermore, our findings are to a large extent in accordance with our literature review.

First, there is a consensus in the literature that there is a trade-off between growth and profitability for SaaS firms. The Rule of 40 provides an alternative to those metrics relying solely on one of the components (growth or profitability), implying a rationale to why the Rule of 40 might have a higher explanatory value. As there is such an evident trade-off, the metric allows for benchmarking between comparable firms to an extent other metrics can not.

Consequently, the number of comparable firms can be increased in an analysis, and therefore a stronger conclusion can be made.

Second, referring to the life cycle framework (Damodaran, 2009b, p. 8), our data set supports that the SaaS sector is at the end of the 'Young growth' cycle or in the beginning of the 'Mature growth' cycle. The median TTM sales growth and TTM EBITDA margin is 31.7% and 1.1%, respectively, but is expected to shift slightly towards profitability during the NTM period (sales growth of 28.7% and EBITDA margin of 14.5%). As such, the two most common trading multiples enterprise-value-to-EBITDA and price-to-earnings is less applicable for these firms, as the denominator in such an equation is low or negative. Pinto et al. (2018) and Fernández (2001) found that trading multiples was commonly used in conjunction with a DCF to "sanity-check" the latter method's findings; hence it is reasonable that Rule of 40 can serve as a substitute in the valuation of SaaS firms.

Additionally, the dependent variable *V2* renders a higher explanatory value across all regressions, supported by Sleeper (n.d.) albeit in contrast to numerous publications using *V1* as the dependent variable (GP Bullhound, 2021; Piper Jaffray, 2019; Norwest Venture Partners, 2019; Kellogg, 2017, 2019; Epstein and Harder, 2016). Sleeper argues that software companies commonly differ in operating models, in terms of e.g. how revenue is recorded and how the service business is structured, which is not reflected in enterprise-value-to-sales, but carry important implications on cost of goods sold (COGS). Hence, given that gross profit reflects these differences in COGS whilst sales does not, this is a plausible reason behind the higher explanatory power of the dependent variable *V2* in regards to SaaS valuation.

5.1.1 Hypothesis 2

Based on our literature review, we hypothesised that the Rule of 40 combination of forward-looking *Sales growth + FCF margin* will serve as the best indicator of SaaS firm's valuation. The results in regression model 1 concludes that the combination with the highest explanatory power is the independent variable *G1B+M2B,* with an observed p-value <0.01 for both dependent variables *V1* and *V2*, thereby allowing us to reject our second null hypothesis at a 1% significance level and find indications of positive correlation to the dependent variables. Data suggests that *NTM Sales growth + NTM FCF margin* indeed is the Rule of 40 combination yielding the highest explanatory power, reflecting the consensus found in precedent literature describing this combination as the superior (GP Bullhound, 2021; Latka, 2020; Piper Jaffray, 2019; Battery Ventures, 2019; Kellogg, 2017, 2019; Epstein & Harder, 2016; KPMG, 2016; Feld, 2015). Furthermore, the independent variable *G1B+M2B* displays the highest coefficients across all regressions, corresponding to 53.9 and 31.2 for *V2* and *V1*, respectively. Thereby indicating that an increase in *NTM sales growth + NTM FCF margin* renders the highest rise in valuation multiple for both dependent variables, thus seemingly constituting the Rule of 40 combination with the strongest positive correlation to SaaS valuation. However, as previously described, the data suggest potential issues with heteroskedasticity for this independent variable, which potentially have influenced our results discussed above.

5.2 Hypothesis 3

From Model 2 we can not (with one exception) conclude that companies satisfying the Rule of 40 threshold are acknowledged by investors and valued significantly higher than firms not achieving the 40% score on a 5% significance level, and hence we can not reject our third null hypothesis. However, we find that the null hypothesis can be rejected in *Analysis 2* on a 5% significance level. The coefficient for *Ro40_SX* in *Analysis 2* is 10.6, and means that a firm that satisfies the Rule of 40 boundary increases their valuation by 10.6 (on an enterprise-value-to-gross-profit basis). We note that the results from *Analysis 1* and Analysis *3* describe a contradicting relation; the coefficient for *Ro40_SX* is instead negative, implying that a firm that fulfills the 40% threshold is valued lower than the firms scoring below 40%. There could be several plausible reasons causing this result, with the most significant being that there is no clearly stated rationale in the literature for determining 40% as the boundary for desirable performance. Rather, as the literature mentions, it should perhaps be used as a rule-of-thumb, and is not applicable to every situation. Instead, it should be adjusted for each sector (SaaS includes several sub-sectors) and how matured it is, as well as what life cycle stage the firm is situated within. As such, it is hard to make a conclusion on the basis of our regression results and reject our third null hypothesis. Therefore, we can not draw the same conclusion that Bain (2018) found in their analysis where they suggested that outperforming the Rule of 40 rendered a twice as high enterprise-value-to-sales multiple (compared to those that did not). A possible explanation could be that Bain examined the software sector as a whole while we examine SaaS specifically which significantly delimits the sample size. Further, they provide no additional insights to the statistical significance of their analysis.

5.3 Outliers

By winsorizing Model 1, we observe the effect of outliers on our regression analysis. Already at 1% level of winsorizing, we could note a change in R-squared value across all relevant independent variables. The largest difference in R-squared value was noted for the independent variable *G1A+M2A*; shifting the R-squared value from 0.135 to 0.218 at a 1% level of winsorizing. The data point adjusted was Zoom Video Communications with a Rule of 40 score (based on the mentioned combination) of 378% that was subsequently adjusted to 200%. As such, we can conclude that the regression could be explained to a larger extent when adjusting for the outliers at 1%-winsorizing level. This is a plausible outcome due to the low sample size (n=69), and corresponds well with the findings of Gujarati (2003). Similar conclusions can be made as we winsorize on a 2.5% and 5% level.

We however note an interesting change in R-squared values as we winsorize on the 10% level; the R-squared values decrease for all regressions. These findings suggest that some data points excluded from our regressions actually fit well to the initial trendline and hence the correlation strength deteriorates.

6. Conclusion and further research

The purpose of our study was to evaluate if the Rule of 40 metric can explain prevailing SaaS market valuations, analysing whether or not a positive correlation can be established between the two. Our regression results can conclude that there is indeed a significant positive correlation between a SaaS firm's valuation and Rule of 40 score - i.e. if you perform well according to the Rule of 40 metric, all else equal, your firm will be valued higher. Hence, our findings are in line with and support the findings of "practitioners". Furthermore, there has not been a unanimous view in the literature on the best profitability metric to construct the Rule of 40 score, and the literature suggested either EBITDA margin or FCF margin. In our regression we find that the forward-looking FCF margin has a higher correlation with valuations; however we acknowledge the arguments from the literature that it should be evaluated on a case-by-case basis. Additionally, we could find indications of heteroskedasticity for the forward-looking independent variables in relation to the dependent variable *V2*, potentially impacting our findings.

Furthermore, we analysed if performance above the 40% boundary results in a higher valuation compared to firms not achieving the target. Except for the regression based on the independent variable *G1A+M2A* and dependent variable *V2* (in which we could reject the null hypothesis at 5% significance level), we can not find a statistically significant relationship for the dummy variable *Ro40_SX* and hence can not reject our third null hypothesis.

There are numerous factors that might have influenced our results and findings. The most prominent factor is likely the sample size of 69 firms, and that all firms included in the regression are listed on large-cap lists, thus smaller companies are excluded from the data set. Additionally, our review is based on prevailing market valuations and does not analyse any historical periods. Furthermore, the purpose of our study took origin in what "practitioners" use in their daily work for valuing these firms. From an academic perspective, it could however be efficient to include control variables and hence potentially strengthen our regression model.

Our suggestion for further research would primarily be to further examine the subject with a similar "practical" approach, as to the best of our knowledge the metric has not been subject to review in the published academic literature. Furthermore, by increasing the sample size and including additional markets (not only the U.S.), the regression would be strengthened and provide additional insights. Also, our sample is currently skewed towards larger firms which could influence the outcome. Moreover, our analysis reviews prevailing market valuations; by extending the time period the strength of correlation could be further improved.

Another aspect of relevance in future research, as suggested by KPMG (2016) and Norwest Venture Partners (2019), might be to investigate the explanatory power of a growth-weighted Rule of 40 composition. Referring back to the life cycle stage framework as described by Damodaran (2009b, p. 8), increasing emphasis on growth relative to margins in the regression analysis could potentially yield interesting results. Additionally, more operational metrics such as annual recurring revenue, number of customers, customer churn and firm size could provide additional insights; however the approach used by practitioners is then neglected to some extent and instead a multi-variable regression model would be utilised.

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8. Appendix

Appendix 2.1 - Equation for the WACC formula

$$WACC = \frac{E}{E+D} * R_E + \frac{D}{E+D} * R_D * (1 - T_C) \quad (2.1)$$

where:

E = Market value of the firm's equity

D = Market value of the firm's debt

R_E = Cost of equity

R_D = Cost of debt

T_C = Corporate tax rate

Appendix 3.1 - List of SaaS companies and its source

Company	Source	Company	Source
salesforce.com	Sonders, GP Bullhound	Ceridian	GP Bullhound
Workday	Sonders, GP Bullhound	RealPage	GP Bullhound
ServiceNow	Sonders, GP Bullhound	8x8	GP Bullhound
Square	Sonders, GP Bullhound	Alteryx	GP Bullhound
Atlassian	Sonders, GP Bullhound	Cornerstone OnDemand	GP Bullhound
Shopify	Sonders, GP Bullhound	LivePerson	GP Bullhound
Veeva Systems	Sonders, GP Bullhound	SPS Commerce	GP Bullhound
Twilio	Sonders, GP Bullhound	Workiva	GP Bullhound
Paycom Software	Sonders, GP Bullhound	Tenable Holdings	GP Bullhound
Dropbox	Sonders, GP Bullhound	Everbridge	GP Bullhound
Okta	Sonders, GP Bullhound	Medallia	GP Bullhound
DocuSign	Sonders, GP Bullhound	Adobe	Sonders
Zendesk	Sonders, GP Bullhound	Intuit	Sonders
RingCentral	Sonders, GP Bullhound	CrowdStrike Holdings	Sonders
HubSpot	Sonders, GP Bullhound	Slack Technologies	Sonders
Proofpoint	Sonders, GP Bullhound	ZoomInfo Technologies***	Sonders
New Relic	Sonders, GP Bullhound	Akamai Technologies	Sonders
Zscaler	Sonders, GP Bullhound	Citrix Systems	Sonders
Coupa Software	Sonders, GP Bullhound	F5 Networks	Sonders
MongoDB	Sonders, GP Bullhound	Guidewire Software	Sonders
Wix.com	Sonders, GP Bullhound	Fastly	Sonders
Anaplan	Sonders, GP Bullhound	Smartsheet	Sonders
Paylocity Holding	Sonders, GP Bullhound	Change Healthcare*	Sonders
2U	Sonders, GP Bullhound	Bentley Systems*	Sonders
J2 Global	Sonders, GP Bullhound	Qualtrics Intl***	Sonders
Cloudera	Sonders, GP Bullhound	Asana***	GP Bullhound
Avalara	Sonders	BigCommerce Holdings***	GP Bullhound
Qualys	Sonders, GP Bullhound	Rackspace Technology***	GP Bullhound
Five9	Sonders, GP Bullhound	Yext	GP Bullhound
Q2	Sonders, GP Bullhound	JFrog***	GP Bullhound
Mimecast	Sonders, GP Bullhound	Brightcove	GP Bullhound
Box	Sonders, GP Bullhound	Castlight Health	GP Bullhound
BlackLine	Sonders, GP Bullhound	ChannelAdvisor	GP Bullhound
AppFolio	Sonders, GP Bullhound	Benefitfocus	GP Bullhound
Appian	Sonders, GP Bullhound	Sinch**	GP Bullhound
Zoom Video Communications	GP Bullhound	Bill.com Holdings	GP Bullhound
Datadog	GP Bullhound	Unity Software*	GP Bullhound
Splunk	GP Bullhound	Snowflake***	GP Bullhound
Cloudflare	GP Bullhound	Zuora	Sonders, GP Bullhound
Dynatrace	GP Bullhound	Elastic	Sonders, GP Bullhound

*Note: * Missing complete historical financial data; ** Financial estimates missing; *** IPO on or later than May 2020*

Appendix 3.2 - Independent and dependent variables

Variable name	Period	Definition
G1A+M1A	TTM	*Independent variable (model 1 & 2)* - Historical sales growth plus historical EBITDA margin during the trailing-twelve-months
G1A+M2A	TTM	*Independent variable (model 1 & 2)* - Historical sales growth plus historical FCF margin during the trailing-twelve-months
G1B+M1B	NTM	*Independent variable (model 1 & 2)* - Expected sales growth plus expected EBITDA margin during the trailing next-twelve-months
G1B+M2B	NTM	*Independent variable (model 1 & 2)* - Expected sales growth plus expected FCF margin during the trailing next-twelve-months
Ro40_SX	n.a.	*Dummy variable (model 2)* - Returns the value 1 if the Rule of 40 score is above 40%, otherwise it is 0
V1	n.a.	*Dependent variable (model 1 & 2)* - Enterprise-value-to-TTM-sales
V2	n.a.	*Dependent variable (model 1 & 2)* - Enterprise-value-to-TTM-gross-profit