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THE PUBLIC COMPANY LIFECYCLE FRAMEWORK:
A TOOL FOR UNDERSTANDING A COMPANY’S STOCK
MARKET PERFORMANCE

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**The public company lifecycle framework: A tool
for understanding company stock performance.**

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"I think a life properly lived is just learn, learn, learn all the time"

Charlie Munger

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Resumo

O desempenho do mercado de ações e as metodologias de avaliação estão interligadas. Para os investidores, possuir uma ferramenta de avaliação eficaz é crucial. Diversos modelos foram desenvolvidos, incorporando indicadores financeiros e não financeiros, que oferecem diferentes níveis de precisão e confiança. Estudos têm demonstrado que os modelos de avaliação apresentam desempenhos diferentes entre mercados. Mais, os resultados de vários estudos destacam a importância de considerar as condições de mercado, as idiosincrasias de cada setor e a seleção de metodologias de avaliação apropriadas para melhorar a precisão na avaliação de ações. Não existe uma "solução única", mas sim várias variáveis que precisam de ser consideradas na escolha da metodologia de avaliação adequada.

Métodos de avaliação como a Avaliação Relativa, que envolve a comparação de métricas financeiras de empresas semelhantes, e a análise DCF, que calcula o valor presente dos fluxos de caixa futuros esperados, são fundamentais para determinar o valor intrínseco das ações. Contudo, ambos os métodos têm deficiências inerentes, o que exige o desenvolvimento de abordagens alternativas para melhorar a precisão e a confiança da avaliação de ações. Esta tese propõe uma nova metodologia para a tomada de decisões de investimento com base na fase do ciclo de vida de uma empresa. A metodologia utiliza uma combinação de métricas financeiras, incluindo vendas, lucro operacional, atividades operacionais, fluxo de caixa livre e rácios de dívida, para categorizar empresas em uma das três fases distintas do ciclo de vida: Infância/Adolescência, Adulto ou Terceira Idade. Essas fases são caracterizadas por taxas de crescimento específicas, padrões de investimento e indicadores de saúde financeira. Ao compreender a fase do ciclo de vida de uma empresa, os investidores podem obter pontos de vista valiosos sobre o seu potencial de crescimento futuro, perfil de risco e sustentabilidade financeira. A metodologia reconhece a possibilidade de não linearidade e reinvenção dentro da estrutura do ciclo de vida. Esta pesquisa contribui para o campo da análise de investimentos ao fornecer uma ferramenta prática para os investidores avaliarem empresas e tomarem decisões de investimento informadas.

Palavras-Chave: Investimentos, análise financeira, metodologia, avaliação.

Abstract

Stock market performance and valuation methodologies are closely intertwined. For investors, having an effective valuation tool is crucial. Several models have been developed, incorporating financial and non-financial indicators, which offer different levels of precision and reliability. Studies have shown that valuation models perform differently across markets. Furthermore, the results of several studies highlight the importance of considering market conditions, the idiosyncrasies of each sector, and of selecting appropriate valuation methodologies to improve accuracy in evaluating stocks. There is no “one-size-fits-all solution,” but rather several variables that need to be taken into consideration to choose the appropriate assessment methodology.

Valuation methods such as Relative Valuation, which involves comparing financial metrics of similar companies, and DCF analysis, which calculates the present value of projected future cash flows, are pivotal in determining the intrinsic value of securities. However, both methods have inherent shortcomings, necessitating the development of alternative approaches to enhance the accuracy and reliability of stock valuation.

This thesis proposes a novel methodology for investment decision-making based on a company's life cycle stage. The methodology utilizes a combination of financial metrics, including sales, operating profit, operating activities, free cash flow, and debt ratios, to categorize companies into one of three distinct life cycle stages: Childhood/Adolescence, Adulthood, or Mature (Stage 1, 2 and 3 respectively). These stages are characterized by specific growth rates, investment patterns, and financial health indicators. By understanding a company's life cycle stage, investors can gain valuable insights into its potential for future growth, risk profile, and financial sustainability. The methodology acknowledges the possibility of non-linearity and reinvention within the life cycle framework. This research contributes to the field of investment analysis by providing a practical tool for investors to assess companies and make informed investment decisions.

Key Words: Investment, financial analysis, framework, valuation.

Index

Index of tables	8
List of abbreviations and acronyms	10
1. Introduction	11
2. Literature review: Valuation	15
2.1 The discounted cash flow model.....	17
2.2 The relative valuation	18
2.3 Loss making valuation.....	20
3. Methodology	22
4. Framework Analysis	25
4.1 Tech industry Companies (Analysis 1)	26
4.2 Traditional businesses (Analysis 2).....	30
4.3 The chip industry (Analysis 3)	33
5. Conclusion	35
References	37
References To Financial Fillings	42
6. Appendix: Case Studies	43
6.1 Alphabet Inc.....	44
6.2 Microsoft Corporation	45
6.3 Apple Computer	47
6.4 Meta Platforms, Inc.	50
6.5 Amazon.com, Inc.....	51
6.6 McDonald's Corporation	52
6.7 The Coca-Cola Company.....	53
6.8 Tesla, Inc	54
6.9 Duolingo, Inc.....	56
6.10 Ferrari S.p.A	57
6.11 Nestlé S.A.....	58
6.12 F. Hoffmann-La Roche AG	59
6.13 Tencent Holdings Ltd.....	61

6.14	Adidas AG	63
6.15	Intel Corporation.....	64
6.16	Taiwan Semiconductor Manufacturing Company Limited.....	66
6.17	ASML Holding N.V.	69
6.18	Advanced Micro Devices, Inc.	71
6.19	Nvidia Corporation.....	73

Index of tables

Table 1: Framework stage characteristics	25
Table 2: Tech industry companies evolution of market capitalization (2012-2022)	27
Table 3: Tech industry companies FCF and P/FCF ratio (2012-2022)	28
Table 4: Tech industry companies CAGR for the Relative Valuation (2012-2022)	29
Table 5: Tech industry companies in stage 1 CAGR (2012-2022)	29
Table 6: Tech industry companies is stage 1 and 2 CAGR (2012-2022)	30
Table 7: Traditional businesses companies evolution of market capitalization (2010-2022)	31
Table 8: Traditional businesses companies FCF and P/FCF ratio for the Relative Valuation (2010-2022)	31
Table 9: Traditional companies CAGR for the Relative Valuation (2012-2022)	32
Table 10: Traditional companies and Stage 2 CAGR (2015-2022)	32
Table 11: Chip industry companies evolution of market capitalization (2011-2022)	33
Table 12 : Chip industry companies FCF and P/FCF ratio (2011-2022)	34
Table 13 : Chip industry companies CAGR for the Relative Valuation (2011-2022)	34
Table 14: Chip industry companies in stage 1 CAGR (2011-2022)	35
Table 15: Chip industry companies in stage 1 and stage 2 CAGR (2011-2022)	35
Table 16: Alphabet growth rate for stage 1 and 2	45
Table 17: Microsoft growth rate for stage 1, 2 and 3.	47
Table 18: Apple growth rate for stages 1, 2 and double 3	49
Table 19: Meta growth rate for stage 1	50
Table 20: Amazon growth rate for stage 1	52
Table 21: McDonald's growth rate for stage 3	52
Table 22: Coca-Cola growth rate for stage 3	54
Table 23: Tesla growth rate for stage 1	55
Table 24: Duolingo growth rate for stage 1	56
Table 25: Ferrari growth rate for stage 2	58

Table 26: Nestlé growth rate for stage 3	59
Table 27: Roche growth rate for stage 3.....	61
Table 28: Tencent growth rate for stages 1 and 2.....	63
Table 29: Adidas growth rate for stage 3	64
Table 30: Intel growth rate for stage 3	66
Table 31: TSMC growth rate for stages 1 and 2	69
Table 32: ASML growth rate for stages 1 and 2.....	71
Table 33: AMD growth rates for stage 3 and 1.....	73
Table 34: Nvidia growth rates for stage 1	74

List of abbreviations and acronyms

FCF	Free Cash Flow
DCF	Discounted Cash Flow
Capex	Capital Expenditures
IPO	Initial Public Offering
P/S	Price-to-Sales Ratio
P/E	Price-to-Earnings Ratio
P/FCF	Price-to-Free Cash Flow Ratio
LLC	Limited Liability Company
INC	Incorporated
USD	United States Dollar
EUR	Euro
GAAP	General Accounting Accepted Principles
IFRS	International Financial Reporting Standards
NPV	Net Present Value

1. Introduction

Stock market valuation is a critical aspect of financial analysis, influencing investment decisions and portfolio management strategies. This dissertation aims to develop a novel methodology that enhances stock market analysts' ability to increase returns on investments in publicly traded companies. The methodology supports the existing model for relative valuation, as presented in the literature review, by incorporating a comprehensive analysis of key financial metrics and the capital allocation strategies of businesses at different stages of their life cycle. This approach allows investors to better assess a company's potential from a financial investment standpoint.

Motivation

Existing stock market valuation methodologies, such as DCF and Relative Valuation, offer valuable insights but have some limitations. DCF models can be sensitive to assumptions about future growth rates and discount rates, while the Relative Valuation may not fully capture a company's growth potential or risk factors and relies on the availability of comparable firms, which can be challenging to identify. The possibility to create and identify a novel valuation approach that incorporates lifecycle stages and supports the existing methods motivated this research.

Objectives

The primary objective of this research is to develop a systematic framework that:

1. Categorizes companies into three distinct lifecycle stages—childhood/adolescence, adulthood, and maturity.
2. Identifies key financial metrics and capital allocation behaviours characteristic of each stage.
3. Demonstrates the impact of these lifecycle stages on stock performance and investment returns.
4. Validates the applicability of the framework through case studies across various industries and market conditions.

Methodology Summary

Understanding the lifecycle stages of companies is crucial for investors aiming to optimize their returns. Companies in stage 1 typically exhibit the highest growth potential, leading to significant stock price appreciation. Stage 2 companies, in their adulthood, often experience steady growth and profitability. In contrast, stage 3 companies often face stagnation or decline due to mature markets and suboptimal capital allocation. By accurately identifying these stages, investors can make more informed decisions, allocating resources to companies with the highest potential for growth and avoiding those likely to underperform.

This dissertation shows the differences and characteristics of the 3 stages through multiple case studies of companies evolving between these same stages, presenting their capital allocation and respective growth rates of key financial metrics for the periods, while explaining the reasons for the change of stage and effects on stock price appreciation and consequent effect on investment returns.

The relevance of these case studies lies in their ability to demonstrate the practical implications of the lifecycle framework. By analyzing companies that have successfully navigated or struggled through these stages, we can better understand the critical factors that influence their transitions and the resultant impact on stock performance.

While this dissertation primarily uses case studies to illustrate the lifecycle stages of companies, the implications of the findings extend beyond the individual cases examined. The framework analysis developed in this research provides a systematic approach to categorizing companies based on their lifecycle stages, enabling broader applicability across various industries and market conditions. By defining criteria for each stage and identifying key financial metrics and capital allocation behaviors, the framework allows for a more generalized assessment that can be applied to a wide range of companies. This approach not only enhances the predictive power of stock valuation but also offers a tool for analysts to identify investment opportunities and risks in the broader market context.

The title of this dissertation, "The Public Company Lifecycle Framework: A Tool for Understanding Company Stock Performance," reflects the central thesis of the research. The framework developed in this study categorizes publicly traded companies into three distinct lifecycle stages: childhood/adolescence (stage 1), adulthood (stage 2), and mature (stage 3). By analyzing the financial metrics and capital allocation strategies characteristic of each stage, the framework provides investors with a systematic tool for evaluating stock performance. This approach helps investors identify growth potential and risks associated with companies at different lifecycle stages, aiding in more informed and strategic investment decisions.

Despite its mentions in industry discussions, such as those by the management of PDD Holdings during earnings calls and by Bridgewater, a hedge fund, in a public research paper (Maisonneuve, 2024), this methodology has not yet been empirically studied in a systematic manner. A comprehensive empirical analysis linking these lifecycle stages to stock market valuation remains unexplored. This dissertation aims to explore this gap, providing an original investigation into the lifecycle framework and its practical implications for stock valuation and investment strategies.

Results

Preliminary findings indicate that companies in stage 1 exhibit higher growth potential and stock price appreciation, while mature companies stage 3 often face challenges such as stagnation or decline. This research demonstrates that accurately identifying lifecycle stages enables investors to allocate resources more effectively, focusing on companies with high growth potential while mitigating risks associated with mature firms. These results show the utility of the lifecycle framework as a tool for investment decision-making.

Literature Contribution

This dissertation contributes to the literature by studying the relationship between company lifecycle stages and stock market valuation. By integrating lifecycle analysis into valuation practices, this research bridges a gap, offering a practical and scalable framework for investors and analysts. Additionally, the study enriches the

understanding of capital allocation behaviours and their role in shaping a company's financial trajectory, providing insights for both academic and practical applications.

This dissertation is structured as follows:

1. **Literature Review:** This section provides an overview of existing stock market valuation methods and their strengths and weaknesses. It sets the foundation for the proposed lifecycle framework by highlighting the gaps and limitations in current methodologies.
2. **Methodology:** This section details the development of the lifecycle framework, including the criteria for classifying companies into different stages and the key financial metrics used for evaluation. It explains the research design and data collection methods used to support the analysis.
3. **Framework Analysis:** This section critically examines the findings from the case studies, discussing the broader implications of the lifecycle framework. It addresses how the methodology can be applied to a wider range of companies and identifies potential limitations and areas for future research.
4. **Conclusion:** This section summarizes the key insights from the research, highlighting the practical applications of the lifecycle framework for investors and stock market analysts. It also outlines the contributions of the study to the field of stock market valuation and suggests directions for further investigation.
5. **Case Studies:** This section presents in-depth analyses of multiple companies that have transitioned through different lifecycle stages. It illustrates the capital allocation patterns and growth rates of key financial metrics across these stages, providing empirical evidence for the framework.

2. Literature review: Valuation

In the stock market, valuation serves as a cornerstone of equity selection. Investors analyze a company's intrinsic value and aim to identify stocks trading at a significant discount to that value (Drakopoulou, 2016; Fabozzi & Grant, 2008).

In tracing the historical development of stock market valuation methods, we see their evolution from rudimentary techniques to sophisticated models grounded in financial theory. The early 20th century was marked by the introduction of methods such as the Dow Theory, which combined stock price movements and market trends (Hamilton, W. P. 1922). The post-World War I era witnessed a surge in the application of quantitative methods, spurred by the works of Graham and Dodd (1934) who pioneered fundamental analysis and the concept of intrinsic value. The advent of modern portfolio theory in the 1950s, spearheaded by Markowitz (1952), and the subsequent development of the Capital Asset Pricing Model (CAPM) by Sharpe (1964) Lintner (1965), and Mossin (1966) further advanced the field, introducing risk-adjusted returns into valuation equations. By the late 20th century, the integration of behavioral finance and advances in econometrics provided deeper insights, allowing for more nuanced valuations that account for investor psychology and market anomalies (Kahneman & Tversky, 1979; Shiller, 1981). These historical advancements underscore the dynamic nature of valuation methodologies, reflecting ongoing efforts to better capture the complexities of financial markets.

Research suggests that investors actively seek to avoid overvalued stocks, as these are likely to experience price collapses (Lev & Wu, 2019). When considering the overall market, the value-to-price ratios of individual companies can be instructive (Lee & Swaminathan, 1999). Additionally, broader market valuation metrics, such as the Shiller P/E ratio (J. Campbell & Shiller, 2001; J. Y. Campbell & Shiller, 1998) and the Buffett indicator, provide valuable insights (Swinkels & Umlauft, 2022).

The choice of valuation methodology is often context-specific, dictated by the characteristics of different markets, sectors, and specific market conditions. For instance, in emerging markets, valuation might lean towards methods that account for

higher volatility and risk, while in stable, mature markets, DCF methods might be more prevalent (Fernández, 2001). Specific sectors, such as technology versus utilities, also necessitate different approaches due to their unique growth patterns and risk profiles (Narkunienė & Ulbinaitė, 2018).

There are several equity valuation methods, each with varying complexity and underlying assumptions, employed to estimate a company's intrinsic value (Christensen et al., 2010). Despite the established nature of valuation methods, achieving consensus among professionals remains elusive (Damodaran, 2006). This thesis argues that there's room for further development in valuation techniques. By refining existing methods, we can potentially enhance returns on investments in publicly traded equities.

The contribution of this thesis to the literature lies in its integration of the Lifecycle Framework into the discourse on stock market valuation, building upon the historical evolution of existing methodologies. While prior research has extensively explored models like the DCF and the relative valuation, this study identifies a gap in the ability of these methods to adequately account for the dynamic nature of companies lifecycle stage. By systematically categorizing firms into distinct lifecycle stages and linking these stages to financial metrics and capital allocation strategies, this research offers a novel lens through which valuation can be approached. Unlike traditional methodologies that often rely on static assumptions, the lifecycle framework introduces a component that reflects a company's developmental phase. This contribution not only refines existing valuation practices but also provides a more actionable tool for investors seeking to optimize returns by tailoring strategies to the lifecycle stage of their target companies, although we advise that this framework is not exempt from subjectivity and speculation when classifying a specific stage for a company. This can plausibly create the same set of risks already existent in the traditional valuation methods mentioned in the continuation of this section.

In what follows I describe some of the existing valuation methods.

2.1 The discounted cash flow model

The DCF method is a cornerstone of financial valuation, praised for its ability to capture the intrinsic value of profitable, economically sound companies (Capinski & Patena, 2009), “the heart of most corporate capital-budgeting systems” as in Timothy A. Luehrman (1998). Fisher's introduction of the DCF model has been widely adopted, but its application varies significantly across practitioners (Bancel & Mittoo, 2014). However, this power comes with a caveat – DCF is susceptible to significant assumption bias and potential manipulation (Cornell, 2003a; Steiger, 2010). The complexity of the model necessitates careful consideration of discount rates, future cash flow projections, and terminal values. Despite this limitation, DCF remains a valuable tool, particularly useful in assessing project risk and uncertainty (Uzma et al., 2010). Companies like Infosys have successfully employed DCF for intangible asset valuation, demonstrating its versatility (Uzma et al., 2010).

To mitigate the risk of manipulation and ensure transparency, detailed DCF models should be provided to directors (Cornell, 2003b). This empowers boards to understand how management intends to create value over time, fostering responsible decision-making. Furthermore, practitioners must disclose their valuation parameter estimates to minimize assumption bias, as emphasized by Steiger (2010). While DCF is a key tool in M&A valuation (Schill et al., 2006), it's crucial to consider other valuation methodologies for a more comprehensive picture. Frameworks like those proposed by Schueler (2018) can be invaluable in achieving consistent and well-founded DCF valuations, integrating various factors and assumptions to arrive at a more accurate assessment of a company's worth.

The DCF method measures the value of the future cash flow streams a company will produce in the future discounted by an appropriate discount rate, resulting in the net present value of the company (NPV) which is show below (Steiger, 2010).

$$NPV = \sum_{t=0}^n \frac{FCF_t}{(1+r)^t}$$

FCF = Free cash flow
n = time period
t = time of cash flow
R = discount rate

The FCF is the amount of “cash not required for operations or reinvestment” (Brealey et al., 2020), so a well done DCF valuation is based upon a company’s fundamentals. However, due to its forward-looking nature, this method involves taking business and economic assumptions based on its past performance. Changing the assumptions can drastically change the NPV of a company. It is then very important to know which assumptions to use and how they will affect the result of the analysis (Steiger, 2010). This paper recognizes the established nature of the DCF methodology and introduces a complementary framework, although not immune from the DCF flaws altogether. This framework aims to support the analysis by adding robustness to the assumptions used within the DCF model.

2.2 The relative valuation

Relative valuation is a widely used method for estimating asset values by comparing them to similar assets in the market (Bilir, 2013; Larsen, 2008; Sharma & Prashar, 2013). It assumes that an asset's value equals its market value and relies on standardized price multiples for comparison (Sharma & Prashar, 2013). The method is based on two principles: intrinsic value is determined by market willingness to pay, and market inefficiencies can be identified through comparisons (Sharma & Prashar, 2013). Relative valuation is popular due to its ease of use and reliance on real data (Bilir, 2013). However, it has limitations, including the potential for selecting incorrect comparable firms and neglecting fundamental variables like risk and growth (Bilir, 2013; Larsen, 2008). Multiples can be categorized as enterprise or equity-based, with enterprise multiples being less dependent on capital structure (Bilir, 2013). Despite its limitations,

relative valuation remains a primary alternative to discounted cash flow methods (Larsen, 2008).

There are 3 steps in the relative valuation method (Damodaran, 2006). The first is to find comparable companies in the stock market. Analysts tend to use companies in the same sector of activity, Pétursson (2016) applies statistical tests to different multiples and different industries and concludes that using companies from different industries can lead to bad valuation results. The second step is to scale the market price to a common variable to create comparable prices, as a larger house should trade at a higher price than a smaller house, so to this should be accounted for in the stock market and can be done by converting the market value of the company to a multiple of the earnings, book value or revenues. (Damodaran, 2006). The last step is adjusting for differences across companies, a fast-growing company should be valued at a higher price than a lower growth company in the same sector for example, however analysts might adjust for these differences qualitatively, turning a relative valuation into a sales pitch where better stories receive more credit for better valuation. (Bilir, 2013; Damodaran, 2006)

There is a significant difference between these two methods. In the DCF we try to establish the value of a company by predicting its future cash flow, while in the relative valuation we are making a judgment on the price of an asset based on its current market pricing and the one of its peers (Damodaran, 2006). It is worth noting that Damodaran (2002) mentions that 90% of equity research valuations follow the relative valuation method, meaning that this is the most common method used by professional investors, a vision corroborated by Bancel and Mittoo (2014).

Standardization and Multiples

When comparing identical items, it is possible to compare its prices. We can compare the price of a couch with the price of an identical item being sold or bought, however companies can have big differences between themselves turning the job of comparing them into a herculean task. A stock split can halve the price of a company by doubling the number of shares available, so we need to standardize the values to a common variable. Values can be standardized relative to the revenues, book value or earnings. (Damodaran, 2006). So, the selection of comparable firms and appropriate multiples is

crucial for accurate valuation. Industry-specific factors also influence valuation accuracy, with some sectors showing lower valuation errors than others (Pétursson, 2016).

Usually, prices of stocks are seen as a multiple of its earnings and a higher multiple is generally worse than a lower multiple for the buyer, but the P/E ratio will reflect the growth of the business and the risk taken (Murphy & Stevenson, 1967). Similarly, an investor might look at the P/S ratio method. These methods are subject to the possible differences in accounting methods and how sales and earnings are being recorded. If we are comparing an American traded company with a European one, it's possible that the former follows the GAAP method of accounting while the latter follows the IFRS method, resulting in possible differences in the values reported and consequently altering the valuation. (Bae et al., 2006)

There are also ratios specific to the sectors, Graham (2002) and Trueman (2000) found that traditional financial measures like net income have limited explanatory power for internet stock prices, while non-financial metrics such as unique users and page views provide significant incremental value. However, the importance of these metrics varies across different internet subsectors. Curto (2020) highlights the limitations of current accounting systems in enabling comparability across sectors, emphasizing the need for economic adjustments to valuation ratios. Weitz (2014) raise concerns about the reliability and verifiability of non-financial metrics reported by social media companies.

2.3 Loss making valuation

Using DCF

The DCF method is a powerful tool for company valuation, but it has limitations when applied to certain types of firms. While effective for companies with positive earnings and historical data, the DCF method faces challenges when valuing firms with negative earnings, no history, or no comparable (Damodaran, 1999; Montani et al., 2020). The method is subject to significant assumption bias, where small changes in inputs can drastically alter results (Steiger, 2010). Valuation challenges arise from the difficulty in determining key parameters such as free cash flows and earnings ratios especially for newly established or unprofitable firms (Goker & Derindere Köseoğlu, 2020).

It can be said that such firms cannot possibly be valued since past growth rates cannot be applied to current earnings and estimate future earnings if they do not exist, however Damodaran (2000) affirms that's not the case. In fact, the author shows that there are three possible alternatives to value such a company using the DCF method. The first is to normalize earnings: we need to consider first that the state of losing money is temporary and will revert to a profit in a normal year, then we substitute the loss with "normalized earnings". The second approach is to project revenue growth and use it to estimate future margins and, consequently, profits since higher revenue can lead to a better financial position. The third and last method is to reduce leverage. This is possible when a business is loss making due to high debt costs, so it is possible for an investor to adjust the future earnings of a company to the deleveraging process until it is making profits.

Even if we do not have long track records and comparable business, we usually have one of the two present, compensating for the lack of the other (Damodaran, 2000). One important fact to state is that such valuations will always be unprecise, this is not a result of the lack of quality of such methods, but of the uncertainty about the future, a constant in the investing world (Damodaran, 2013). An investor must always be ready to be wrong and diversify to protect him from such risks (Booth & Fama, 1992), look at competitive advantages (Øystein Gjerde et al., 2009), and pay close attention to reported earnings and the possibility of survival of the company.

Using relative valuation

When it comes to the relative valuation method, there are similarly three steps to follow to use such a process in this category of companies: standardize prices of the different firms before using ratios (P/E ratio, P/S ratio) (Sharma & Prashar, 2013) using firms in some way similar to the targeted firm and to finalize, compare the standardized prices with the group of companies gathered bearing in mind it's different fundamentals (Henschke & Homburg, 2009).

It seems easier than the DCF method previously explained, but we are still making assumptions about the future when comparing the multiples of the group of companies selected. More, we are considering them correct when in fact we might be upon a

general overvaluation of the sector, meaning that a company that looks cheap in comparison to its peers might still be expensive in an intrinsic basis (Damodaran, 2006).

In summary, while traditional valuation methods such as DCF and Relative Valuation provide essential frameworks for assessing company value, they come with challenges and limitations, particularly when applied to firms with negative earnings, no history, or lacking comparable peers. These methods require careful consideration of assumptions and adjustments to address the unique circumstances of such companies. Furthermore, the uncertainty in predicting future performance underscores the need for a diversified approach. Despite these complexities, the DCF and Relative Valuation methods remain invaluable tools for investors, offering critical insights into potential growth and financial health. As we transition to the methodology section, this dissertation introduces a lifecycle framework designed to enhance the applicability of these traditional models, although if not immune from the same imperfections mentioned for the previous valuation methods, we believe it provides a comprehensive approach to stock market valuation.

3. Methodology

Key Financial Metrics

To determine a company's life cycle stage, we analyze a combination of financial metrics. These metrics provide a clear picture of a company's current stage and how long it has been in that stage. Warren Buffet (Jennifer Saibil, 2024) suggests that operating profit is a crucial metric as it excludes financial instrument gains and losses, offering a more transparent view of organic profit growth compared to net income. However, two critical metrics are operating activities and free cash flow, which reflect a company's financial health (Dickinson, 2011). We also consider debt-to-free cash flow and net-debt-to free cash flow ratios (Ramsay & Sarlin, 2014). Excessive debt can threaten a company's survival (Scott, 2009; Valery V. Shemetov, 2021). These ratios indicate a company's proximity to Stage 3, but they are not definitive, as restructuring or management changes can alter a company's trajectory (Morrone et al., 2021).

Non-Linearity and Reinvention

Companies may skip stages or reinvent themselves, returning to an earlier stage. This methodology is not strictly linear, although it is for most cases, as presented. To effectively utilize the public company lifecycle framework, it's crucial to understand the distinct characteristics of each stage. The next section dives deep into the three stages a company typically navigates. Each stage is defined by specific growth patterns and capital allocation strategies. By recognizing these unique traits, investors can leverage the framework to assess a company's position and future and make informed investment decisions.

The Three Stages of a Company's Life Cycle

Our methodology assumes that all entities, including businesses, follow a similar life cycle: birth, growth, and eventual decline. This pattern is evident in various aspects of life, from living organisms to inanimate objects like houses. Similarly, businesses experience distinct stages of development.

Stage 1: Childhood/Adolescence

Companies in their early stages, typically under 15 years old, are considered in "Stage 1." They operate in new industries or introduce innovative business models to established industries. Not only that, but it is also possible for such a company to emerge from a mature field simply by being more competitive and productive than the old lot. These companies invest heavily in growth, often incurring net losses. They issue debt, sell securities, or seek external financing to fund their expansion. Dividends are not paid, and free cash flow generation is generally nonexistent. Growth rates typically exceed 25%.

Stage 2: Adulthood

Companies in "Stage 2" are typically between 15 and 20 years old and operate in more mature industries. They allocate capital intelligently, prioritizing organic growth or acquisitions. Remaining capital is distributed to shareholders or retained as cash or

highly liquid assets. Debt is manageable and can be paid off within three years of annual cash flow. Growth rates range from 15% to 25%.

Stage 3: Mature

Companies in "Stage 3" are typically over 20 years old and operate in mature industries. They prioritize dividend payments, often funded by debt, as organic growth is insufficient to sustain dividends or share buybacks. Growth rates are 15% or lower, and this stage often leads to a company's decline. However, it is important to note that a company in stage 3 is not doomed to perpetual stagnation or collapse. There are instances where strategic shifts can revitalize a company's fortunes, propelling it back to early stages due to restructurings or a change in the environment where a company operates.

The section "Appendix: Case Studies" provides a detailed examination of the process used to identify the stages for 19 different companies. It explains the patterns of capital allocation and growth rates throughout the stages and justifies the selection of a particular stage over others.

We should as well advise the reader for the absence of clear and objectively quantified criteria for the identification of each phase of the life cycle, therefore, it is largely based on subjective criteria, of a speculative and/or opinionated nature for the characterizations of each life stage.

We also present below a table with each stage characteristics for easy comprehension of the different company life stages.

Table 1: Framework stage characteristics

Stage 1	Stage 2	Stage 3
< 15 years	15 – 20 years	> 20 years
High growth and investment	Organic growth or acquisitions	Low growth
Debt, stock dilution and external financing	Healthy balance sheet	High debt level
No dividend and no FCF	Buybacks and/or dividend payment	High buybacks and dividend payments
Growth > 25%	Growth 15% - 25%	Growth < 15%

4. Framework Analysis

This section conducts a comparative analysis of investment returns for two stock portfolio configurations. The initial portfolio is constructed using the traditional relative valuation method applied to case study companies. Subsequently, the analysis extends to portfolios comprising the same case study companies but adjusted according to our proposed framework.

We should advise the reader that the selection might suffer from self-selection bias insofar as both the choice of company shares and the decision regarding financial indicators with a view to forming investment portfolios with the company shares and the comparative analysis of their performance are carried out in a subjective and somewhat "ad-hoc" manner, in order to validate the hypothesis of the existence of three phases in the companies' life cycle. Likewise, the fact that the data was not collected from scientific and organized databases with detailed and comparable financial information from companies (e.g., S&P Global's Compustat Financials, Moody's Orbis and/or LSEG Data & Analytics's Refinitiv Datastream/Eikon) makes the analysis

vulnerable to potential measurement errors. This would clearly violate some assumptions of the linear regression model, which would call into question the validity and interpretation of the results.

As the first step of a traditional relative valuation is to pick companies in some way similar, we allocated our case studies into three different portfolios: the first (Analysis 1) consists of companies in the tech industry, the second (Analysis 2) mashes together traditional businesses and the third (Analysis 3) is constituted by businesses in the chip industry only. This segregation is shown in table 1 below.

Table 1: Portfolios of companies for the framework testing

Tech	Traditional	Chip
Alphabet	McDonald's	Intel
Microsoft	Coca-Cola	TSMC
Apple	Ferrari	ASML
Meta	Nestlé	AMD
Amazon	Roche	Nvidia
Tesla	Adidas	-
Tencent	-	-

With these portfolios in mind, we proceed to the next steps of the traditional relative valuation above.

4.1 Tech industry Companies (Analysis 1)

Given the selection of comparable companies, the subsequent step involves price standardization across a defined number of years. To achieve this, total market capitalization in USD, sourced from the Macrotrends database, is utilized. The year 2012 at the final trading day is established as the base year for analysis, coinciding with Facebook's (now Meta) IPO, as this point marks the initiation of a consistent historical stock market dataset for all the companies in the portfolio up to and including the final trading day of 2022, which represents the conclusion of the study period for all case

studies. The market capitalization for the companies in both periods is presented in table 2.

For Meta in this analysis, we opted to utilize the closing market capitalization and stock price on the final trading day of 2021 to compute the CAGR, rather than the 2022 price, while maintaining the 10-year valuation window. This decision stems from the company experiencing a temporary, yet significant, devaluation in 2022. Given the stock's recovery by year-end 2023 and surpassing the 2021 closing price by 39% on 01 July 2024, this approach provides a more realistic representation of Meta's overall performance.

Table 2: Tech industry companies evolution of market capitalization (2012-2022)

Company	Market capitalization USD 2012	Market capitalization USD 2022
Alphabet	487.730 million	1.159 billion
Microsoft	223.650 million	1.787 billion
Apple	495.180 million	2.065 billion
Meta	68.620 million	323.350 million
Amazon	117.910 million	855.880 billion
Tesla	3.950 million	385.550 billion
Tencent	75.650 million	475.150 billion

Source: Macrotrends database at <https://www.macrotrends.net/stocks/research>

The next step involves calculating the P/FCF ratio for all portfolio companies. Subsequently, companies exhibiting the lowest P/FCF ratios are identified as potential investment targets. The formula used to calculate this ratio is presented below, table 3 shows the FCF number to serve as input along with the P/FCF ratio for each company in 2012.

$$P/FCF \text{ ratio} = \frac{\text{Market capitalization}}{FCF}$$

Table 3: Tech industry companies FCF and P/FCF ratio (2012-2022)

FCF USD 2012	P/FCF ratio
Alphabet - 13.246 million	36,5
Microsoft – 29.321 million	7,6
Apple – 42.561 million	11,6
Meta – 377 million	182
Amazon – 395 million	298,5
Tesla – (505) million	-
Tencent - 2.020 million	37,5

From the table above we can observe 2 companies with ratios above 100, a value much superior to any other company in the portfolio and one with no ratio at all due to the presence of negative FCF, meaning that these businesses can be considered as more expensive than the rest and so, removed from a portfolio of similar companies trading at lower valuations. We now have a portfolio according to the traditional method of relative valuation.

Now, we can simulate an investment executed on these specific companies in 2012 and see the total returns in 2022.

Using the stock prices available in the Yahoo! Finance database, we present next the average rate of return compounded annually for each business and the total average return of the portfolio, the values were calculated using the function RRI in excel.

Utilizing stock price data obtained from the Yahoo! Finance database, the CAGR is calculated for each individual company within the portfolio, as well as for the overall portfolio. The CAGR values are determined using the RRI function in Excel and are presented in table 4 below.

Table 4: Tech industry companies CAGR for the Relative Valuation (2012-2022)

Company	CAGR
Alphabet	18%
Microsoft	25%
Apple	21%
Tencent	20%
Average	21%

Having concluded the traditional relative valuation analysis for the technology companies, the subsequent step involves applying our proposed framework to the same dataset. The objective is to assess the potential for enhanced investment outcomes through the implementation of our methodology.

Rather than selecting companies based on price ratios, this framework prioritizes companies at earlier stages of development, hypothesizing a positive correlation between early stage and future return potential. Initially, a portfolio is constructed exclusively from stage one companies. The subsequent calculation of the portfolio's CAGR follows the method employed in the traditional relative valuation analysis and is presented in table 5.

Table 5: Tech industry companies in stage 1 CAGR (2012-2022)

Company in Stage 1	CAGR
Meta	28,29%
Amazon	20%
Tesla	47,6%
Average	31,9%

A comparison of the two portfolio strategies reveals superior performance for the stage 1 company portfolio, which exhibited a CAGR of 31.9% compared to the 21% CAGR achieved by the portfolio of companies selected based on the lowest valuation metrics.

In the next exercise, we pick the same stage 1 companies, but add to the portfolio the stage 2 companies as well, the new group is shown in table 6.

Table 6: Tech industry companies is stage 1 and 2 CAGR (2012-2022)

Company in Stage 1 and 2	CAGR
Meta	28,29%
Amazon	20%
Tesla	47,6%
Alphabet	18%
Tencent	20%
Average	26,8%

The inclusion of later stage companies within the portfolio resulted in a decreased overall return compared to the stage one portfolio. This finding supports the initial hypothesis regarding the relationship between company stages and potential returns. Nevertheless, the portfolio's performance remains superior to that of a portfolio constructed using the traditional relative valuation method.

4.2 Traditional businesses (Analysis 2)

In this second analysis we follow the exact same process as in Analysis 1, applied to companies in the “traditional” category starting from the last trading day of 2010, exception being Ferrari, which only has available stock price data after 25/10/2015, after its IPO. In the same manner as the Analysis 1, we start in the price standardization for the group of traditional stocks. This standardization by market capitalization for the beginning and ending periods is shown in table 7.

Table 7: Traditional businesses companies evolution of market capitalization (2010-2022)

Company	Market capitalization USD 2010	Market capitalization USD 2022
McDonald's	81.300 million	194.09 million
Coca-Cola	151.800 million	275.300 million
Nestlé	190.820 million	318.590 million
Roche	127.450 million	259.550 million
Adidas	13.610 million	24.830 million
Ferrari (2015)	9.070 million	40.730 million

Source: Macrotrends database at <https://www.macrotrends.net/stocks/research>

Next, we calculate the P/FCF ratio for the presented companies and choose the ones with the lower P/FCF ratio as investment targets. The FCF value of 2010 and P/FCF ratio is shown below, in table 8.

Table 8: Traditional businesses companies FCF and P/FCF ratio for the Relative Valuation (2010-2022)

FCF USD 2010	P/FCF ratio
McDonald's – 4.206 million	19,4
Coca-Cola – 7.317 million	20,7
Nestlé – 8.788 million	21,7
Roche – 11.323 million	11,2
Adidas – 887 million	15,3
Ferrari (2015) – 581 million	15,6 (2015)

Unlike the previous case, this portfolio has very similar P/FCF ratios, to make a relative valuation in this case we calculate the average P/FCF ratio - 17,6 – and pick the companies with lower values to simulate an investment in this specific portfolio and verify the CAGR, which is given in table 9.

Table 9: Traditional companies CAGR for the Relative Valuation (2012-2022)

Company	CAGR
McDonald's	11%
Coca-Cola	5%
Nestle	5%
Roche	4%
Adidas	5%
Average	6%

The traditional portfolio, constructed from the cheapest stocks according to the lower P/FCF ratio and hypothetically held from 2010 to 2022, would have yielded an average annual return of 6%. While the limited number of companies in this category impedes a direct portfolio comparison, we can note this portfolio is composed only of stage 3 companies and exhibits – except for McDonald's – annual returns below 10% since inception, as is possible to observe in table 10. However, we have a stage 2 company in the traditional category, so how well this one company in the old automotive industry, but stage 2 none the less would have performed from 2015 onwards against this portfolio?

Table 10: Traditional companies and Stage 2 CAGR (2015-2022)

Company	CAGR (2015 - 2022)
McDonald's	12,1%
Coca-Cola	5,7%
Nestle	5,3%
Roche	0,7%
Adidas	5,1%
Ferrari	21,4%
Stage 3 Average	5,7%

An analysis of this sole stage 2 company's performance, specifically from 2015 onwards in the table 10 above, reveals a significant outperformance compared to the traditional

stage 3 portfolio. Notably, Ferrari, the stage 2 company, achieved an average annual return of 21.4% from 2015 to 2022, exceeding the overall return and individual returns of all stage 3 companies regardless of the chosen starting point for calculation.

This performance by the stage 2 company, coupled with its capital allocation strategy detailed in Case Study 10, exemplifies the characteristics we have defined as indicative of a stage 2 company. Furthermore, its outperformance relative to the stage 3 companies within the traditional portfolio aligns with the predictions established by our proposed framework.

4.3 The chip industry (Analysis 3)

In the third and final analysis we follow the exact same process, applied to companies in the “chip” category starting from the last trading day of 2011.

We start with the price standardization for the group of chip stocks, presented in table 11.

Table 11: Chip industry companies evolution of market capitalization (2011-2022)

Company	Market capitalization USD 2011	Market capitalization USD 2022
Intel	127. 460 million	108.570 million
TSMC	67.330 million	386.330 million
ASML	17.370 million	217.300 million
AMD	3.930 million	101.110 million
Nvidia	8.370 million	303.450 million

Then, we present in table 12 the FCF value and P/FCF ratio for the companies in this portfolio at the beginning period of 2011, in the same manner as for the previous analysis.

Table 12 : Chip industry companies FCF and P/FCF ratio (2011-2022)

FCF USD 2011	P/FCF ratio
Intel – 10.199 million	12,5
TSMC – 1.111 million	60,6
ASML – 1.769 million	9,8
AMD – 126 million	31,2
Nvidia – 577 million	14,5

The following step is choosing the businesses with the lower P/FCF ratio as investment targets.

Within this portfolio, two companies, TSMC and AMD, exhibit exceptionally high P/FCF ratios, as per table 12. Even when considering the average P/FCF of the entire portfolio at 31, these two companies remain outliers. Both methods result in the same exclusion of companies when building the relative valuation portfolio.

Below, in table 13, we present the CAGR of the portfolio according to the relative valuation.

Table 13 : Chip industry companies CAGR for the Relative Valuation (2011-2022)

Company	CAGR
Intel	-1%
ASML	26,3%
Nvidia	279%
Average	101%

In accordance with our proposed framework, two distinct portfolios are constructed next. The first portfolio exclusively comprises stage 1 companies, while the second portfolio incorporates both stage 1 and stage 2 companies. By comparing the investment outcomes of these portfolios, we can assess whether the anticipated trend emerges – that the stage 1 portfolio, in table 14, delivers the highest return, followed

by the combined stage 1 and stage 2 portfolio, in table 15. Notably, both portfolios are expected to outperform the portfolio constructed using the relative valuation method.

Table 14: Chip industry companies in stage 1 CAGR (2011-2022)

Stage 1	CAGR
ASML	26,3%
Nvidia	279%
Average	152,7%

Table 15: Chip industry companies in stage 1 and stage 2 CAGR (2011-2022)

Stage 1 + Stage 2	CAGR
TSMC	17,3%
ASML	26,3%
Nvidia	279%
Average	107,5%

The expected pattern emerges, the stage 1 companies portfolio shows the better results, followed by the portfolio including the stage 2 company and the traditional relative valuation in last place.

5. Conclusion

The primary objective of this dissertation was to develop and validate a novel lifecycle framework for stock market valuation that enhances the traditional methodologies such as the DCF and relative valuation. This objective is crucial as it addresses the limitations of existing models, particularly their sensitivity to assumptions and the challenges in valuing firms with negative earnings or no comparable peers, although, as mentioned at the beginning of the methodology explanation, the framework is not exempt from such bias. By introducing a lifecycle perspective, this framework aims to provide a more nuanced and comprehensive understanding of a company's potential and investment value.

In our analyses, the investment returns presented by portfolios composed of companies in early stages consistently outstripped those composed of businesses in higher stages and exhibited returns superior to those achieved through relative valuation methods that only consider price ratios, disregarding the fundamentals of the companies selected. These results demonstrate the efficacy of our proposed framework: the higher the lifecycle stage, the lower the expected returns. This finding suggests that investors and other financial market participants can adapt this method to their stock market companies valuations with the intent of enhancing their stock market returns by having an organic view of the lifecycle stages of each company based on the fundamentals presented in the financial statements.

To achieve this objective, we conducted multiple case studies to illustrate the lifecycle stages and their impact on investment returns. By comparing the performance of portfolios structured around these stages against those selected solely on price ratios, we provided empirical evidence supporting the framework's effectiveness. Furthermore, we detailed how strategic shifts, such as the case of AMD transitioning from stage 3 to stage 1, can significantly alter a company's growth trajectory and investment potential.

It is important to acknowledge the continued relevance of traditional valuation approaches like DCF and relative valuation. Our objective was not to replace these methods but to provide a complementary tool that enhances their efficacy. The framework showed admirable results, but we believe its best utilization lies in conjunction with DCF or relative valuation methods, which have long-term proven results, to reach a more informed investment conclusion on a company or portfolio.

While this study demonstrates promising results for our framework in isolation, future research could explore its potential when merged with established methodologies. By integrating the lifecycle framework with traditional valuation techniques, investors may achieve a more robust and accurate assessment of company value and investment opportunities. Additionally, testing the framework during specific market cycles and distinct economic periods could provide insights into its robustness and adaptability. By fine-tuning the model to account for varying market conditions and economic

environments, the lifecycle framework can become a more versatile and reliable complement to traditional stock market valuation methods. This further research would help validate the framework's broader applicability and reinforce its utility as a comprehensive tool for investment analysis.

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6. Appendix: Case Studies

This section presents detailed case studies of 19 different companies, each exemplifying various stages of the corporate lifecycle. These case studies are designed to illustrate the practical application of the lifecycle framework developed in this dissertation. By examining the financial strategies, growth trajectories, and capital allocation behaviours of these companies, we aim to provide a comprehensive understanding of how businesses evolve through different lifecycle stages.

The selection of these 19 companies is intentional, representing a diverse cross-section of industries, sizes, and market conditions. Each company has been chosen for its journey through the stages of development, offering valuable insights into the dynamics of corporate growth and decline. Despite their differences, these companies share commonalities in their progression through the lifecycle stages, making them relevant to the framework proposed in this study, however we advise this selection method is speculative, opinionated and subjective, lacking clear and objectively quantified criteria for the characterization of each life stage as previously written in the methodology section of this thesis.

Information

Financial data for the analyzed case studies, business introductions and product presentations originated from the official annual reports and financial filings filed by the respective companies with their regulators. Exceptions are noted where applicable. The companies CAGR divided by stages shown in the tables for the case studies were calculated using the RRI function on excel using the financial data available on the official annual reports and financial filings.

6.1 Alphabet Inc.

Google LLC (currently Alphabet Inc.) is a multinational technology company specializing in internet-related services and products. Founded in 1998 by Larry Page and Sergey Brin, it has grown to become the world's leading search engine and a dominant player in the internet ecosystem.

From 2004 until 2012 Alphabet was a stage 1 company.

During the 2004-06 period Alphabet was investing heavily in marketable securities and cash, supplementing the deficit with dilution of stock on the market in the years preceding the IPO.

From 2007 until 2012 Alphabet is constantly running surplus of cash after investment and financing activities, choosing to hoard that cash on their balance sheet in the form of cash and marketable securities.

From 2013 until 2022 we categorize Alphabet as a stage 2, this conversion is due to its slowing growth rate when compared with the stage 1 period and to the beginning of payment of considerable buybacks, this being shown on the cash flow statement, under financing activities.

During the 2012-2014 financial years, Alphabet showcased continued positive financial growth, albeit at a slower pace than previously witnessed. A significant portion of its free cash flow remained unallocated, similar to past years.

In 2015, Alphabet implemented a share buyback program totaling 1.7 billion USD. This action, coupled with the sustained growth trajectory, reflects the characteristics of a company in stage 2 of its development. The program has seen consistent growth, culminating in a 59.2 billion USD allocation in 2022, representing nearly 98,67% of FCF directed towards shareholder returns.

We refrain from currently classifying Alphabet as a stage 3 company due to its continuing growth metrics exceeding 15%, excluding retained earnings.

In table 16 below, we present Alphabet's average growth rates for the periods divided by stages. As shown, the growth rates slowed during stage 2 compared to stage 1, as

expected per our framework. Specifically, the average growth rates for stage 1 were high across various metrics at 56.41%, while for stage 2, the average growth rates were lower at 22.05%.

Table 16: Alphabet growth rate for stage 1 and 2

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 1	50,13%	53,64%	65,48%	43,35%	43,40%	84,45%
Stage 2	20,09%	26,18%	29,59%	23,41%	20,28%	12,75%

Source: Growth rates calculated using official data from the company 10-K file

6.2 Microsoft Corporation

Microsoft Corporation, established in 1975 by Bill Gates and Paul Allen, is an American multinational technology corporation headquartered in Redmond, Washington. It is recognized globally for its software products, consumer electronics, personal computers, and cloud computing services.

From 1994 until 2000 Microsoft was a stage 1 company.

During the 1994-2000 period Microsoft was investing heavily in marketable securities and cash, supplementing the deficit, when present, with dilution of stock. During the period buybacks were constant, but the amount was symmetric to stock grants given to employees, resulting in a net-zero payout to shareholders.

From 2001 until 2009 we categorize Microsoft as a stage 2, this classification is based on its slowing growth rate compared to the stage 1 period and the initiation of net buyback

payments. In 2004, a dividend program was introduced. From 2005 to 2007, Microsoft used its substantial cash position to supplement shareholder payouts. The cash position remained stable in 2008.

The average numbers give a sense of the presence of a stage 3 company, however Microsoft was in the midst of a battle with regulators on monopoly practices. (Spitzer, 2001) Further analysis shows the lack of high debt, deficits being filled with external sources of financing to pay shareholder payouts and an industry and company growing old. In fact, the long-term debt/FCF of Microsoft was only positive after 2008, this was because, before this year, there was no debt at all on the balance sheet.

Therefore, considering these factors, we argue that while Microsoft displayed some characteristics of a stage 3 company, the presence of stage 2 features alongside the unique context of regulatory challenges and conservative debt management justifies classifying it as a stage 2 company during this period.

Our analysis categorized Microsoft as Stage 3 from 2010 to 2022, reflecting a combination of low overall growth and large, progressively increasing shareholder payouts. While Microsoft allocated substantial FCF for payouts prior to 2014, their strategy shifted post-2015. They consistently exceeded FCF with shareholder distributions, resulting in deficits financed through debt issuance.

Prior to 2015, Microsoft distributed significant shareholder payouts, consistently maintaining a portion of their FCF as marketable securities while actively pursuing acquisitions. This strategy aligns with stage 2 characteristics. However, a shift occurred in 2015. Payouts began to exceed FCF, necessitating debt issuance to bridge the gap, a hallmark of Stage 3. This trend continued in 2017, even with the significant LinkedIn acquisition (25.9 billion USD), marketable securities savings (12.6 billion USD), and payouts (23.5 billion USD), surpassing the total FCF of 31.3 billion USD. As indicated by the financing activities section of the cash flow statement, debt issuance was utilized to finance this substantial expenditure.

Microsoft moderated its spending from 2018 to 2021, returning to a pattern similar to the 2010-2014 period, yet maintaining high payouts close to FCF levels. However, 2022

witnessed a return to deficit spending with the 22 billion USD acquisition of Nuance Communications and 50.7 billion USD in payouts, financed using existing cash reserves.

This strategic shift towards utilizing debt and existing cash reserves to sustain substantial shareholder payouts, coupled with consistently low growth rates, positions Microsoft firmly within Stage 3 of the framework.

Table 17: Microsoft growth rate for stage 1, 2 and 3.

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 1	44,93%	49,69%	43,27%	37,63%	30,81%	37,99%
Stage 2	4,34%	3,23%	7,39%	9,65%	11,10%	(7,96)%
Stage 3	13,14%	12,45%	17,05%	13,78%	10,13%	159,30%

Source: Growth rates calculated using official data from the company 10-K file

6.3 Apple Computer

Apple Inc. is a multinational technology company headquartered in Cupertino, California, specializing in consumer electronics, computer software, and online services. Founded in 1976 by Steve Jobs, Steve Wozniak, and Ronald Wayne, it has grown into one of the world's most valuable brands and a leading force in the technological revolution. (Patel, 2020)

From 1994 until 1997 Apple was a stage 3 company.

Apple's financial performance between 1994 and 1997 painted a concerning picture. During this period, the company experienced declining growth rates across all metrics.

In 1995, Apple suffered operating losses, followed by negative operating income and net income in 1996 and 1997. Despite these financial difficulties, Apple continued to pay dividends. This decision was financed through debt, stock issuance, and the depletion of their cash reserves, further straining the company's financial health. These factors strongly suggest that Apple was in a precarious financial position during this time.

From 1998 until 2003 we categorize Apple as a stage 2, the reason for this inversion of stages comes from the capital allocation method changing drastically and the growth rates improving, even if some were still negative, the pace of decline slowed.

Between 1998 and 2003, Apple exhibited a puzzling disconnect between its growth rates. Operating activities flourished, experiencing significant growth. However, net income followed a contrasting trend, declining during this period. This inconsistency prompted a shift in capital allocation strategy. In 1998, shareholder payouts were eliminated, and FCF was redirected towards building a stronger balance sheet by increasing cash reserves or investing in marketable securities. This strategic move prioritized financial stability while research and development for new devices continued.

The revised capital allocation strategy and improved growth rates suggest Apple had transitioned out of its precarious financial state. However, the lack of positive net income and ongoing FCF accumulation don't fully align with the characteristics of a high-growth, stage 1 company. While Apple generated FCF, its utilization for balance sheet improvement is more typical of a stage 2 company. This unique case demonstrates Apple's ability to defy the typical developmental trajectory. Through strategic restructuring, the company reversed its decline, rejuvenating itself and entering a new stage 2, characterized by financial stability and ongoing growth.

From 2004 until 2012 we categorize Apple as a stage 1, this reversal is clear from the staggering growth rates Apple showed during the period while creating state of the art products never seen before.

Being at the vanguard of technology and sustaining huge growth is a quality of a young company even when their capital allocation did not suffer big changes, they kept saving their FCF in the form of marketable securities but also booting capex year after year.

Apple is not a linear story, they did not follow the usual path of birth and growth, establishment, and dead we described at the beginning of the thesis. We mentioned that there are cases where exceptions emerge, successful restructurings are such cases, that is what is presented here. Apple did have a birth and a growth stage, but huge setbacks sent the company into stage 3, our study of the business starts there, for which data is available and the period of recovery can be categorized as the stage 2 and 1 described above. The stages are present, but inverted, as is normal for a company that inverted himself into life.

From 2013 until 2022 we categorize Apple as a stage 3, the change happens when massive shareholder payouts are instituted while the average growth rates face a slowdown.

In recent years (2014, 2018, 2019, 2020, and 2021), Apple has engaged in significant shareholder payouts exceeding the company's FCF generation. This trend, coupled with a deceleration in growth rates, suggests a shift towards a stage 3 company classification.

Table 18 illustrates the fluctuating growth rates of Apple as it navigates through various stages of financial stability. Initially, in stage 3, the company faces significant financial challenges, reflected in its poor growth rates. However, the company managed to recover, moving into stage 2, where its growth rates improve markedly. This positive trend continues as the company advances to stage 1, experiencing accelerated growth. Unfortunately, the company eventually re-enters stage 3, resulting in a deceleration of its growth once more.

Table 18: Apple growth rate for stages 1, 2 and double 3

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 3	-170,86%	-150,86%	-75,87%	-97,93%	-6,24%	-26,69%
Stage 2	68,99%	27,67%	-76,89%	-69,69%	-0,06%	29,43%
Stage 1	84%	118%	115%	120%	41%	48%
Stage 3	11%	12,25%	13,71%	12,52%	10,42%	68,17%

Source: Growth rates calculated using official data from the company 10-K file

6.4 Meta Platforms, Inc.

Meta Platforms, Inc., formerly known as Facebook, Inc., is a multinational technology conglomerate headquartered in Menlo Park, California. The company strives to be a force shaping the way we connect and interact online.

From 2012 until 2022 Meta was a stage 1 company.

Meta's growth trajectory since its 2012 IPO has been nothing short of astonishing. Over the years, the company exhibited characteristics of a classic stage 1. It established itself in a nascent industry with minimal competition, aggressively issued stock for capital in 2012 and 2013, and reinvested heavily in growth initiatives. A prime example was the 2014 acquisition of WhatsApp for 4.8 billion USD – a bold move considering WhatsApp's limited FCF (3.6 billion USD) at the time. Notably, the acquisition also included 12 billion USD worth of Facebook shares, highlighting Meta's strategic use of its own stock as currency. (Jabura, 2021) It's important to remember that Meta's public trading history is relatively brief, spanning less than 15 years.

Table 19 below shows the astounding growth rates of Meta during stage 1, significantly exceeding the 25% threshold that delineates stage 1 from stage 2.

Table 19: Meta growth rate for stage 1

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 1	47,44%	94,62%	315,87%	74,70%	37,97%	50,04%

Source: Growth rates calculated using official data from the company 10-K file

6.5 Amazon.com, Inc.

Amazon.com, Inc., a name synonymous with online shopping, is a global technology powerhouse that extends far beyond retail. Fuelled by a relentless focus on customer obsession and a culture of innovation, Amazon's influence how we shop, consume entertainment, and access cloud computing.

From 1997 until 2022 Amazon was a stage 1 company.

Despite its immense size and two decades as a publicly traded company, Amazon exhibits a unique approach, their capital allocation of 1997 was the same of 2022, the company's cash investments consistently exceeded its capital expenditures, resulting in low or negative FCF. This deficit was bridged by strategic use of debt and stock issuance. While Amazon doesn't offer dividends, its share buybacks are carefully calibrated to offset stock dilution, resulting in a net-zero return on shareholder payouts. However, this hasn't hampered its remarkable growth trajectory, even from its already substantial base.

Amazon's journey aligns with the stages outlined in our thesis. Having dominated online retail throughout the 1990s and early 2000s, it appeared poised to enter stage 2. However, Amazon defied expectations by ingeniously creating a new industry and business segment – cloud computing. By establishing itself as a major player in this nascent field with Amazon Web Services (AWS), Amazon essentially transitioned from stage 1 in retail to stage one in cloud computing, effectively revitalizing its growth engine.

Table 20 below, shows the high growth rates of Amazon during stage 1, much higher than the 25% threshold that separates stage 1 from stage 2.

Table 20: Amazon growth rate for stage 1

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 1	13,57%	43,19%	61,00%	99,22%	45,80%	89,46%

Source: Growth rates calculated using official data from the company 10-K file

6.6 McDonald's Corporation

McDonald's Corporation is a multinational fast-food chain, founded in 1940 as a restaurant operated by Richard and Maurice McDonald. It has grown to become the world's largest fast food restaurant chain, serving millions of customers daily in over 100 countries.

From 1993 until 2022 McDonald's was a stage 3 company.

McDonald's exemplifies a classic stage 3 company based on several key characteristics. Firstly, its average growth rates have exhibited weakness for several decades. Secondly, its capital allocation strategy prioritizes shareholder returns, consistently distributing all FCF and even exceeding it to fund these payouts. This deficit is primarily financed through debt accumulation, with stock issuance playing a secondary role. From 1993 to 2002, McDonald's debt levels increased, compromising the long-term sustainability of its balance sheet. Despite a brief improvement in 2006 and 2007 due to reduced payouts and debt reduction, the company reverted to its previous pattern, raising debt again to maintain high shareholder distributions while growth remained sluggish. This cycle of prioritizing short-term payouts over long-term investments aligns perfectly with the established framework for a stage 3 company.

Table 20 illustrates the slow growth rates of McDonald's during stage 3, averaging 9.9%, which is characteristic of a stage 3 performance.

Table 21: McDonald's growth rate for stage 3

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 3	6,14%	21,49%	13,38%	7,04%	4,27%	7,41%

Source: Growth rates calculated using official data from the company 10-K file

6.7 The Coca-Cola Company

Founded in 1886 by John Pemberton, Coca-Cola has transcended its humble beginnings as a soda fountain beverage to become a global icon synonymous with refreshment. Their commitment to a unique secret formula and a dedication to capturing the spirit of togetherness have solidified their position as a cultural powerhouse.

From 1993 until 2022 Coca-Cola was a stage 3 company.

Coca-Cola serves as another prime example of a stage 3 company, characterized by several key attributes. Firstly, the company operates within a mature industry and has existed for over a century, resulting in inherently slower growth rates. Secondly, its capital allocation strategy reflects a stage 3 focus on shareholder payouts. From 1993 to 1999, Coca-Cola consistently distributed more cash to shareholders than its FCF could support. This deficit was financed primarily through debt accumulation, a classic tactic employed by stage 3 companies struggling to achieve organic growth sufficient to drive stock prices upwards. While this practice slowed down in 2000, with Coca-Cola prioritizing balance sheet health by retaining some cash, shareholder distributions never dipped below 60% of FCF. This coincided with stagnant growth. Notably, in 2006, Coca-Cola reverted to its previous unsustainable pattern, exceeding FCF with shareholder payouts and relying on debt to cover the shortfall. The following year exemplified this approach – the company spent 5.6 billion USD on acquisitions (against 5.5 billion USD in FCF) and distributed 4.9 billion USD to shareholders, once again resorting to debt to bridge the gap. From then until 2022, Coca-Cola cycled between periods of significant debt-financed deficits for payouts and minor surpluses. Importantly, debt levels continued to rise throughout this period, while shareholder distributions never

decreased – in fact, they consistently increased and always exceeded 60% of FCF. This strategy aligns with the expected characteristics of a stage 3 company, resulting in the modest annual stock returns typically associated with this stage.

Table 22 highlights the modest growth rates of Coca-Cola during stage 3, with an average of 8.1%, indicative of stage 3 performance.

Table 22: Coca-Cola growth rate for stage 3

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 3	6%	7%	20%	5%	4%	7%

Source: Growth rates calculated using official data from the company 10-K file

6.8 Tesla, Inc

Tesla, Inc., founded in 2003 and headquartered in Austin, Texas, is an American multinational automotive and clean energy company. The company is a pioneer in the electric vehicle market and offer sustainable energy solutions.

From 2011 until 2022 Tesla was a stage 1 company.

Tesla exemplifies a classic stage 1 company, particularly evident in its capital allocation strategy. Prior to 2017, the company operated at significant losses, requiring substantial debt and stock issuance to maintain operations. This capital was aggressively reinvested in growth initiatives within the nascent electric vehicle industry. This focus on growth at all costs aligns perfectly with the characteristics of a stage 1 company, further emphasized by the absence of shareholder payouts. Since 2019, Tesla has achieved financial stability, reducing its reliance on debt issuance. However, the company maintains a high-growth trajectory, necessitating continued investment in research, development, and production capacity.

To facilitate a deeper understanding of Tesla's growth rates and their alignment with stage 1 company characteristics, we propose dividing the stage into two distinct time periods:

First, the period from 2011 to 2017 represents a stage characterized by significant FCF deficits. These deficits were bridged through strategic use of debt and stock issuance, with the primary objective of fueling aggressive investments aimed at achieving future high-growth rates.

Second, the period from 2017 to 2022 represents the fruition of Tesla's earlier investments. Here, we witness the realization of the high-growth trajectory envisioned during the previous stage. While investment remains substantial, reflecting Tesla's relative youth in the market, the company has successfully transitioned from FCF deficits to positive and remarkably high growth rates.

Despite the significant disparity in growth rates between these two periods, they both exemplify the core logic of a stage 1 company: a young player in a nascent industry prioritizing aggressive growth. Notably, the company's capital allocation strategy remained consistent, except for a reduction in annual debt issuance. However, that debt issuance persists, and Tesla continues to invest heavily in itself. This continuity underscores how the deficits incurred during the first period ultimately fueled the remarkable growth witnessed in the second.

We can observe Tesla's astounding growth rates during stage 1 in table 23, despite experiencing negative FCF in its early years. Sales consistently showed strong growth, while other profitability metrics were more variable but gradually improved over time. Notably, after 2017, there were no instances of negative growth.

Table 23: Tesla growth rate for stage 1

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 1	279,27%	-1494,78%	28,87%	262,24%	87,60%	330,89%

Stage 1 2011-2017	-125%	-2865%	-109%	-100%	119%	-42%
Stage 1 2017-2022	764,52%	149,91%	193,73%	696,96%	49,47%	777,76%

Source: Growth rates calculated using official data from the company 10-K file

6.9 Duolingo, Inc

Founded in 2011, Duolingo is a leading online language learning platform offering a completely free and accessible service to millions of users globally. Founded on a data-driven approach and a commitment to making education engaging, Duolingo seeks to transform the way people learn languages.

From 2021 until 2022 Duolingo was a stage 1 company.

While Duolingo's publicly traded history is brief, its growth trajectory is nothing short of remarkable. Despite its relative youth, the company operates within the nascent field of online language learning powered by artificial intelligence. This positions Duolingo as a classic stage one company, evident in its capital allocation strategy. However, it is important to consider that Duolingo's 2023 FCF is significantly impacted by 73.8 billion USD in stock grants recorded as an intangible expense according to GAAP. Excluding this non-cash expense, Duolingo's cash flow from product sales wouldn't be positive, which is typical for young, high-growth, stage 1 companies. Additionally, the substantial stock issuance reflects another characteristic move of stage one businesses, prioritizing investment and growth over immediate profitability.

Table 24 below presents Duolingo's growth rates, where FCF is notably enhanced by stock grants, as previously discussed. While the remaining metrics show lower figures, they still reflect high growth rates.

Table 24: Duolingo growth rate for stage 1

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 1	485,13%	1368,69%	-0,93%	8,65%	47,34%	34,86%

Source: Growth rates calculated using official data from the company 10-K file

6.10 Ferrari S.p.A

Founded in 1939 by Enzo Ferrari, Ferrari S.p.A. has become synonymous of automotive excellence. Their dedication to crafting high-performance vehicles and capturing the essence of Italian design has solidified their position as a legend in the world of luxury sports cars.

From 2013 until 2022 Ferrari was a stage 2 company.

Ferrari presents an interesting case study within the framework of our stage-based analysis. While its growth rates lack the explosiveness of stage 1 companies like Duolingo or Amazon (discussed previously), they also don't exhibit the stagnation or decline characteristic of stage 3 companies like Coca-Cola or McDonald's.

Ferrari's capital allocation strategy further reinforces this unique position. The company distributes shareholder payouts, but unlike stage 3 businesses, these distributions are not coupled with unsustainable debt. Instead, Ferrari has consistently reduced its debt levels from a previously high point, demonstrating a commitment to financial stability. Notably, the company generates consistent FCF which is also used to strengthen its balance sheet through cash reserves.

This balance between growth, profitability, and financial prudence positions Ferrari outside of both stage 1 and stage 3 classifications. While not a new player in a nascent field (having existed as a car manufacturer for nearly a century), Ferrari also avoids the high stock dilution and aggressive reinvestment patterns of stage 1 companies. Additionally, unlike stage 3 companies, Ferrari exhibits neither declining growth nor a reliance on debt-fueled payouts to maintain shareholder returns.

This unique position aligns with the concept of a stage 2 company. Growth is present, exceeding 15% for most growth rates, but not at the astronomical rates seen in stage 1 companies. Similarly, Ferrari prioritizes shareholder rewards through dividends and buybacks, but unlike stage 3 businesses, it maintains a healthy debt profile. Crucially, Ferrari avoids the decline and unsustainable practices observed in stage 3 companies like Intel, which used debt to fund dividends while experiencing negative growth.

Ferrari serves as a prime example of a stage 2 company, demonstrating the existence of a middle ground between the aggressive growth of stage 1 and the potential stagnation of stage 3. This stage represents a period of balanced growth, profitability, and financial prudence – a bridge between birth and death.

Table 25 illustrates the nuanced growth rates of a company during stage 2, characterized by a mix of both high and low growth rates.

Table 25: Ferrari growth rate for stage 2

Average growth Stages	Operating activities	Free cash flow	Net income	Sales	Retained earnings
Stage 2	19,48%	101,66%	17,92%	9,47%	310,87%

Source: Growth rates calculated using official data from the company annual report

6.11 Nestlé S.A.

Founded in 1866 by Henri Nestlé, Nestlé S.A. has grown into a global leader in the food and beverage industry. Their commitment to providing nutritious and delicious products has positioned them as a household name across the world.

From 2001 until 2022 Nestlé was a stage 3 company.

Nestlé's growth trajectory exemplifies the classic hallmarks of a stage 3 company. The metrics presented reveal consistently low growth rates, a strong indicator of a mature business operating within a saturated industry. Nestlé's venerable age, over a century

and a half, further reinforces this notion – the company has long established itself within the food industry.

The company's capital allocation strategy further strengthens the argument for its stage 3 classification. Nestlé prioritizes consistently increasing dividends for shareholders. However, the FCF growth rate fails to keep pace with these rising payouts, creating a funding gap. To bridge this deficit, Nestlé resorts to a combination of strategies:

- I. Debt issuance: This approach weakens Nestlé's long-term financial health by increasing its debt burden.
- II. Depletion of cash reserves: Nestlé dips into its cash reserves to supplement the shortfall, potentially compromising its financial flexibility in the future.

Not only that, but the company also executes constant stock buybacks. These repurchases further increase shareholder returns beyond what FCF can support, exacerbating the funding gap and aligning with another characteristic behavior of stage 3 companies.

This pattern of prioritizing short-term shareholder returns through a combination of debt issuance, cash reserve depletion, and stock buybacks, while forsaken financial stability, aligns perfectly with the defining characteristics of a stage 3 company. Nestlé's case effectively demonstrates the textbook definition of this stage within the framework we have established.

Table 26 below shows the meagre growth rates of Nestlé during stage 3, a characteristic of a company in this stage.

Table 26: Nestlé growth rate for stage 3

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 3	4,25%	8,53%	16,48%	2,32%	0,40%	6,23%

Source: Growth rates calculated using official data from the company annual report

6.12 F. Hoffmann-La Roche AG

Founded in 1896 by Fritz Hoffmann-La Roche, F. Hoffmann-La Roche AG, commonly known as Roche, has become a global leader in the healthcare industry. Their dedication to research and development fuels their mission to improve people's lives by preventing, diagnosing, and treating diseases.

From 2004 until 2022 Roche was a stage 3 company.

Roche's growth trajectory paints a clear picture of a company in the later stages of its lifecycle. Throughout the analyzed period, growth rates consistently fell below 15%, a strong indicator of a mature business operating within a well-established industry – pharmaceuticals. Furthermore, Roche's age of 128 years underscores its longevity in this mature market.

The company's capital allocation strategy provides further evidence of its stage 3 classification. However, Roche's case also offers a unique perspective on the potential evolution of this stage. Unlike some stage 3 companies that fall victim to overspending, Roche's deficits stemmed primarily from litigation expenses, not mismanagement or operational issues.

In 2004, the ratio of FCF to dividend payments stood at 38.7%, a respectable level, but not high by stage 3 standards, however as FCF did not grow at a high rate while the dividend was consistently increasing it created a funding gap, by 2016 it reached 70% and in 2021 Roche reached the typical point of a stage 3, payouts superior to FCF with the deficit filled by debt.

Roche's case serves as a valuable illustration of how a company can operate on a single stage for an extended period. In this instance, Roche progressed in the stage 3 characteristics for 18 years. This highlights the potential for a gradual evolution inside the characteristics that define a stage.

Table 27 highlights the modest growth rates of Roche during stage 3, typical of a company at this stage of development.

Table 27: Roche growth rate for stage 3

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 3	5,90%	7,41%	11,00%	7,44%	4,27%	6,05%

Source: Growth rates calculated using official data from the company annual report

6.13 Tencent Holdings Ltd.

Founded in 1998 by Ma Huateng, Tencent Holdings Ltd. has become a Chinese multinational technology conglomerate. Their mission centres around improving the quality of life through internet value-added services, connecting people and fostering innovation across various sectors.

From 2004 until 2012 Tencent was a stage 1 company.

Tencent's performance during the 2004-2012 period exemplifies the defining characteristics of a stage 1 company. Its growth rates were nothing short of phenomenal, consistently exceeding not only 25% but often doubling that figure and more. This explosive growth aligns perfectly with a young company operating in a pioneering field – the internet. Tencent's early success stemmed from its flagship product, the QQ web chat website, launched during the internet's nascent years.

The company's capital allocation strategy further reinforces its stage 1 classification. During this period, Tencent exhibited classic stage 1 behavior. In 2004, the company was still generating negative FCF. To bridge this deficit and fuel its aggressive growth initiatives, Tencent relied on stock dilution. However, this did not hinder investment. Tencent consistently reinvested a substantial portion of its capital back into the business itself.

In the subsequent years Tencent achieved financial stability and FCF transitioned into positive territory. Even with this positive cash flow, Tencent maintained its focus on reinvestment. While shareholder payouts were present, they remained modest, with dividends kept low and stock buybacks overshadowed by stock dilution used for

employee stock options. This net dilution strategy prioritized investment over immediate shareholder returns, a hallmark characteristic of stage 1 companies.

In essence, Tencent's capital allocation strategy remained remarkably consistent throughout this period, further solidifying its position as a textbook example of a stage 1 company experiencing phenomenal growth within a nascent industry.

From 2013 until 2022 we categorize Tencent as a stage 2, this conversion is due to its slowing growth rate when compared with the stage 1 period and to the beginning of issuance of higher debt, this being shown on the cash flow statement, under financing activities and in the balance sheet under long-term liabilities and short-term liabilities.

Tencent's trajectory following the 2004-2012 period offers valuable insights into the concept of a "middle stage" between the explosive growth of stage 1 and the potential stagnation of stage 3. While growth rates undeniably slowed compared to the earlier period, some metrics still exceed 25%. This aligns with Tencent's evolving position – no longer a young company at 24 years old and operating within a maturing internet landscape, but also not a stage 3 due to its still impressive results.

This shift is further reflected in Tencent's capital allocation strategy. The company now utilizes debt more readily, with positive debt ratios emerging. However, it's important to note that these debt levels remain well below the concerning thresholds observed in stage 3 companies. Tencent's overall financial position remains strong.

Crucially, Tencent continues to prioritize reinvestment. The company allocates 100% of its FCF back into the business, demonstrating a sustained commitment to growth. Shareholder payouts, while present, mirror the previous stage – modest dividends and stock buybacks that do not overshadow the focus on internal investment.

Tencent's case exemplifies the existence of a "middle stage" – a period of measured growth following the initial explosive stage. This stage is characterized by a slowdown in growth rates but not a dramatic decline, coupled with a continued focus on reinvestment and a healthy financial position. Tencent's successful navigation through this middle stage serves as a compelling argument for its existence within the framework we established.

Table 28 below provides an excellent overview of Tencent's substantial growth rates as it transitions from stage 1 to stage 2, where growth begins to decelerate. However, the growth rates remain robust, indicative of a company in its mid-life stage, rather than showing the stagnation typical of stage 3.

Table 28: Tencent growth rate for stages 1 and 2

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales
Stage 1	120%	98%	52%	56%	57%
Stage 2	25,77%	24,89%	33,67%	33,43%	29,79%

Source: Growth rates calculated using official data from the company annual report

6.14 Adidas AG

Founded in 1949 by Adolf Dassler, Adidas AG has become a global icon in the world of sportswear. Their commitment to pushing the boundaries of performance apparel, footwear, and innovation has solidified their position as a leader in the athletic industry.

From 2010 until 2022 Adidas was a stage 3 company.

Analyzing Adidas' average growth rates initially creates some ambiguity regarding its stage classification. Sales growth sits below 10%, a characteristic typically associated with stage 3 companies. However, FCF growth demonstrates a 21.44% increase, aligning with stage 2 companies, while net income boasts a 40.54% growth rate, a hallmark of stage 1 businesses.

A closer examination reveals that only net income and FCF growth rates deviate from the stage 3 norm. All other metrics paint a picture of a mature company.

Adidas' capital allocation strategy further reinforces this notion. In 2011, the company experienced a contraction in operating cash flow and FCF, yet it still increased shareholder payouts. This trend continued until 2014, with FCF declining while Adidas persisted in elevating payouts. To bridge the funding gap in 2014, the company finally resorted to debt, a behavior characteristic of stage 3 businesses.

While Adidas showed a slight recovery post-2014, it still allocated over half of its FCF to dividends. This culminated in 2022, when Adidas faced operating cash flow and FCF deficits exceeding 1 billion EUR while still committing 3.1 billion EUR to shareholder payouts. These payouts were partially financed through 1 billion EUR in debt issuance and the depletion of cash reserves.

Adidas' trajectory exemplifies a gradual progression into stage 3 characteristics. Over several years, the company transitioned from a period of financial discipline (2010-2012) into a stage of unsustainable payouts (2013-2021). Ultimately, this culminated in deficits while clinging to increasing payouts, a strategy that compromises future health by deteriorating the balance sheet (2022).

Adidas thus serves as a prime example of a company exhibiting the defining characteristics of a stage 3 business through its gradual decline in financial health and prioritization of short-term shareholder returns over long-term sustainability.

Table 29 presented next shows unimpressive growth rates, though it does highlight some bright spots. Overall, the growth rates fall short of being remarkable, which is typical of a stage 3 company.

Table 29: Adidas growth rate for stage 3

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 3	8,70%	21,44%	40,54%	13,40%	5,75%	2,29%

Source: Growth rates calculated using official data from the company 10-K file

6.15 Intel Corporation

Founded in 1968, Intel Corporation has become synonymous with technological innovation. Their core mission centres around developing innovative microprocessor technology that drives the digital age. Intel's relentless of performance and efficiency has established them as a cornerstone of the global computing landscape.

From 2011 until 2022 Intel was a stage 3 company.

Intel's financial performance over the past decade exemplifies the perils of a stage 3 company. Key metrics like FCF and operating income paint a stark picture. In 2011, FCF stood at a robust 10.1 billion USD, plummeting to negative territory in 2022. Similarly, operating income contracted significantly, falling from 17.4 billion USD in 2011 to a mere 2.3 billion USD in 2022.

These financial woes are particularly concerning given Intel's former market dominance. In 2011, Intel held a virtual monopoly in x86 CPU chip production, facing minimal competition from a struggling AMD (This period of AMD is discussed on case study number 18). Even by 2022, Intel retained a respectable 71% market share in the data center CPU market¹, albeit lower than its peak of over 80% in 2016 and experiencing a steady decline.² This decline can be attributed to Intel's gradual shift towards stage 3 behavior. While the company initially prioritized substantial shareholder payouts, it maintained a healthy balance sheet with a net-debt/FCF ratio below 1, indicating prudent debt levels. Notably, Intel boasted a positive net cash position in 2011.

However, this prudent approach began to unravel. Intel famously missed the smartphone revolution by rejecting Apple's iPhone CPU manufacturing proposal. This misstep coincided with a deterioration in debt ratios and lackluster growth rates. By 2017, the net-debt/FCF ratio had doubled to 2 years, while shareholder payouts

¹<https://www.counterpointresearch.com/insights/data-center-cpu-market-amd-surpasses-intel-share-growth/>

²<https://www.techpowerup.com/276834/amd-briefly-overtakes-intel-in-desktop-market-share-according-to-passmark-data>

continued to rise. Debt became a tool to sustain dividends despite a contracting business, a hallmark of a stage 3 company on the downswing.

Intel's woes deepened in 2020 when it lost Apple, a major client for its dominant chips, to rival TSMC, who enjoyed subsequent success.^{3 4} By 2022, the once-dominant company found itself in a precarious financial position. FCF was negative, the net-debt/FCF ratio had ballooned to 2.9 in 2021 and 3.1 for long-term debt/FCF, and sales had contracted by a significant 20.21% during the 2022 fiscal year.

Intel's story serves as a cautionary tale. No company, not even a former monopolist, is immune to the pitfalls of stage 3 behavior. It underscores the importance of adapting to market dynamics. While Intel faltered, competitors like Nvidia, AMD, and TSMC (covered in the case studies) thrived, capitalizing on new opportunities and currently exhibiting characteristics of stage 1 and 2 companies.

Table 30: Intel growth rate for stage 3

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 3	8,59%	-13,22%	2,64%	-5,34%	1,78%	8,42%

Source: Growth rates calculated using official data from the company 10-K file

Table 30 illustrates the growth rates of Intel, perfectly depicting the characteristics of a declining stage 3 company. No growth rate reaches 9%, and both FCF and operating income are in decline, which is indicative of a company nearing the end of its stage 3 lifecycle.

6.16 Taiwan Semiconductor Manufacturing Company Limited

Founded in 1987 by Morris Chang, Taiwan Semiconductor Manufacturing Company (TSMC) has become synonymous with cutting-edge semiconductor manufacturing. Their

³<https://www.oberlo.com/statistics/iphone-market-share-us>;

⁴<https://www.cnbc.com/2021/12/29/apple-ditched-intel-and-it-paid-off.html>

relentless pursuit of technological advancement and relentless focus on foundry services have positioned them as a global leader in the production of the chips that power our world.

From 1998 until 2008 TSMC was a stage 1 company.

TSMC's early years were characterized by explosive growth and a relentless focus on investment. Prior to 2000, the company ran deficits, which it financed through debt and stock issuance. Only after this point did TSMC achieve positive cash flow.

While the chip industry itself was not entirely novel, dating back to 1874, TSMC pioneered a revolutionary approach to chip manufacturing. Instead of vertically integrating design and production, TSMC focused solely on the manufacturing side, leaving chip design to third parties. This "fabless" model was driven by the company's belief in Moore's Law, which states that each generation of chips should double in transistor count and capacity. By specializing in manufacturing, TSMC aimed to become the industry leader in this critical area.

However, TSMC believed that building continuously smaller transistors for a chip would become a hard and expensive task. By putting all its resources in manufacturing however, it could become the leading company in that particular field.

This is important to understand the capital allocation of TSMC, since they need to invest heavily to design the next generation of a chip while following Moore's law, almost all FCF is invested in the business and then the small amount remaining is allocated to small payouts and fortifying the balance sheet.

With such growth for the period, the innovative business model and young age, we categorize this business as a stage 1 company.⁴

From 2009 until 2022 we categorize TSMC as a stage 2.

⁴<https://www.hitachi-hightech.com/global/en/knowledge/semiconductor/room/about/history.html>

To understand the conversion between stages we need to give context to the period in question, as we stated previously Intel at the time was coming close to the stage 3 stage (studied previously) and their financial position degraded severely during that stage, but as we mentioned above, chip production is a hard and capital intensive task due to the demanding Moore's law, for this reason TSMC decided to not design the chip, only manufacture it.

This was the mistake of Intel, by going all alone in both fields it did not keep its leading position, losing its market share to TSMC, Intel converted into stage 3, while TSMC fortified their position in the chip industry and their financial position, which stayed impressive during their stage 2 stage.

Their capital allocation remained the same however, since chip manufacturing is capital intensive and hard due to the demanding Moore law, close to all FCF of TSMC needs to be invested in the business to design the next generation of chips while building a new chip manufacturing plant can cost TSMC as much as 20 billion USD².

The change in stage however is clear from the perspective of growth rates, since their decline between stages was clear as seen above and in 2021-22 the long-term debt-to-FCF ratio crossed 1 for the first time (still a good financial position and respectable growth).

But between the amazing performance of the past and the declining position of a stage 3, which we see in its competitor Intel, TSMC is at the time in the middle.

The conclusion to take from this is that the conversion in stages can assume the surrounding environment a company is inserted into, it does not to be an insulated process of valuation.⁵

Table 31 offers a clear view of TSMC's impressive growth rates during its transition from stage 1 to stage 2, where growth starts to moderate. Despite this slowdown, the growth

⁵<https://www.bloomberg.com/news/articles/2017-10-06/tsmc-ready-to-spend-20-billion-on-its-most-advanced-chip-plant>

rates remain strong, characteristic of a company in its mid-life stage, rather than the stagnation typical of stage 3.

Table 31: TSMC growth rate for stages 1 and 2

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales
Stage 1	26,62%	85,95%	45,71%	49,73%	490,65%
Stage 2	19,67%	30,88%	21,09%	20,60%	15,43%

Source: Growth rates calculated using official data from the company 20-F file

6.17 ASML Holding N.V.

Founded in 1984, Advanced Semiconductor Materials Lithography Holding N.V. (ASML) has become the undisputed leader in the development and manufacturing of photolithography machines. These machines are the cornerstone of modern chip production, etching intricate circuit patterns onto silicon wafers, a process fundamental to creating the microchips that power our digital world.

From 1999 until 2012 ASML was a stage 1 company.

ASML's early years offer a textbook example of a stage 1 company. Exceptionally high growth rates leave no doubt about the company's rapid ascent. Its capital allocation strategy during this period further reinforces this classification.

ASML prioritized aggressive investment, fueled by a combination of debt issuance and stock dilution. This approach was necessary to bridge the gap during periods of negative FCF, in 1999, 2001, 2002, 2006 and 2009, but was not different even when FCF was positive. This focus on investment aligns perfectly with the characteristics of a young company seeking to establish itself in a new and potentially disruptive market.

Furthermore, ASML was at the forefront of a technological revolution. The company aimed to develop chip-manufacturing machines utilizing extreme ultraviolet (EUV)

lithography. This innovative technology promised to enable the creation of chips with even smaller transistors, ensuring the continued validity of Moore's Law. By pioneering EUV technology, ASML positioned itself as a key player in the future of chip manufacturing, further solidifying its status as a classic stage 1 company.

From 2013 until 2022 we categorize ASML as a stage 2, this conversion is due to its slowing growth rate when compared with the stage 1 period, different capital allocation and the success of their task of creating a machine capable of using EUV technology.

Following its high-growth stage 1 period, ASML's trajectory demonstrates a successful transition into the characteristics of a stage 2 company. While growth rates have understandably declined from their earlier peaks, they remain robust. This shift is mirrored in the company's capital allocation strategy.

In 2008, ASML initiated shareholder payouts, with a consistent upward trend over the subsequent period. While over 50% of FCF is routinely allocated to these payouts, they remain sustainable and do not compromise reinvestment. ASML continues to prioritize investment, actively pursuing advancements beyond EUV technology. The company's recent introduction of the next-generation NA-EUV machines exemplifies this commitment to innovation.

Considering these factors, ASML has demonstrably overcome the initial challenges of its founding vision. The company is no longer a young startup, but it maintains strong growth momentum and exhibits a sound capital allocation approach. The focus on investment, coupled with ongoing product development through initiatives like the NA-EUV machines, further solidifies ASML's position as a quintessential stage 2 corporation.

A critical driver of ASML's transition to stage two was its success with EUV technology. The 2013 shipment of the first EUV machine 1 marked a culmination of significant investment and the successful realization of its core mission. This milestone, however, does not exist in isolation from the broader semiconductor industry landscape.

While Intel lagged in adopting EUV technology, TSMC's swift embrace allowed its clients to be the first to benefit and develop superior products. This early adoption by TSMC ultimately contributed to the immense success of its clients, AMD and Nvidia.⁶

Table 32 provided below gives a comprehensive view of ASML's remarkable growth rates as it transitions from stage 1 to stage 2, where the growth pace begins to decelerate. Despite this slowdown, the growth rates remain robust, reflecting a company in its stage2 rather than exhibiting the stagnation typical of stage 3.

Table 32: ASML growth rate for stages 1 and 2

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 1	232%	819%	82%	93%	21%	41%
Stage 2	36,57%	42,94%	22,72%	24,65%	17,15%	9,29%

Source: Growth rates calculated using official data from the company annual report

6.18 Advanced Micro Devices, Inc.

Advanced Micro Devices (AMD) is a key player in the semiconductor industry, renowned for its high-performance processors and graphics technologies. Focused on innovation and open standards, AMD's products are central to personal computing, gaming, and data center solutions.

⁶<https://www.asml.com/en/products/euv-lithography-systems>

From 2011 until 2018 AMD was a stage 3 company.

During the period AMD exemplified a stage 3 company teetering on the brink of collapse. The company experienced consistent contraction, unable to compete with its dominant rival, Intel. This struggle was reflected in both average growth rates and capital allocation strategies.

While AMD avoided resorting to massive debt issuance to bridge its multi-year deficits, it did engage in aggressive stock dilution. Furthermore, the company resorted to liquidating assets across its entire balance sheet in a desperate attempt to maintain solvency. These measures, however, failed to reignite growth, leaving the company's future in doubt.

From 2019 until 2022 AMD was a stage 1 company, this revival is due to the overturn of its dire condition into becoming a leading business in the chip industry and its impressive growth from then on.

AMD's story serves as a compelling testament to the proposition outlined in this thesis' introduction: that a company's demise is not always preordained, and unlike biological organisms, businesses possess the potential for self-rejuvenation and renewed growth.

This remarkable turnaround cannot be viewed in isolation from the broader industry ecosystem. Until 2014, AMD directly competed with Intel, employing the same combined design and manufacturing business model. However, as previously discussed in the context of TSMC, this approach was becoming increasingly expensive and difficult to sustain for a single entity. While Intel, failing to recognize this impending threat, succumbed to the pitfalls of stage 3 behavior, AMD, under the leadership of its newly appointed CEO, Lisa Su, made a critical strategic shift. The company spun off its manufacturing assets, transitioning to a fabless chip design model.

By focusing all resources on design and entrusting manufacturing to TSMC, a leader that had surpassed Intel by 2019 due to its embrace of EUV technology, AMD was able to create superior products and achieve a remarkable transformation – from a stage 3 company on the brink of collapse to a stage 1 company experiencing robust growth and producing cutting-edge technology.

This strategic pivot also yielded significant changes in AMD's capital allocation. The company transitioned to generating free cash flow surpluses, enabling it to strengthen its balance sheet with cash reserves and reduce reliance on stock dilution.

Table 33 below illustrates the transformation in AMD's growth rates as it moved from stage 3 to stage 1, showcasing a remarkable revitalization from significant declines to huge growth.

Table 33: AMD growth rates for stage 3 and 1

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 3	-16,84%	-162,75%	17,11%	-2,68%	1,42%	-6,23%
Stage 1	424,31%	183,19%	150,03%	64,50%	40,25%	49,96%

Source: Growth rates calculated using official data from the company 10-K file

6.19 Nvidia Corporation

Founded in 1993, Nvidia has become a leading innovator in the field of computer graphics processing units (GPUs). Their commitment to technological advancement and a dedication to pushing the boundaries of graphical fidelity have positioned them as a leader of the computing industry.

From 2011 until 2022 Nvidia was a stage 1 company.

Nvidia presents a compelling case study, mirroring Amazon's growth trajectory in several ways. Similar to Amazon, Nvidia's story begins with the creation of a game-changing technology – the Graphics Processing Unit (GPU) – initially targeted towards rendering high-fidelity video games (AAA titles). However, recognizing the broader potential of their invention, Nvidia embarked on a strategic expansion into the realm of artificial intelligence (AI) tools in 2012. This visionary move proved instrumental, propelling them to a dominant market share exceeding 80% by long periods of time.^{7 8}

Like Amazon, Nvidia exemplifies the ability to successfully transition from one industry to another, fueling sustained growth even after achieving significant scale. This "rejuvenation," allows the company to maintain its growth momentum by turning itself into a different business.

Nvidia's capital allocation strategy demonstrates a prudent approach compared to some high-growth companies. They have consistently avoided incurring annual deficits, and when shareholder payouts exceeded FCF, they ensured sufficient cash reserves to cover any resulting debt. However, similar to Duolingo, Nvidia utilizes massive stock grants – a substantial non-cash expense – to incentivize and retain talent. This practice, while a common tactic for stage 1 companies operating in pioneering fields and developing novel technologies, leads to ongoing stock dilution, typical of a stage 1 business.

Table 34 highlights Nvidia's growth rates, which are consistently strong across all metrics.

Table 34: Nvidia growth rates for stage 1

Average growth Stages	Operating activities	Free cash flow	Net income	Operating income	Sales	Retained earnings
Stage 1	30,03%	30,95%	30,03%	53,01%	22,11%	21,39%

⁷<https://www.techradar.com/computing/gpu/nvidia-now-owns-88-of-the-gpu-market-but-that-might-not-be-a-bad-thing-yet>

⁸<https://wccftech.com/q3-2022-discrete-gpu-market-share-report-nvidia-gains-amd-intel-in-single-digit-figures/>

Source: Growth rates calculated using official data from the company 10-K file