

A Work Project, presented as part of the requirements for the Award of a Master's degree in International Finance (IMF) from the Nova School of Business and Economics.

Pairs Trade – Apple & Microsoft

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Abstract

This work project addresses the challenge of formulating a valuable long-short strategy within the oligopolistic competition between Apple and Microsoft in the technology sector. The problem lies in effectively evaluating and distinguishing between the two companies, making reasonable forecast assumptions, and, ultimately, identifying the out- and underperformer through comprehensive valuation methods like discounted cash flow (DCF) and relative valuation. The objective is to develop a long-short strategy that optimizes risk-adjusted returns by leveraging insights from the valuation analyses. The study aims to contribute valuable insights for investors navigating oligopolistic rivalries in the technology sector.

Keywords: Pairs Trade; Discounted Cash Flow; Relative Valuation; Company Analysis

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0. Introduction

Embarking on the exploration of Pairs Trading within the technology sector, this work project seeks to unravel the intricate dynamics between two colossal entities – Apple and Microsoft, collectively representing a market capitalization exceeding USD 5.5 trillion as of the submission date.

Commencing with chapter 1, a thorough examination unfolds, encompassing company and industry analyses of the selected oligopolistic rivals, highlighting key parallels and distinctions in their respective business models.

A core element of the work lies in the valuation techniques outlined in chapter 2. Employing intrinsic valuation through DCF and relative valuation, the exploration navigates through fundamental assumptions and derives applicable discount rates for each company. The project then asserts its contribution by addressing political tensions between the U.S. and China, delving into the potential impact on manufacturing capabilities for both companies, which, in turn, have a consequential impact on both revenue and cost aspects and, ultimately, the final long-short recommendation.

In chapter 3, the focus shifts to unveiling the long-short approaches explored, culminating in the presentation of the final strategy. This comprehensive overview aims to encapsulate the essence of the preceding sections, setting the tone for an insightful exploration of Pairs Trading dynamics between the technology giants.

In revealing the rationale for this work project, personal motivations are grounded in past research, work experiences, and a firm interest in the captivating interplay between economic, political, and technological forces.

1. Company and Industry Analysis

1.1 Apple

Apple Inc. (Ticker: *AAPL*) is a global company that designs, manufactures, and markets smartphones, PCs, tablets, wearables and related accessories, primarily targeting business-to-consumer (B2C) customers. The company's product portfolio includes the iPhone series, a range of smartphones; Mac, a range of PCs; iPad, a versatile range of tablets; and wearables, home and accessories that include AirPods, Apple TV, Apple Watch, Beats products and HomePod. Over the years, Apple expanded its services to include AppleCare support and cloud services, which account for a growing share of total revenues. Besides the AppStore, the company operates various platforms including gaming, fitness, music, news, television, credit card, IP, and cashless payment services. As of the 2023 fiscal year (FY), iPhone sales accounted for nearly 50% of total revenues, followed by services and wearables.

1.2 Microsoft

Microsoft Corporation (Ticker: *MSFT*) develops, licenses, and supports a wide range of software, services, devices and solutions worldwide. The company operates in three main segments: Productivity and Business Processes, Intelligent Cloud, and More Personal Computing. In the Productivity and Business Processes segment, Microsoft offers a range of products such as Office, SharePoint, and Microsoft Teams. The Intelligent Cloud segment focuses on the licensing of Windows servers, Visual Studio, and Azure, a comprehensive cloud platform. Furthermore, Microsoft supports its customers with enterprise support, consulting services and professional. The More Personal Computing segment deals with Windows original equipment manufacturer (OEM) licensing and other non-volume licensing for the Windows operating system. Microsoft pursues a dual-focused strategy by offering consumer-oriented products such as Windows and Office Suite for the B2C segment, while providing business solutions such as Microsoft Azure and 365 for the business-to-business (B2B) segment.

1.3 Similarities and Differences

Despite their distinctions in core businesses, Apple and Microsoft share notable similarities across various industry segments. Both companies offer operating systems (macOS and Windows), productivity software (iWork and Microsoft Office), cloud services (iCloud and Microsoft Azure), devices and accessories (i-products and Microsoft Surface-products), software development (AppStore and Microsoft Visual Studio), physical retail presence, and entertainment services.

However, it is crucial to recognize the substantial differences in their core strategies, product philosophies, and target markets. Apple places a strong emphasis on consumer electronics and design, mainly targeting the B2C segment, while Microsoft historically focuses on software and business services, targeting both B2C and B2B customers. Additionally, despite both companies having significant manufacturing bases in Asia, especially in mainland China, a nuanced difference arises in their dependency on production facilities. Microsoft's diversified portfolio mitigates its reliance on physical product manufacturing. In contrast, Apple, with its focus on consumer electronics, remains heavily dependent on intricate manufacturing processes. This distinction becomes crucial in the evolving tech sector, where Microsoft's software-centric approach contrasts with Apple's reliance on cutting-edge hardware, making it more sensitive to global supply chain disruptions, an issue that is further investigated later in the work project.

Examining the financial performances in the 2023 FY, Apple experienced a 2.8% year-on-year (YoY) decline in revenue growth, while Microsoft witnessed a 6.9% increase amid a challenging fiscal climate. Apple achieved a 25% net profit margin, whereas Microsoft's stood notably higher at 34%. Free cash flow (FCF) decreased by 14% for Apple and 2% for Microsoft. In terms of stock prices, Apple's rose from USD 152 to USD 170, reflecting a 12% YoY increase, while Microsoft's increased from USD 229 to USD 338, marking a substantial 48%

rise as of October 31, 2023. It is noteworthy that both companies outperformed the S&P500 index, which rose by 8% during the same period. For additional financial highlights and key ratios, see *Table 1*.

1.4 Industry Analysis

Both Apple and Microsoft are prominent players in the consumer access and technology space, competing fiercely in the various areas introduced above. Both rivals have a market capitalization of more than USD 2.5 trillion (as of October 31, 2023), with Apple's market value being ~USD 2.65 trillion and Microsoft's ~USD 2.51 trillion, making them the two largest companies in the world by market capitalization.

Despite widespread recent supply chain challenges impacting multiple sectors, the Technology, Consumer Goods, and Cloud Computing industries have demonstrated remarkable resilience. The Porter Five Industry Analysis provides a comprehensive framework for understanding the fundamental drivers of profitability and competition in each industry.

Examining the position of Apple and Microsoft in the technology sector using a five-factor analysis, and based on thorough recent annual reports' analysis, industry competition and buyer bargaining power emerge as the strongest market forces affecting the profitability of both companies. Vendor bargaining power, the threat of buyers opting for substitute products and the potential threat of new entrants are identified as comparatively weaker elements among the key industry forces. Both Apple and Microsoft persistently face the challenge of competition in the market, forcing them to constantly innovate and introduce unique products to increase and strengthen their market share. This force is primarily driven by the similarity of business with other large global competitors. Although bargaining power of individual buyers is a weak force, as the loss of a single customer has little impact on revenue for both Apple and Microsoft, collective buyer bargaining power and the potential for a large-scale shift of customers to a competing company is high. The companies address this by investing heavily in research and

development (R&D) to stay ahead of their rivals and by extending integrated features across their products to increase switching costs. The threat of new entrants is relatively low for both due to the extraordinarily high costs associated with establishing a company in the industry and building brand awareness. New entrants would need significant capital for R&D and would face the challenge of establishing themselves as a brand in a market already dominated by the major players. Supplier bargaining power is low since both companies have a wide range of suppliers and low switching costs. Designing their own chips and controlling manufacturing equipment reduces supplier influence. However, both companies primarily source their products in Asia, predominantly in mainland China, and are therefore dependent on favorable political and trade US-China relations to maintain a frictionless supply chain. The risk of buyers opting for substitute products is low. In the case of Apple and Microsoft, substitute products would be landline telephones or manual mechanical processes, having limited options compared to their products.

To summarize, dynamic rivalry and collective buyer influence strongly impact the competitive landscape of Apple and Microsoft, while factors such as supplier power, the threat of substitute products and new entrants have relatively less dominant effects on their market position.

2. Valuation

2.1 Fundamental Assumptions

The underlying textbook for the applied valuation is the corporate finance book by Berk and DeMarzo (2014). Company data and financials were sourced from Bloomberg as per default, if not otherwise specified. Retrieved figures are denoted in millions of USD, except per share prices. The valuation date for Apple and Microsoft, as well as the rationale for the long-short trading recommendation, is October 18, 2023. For the determination of the market risk premium (MRP), 5.0% was assumed, which is in line with the latest Damodaran recommendation as per July 2023 (Damodaran 2023). The risk-free rate, set at 4.83%, was derived from the ten-year

US Treasury yield as per the valuation date (“10 Year Treasury Rate” 2023). The long-term growth rate, which serves as a crucial input in the DCF calculation, is set at 2.40%. This figure is within the range of investment professionals’ common assumption, which typically yields between 2% and 4% for the US. The selected figure was derived as the average of the real US gross domestic product (GDP) growth rates between 1990 and 2022 (“Real GDP Growth Rate U.S.” 2023), see *Table 2*. Despite both competitors being established entities, a ten-year time horizon was selected for the DCF, given the substantial YoY growth rates observed in recent years, allowing for convergence toward the chosen long-term growth rate.

Additionally, the financial model incorporates 4 distinct scenarios. The base case scenario is taken as default and integrates assumptions that are deemed to be most realistic. The optimistic scenario embeds favorable factors such as above-expectation successful product launches, cost-saving initiatives, and a beneficial macro-environment, projecting a higher end of potential valuation. Conversely, the pessimistic scenario factors in challenges like economic downturns, increased competition, or unforeseen operational issues, offering a conservative estimate of the company’s intrinsic value.

Lastly, the “China x Base” scenario assumes an escalation of the US-China relations, culminating in an economical decoupling of the two countries, resulting in a total loss of mainland China sales for both companies. In recent years, the conflict between the People’s Republic of China and its “One-China”-policy, and the democratic island Taiwan, has intensified, with a war not off the table. A study undertaken by William & Mary’s Global Research Institute, supported by the Carnegie Corporation of New York, (Gillooly et al. 2023), suggests that the likelihood of a Chinese attack against Taiwan in the next year (i.e., 2024) stands at roughly 24%. A war would mean the worst-case scenario for both Apple and Microsoft’s manufacturing capabilities, which rely on favorable trade relations. The possibility of this scenario and other US-China intensifications were considered when estimating the YoY

revenue growth figures. Additionally, drivers such as cost of goods sold (COGS), capital expenditures (Capex), and net working capital (NWC) are expected to be negatively impacted in the first two years as a result of deteriorated relations, leading to higher implied costs caused by replacement of manufacturers, before reverting to base case scenario assumptions in the subsequent years of the forecast period. Since Apple's economic success is heavily reliant on its manufacturing capabilities in China, the company is expected to suffer relatively higher in the China case than Microsoft, e.g., COGS increase in the first year by 10%, as opposed to 5% for Microsoft. Other drivers are adjusted accordingly and explained where necessary.

2.2 Discount Rate Derivation

2.2.1 WACC Introduction

The DCF is the chosen method for determining the intrinsic value of the companies. This approach involves calculating the present value of the anticipated cash flows over the next ten years, incorporating the time value of money. To account for appropriate discount rates for the DCF, the weighted average cost of capital¹ (WACC) was derived for both companies. In order to get the appropriate inputs for the WACC, the cost of equity, the cost of debt, and the respective capital structure ratios are explained in the following. *Table 3* shows an overview of the selected and calculated WACC components.

2.2.2 Cost of Equity

To determine the cost of equity, the capital asset pricing model² (CAPM), a widely accepted and practical tool among practitioners for estimating the cost of equity in financial analysis, was used. For the risk-free rate, the 4.83% ten-year US treasury bond yield was selected. The MRP of 5.0% was chosen based on the current Damodaran recommendation.

¹ $WACC = r_E \left(\frac{E}{E+D} \right) + r_D \left(\frac{D}{E+D} \right) (1 - t_c)$

² $r_E = r_f + \beta_e \times MRP$

Regarding the calculation of equity betas, two different approaches were examined. The first approach involved determining the unlevered equity betas of comparable companies, which are explained in more detail in section 2.4 *Relative Valuation*. After having eliminated the foreign peers to create a more homogenous and comparable set of companies with regards to economic and regulatory environment, eight peers remained for Apple and nine for Microsoft. Then, the five-year equity betas were sourced from Bloomberg, with the S&P500 selected as default comparable index. To factor in the companies' current net debt³ position, both short and long-term debt positions were calculated based on their recent annual results. Then, the debt-to-enterprise value⁴ (D/EV) ratio was calculated, where market capitalization was used to account for the market value of equity at the end of the respective FY. The average (D/EV) ratios for peer companies of Apple are observed at 0.6%, whereas for Microsoft's peers, the average is 5.4%, as illustrated in *Table 4* and *Table 5* for a comprehensive overview. To mitigate the influence of outliers, the effective tax rate was computed based on the three-year average for each company. Subsequently, the equity betas were unlevered⁵ to isolate and compare the inherent business risk without the distortion introduced by differences in capital structures.

As next step, the median unlevered beta from the comparable datasets was re-levered⁶ to reflect the capital structure of the respective target company. Consequently, the re-levering of the median values show an equity beta of 1.008 for Apple and 1.036 for Microsoft, as illustrated in the tables introduced above.

In the second approach, the equity betas were directly extracted from the performance of the two oligopolistic companies relative to the S&P500 over the past five years, as obtained from Bloomberg. This yielded a beta of 1.074 for Apple and 0.976 for Microsoft. After evaluating

³ *Net debt = total debt – cash & cash equivalents*

⁴ $\left(\frac{D}{EV}\right)$ ratio: $\frac{\text{net debt}}{\text{market value of equity} + \text{net debt}}$

⁵ *Unlevered beta* = $\frac{\text{levered beta}}{\left(1 + \frac{(1-t_c) \times \text{debt}}{\text{equity}}\right)}$

⁶ *Levered beta* = *unlevered beta* $\times \left[1 + (1 - t_c) \times \left(\frac{\text{net debt}}{\text{equity}}\right)\right]$

both methods, the second approach was selected as input for the WACC calculation. Utilizing the last five-year equity beta from Bloomberg in the DCF WACC calculation is preferable as it provides a more comprehensive view of the company's historical risk profile, smoothing out short-term volatility, and aligning with the extended investment horizon of the valuation, thereby offering a stable and forward-looking measure of market risk. Upon applying the WACC formula, the cost of equity amounts to 10.20% for Apple and 9.71% for Microsoft.

2.2.3 Cost of Debt

For the cost of debt calculation, the work on Risk in Capital Structure Arbitrage, by Schaefer and Strebulaev (2009), was taken as the fundament. To determine the cost of debt, the CAPM-based formula⁷ was selected. Consequently, the debt betas of the two companies were determined according to their respective Standard & Poors recommended credit ratings, with Apple holding an AA+ rating (“S&P Global Ratings Affirms Apple at AA+” 2023) and Microsoft securing an AAA rating (“S&P Global Ratings Affirms Microsoft at AAA” 2023). Following the work of the authors, Apple's debt beta estimation slightly exceeds that of Microsoft due to its relatively weaker credit rating, standing at 0.025 compared to Microsoft's 0.010. Although some investment practitioners might choose to disregard the debt betas altogether, given the low (D/EV) ratios of both companies, to reflect the difference in credit ratings, the debt betas were adjusted accordingly. Upon inserting the relevant figures, the resulting cost of debt is 4.96% for Apple and 4.88% for Microsoft. The tax rates, calculated as the averages of the effective tax rates over the last three FY, denote 14.71% for Apple and 15.46% for Microsoft, respectively. Correspondingly, the post-tax cost of debt is 4.23% for Apple and 4.13% for Microsoft.

⁷ $r_D = r_f + \beta_D \times MRP$

2.2.4 Capital Structure Ratios

To determine the competing parties' capital structure ratios, an analysis of the past five FY of each company was conducted. During this period, both companies consistently maintained negative net debt positions, resulting in negative (D/EV) ratios. The average (D/EV) over the period, spanning from 2019 to 2023, is -3.7% for Apple and -3.2% for Microsoft. Concurrently, the (E/EV) ratios for the same period are 103.7% and 103.2%, respectively. For a more detailed view on the capital structure ratios, refer to *Table 6* and *Table 7*. However, due to the negative (D/EV) ratios, which can introduce errors and inconsistencies into financial models, the target capital structure was selected by looking at industry peers' ratios. Considering the peer (D/EV) ranges of 0.6% and 5.4%, as outlined above, the chosen target capital structures are positioned at the more conservative end, i.e., at 5.0%. Targeting a modest debt position ensures financial flexibility, allowing the company to pursue strategic initiatives and capital projects while signalling financial stability to potential investors. Consequently, the (E/EV) ratio stands at a 95.0% target for the purpose of the WACC. Identical target capital structures were applied to both companies, given the similarities in their peer groups, risk profiles, and operational models, and to allow for enhanced comparability.

After having derived all necessary inputs, the WACC stands at 9.90% for Apple and 9.43% for Microsoft. *Figure 1* visualizes the detailed WACC derivation for both companies.

2.3 Intrinsic Valuation

The DCF starts off with forecast assumptions about revenues, COGS, operating costs such as SG&A and R&D, and taxes, before delving into Capex, D&A, and NWC to arrive at unlevered free cash flow (UFCF). To project working capital needs, a NWC schedule was built.

2.3.1 Revenue Forecast Methods

The revenue growth figures for the two companies were obtained through own calculations grounded in historical revenue growth rates, and Bloomberg consensus estimates.

In deriving revenue growth for the own calculation, the forecast incorporated the average of two approaches: the simple ten-year historical average (v1) and a regression analysis based on last ten years' revenues (v2). The ten-year timeframe was selected to ensure robustness by minimizing the impact of outliers. Furthermore, integrating the simple average of historical revenue growth with regression analysis enhances the forecast by capturing historical trends through the former and providing a more nuanced understanding of various influencing variables with the latter. For the v1 approach, the average yearly revenue growth and average yearly US inflation rates of the last ten years were derived. Then, the difference between average historic revenue growth and average historic inflation rate was computed to determine the inflation-adjusted company growth rates. To account for past and future US inflation rates, data was sourced from Statista ("Projected U.S. Inflation Rate 2010-2028" 2023). Assuming the 2023 inflation forecast of 4.50% holds true, the average inflation rate over the past ten years is recorded at 2.78%. Projected inflation rates were considered reasonable until 2025, with the default assumption being the Federal Reserve's (FED) long-run target of 2% for US inflation from 2026 onward.

In the v2 approach, the application of the same methodology involved using the regression growth coefficient instead of the simple average. The v2 approach demonstrates a regression of last ten years logarithmic revenues on the respective years. The regression coefficient for Apple yields 8.19% (see *Table 8*) with an R-squared of 90%, and 10.72% for Microsoft (see *Table 9*), with an R-squared of 95%. The high R-squared figures for both companies suggest that most of the variability in the dependent variable is captured by the independent variables in the respective models, showcasing the models' effectiveness in capturing and predicting the observed outcomes for both Apple and Microsoft. For a graphical illustration of the regressions, refer to *Figure 2* and *Figure 3*, respectively. After having derived the differences between past US inflation and the respective revenue growth methods, the average of v1 and v2 denotes

5.86% for Apple and 7.93% for Microsoft. *Table 10* and *Table 11* illustrate the described approach and findings.

2.3.2 Operational and other Parameters

To ensure a reliable basis for projecting future financial performance and to consider long-term trends, the DCF model utilizes historic three-year percent of revenue averages for operating parameters below the top-line as the default value for forecast assumptions, except for D&A, which assumes five-year averages and is directly tied to Capex. This approach helps to smooth out annual fluctuations, mitigate the impact of outliers, and align with industry norms, resulting in a more accurate valuation model. This includes COGS, operating costs such as SG&A and R&D, corporate tax rates, and other relevant parameters.

NWC Schedule

For the NWC⁸ schedule, the key components, excluding cash and debt, include trade receivables and inventories on the current assets side and trade payables on the current liabilities side. The schedule takes days sales outstanding (DSO), days inventory held (DIH), and days payable outstanding (DPO) into account to arrive at the cash conversion cycle. Last three years DSO, DIH, and DPO averages were taken as assumptions for future forecasts and are assumed to stay constant in the base scenario. For a more detailed picture of the profit and loss (P&L) and non-operating assumptions, see *Table 12* for Apple and *Table 13* for Microsoft.

China x Base

Apple generates roughly 19% of its total revenue in Greater China, including the special administrative zones Taiwan and Hong Kong, as published in the latest quarterly report. To account only for mainland China, a conservative 2% was deducted to arrive at an approximate 17% revenue share, excluding the special administrative zones. Opposed to Apple, Microsoft only earns about 1.8% of its total revenue in mainland China, according to Microsoft's vice

⁸ NWC = current assets – current liabilities

chair and president Brad Smith (“Microsoft’s Smith Says U.S.-China Divisions Risk Tech ‘Cold War’ - Bloomberg” 2020), and is therefore less reliant in terms of sales than its oligopolistic competitor. Given that the most recent statement regarding Microsoft’s mainland China revenue share dates back three years and considering Microsoft’s consistent shift away from a focus on China, a conservative downward adjustment of 0.3% is considered reasonable. This leads to a 1.5% long-term mainland China revenue share assumption.

However, both companies rely on China as a manufacturing partner and, therefore, a worsening of relations would disrupt supply chains and lead to delays and increased COGS in the short to medium term. Microsoft’s CEO Satya Nadella is reportedly focusing Asian production efforts on countries outside of mainland China. This strategy does not come as a surprise since Chinese government advised agencies and state-backed enterprises to move away from Windows operating system in 2022, as a response to the US-Chinese trade war, which commenced in 2018 (Novet 2023). The scenario-specific assumptions are explained in the corresponding sections for each company, if applicable.

2.3.3 Microsoft Forecast

Revenue Growth

Microsoft’s 2024 and 2025 YoY revenue growth figures, 14.8% and 13.9%, respectively, were derived directly from Bloomberg and are the consensus estimates of numerous selected analysts of reputable investment firms across the globe (see *Table 14*). The average of the two previously mentioned YoY figures, i.e., 14.4%, is assumed for the subsequent four years YoY growth figures, meaning from 2026 until 2029. This approach, which surpasses the (v1/v2) recommended growth rate by 4.4%, is selected because Microsoft is expected to outperform the historic growth average due to various reasons.

First and foremost, Microsoft is on the forefront of new artificial intelligence (AI) development, and, according to Microsoft’s CEO Satya Nadella, AI will “fundamentally transform

productivity for every individual, organization, and industry on earth [and] will reshape every software category and every business.” (“Microsoft 2023 Annual Report” 2023)

Nadella affirms that the company is planning to implement AI on every layer of its business and wants to stay ahead of competition, tapping a multi-billion-dollar market with surging compound annual growth rate (CAGR) forecasts. Microsoft’s revenue is poised for significant growth, primarily driven by its emphasis on its fastest growing segment, Intelligent Cloud, which is also predicted to be the most robust in the coming years, according to the CEO. With latest four quarterly growth rates consistently exceeding 20%, and further fueled by the integration of AI, Microsoft is positioned to achieve substantial growth in the coming years. Adding to that, the global cloud computing market is expected to soar to USD 2,495.2 billion by 2032, up from USD 495.3 billion in 2022, denoting a CAGR of 17.8% (Acumen Research 2023a). Generative AI, one of the predominant focus sectors within Microsoft’s AI capabilities, is expected to reach a global market size of USD 208.8 billion by 2032, up from USD 10.5 billion in 2022, denoting an exceptional 35.1% CAGR (Acumen Research 2023b). Other applications of AI in industries such as healthcare or call-centers, where Microsoft is also actively involved in, have similarly high expected CAGRs. Additionally, Microsoft has reportedly invested USD 13 billion into the development of OpenAI’s ChatGPT, (Cohan 2023), aiming to pioneer generative AI. This effort together with Microsoft’s vision to build a supercomputer in partnership with OpenAI, will further fuel near-future revenues. Furthermore, Microsoft recently invested USD 3.2 billion in the UK, spending big on building UK’s AI infrastructure, safety, and training of workers (Smith 2023).

In summary, the compelling discussed factors point to a strong likelihood of Microsoft experiencing significant revenue growth in the upcoming years. The company’s strategic focus on cloud computing, a diversified product portfolio, and its swift response to evolving market demands all contribute to a positive outlook. Microsoft’s commitment to innovation and proven

track record suggest that the projected high revenue figures are not only justified but also reflective of an AI pioneering company well-poised for success in the dynamic tech landscape. Between 2030 and 2031, the v1/v2 average growth rate, i.e., 7.9% above inflation, based on the introduced methods, is selected. Assuming the FED achieves its 2% inflation goal, the YoY growth figure stands at 9.9% when adding the growth rate to the inflation target, as derived in *Table 11*. During the final two years, the growth rate experiences a reduction to 6.5% and eventually further declines to 3.0% in 2033 to converge to the long-term growth rate.

COGS Assumptions

The model incorporates the assumption that COGS, calculated as the average of last three years, will decrease from 31.3% to 26.0%, accounting for an approximate 17% decrease over the course of the forecast period (see *Table 14*). This assumption stems from the continued trend of decreasing COGS as percentage of sales during the last eight years, i.e., from 36.0% in 2016 to 31.1% in 2023, which accounts for an approximate 14% decrease. Additionally, since the latest Annual Report suggests that its cloud-based services will develop into the biggest revenue driver during the coming years, cost efficiencies will be achieved. According to the report, the cloud business benefits from three economies of scale. The lower cost per unit of large datacenters that deploy computational resources, the fact that large datacenters are more efficient in terms of utilization of computing, storage, and network resources, and, lastly, lower application maintenance labor costs driven by multi-tenancy locations. Further cost reductions will stem from operating cost reduction related to product support service centers and product distribution centers. The China scenario foresees 5% increased COGS in the first, and 1% in the second year due to manufacturing operations adjustments, before converging to the base case.

SG&A

Forecasted is a decrease in SG&A costs from 14.4% to 7.0% of revenue, indicating a 52% decline. This projection aligns with Microsoft's strategic initiative to implement its AI capabilities across all layers, facilitating enhanced time to value, improved cross-collaboration efficiency and effectiveness, and increased agility, as outlined in the recent Annual Report. The efficiency gains are further supported by a recent study on the impact of generative AI on knowledge worker productivity and quality, suggesting up to a 40% improvement in performance when AI is utilized within its capabilities (Dell'Acqua et al. 2023). Therefore, and given the substantial performance improvement stemming from effective AI implementation, the assumption includes cost savings associated with lower headcount and staffing needs.

Capex and other

Projected as a percentage of forecasted revenues, Capex are anticipated to decline from the previous three-year average of 14.1% to 10.0%, marking a 29% decrease. Microsoft foresees an increase in Capex to support the expansion of their cloud services and investments in AI infrastructure. However, the expected decrease in the percentage of revenue is attributed to operational streamlining initiatives. This includes enhancing efficiency through AI-driven process improvements, a strategy that aligns with Microsoft's commitment to optimizing resource utilization. Additionally, advancements such as cloud computing are anticipated to diminish the reliance on on-premises hardware, contributing to this downward trend in expenditure as a percentage of revenue, as concluded from the Annual Report. R&D, taxes, and D&A are projected to stay constant based on historic averages.

2.3.4 Apple Forecast

Revenue Growth

Apple's revenues are driven by 5 segments: iPhone, Mac, iPad, and Services, where iPhone sales are the main driver with nearly 50% revenue share in FY 2023, followed by Services and

Wearables, home and accessories. The company's first two years revenue growth YoY figures, i.e., 3.7% and 6.0%, were derived directly from Bloomberg and are the consensus estimates of numerous selected analysts (see *Table 15*). In the subsequent 6 years, i.e., from 2026 until 2031, the average of the (v1/v2) method, introduced earlier in this paper, was added on top of the expected FED 2% inflation target, to arrive at a 7.9% yearly revenue growth, see *Table 10*. After six years, revenue growth is assumed to converge to the long-term growth rate, falling to 5.0% in 2032 and 3.0% in the last forecast year, implying that Apple will keep its market share. The more conservative revenue forecast of Apple compared to Microsoft stems from several reasons. Apple's most recent Q4 results witnessed its fourth consecutive quarter of declining revenues, marking the longest slowdown since 2001, culminating in a 2.8% YoY revenue decrease, primarily attributed to challenges stemming from weak iMac demand and a slowdown in Chinese sales as a response to worsened trade relations ("Apple 10K Q4 2023" 2023). As further outlined in the report, the company relies significantly on its manufacturing partners, primarily located in Asia, and their ability to procure raw materials at reasonable prices. China, in particular, serves as the production hub for over 95% of iPhones, Macs, iPads, and AirPods (Banker 2023), which collectively contribute to roughly 70% of Apple's total revenues. This dependency exposes the company to a variety of external threats, first and foremost US-China trade relations, raw materials crucial for components, supply chain disruptions due to raw materials shortages, industry-wide shortages, and fluctuating commodity prices. Certain customized components, unique to the company, often come from a single source, leading to dependency issues and potential capacity constraints for new technologies. Thereby, missing components reportedly led to lost revenues due to delivery shortages and pose a serious danger to the firm.

COGS Assumptions

Compared to Microsoft, Apple's COGS assumptions are more pessimistic because of its increased reliance on manufacturing partners, in line with above mentioned points. COGS are 3 percentage points higher in the pessimistic scenario than the base, as opposed to a 1 percentage point increase in the respective Microsoft scenario. One of Apple's main manufacturing partners, Taiwan-based Foxconn, maintains significant manufacturing operations in mainland China and, therefore, favorable political relations between mainland China and the island-state are crucial to sustain the supply chain. The China scenario further incorporates a 10% increase in COGS in the first and second year following the worst-case scenario due to Apple's heavy reliance on China and resulting increased costs associated with shifting production capacities to other countries. Concluding, the company anticipates gross margin pressure from various factors, including industry-wide pricing pressures, heightened competition, supply shortages, rising component costs, and political tensions, leading to a rather pessimistic medium-term company performance outlook.

However, the base case assumes an interpolated decline in COGS from 56.9% to 49% over the forecast period, denoting a 14% decrease. This assumption is in line with past successful efforts to continuously decrease COGS. By growing unit sales, Apple is forecast to further leverage its economies of scale and to successfully integrate its technological advancements, mainly in the AI field, in the realm of process and supply chain optimization.

SG&A

SG&A is forecast to experience a minor interpolated decline from 6.3% to 6.0%, accounting for a 5% decline during the forecast period. The reasoning is the same as for Microsoft and stems from leveraging efficiencies by implementing AI efforts for more effectiveness. However, there is less potential for improvement due to already low figures, as compared to the industry.

D&A of Capex

D&A currently stands at 116% of Capex and is projected to experience an interpolated decrease to 95% of Capex over the next years, denoting an 18% decline. Capex-spend as percent of revenue is projected at 2.9% and conservatively declines by 0.1% each year in the last three years to 2.6% due to expectations that less capital for maintenance and growth will be required, explained by efficient operations.

2.3.5 Valuation Results and Conclusion

For a summary of the two-step base case scenario DCF valuation, which comprises both the sum of FCF and the discounted terminal values (TV), refer to *Table 16* for Microsoft and *Table 17* for Apple. After having adjusted for the respective reporting dates for the discounting periods, the discounted FCF were added to the discounted TV to arrive at the respective EV. To derive the TV, the Gordon Growth model⁹ was applied.

Microsoft

Following this methodology, the sum of Microsoft's discounted FCF totals USD 920,999. After adding the discounted TV of USD 1,589,210, an EV of USD 2,510,209 is obtained. Less USD -51,297 net debt, an equity value of USD 2,561,506 is calculated. Dividing by 7,432 outstanding Microsoft shares, the base case price target stands at USD 344.66 per share, suggesting a 4.41% upside potential to the share price of USD 330.11, as of the valuation date.

The price targets for the optimistic, pessimistic, and China scenario yield USD 438.73 (32.90%), USD 269.69 (-18.30%), and USD 338.13 (2.43%), respectively. After equally weighting the four scenarios, a share price target of USD 347.80 is calculated, accounting for a 5.36% upside potential.

⁹ Gordon Growth TV = $\frac{UFCF_{n+1}(1+g)}{WACC-g}$

Apple

Apple's discounted FCF amounts to USD 965,872. When combined with the discounted TV of USD 1,240,230, the EV totals USD 2,206,102. After deducting the net debt of USD -51,011, the equity value is calculated at USD 2,257,113. Dividing this figure by 15,550 outstanding Microsoft shares yields a price target of USD 145.15 per share, indicating a 17.34% downside potential from the current share price of USD 175.61, as of the valuation date.

The optimistic, pessimistic, and China scenario price targets result in USD 183.27 (4.36%), USD 107.88 (-38.57%), and USD 117.98 (-32.81%), respectively. Upon equally weighting the four scenarios, a share price target of USD 138.57 is determined, reflecting a 21.09% downside.

Sensitivity Analysis

In the final step of the valuation, a sensitivity analysis has been carried out to see how the share prices of the two competitors react to changing economic conditions. Therefore, the impact of two key components of the DCF has been analyzed, i.e., the WACC and the long-term US GDP growth rate. *Table 18* refers to the sensitivity analysis for Apple, showing that the lower quartile (USD 132) deviates by -10% from the median (USD 145), while the upper quartile (USD 161) amounts to an 11% increase compared to the median.

The result of the sensitivity analysis for Microsoft is visualized in *Table 19*, where the lower (USD 309) and upper quartiles (USD 387) deviate by -11% and 12% from the USD 345 median, respectively. Comparing the two sensitivity analyses leads to the conclusion that, given the similar percentage quartile deviations resulting from changing economic parameters, both companies are equally exposed to economic changes.

Conclusion

In the realm of corporate valuation via DCF, the analysis suggests that Microsoft is positioned as the winner while Apple faces a more challenging trajectory. This assertion is founded in the resilience exhibited by Microsoft in the face of macroeconomic conditions, a quality that

surpasses that of Apple. A pivotal factor contributing to Microsoft's robustness is its diversified market presence, engaging significantly in both the B2B and B2C domains. This strategic dual focus allows Microsoft to navigate economic fluctuations with greater adaptability, demonstrated by growing revenues despite challenging market environment, leveraging strength from both sectors. Additionally, Microsoft is poised for success in its dominant Intelligent Cloud business, leveraging their pioneering AI position across all layers within the company and profiting from tremendously high expected CAGR industry forecasts.

In contrast, Apple's predominant concentration in the B2C consumer market, renders it more susceptible to fluctuations in consumer spending, economic downturns, and continuously worsening US-China relations. Additionally, Apple depends much more on sales in China as compared to Microsoft, deriving approximately a fifth of total sales, where sales are expected to stagger due to worsening political tensions and regulations. This, combined with factors such as industry-wide pricing pressures, increased competition, supply shortages, and rising component costs, contributes to a modest medium-term performance outlook for the company. By unveiling the differential impact of market focus on resilience in the face of macro-economic conditions, the valuation supports the assertion that Microsoft emerges as the more resilient contender compared to Apple.

2.4 Relative Valuation

The relative valuation, as opposed to the intrinsic valuation, measures a company's current value by looking at comparable companies. Ten peers were selected for each company, where both Apple and Microsoft are among the selected competitors, leaving space for nine rivals each. For both, the main criteria for comparable company selection were significant market capitalization, global reach, and operations in similar businesses.

Apple's peers were selected by the criterion of "Global Technology Players – Consumer Electronics & Software", which includes the following rivals: Samsung, Alphabet, Amazon,

Meta, Sony, Nvidia, Adobe, Oracle, and Cisco. Microsoft's peers were selected by "Global Technology Players – Cloud Computing & Software". The companies not yet mentioned include Salesforce, IBM, SAP, and VMware. For an overview of the mentioned peers' business model and products and services, refer to *Table 20*. As next step, the P/E, P/B, EV/EBITDA, and EV/Sales trailing twelve months (TTM) ratios were analyzed.

Table 21 and *Table 22* show the detailed breakdowns of peer multiples. As the next step, the lower quartile, median, and upper quartile figures were calculated to account for inputs for the pessimistic, base, and optimistic scenario in the relative valuation, respectively. The choice for median over mean was selected as the median is less sensitive to extremes and therefore conveys a more realistic picture. Compared to peers, Apple heavily outlies in the P/B ratio, denoting a 550% premium compared to the median, i.e., 44 P/B ratio for Apple compared to the 6.8 median. Microsoft's most notable deviations lie in the EV/Sales TTM ratio, standing at 11.3 as opposed to the 6.2 peer median, corresponding to an 84% premium, and in the P/E ratio, where Microsoft stands at 34.0 as opposed to the 47.0 median, denoting a 28% discount. Furthermore, both companies demonstrate much larger market capitalizations than their peers, with Apple exceeding the peer median by nearly 4x and Microsoft by more than 8x, considering that these two companies are the largest by market capitalization.

Putting the observations into context and based on the average of the above-mentioned peer multiples, Apple shares yield USD 64.76 in the pessimistic, USD 114.85 in the base, and USD 221.93 in the optimistic scenario, signifying that the DCF base case scenario exceeds the multiples average by approximately 26%. Excluding the P/B ratio, which is a heavy outlier due to Apple's very low book value, the multiples are approximately 25% higher, see *Table 23*, and, in the base case, the multiple excluding the outlying P/B ratio, stands at USD 144.12, which is very close to the DCF base scenario calculation of USD 145.12.

The football field chart in *Table 24* illustrates the ranges of the selected multiples.

Applying the same methodology for Microsoft, shares target USD 186.64 in the pessimistic, USD 292.80 in the base, and USD 569.49 in the optimistic scenario. *Table 25* demonstrates the summary of multiples, followed by a football field chart for visual illustration in *Table 26*. The DCF value of USD 344.66 exceeds the multiples average by roughly 18%.

2.5 Preferred Valuation Methodology

While multiples offer a snapshot of a company's valuation relative to its peers, they often carry a short-term bias influenced by market sentiment and comparable company dynamics. In contrast, the preferred DCF method lies in its emphasis on the intrinsic, long-term value of a company. DCF analysis delves into projected cash flows, discounting them to present value and providing a comprehensive view of a company's growth prospects, capital structure, and risk profile over an extended horizon.

3. Long-Short Strategy

In order to craft a long-short strategy based on the two oligopolistic rivals, the mean reversion principle was explored. The fundamental idea behind the mean reversion approach is that, over time, the spread between the prices of the two assets tends to revert to its historical mean.

First, the market-daily closing stock prices of both Apple and Microsoft for the last two years were sourced from Bloomberg. Subsequently, the daily spread between Microsoft and Apple was calculated, where the Apple stock price was deducted from Microsoft's. To find the z-score¹⁰, both the mean and standard deviation of the spread had to be calculated for the selected time horizons. However, as the study advanced, it became apparent that despite the theoretical soundness of the mean reversion approach, it did not generate successful strategies within the chosen time frames. Explorations were made into trading signals based on the daily positive or negative z-score operator signs to the various periodic mean and standard deviations to

¹⁰ $z = \frac{x - \mu}{\sigma}$; x = evaluated value, μ = periodic mean, σ = periodic standard deviation

determine over- or undervaluation. Additionally, attempts were made to alter the approach by, for instance, only implementing a trading signal if the operator sign remained positive or negative for several days or more, or if a certain z-score threshold was exceeded. However, these variations failed to exhibit consistency and to show clear patterns when back-testing seemingly successful strategies on different time periods. Consequently, further analysis was neglected, and the DCF was selected for the long-short approach.

According to the equal-weighted four-scenario DCF assessments, Microsoft appears undervalued by 5.36%, suggesting a potential market under-appreciation of its intrinsic worth. Conversely, Apple shows an overvaluation of 21.09%, highlighting a premium in its market pricing relative to its fundamental value. Leveraging these DCF-derived insights, a long-short pairs trading strategy emerges as a compelling approach.

By taking an equal-weighted long position in Microsoft, anticipating a market correction, and simultaneously shorting Apple as of the valuation date, the strategy seeks to capitalize on the relative mispricing between these tech giants, aligning fundamental analysis with market dynamics to capture potential inefficiencies. This strategy, aligned with mean reversion principles, introduces a market-neutral dimension, providing resilience against overall industry and economic growth factors that might similarly impact both firms. The proposed time horizon for holding the positions is set until the end of 2024, so that the China scenario can keep its validity, facilitating a structured evaluation of the strategy's performance over a defined period. Moreover, the success of this pairs trading strategy hinges on the continual monitoring of risk factors and the readiness to make timely adjustments in response to changes in the business and macro environment, e.g., FED changes, political and trade developments, manufacturing bottlenecks, etc. Attentive risk management ensures adaptability to evolving market conditions, helping to fine-tune the strategy and optimize its performance over time.

Appendices

If not otherwise specified, the source is based on own Excel calculations. In terms of color coding, the Excel appendices utilize different colors to distinguish between linked cells (green), hard-copied input cells (blue), calculated cells (black/default), and assumption cells (light grey fill). OpenAI's ChatGPT has been used for paraphrasing paragraphs.

Financial data – Apple

Apple Inc (AAPL US) - Income Statement - As Reported					
<i>In Millions of USD except Per Share</i>	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
12 Months Ending	09/28/2019	09/26/2020	09/25/2021	09/24/2022	09/24/2023
Total Revenues	260,174	274,515	365,817	394,328	383,285
Product Revenue	213,883	220,747	297,392	316,199	298,085
Service Revenue	46,291	53,768	68,425	78,129	85,200
Total Cost of Revenues	161,782	169,559	212,981	223,546	214,137
Cost of Products Sold	144,996	151,286	192,266	201,471	189,282
Cost of Services	16,786	18,273	20,715	22,075	24,855
Gross Profit	98,392	104,956	152,836	170,782	169,148
<i>Gross Profit margin %</i>	38%	38%	42%	43%	44%
Operating Expenses	34,462	38,668	43,887	51,345	54,847
R & D Expenditures	16,217	18,752	21,914	26,251	29,915
Selling General and Administrative Expenses	18,245	19,916	21,973	25,094	24,932
Operating Income	63,930	66,288	108,949	119,437	114,301
Other Non-Operating (Income)/Expense - Net	1,807	803	258	-334	565
EBT	65,737	67,091	109,207	119,103	113,736
Income Tax Expense (Benefit)	10,481	9,680	14,527	19,300	16,741
Net Income	55,256	57,411	94,680	99,803	96,995
Dividends Per Share	0.8	0.8	0.9	0.9	0.9
Basic EPS	3.0	3.3	5.7	6.2	6.2
Weighted Avg. Shares - Basic	18,471	17,352	16,701	16,216	15,744
Diluted EPS	3.0	3.3	5.6	6.1	6.1
Weighted Avg. Shares - Diluted	18,596	17,528	16,865	16,326	15,813
Cumulative Net Income	55,256	57,411	94,680	99,803	96,995
EBITDA	76,477	77,344	120,233	130,541	125,820
<i>% of revenue</i>	29%	28%	33%	33%	33%
Depreciation and Amortization	12,547	11,056	11,284	11,104	11,519
EBIT	63,930	66,288	108,949	119,437	114,301
<i>% of revenue</i>	25%	24%	30%	30%	30%
Depreciation Expense	12,547	11,056	11,284	11,104	11,519
Interest Expense	3,576	2,873	2,645	2,931	3,933
Interest Income	4,961	3,763	2,843	2,825	3,750
Income Tax Expense (Benefit)	10,481	9,680	14,527	19,300	16,741
Capital Expenditures As Reported	10,495	7,309	11,085	10,708	10,959

Source: Bloomberg

Apple Inc (AAPL US) - Balance Sheet - As Reported					
In Millions of USD except Per Share	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
12 Months Ending	09/28/2019	09/26/2020	09/25/2021	09/24/2022	09/24/2023
Cash and Equivalents	48,844	38,016	34,940	23,646	29,965
Marketable Securities	51,713	52,927	27,699	24,658	31,590
Accounts Receivable - Trade	22,926	16,120	26,278	28,184	29,508
Inventories	4,106	4,061	6,580	4,946	6,331
Other Current Assets	12,352	11,264	14,111	21,223	14,695
Accounts Receivable - Affiliates/Non-Trade	22,878	21,325	25,228	32,748	31,477
Total Current Assets	162,819	143,713	134,836	135,405	143,566
Non-Current Marketable Securities	105,341	100,887	127,877	120,805	100,544
Property Plant & Equipment - Net	37,378	36,766	39,440	42,117	43,715
Other Noncurrent Assets	32,978	42,522	48,849	54,428	64,758
Total Non-Current Assets	175,697	180,175	216,166	217,350	209,017
Total Assets	338,516	323,888	351,002	352,755	352,583
Accounts Payable - Trade	46,236	42,296	54,763	64,115	62,611
Current Portion of Long-Term Debt	10,260	8,773	9,613	11,128	9,822
Short-Term Borrowings	5,980	4,996	6,000	9,982	5,985
Deferred/Unearned Revenue (Short-Term)	5,522	6,643	7,612	7,912	8,061
Other Current Liabilities	37,720	42,684	47,493	60,845	58,829
Total Current Liabilities	105,718	105,392	125,481	153,982	145,308
Long Term Debt	91,807	98,667	109,106	98,959	95,281
Deferred/Unearned Revenue (Long-Term)	—	—	—	—	—
Other Noncurrent Liabilities	50,503	54,490	53,325	49,142	49,848
Total Non-current Liabilities	142,310	153,157	162,431	148,101	145,129
Total Liabilities	248,028	258,549	287,912	302,083	290,437
Accumulated Other Comprehensive Income	-584	-406	163	-11,109	-11,452
Retained Earnings (Accumulated Deficit)	45,898	14,966	5,562	-3,068	-214
Shares Outstanding	17,773	16,977	16,427	15,943	15,550
Common Stock & APIC	45,174	50,779	57,365	64,849	73,812
Total Shareholders Equity	90,488	65,339	63,090	50,672	62,146
Total Liabilities and Shareholders Equity	338,516	323,888	351,002	352,755	352,583
Land and Buildings	17,085	17,952	20,041	22,126	23,446
Leasehold Improvements	9,075	10,283	11,023	11,271	12,839
Furniture/Machinery/Equipment	69,797	75,291	78,659	81,060	78,314
Property Plant & Equipment - Gross	95,957	103,526	109,723	114,457	114,599
Accumulated Depreciation	58,579	66,760	70,283	72,340	70,884
Property Plant & Equipment - Net	37,378	36,766	39,440	42,117	43,715
Deferred Income Tax Asset (LT)	19,640	18,295	20,326	20,094	24,369

Source: Bloomberg

Apple Inc (AAPL US) - Cash Flow - As Reported					
<i>In Millions of USD except Per Share</i>	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
12 Months Ending	09/28/2019	09/26/2020	09/25/2021	09/24/2022	9/30/2023
Net Income - CF	55,256	57,411	94,680	99,803	96,995
Depreciation And Amortization - CF	12,547	11,056	11,284	11,104	11,519
Deferred Income Taxes - CF	-340	-215	-4,774	895	—
Stock Based Compensation	6,068	6,829	7,906	9,038	10,833
Other Non-Cash Items	-652	-97	-147	111	-2,227
Change in Inventories	-289	-127	-2,642	1,484	-1,618
Change in Accounts Payable	-1,923	-4,062	12,326	9,448	-1,889
Change in Accounts Receivable	245	6,917	-10,125	-1,823	-1,688
Change in Deferred/Unearned Revenue -ST	-625	2,081	1,676	478	—
Change in Other Assets	873	-9,588	-8,042	-6,499	-5,684
Change In Other Liabilities	-4,700	8,916	5,799	5,632	3,031
Total Cash Flows From Operations	69,391	80,674	104,038	122,151	110,543
Increase/Decrease In Trade & Other Receivables	2,931	1,553	-3,903	-7,520	1,271
Cash From Investing Activities					
Capital Expenditures	-10,495	-7,309	-11,085	-10,708	-10,959
Proceeds From Investments	1,634	—	—	—	—
Purchases of Investments	-1,001	—	—	—	—
Acquisition of Business	-624	-1,524	-33	-306	—
Other Investing Activities	-1,078	-909	-352	-1,780	-1,337
Incr In Marketable & Investment Securities	-39,630	-114,938	-109,558	-76,923	-29,513
Total Cash Flows From Investing	45,896	-4,289	-14,545	-22,354	3,705
Dividends Paid	-14,119	-14,081	-14,467	-14,841	-15,025
Increase In Long-Term Borrowings	6,963	16,091	20,393	5,465	5,228
Decrease In Long-Term Borrowings	-8,805	-12,629	-8,750	-9,543	-11,151
Issuance of Common Stock	781	—	—	—	—
Repurchase of Common Stock	-66,897	-72,358	-85,971	-89,402	-77,550
Other Financing Activities	-2,922	-2,880	-5,580	-6,383	-6,012
Cash Paid For Taxes	15,263	9,501	25,385	19,573	18,679
Cash Paid For Interest	3,423	3,002	2,687	2,865	3,803
Change in Commercial Paper	-5,977	-963	1,022	3,955	-3,978
Net Change In Cash	24,311	-10,435	-3,860	-10,952	5,760
Cash and Cash Equivalents (End of Period)	50,224	39,789	35,929	24,977	30,737
Cash and Cash Equivalents (Beg of Period)	25,913	39,789	35,929	35,929	24,977
Total Cash Flows From Financing	-90,976	-86,820	-93,353	-110,749	-108,488

Source: Bloomberg

Financial data – Microsoft

Microsoft Corp (MSFT US) - Income Statement - As Reported					
<i>In Millions of USD except Per Share</i>	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
12 Months Ending	06/30/2019	06/30/2020	06/30/2021	06/30/2022	06/30/2023
Total Revenues	125,843	143,015	168,088	198,270	211,915
Product Revenue	66,069	68,041	71,074	72,732	64,699
Service Revenue	59,774	74,974	97,014	125,538	147,216
Cost of Revenues	42,910	46,078	52,232	62,650	65,863
Cost of Products Sold	16,273	16,017	18,219	19,064	17,804
Cost of Services	26,637	30,061	34,013	43,586	48,059
Gross Profit	82,933	96,937	115,856	135,620	146,052
<i>Gross Profit margin %</i>	66%	68%	69%	68%	69%
Operating Expenses	39,974	43,978	45,940	52,237	57,529
R & D Expenditures	16,876	19,269	20,716	24,512	27,195
Sales/Marketing/Advertising Expenses	18,213	19,598	20,117	21,825	22,759
General and Administrative Expenses	4,885	5,111	5,107	5,900	7,575
Operating Income	42,959	52,959	69,916	83,383	88,523
Other Non-Operating (Income)/Expense - Net	-729	-77	-1,186	-333	-788
EBT	43,688	53,036	71,102	83,716	89,311
Income Tax Expense (Benefit)	4,448	8,755	9,831	10,978	16,950
Net Income	39,240	44,281	61,271	72,738	72,361
Dividends Per Share	1.8	2.0	2.2	2.5	2.7
Basic EPS	5.1	5.8	8.1	9.7	9.7
Weighted Avg. Shares - Basic	7,673	7,610	7,547	7,496	7,472
Diluted EPS	5.1	5.8	8.1	9.7	9.7
Weighted Avg. Shares - Diluted	7,753	7,683	7,608	7,540	7,472
Net Income Available For Common Shareholders	39,240	44,281	61,271	72,738	72,361
Cumulative Net Income	39,240	44,281	61,271	72,738	72,361
EBITDA	54,641	65,755	81,602	97,843	102,384
<i>% of revenue</i>	43%	46%	49%	49%	48%
Depreciation and Amortization	11,682	12,796	11,686	14,460	13,861
EBIT	42,959	52,959	69,916	83,383	89,694
<i>% of revenue</i>	34%	37%	42%	42%	42%
Amortization Expense	1,900	1,600	1,600	2,000	2,500
Depreciation Expense	9,700	10,700	9,300	12,600	11,000
Net non-operating interest income	76	89	-215	31	1,026
Interest income non-operating	2,762	2,680	2,131	2,094	2,994
Interest Expense	2,686	2,591	2,346	2,063	1,968
Capital Expenditures As Reported	16,900	19,000	24,200	29,200	28,107

Source: Bloomberg

Microsoft Corp (MSFT US) - Balance Sheet - As Reported

<i>In Millions of USD except Per Share</i>	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
12 Months Ending	06/30/2019	06/30/2020	06/30/2021	06/30/2022	06/30/2023
Cash and Equivalents	11,356	13,576	14,224	13,931	34,704
Accounts Receivable - Trade	29,524	32,011	38,043	44,261	48,688
Inventories	2,063	1,895	2,636	3,742	2,500
Other Current Assets	10,146	11,482	13,393	16,924	21,807
Allowance For Doubtful Accounts	411	788	751	633	650
Short-Term Investments	122,463	122,951	116,110	90,826	76,558
Total Current Assets	175,552	181,915	184,406	169,684	184,257
Long Term Investments	2,649	2,965	5,984	6,891	9,879
Property Plant & Equipment - Net	36,477	44,151	59,715	74,398	95,641
Other Intangible Assets	7,750	7,038	7,800	11,298	9,366
Goodwill	42,026	43,351	49,711	67,524	67,886
Other Noncurrent Assets	14,723	13,138	15,075	21,897	30,601
Total Non-Current Assets	—	—	—	—	227,719
Total Assets	286,556	301,311	333,779	364,840	411,976
Accounts Payable - Trade	9,382	12,530	15,163	19,000	18,095
Current Portion of Long-Term Debt	5,516	3,749	8,072	2,749	5,247
Accrued Compensation/Postretirement Obligation	6,830	7,874	10,057	10,661	11,009
Deferred/Unearned Revenue (Short-Term)	32,676	36,000	41,525	45,538	50,901
Other Current Liabilities	9,351	10,027	11,666	13,067	14,745
Income Taxes Accrued/Payable	5,665	2,130	2,174	4,067	4,152
Total Current Liabilities	69,420	72,310	88,657	95,082	104,149
Long Term Debt	66,662	59,578	50,074	47,032	41,990
Deferred Income Taxes (Liabilities)	233	204	198	230	433
Deferred/Unearned Revenue (Long-Term)	4,530	3,180	2,616	2,870	2,912
Other Noncurrent Liabilities	7,581	10,632	13,427	15,526	17,981
Long Term Operating Lease Liabilities	6,188	7,671	9,629	11,489	12,728
Provision For Taxation	29,612	29,432	27,190	26,069	25,560
Total Noncurrent Liabilities	—	—	—	—	101,604
Total Liabilities	184,226	183,007	191,791	198,298	205,753
Accumulated Other Comprehensive Income	-340	3,186	1,822	-4,678	-6,343
Retained Earnings (Accumulated Deficit)	24,150	34,566	57,055	84,281	118,848
Shares Outstanding	7,643	7,571	7,519	7,464	7,432
Common Stock & APIC	78,520	80,552	83,111	86,939	93,718
Total Shareholders Equity	102,330	118,304	141,988	166,542	206,223
Total Liabilities and Shareholders Equity	286,556	301,311	333,779	364,840	411,976
Land	1,540	1,823	3,660	4,734	5,683
Buildings	26,288	33,995	43,928	55,014	68,465
Leasehold Improvements	5,316	5,487	6,884	7,819	8,537
Furniture/Machinery/Equipment	38,663	46,043	56,594	66,491	81,207
Property Plant & Equipment - Gross	71,807	87,348	111,066	134,058	163,892
Accumulated Depreciation	35,330	43,197	51,351	59,660	68,251
Deferred Income Tax Asset (LT)	12,479	14,961	17,167	22,559	29,911

Source: Bloomberg

Microsoft Corp (MSFT US) - Cash Flow - As Reported

<i>In Millions of USD except Per Share</i>	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
12 Months Ending	06/30/2019	06/30/2020	06/30/2021	06/30/2022	06/30/2023
Net Income - CF	39,240	44,281	61,271	72,738	72,361
Depreciation And Amortization - CF	11,682	12,796	11,686	14,460	13,861
Deferred Income Taxes - CF	-6,463	11	-150	-5,702	-6,059
Stock Based Compensation	4,652	5,289	6,118	7,502	9,611
Change in Inventories	597	168	-737	-1,123	1,242
Change in Accounts Payable	232	3,018	2,798	2,943	-2,721
Change in Accounts Receivable	-2,812	-2,577	-6,481	-6,834	-4,087
Change in Deferred/Unearned Revenue -ST	4,462	2,212	4,633	5,109	5,535
Change in Income Taxes Payable (Receivable)	2,929	-3,631	-2,309	696	-358
Change in Other Current Assets	-1,718	-2,330	-932	-709	-1,991
Change in Other Current Liabilities	1,419	1,346	4,149	2,344	2,272
Change in Other Assets	-1,834	-1,037	-3,459	-2,805	-2,833
Change In Other Liabilites	591	1,348	1,402	825	553
Total Cash Flows From Operations	52,185	60,675	76,740	89,035	87,582
Gain (Loss) On Sale of Investments and Mkt Sec	-792	-219	-1,249	-409	196
Cash From Investing Activities					
Capital Expenditures	-13,925	-15,441	-20,622	-23,886	-28,107
Proceeds From Investments	58,237	84,170	65,800	44,894	47,864
Purchases of Investments	-57,697	-77,190	-62,924	-26,456	-37,651
Acquisition of Business	-2,388	-2,521	-8,909	-22,038	-1,670
Other Investing Activities	—	-1,241	-922	-2,825	-3,116
Total Cash Flows From Investing	-15,773	-12,223	-27,577	-30,311	-22,680
Dividends Paid	-13,811	-15,137	-16,521	-18,135	-19,800
Increase (Decrease) Short-Term Borrowings	—	—	—	—	—
Increase In Long-Term Borrowings	—	—	—	—	—
Decrease In Long-Term Borrowings	-4,000	-5,518	-3,750	-9,023	-2,750
Issuance of Common Stock	1,142	1,343	1,693	1,841	1,866
Repurchase of Common Stock	-19,543	-22,968	-27,385	-32,696	-22,245
Effect of Exchange Rates On Cash	-115	-201	-29	-141	-194
Other Financing Activities	-675	-3,751	-2,523	-863	-1,006
Net Change In Cash	-590	2,220	648	-293	20,773
Cash and Cash Equivalents (End of Period)	11,356	13,576	14,224	13,931	34,704
Cash and Cash Equivalents (Beg of Period)	11,946	11,356	13,576	14,224	13,931
Total Cash Flows From Financing	-36,887	-46,031	-48,486	-58,876	-43,935
Cash Paid For Taxes	8,400	12,500	13,400	16,000	23,100
Cash Paid For Interest	2,400	—	—	—	—
ARDR Free Cash Flow	38,260	45,129	56,118	65,149	42,952

Source: Bloomberg

Table 1: Financial highlights

Financial highlights & ratios

>> 2023 figures	Apple	Microsoft
<u>Profitability</u>		
Net profit margin	25%	34%
Return on assets	28%	18%
Return on equity	156%	35%
Operating margin	30%	42%
<u>Growth ratios (YoY)</u>		
Revenue growth	-3%	7%
Earnings growth	-3%	-1%
Operating cash flow	-10%	8%
Free cash flow	-14%	-2%
<u>Liquidity ratios</u>		
Current ratio	1.0	1.8
Quick ratio	0.9	1.7
<u>Efficiency ratios</u>		
Days sales outstanding	28	84
Inventory turnover	11	14
Days payables outstanding	107	100
Cash conversion cycle	-68	-3
<u>Debt and leverage ratios</u>		
Debt-to-equity	1.8	0.3
Interest coverage	29	45
<u>Market valuation</u>		
Price-earnings	29	34
Price-book	44	11
<u>Stock returns</u>		
Last 1 year	12%	48%

Table 2: Historical US GDP growth rates

Historical US GDP growth rate

U.S. real GDP growth rate 1990-2022

Annual growth of the real gross domestic product of the United States from 1990 to 2022

'90	1.90%	Average 2.40%
'91	-0.10%	
'92	3.50%	
'93	2.80%	
'94	4.00%	
'95	2.70%	
'96	3.80%	
'97	4.40%	
'98	4.50%	
'99	4.80%	
'00	4.10%	
'01	1.00%	
'02	1.70%	
'03	2.80%	
'04	3.90%	
'05	3.50%	
'06	2.80%	
'07	2.00%	
'08	0.10%	
'09	-2.60%	
'10	2.70%	
'11	1.50%	
'12	2.30%	
'13	1.80%	
'14	2.30%	
'15	2.70%	
'16	1.70%	
'17	2.20%	
'18	2.90%	
'19	2.30%	
'20	-2.80%	
'21	5.90%	
'22	2.10%	

Table 3: WACC components - overview

WACC components - overview

	Apple	Microsoft
Cost of equity		
Equity beta	1.074	0.976
MRP	5.00%	5.00%
Cost of equity	10.20%	9.71%
Cost of debt		
Debt beta	0.025	0.010
Cost of debt	4.96%	4.88%
Post-tax CoD	4.23%	4.13%
Risk-free rate	4.83%	4.83%
Capital structure		
(D/EV) target	5.00%	5.00%
(E/EV) target	95.00%	95.00%
Tax rate	14.71%	15.46%
Long-term growth rate	2.40%	2.40%
WACC	9.90%	9.43%

Table 4: Equity beta comparables - Apple

Equity Beta comparables - Apple

Comps	Equity beta	Net debt	% Debt	Equity value	% Equity	Ent. value	Eff. tax rate	Unlevered beta
Microsoft	0.976 -	51	-2%	2,453	102%	2,402	15%	0.994
Alphabet	1.004 -	90	-6%	1,660	106%	1,570	11%	1.055
Amazon	0.97	89	6%	1,520	94%	1,609	17%	0.925
META	1.081 -	24	-3%	835	103%	810	16%	1.108
Nvidia	1.357 -	7	-1%	1,160	101%	1,153	13%	1.364
Adobe	1.119 -	3	-1%	279	101%	275	19%	1.130
Oracle	0.86	80	20%	321	80%	401	11%	0.703
Cisco	0.857 -	15	-8%	197	108%	182	17%	0.914
			0.6%				>> comparables median	1.024
Apple	1.074 -	51	-2%	2,719	102%	2,668	15%	1.091
							>> re-levered median	1.008

Table 5: Equity beta comparables - Microsoft

Equity Beta comparables - Microsoft

Comps	Equity beta	Net debt	% Debt	Equity value	% Equity	Ent. value	Eff. tax rate	Unlevered beta
Apple	1.074 -	51	-2%	2,719	102%	2,668	15%	1.091
Alphabet	1.004 -	90	-6%	1,660	106%	1,570	11%	1.055
Amazon	0.97	89	6%	1,520	94%	1,609	17%	0.925
Nvidia	1.357 -	7	-1%	1,160	101%	1,153	13%	1.364
Adobe	1.119 -	3	-1%	279	101%	275	19%	1.130
Oracle	0.86	80	20%	321	80%	401	11%	0.703
Salesforce	1.148	2	1%	252	99%	254	18%	1.141
IBM	0.895	48	24%	147	76%	194	8%	0.690
Vmware	1.008	5	7%	62	93%	66	15%	0.947
			5.4%				>> comparables median	1.055
Microsoft	0.976 -	51	-2%	2,453	102%	2,402	15%	0.994
							>> re-levered median	1.036

Table 6: Capital structure - Apple

Capital structure - Apple

FY	2019	2020	2021	2022	2023
Equity value	1,287,000	2,255,000	2,901,000	2,066,000	2,719,000
LT debt	91,807	98,667	109,106	98,959	95,281
ST debt	16,240	13,769	15,613	21,110	15,807
Total debt	108,047	112,436	124,719	120,069	111,088
Cash & equivalents	205,898	191,830	190,516	169,109	162,099
Net debt	(97,851)	(79,394)	(65,797)	(49,040)	(51,011)
Enterprise value	1,189,149	2,175,606	2,835,203	2,016,960	2,667,989
D/EV	-8.2%	-3.6%	-2.3%	-2.4%	-1.9%
Average D/EV (last 5 years)	-3.7%				
E/EV	108.2%	103.6%	102.3%	102.4%	101.9%
Average E/EV (last 5 years)	103.7%				

Table 7: Capital structure - Microsoft

Capital structure - Microsoft

FY	2019	2020	2021	2022	2023
Equity value	1,200,000	1,681,000	2,522,000	1,787,000	2,745,000
LT debt	72,850	67,249	59,703	58,521	54,718
ST debt	5,516	3,749	8,072	2,749	5,247
Total debt	78,366	70,998	67,775	61,270	59,965
Cash & equivalents	133,819	136,527	130,334	104,757	111,262
Net debt	(55,453)	(65,529)	(62,559)	(43,487)	(51,297)
Enterprise value	1,144,547	1,615,471	2,459,441	1,743,513	2,693,703
D/EV	-4.8%	-4.1%	-2.5%	-2.5%	-1.9%
Average D/EV (last 5 years)	-3.2%				
E/EV	104.8%	104.1%	102.5%	102.5%	101.9%
Average E/EV (last 5 years)	103.2%				

Table 8: Revenue regression output – Apple

Regression - Apple

SUMMARY OUTPUT

Regression Statistics

Multiple R	0.950371983
R Square	0.903206907
Adjusted R Square	0.89110777
Standard Error	0.086070873
Observations	10

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.553025668	0.553025668	74.65052544	2.4991E-05
Residual	8	0.059265562	0.007408195		
Total	9	0.612291231			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-152.749595	19.12750963	-7.985859	4.42278E-05	-196.8577113	-108.6414786	-196.8577113	-108.6414786
X Variable 1	0.081873936	0.009476091	8.640053556	2.4991E-05	0.060022031	0.103725842	0.060022031	0.103725842

Table 9: Revenue regression output - Microsoft

Regression - Microsoft

SUMMARY OUTPUT

Regression Statistics

Multiple R	0.974791197
R Square	0.950217879
Adjusted R Square	0.943995113
Standard Error	0.078822958
Observations	10

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.948735701	0.948735701	152.7002628	1.71391E-06
Residual	8	0.04970447	0.006213059		
Total	9	0.99844017			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-204.7152975	17.51680714	-11.68679291	2.62191E-06	-245.1091272	-164.3214678	-245.1091272	-164.3214678
X Variable 1	0.107237245	0.008678122	12.35719478	1.71391E-06	0.087225459	0.12724903	0.087225459	0.12724903

Figure 1: WACC overview

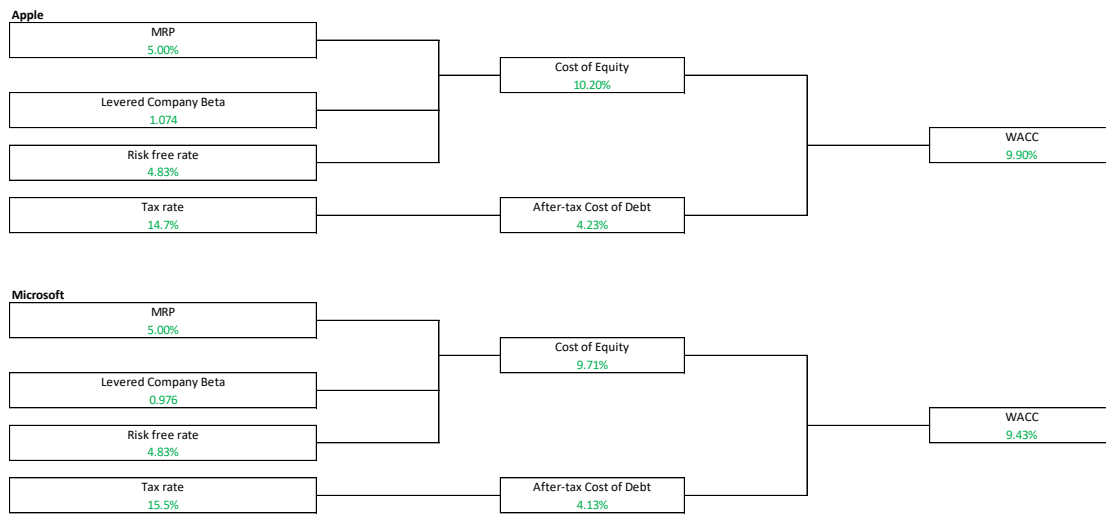


Figure 2: Revenue regression graph - Apple

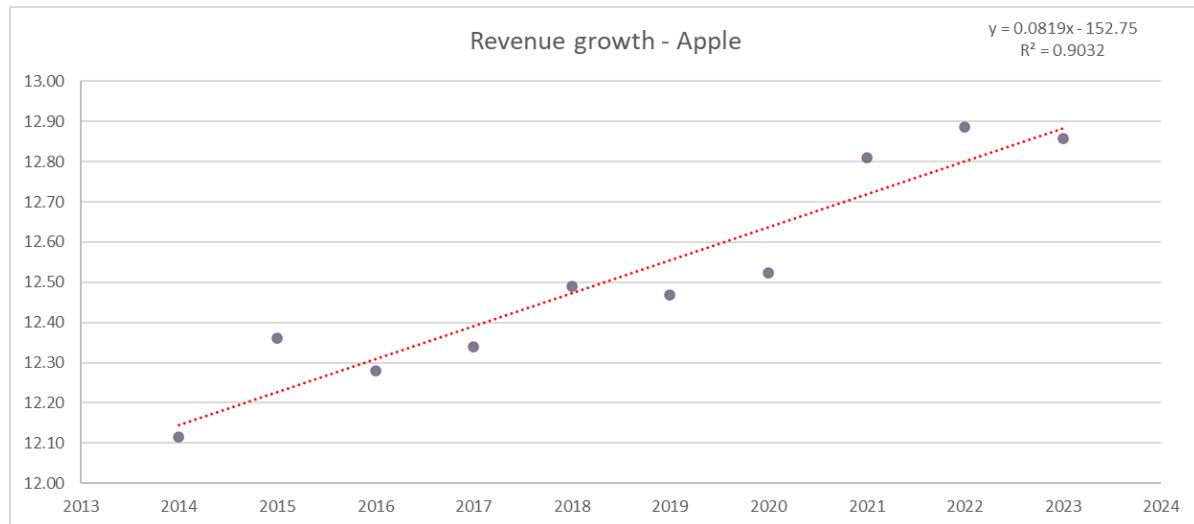


Figure 3: Revenue regression graph - Microsoft

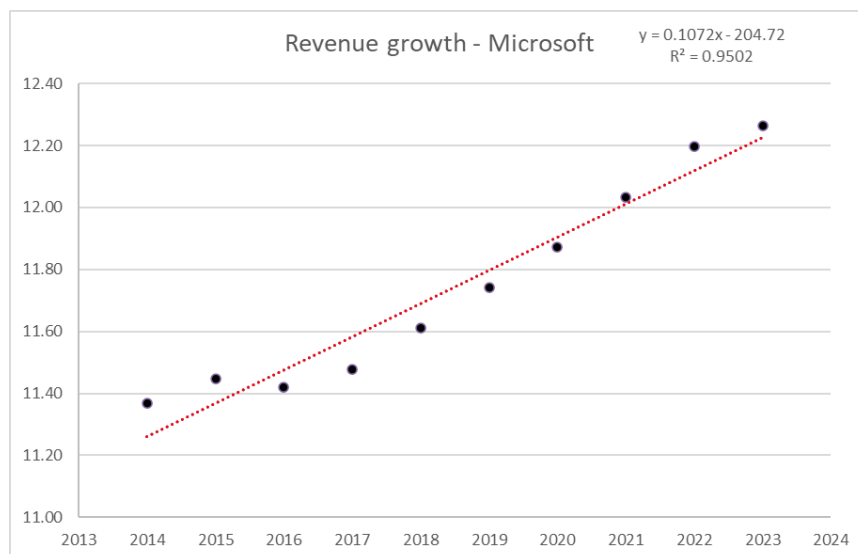


Table 10: Revenue forecast – Apple

Revenues - Apple				
Year	Revenues	US inflation	G-rate	Revenues (ln)
2013	170,910	1.46%	n/a	12.05
2014	182,795	1.62%	6.95%	12.12
2015	233,715	0.12%	27.86%	12.36
2016	215,091	1.26%	-7.97%	12.28
2017	228,594	2.13%	6.28%	12.34
2018	265,595	2.44%	16.19%	12.49
2019	260,174	1.81%	-2.04%	12.47
2020	274,515	1.23%	5.51%	12.52
2021	365,817	4.70%	33.26%	12.81
2022	394,328	8.00%	7.79%	12.88
2023	383,285	4.50%	-2.80%	12.86
2024	397,342	2.30%	3.67%	12.89
2025	421,355	2.10%	6.04%	12.95
2026	454,491	2.00%	7.86%	13.03
2027	490,233	2.00%	7.86%	13.10
2028	528,786	2.00%	7.86%	13.18
2029	570,370	2.00%	7.86%	13.25
2030	615,225	2.00%	7.86%	13.33
2031	663,608	2.00%	7.86%	13.41
2032	696,788	2.00%	5.00%	13.45
2033	717,692	2.00%	3.00%	13.48

Average past US inflation	2.78%
v1 (Simple hist. average)	
Average rev. growth	9.10%
Difference	6.32%
v2 (Regression)	
Regression coefficient	8.19%
Difference	5.41%
Average v1 & v2	5.86%

Table 11: Revenue forecast – Microsoft

Revenues - Microsoft				
Year	Revenues	US inflation	G-rate	Revenues (ln)
2013	77,849	1.46%	n/a	11.26
2014	86,451	1.62%	11.0%	11.37
2015	93,580	0.12%	8.2%	11.45
2016	91,154	1.26%	-2.6%	11.42
2017	96,571	2.13%	5.9%	11.48
2018	110,360	2.44%	14.3%	11.61
2019	125,843	1.81%	14.0%	11.74
2020	143,015	1.23%	13.6%	11.87
2021	168,088	4.70%	17.5%	12.03
2022	198,270	8.00%	18.0%	12.20
2023	211,915	4.50%	6.9%	12.26
2024	243,210	2.30%	14.8%	12.40
2025	277,110	2.10%	13.9%	12.53
2026	316,884	2.00%	14.4%	12.67
2027	362,367	2.00%	14.4%	12.80
2028	414,378	2.00%	14.4%	12.93
2029	473,854	2.00%	14.4%	13.07
2030	520,905	2.00%	9.9%	13.16
2031	572,627	2.00%	9.9%	13.26
2032	609,848	2.00%	6.5%	13.32
2033	628,143	2.00%	3.0%	13.35

Average past US inflation	2.78%
v1 (Simple hist. average)	
Average rev growth	10.70%
Difference	7.92%
v2 (Regression)	
Regression coefficient	10.72%
Difference	7.94%
Average v1 & v2	7.93%

Table 12: P&L and non-operating assumptions - Apple

P&L Forecast assumptions - Apple			
Driver	Apple	Target	% Change
COGS	56.9%	49.0%	-14%
SG&A	6.3%	6.0%	-5%
R&D expense	6.8%		
Tax expense	14.7%		
Capex	2.9%	2.6%	-9%
D&A (as % of Capex)	116.3%	95.0%	-18%

Table 13: P&L and non-operating assumptions - Microsoft

P&L Forecast assumptions - Microsoft

Driver	Microsoft	Target	% Change
COGS	31.3%	26.0%	-17%
SG&A	14.4%	7.0%	-52%
R&D expense	12.5%		
Tax expense	15.5%		
Capex	14.1%	10.0%	-29%
D&A (as % of Capex)	56.7%		

Table 14: P&L and other assumptions – Microsoft - extended

0 P&L Forecast - Microsoft (USD in millions)											
	0	1	2	3	4	5	6	7	8	9	10
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Total revenue	211,915	243,210	277,110	316,884	362,367	414,378	473,854	520,905	572,627	609,848	628,143
% YoY growth	6.9%	14.8%	13.9%	14.4%	14.4%	14.4%	14.4%	9.9%	9.9%	6.5%	3.0%
COGS	65,863	74,728	83,689	94,037	105,632	118,617	133,155	143,641	154,897	161,763	163,317
% of revenue	31%	31%	30%	30%	29%	29%	28%	28%	27%	27%	26%
Gross Profit	146,052	168,482	193,421	222,847	256,735	295,760	340,700	377,264	417,731	448,085	464,826
% mg	69%	69%	70%	70%	71%	71%	72%	72%	73%	73%	74%
SG&A expenses	30,334	33,298	35,880	38,673	41,530	44,410	47,262	48,082	48,599	47,223	43,970
% of revenue	14.31%	13.69%	13%	12%	11%	11%	10%	9%	8%	8%	7%
R&D expenses	27,195	30,418	34,658	39,632	45,321	51,825	59,264	65,149	71,617	76,272	78,561
% of revenue	12.83%	12.51%	13%	13%	13%	13%	13%	13%	13%	13%	13%
EBIT	88,523	104,766	122,884	144,541	169,884	199,525	234,174	264,034	297,515	324,589	342,295
% mg	42%	43%	44%	46%	47%	48%	49%	51%	52%	53%	54%
Tax expense	16,950	16,195	18,996	22,343	26,261	30,843	36,199	40,815	45,990	50,176	52,913
% tax rate	19%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
EBITDA	102,384	123,687	143,794	167,710	195,530	227,881	265,490	297,239	332,676	360,608	377,923
% mg	48%	51%	52%	53%	54%	55%	56%	57%	58%	59%	60%
NOPAT	71,573	88,571	103,888	122,198	143,623	168,682	197,975	223,219	251,524	274,414	289,383
% mg	34%	36%	37%	39%	40%	41%	42%	43%	44%	45%	46%
Capex	28,107	33,360	36,865	40,848	45,215	49,993	55,212	58,543	61,992	63,503	62,814
% of revenue	13%	14%	13%	13%	12%	12%	12%	11%	11%	10%	10%
D&A	13,861	18,921	20,910	23,169	25,645	28,356	31,316	33,205	35,161	36,018	35,628
% of Capex	49%	57%	57%	57%	57%	57%	57%	57%	57%	57%	57%
Delta NWC	4,090	4,041	5,525	6,522	7,516	8,660	9,978	8,137	9,010	6,780	3,770
% of revenue	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%
UFCF	53,237	70,092	82,408	97,996	116,538	138,384	164,101	189,744	215,684	240,149	258,427
% mg	25%	29%	30%	31%	32%	33%	35%	36%	38%	39%	41%
FCF growth rate %	-1.7%	31.7%	17.6%	18.9%	18.9%	18.7%	18.6%	15.6%	13.7%	11.3%	7.6%

1 Revenues - Microsoft											
Base		14.8%	13.9%	14.4%	14.4%	14.4%	14.4%	9.9%	9.9%	6.5%	3.0%
Optimistic		16.8%	15.9%	16.4%	16.4%	16.4%	16.4%	11.9%	11.9%	8.5%	5.0%
Pessimistic		12.8%	11.9%	12.4%	12.4%	12.4%	12.4%	7.9%	7.9%	4.5%	1.0%
China x Base		13.0%	13.9%	14.4%	14.4%	14.4%	14.4%	9.9%	9.9%	6.5%	3.0%
Revenues (Base)	211,915	243,210	277,110	316,884	362,367	414,378	473,854	520,905	572,627	609,848	628,143
Revenue share of mainland China		1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Revenues after China loss	211,915	239,562	272,953	312,131	356,931	408,162	466,746	513,091	564,038	600,700	618,721
2 COGS											
Base		30.7%	30.2%	29.7%	29.2%	28.6%	28.1%	27.6%	27.1%	26.5%	26.0%
Optimistic		29.7%	29.2%	28.7%	28.2%	27.6%	27.1%	26.6%	26.1%	25.5%	25.0%
Pessimistic		31.7%	31.2%	30.7%	30.2%	29.6%	29.1%	28.6%	28.1%	27.5%	27.0%
China x Base		35.7%	31.2%	30%	29%	29%	28%	28%	27%	27%	26%
3 Operating Expenses											
SG&A											
Base		14%	13%	12%	11%	11%	10%	9%	8%	8%	7%
Optimistic		13%	12%	11%	10%	10%	9%	8%	7%	7%	6%
Pessimistic		15%	14%	13%	12%	12%	11%	10%	9%	9%	8%
China x Base		14%	13%	12%	11%	11%	10%	9%	8%	8%	7%
R&D											
Base		13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Optimistic		12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
Pessimistic		14%	14%	14%	14%	14%	14%	14%	14%	14%	14%
China x Base		13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Taxes											
Base		15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Optimistic		14%	14%	14%	14%	14%	14%	14%	14%	14%	14%
Pessimistic		16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
China x Base		15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
4 D&A											
Base		57%	57%	57%	57%	57%	57%	57%	57%	57%	57%
Optimistic		57%	57%	57%	57%	57%	57%	57%	57%	57%	57%
Pessimistic		56%	56%	56%	56%	56%	56%	56%	56%	56%	56%
China x Base		57%	57%	57%	57%	57%	57%	57%	57%	57%	57%
5 Capital Expenditures											
Base		13.7%	13.3%	12.9%	12.5%	12.1%	11.7%	11.2%	10.8%	10.4%	10.0%
Optimistic		13.2%	12.8%	12.4%	12.0%	11.6%	11.2%	10.7%	10.3%	9.9%	9.5%
Pessimistic		14.2%	13.8%	13.4%	13.0%	12.6%	12.2%	11.7%	11.3%	10.9%	10.5%
China x Base		13.7%	13.3%	12.9%	12.5%	12.1%	11.7%	11.2%	10.8%	10.4%	10.0%
6 Net Working Capital											
		365									
Net Working Capital	33,093	37,134	42,659	49,181	56,697	65,357	75,335	83,472	92,482	99,262	103,031
% of Revenue	15.6%	15.3%	15.4%	15.5%	15.6%	15.8%	15.9%	16.0%	16.2%	16.3%	16.4%
Change in NWC	4,090	4,041	5,525	6,522	7,516	8,660	9,978	8,137	9,010	6,780	3,770
Key Assumptions											
Days Sales Outstanding (DSO)	84	83	83	83	83	83	83	83	83	83	83
Days Inventory Held (DIH)	14	18	18	18	18	18	18	18	18	18	18
Days Payable Outstanding (DPO)	100	106	106	106	106	106	106	106	106	106	106
Cash Conversion Cycle	(3)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Calculated NWC											
Accounts Receivable - Trade	48,688	55,072	62,748	71,755	82,054	93,831	107,299	117,953	129,665	138,093	142,236
Inventories	2,500	3,690	4,133	4,644	5,217	5,858	6,576	7,094	7,649	7,989	8,065
Current Assets	51,188	58,763	66,881	76,399	87,270	99,689	113,875	125,047	137,314	146,082	150,301
Accounts Payable - Trade	18,095	21,629	24,223	27,218	30,574	34,332	38,540	41,575	44,833	46,820	47,270
Current Liabilities	18,095	21,629	24,223	27,218	30,574	34,332	38,540	41,575	44,833	46,820	47,270
Base		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Optimistic		97%	94.0%	91.0%	88.0%	85.0%	82.0%	79.0%	76.0%	73.0%	70.0%
Pessimistic		103.00%	106.00%	109.00%	112.00%	115.00%	118.00%	121.00%	124.00%	127.00%	130.00%
China x Base		105.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 15: P&L and other assumptions – Apple - extended


0 P&L Forecast - Apple											
(USD in millions)											
	0	1	2	3	4	5	6	7	8	9	10
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Total revenue	383,285	397,342	421,355	454,491	490,233	528,786	570,370	615,225	663,608	696,788	717,692
% YoY growth	-2.8%	3.7%	6.0%	7.9%	7.9%	7.9%	7.9%	7.9%	7.9%	5.0%	3.0%
COGS	214,137	223,044	233,183	247,919	263,530	280,062	297,566	316,090	335,688	346,949	351,669
% of revenue	55.9%	56%	55%	55%	54%	53%	52%	51%	51%	50%	49%
	-1.4%	53%	51%	48%	45%	43%	40%	38%	35%	32%	30%
	-2.62%										
Gross Profit	169,148	174,298	188,172	206,572	226,703	248,723	272,804	299,135	327,920	349,839	366,023
% mg	44.1%	43.9%	44.7%	45.5%	46.2%	47.0%	47.8%	48.6%	49.4%	50.2%	51.0%
SG&A	24,932	24,884	26,265	28,198	30,272	32,498	34,888	37,452	40,204	42,011	43,062
% of revenue	6.5%	6.3%	6.2%	6.2%	6.2%	6.1%	6.1%	6.1%	6.1%	6.0%	6.0%
R&D	29,915	27,089	28,726	30,985	33,422	36,050	38,885	41,943	45,241	47,503	48,929
% of revenue	8%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
EBIT	114,301	122,326	133,181	147,390	163,010	180,175	199,032	219,740	242,475	260,325	274,033
% mg	29.8%	30.8%	31.6%	32.4%	33.3%	34.1%	34.9%	35.7%	36.5%	37.4%	38.2%
Tax expense	16,741	17,998	19,595	21,686	23,984	26,509	29,284	32,331	35,676	38,302	40,319
% tax rate	14.6%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%
EBITDA	125,820	135,336	146,721	161,717	178,164	196,198	215,967	237,631	260,709	278,383	291,544
% mg	33%	34%	35%	36%	36%	37%	38%	39%	39%	40%	41%
NOPAT	97,560	104,328	113,586	125,704	139,026	153,666	169,748	187,409	206,799	222,023	233,714
%mg	25%	26%	27%	28%	28%	29%	30%	30%	31%	32%	33%
Capex	10,959	11,397	12,086	13,036	14,061	15,167	16,360	17,647	18,371	18,592	18,433
% of revenue	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.7%	2.6%
D&A	11,519	13,010	13,539	14,327	15,154	16,023	16,935	17,891	18,234	18,059	17,511
% of Capex	105.1%	3.3%	3.2%	3.2%	3.1%	3.0%	3.0%	2.9%	2.7%	2.6%	2.4%
Delta NWC	4,213	-89	-784	-1,269	-1,298	-1,323	-1,344	-1,360	-1,371	-393	349
% of revenue	1.1%	0.0%	-0.2%	-0.3%	-0.3%	-0.3%	-0.3%	-0.2%	-0.2%	-0.1%	0.0%
UFCF	93,907	106,031	115,824	128,264	141,416	155,844	171,667	189,014	208,034	221,882	232,443
% mg	25%	27%	27%	28%	29%	29%	30%	31%	31%	32%	32%
FCF growth rate %	-14.3%	12.9%	9.2%	10.7%	10.3%	10.2%	10.2%	10.1%	10.1%	6.7%	4.8%
1 Revenues											
Base		3.67%	6.04%	7.86%	7.86%	7.86%	7.86%	7.86%	7.86%	5.00%	3.00%
Optimistic		5.7%	8.0%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	7.0%	5.0%
Pessimistic		1.7%	4.0%	5.9%	5.9%	5.9%	5.9%	5.9%	5.9%	3.0%	1.0%
China x Base		-13.8%	6.0%	7.9%	7.9%	7.9%	7.9%	7.9%	7.9%	5.0%	3.0%
Revenues (Base)	383,285	397,342	421,355	454,491	490,233	528,786	570,370	615,225	663,608	696,788	717,692
Revenue Share of China Mainland (excl.		16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%
Revenues after China lo	383,285	330,541	350,516	378,082	407,815	439,886	474,479	511,793	552,041	579,644	597,033
2 COGS											
Base		56%	55%	55%	54%	53%	52%	51%	51%	50%	49%
Optimistic		55%	54%	54%	53%	52%	51%	50%	50%	49%	48%
Pessimistic		59%	58%	58%	57%	56%	55%	54%	54%	53%	52%
China x Base		66%	65%	55%	54%	53%	52%	51%	51%	50%	49%
3 Operating Expenses											
SG&A											
Base		6.3%	6.2%	6.2%	6.2%	6.1%	6.1%	6.1%	6.1%	6.0%	6.0%
Optimistic		5.3%	5.2%	5.2%	5.2%	5.1%	5.1%	5.1%	5.1%	5.0%	5.0%
Pessimistic		7.3%	7.2%	7.2%	7.2%	7.1%	7.1%	7.1%	7.1%	7.0%	7.0%
China x Base		6.3%	6.2%	6.2%	6.2%	6.1%	6.1%	6.1%	6.1%	6.0%	6.0%
R&D											
Base		7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Optimistic		6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Pessimistic		8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
China x Base		7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Taxes											
Base		15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Optimistic		14%	14%	14%	14%	14%	14%	14%	14%	14%	14%
Pessimistic		16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
China x Base		15%	15%	15%	15%	15%	15%	15%	15%	15%	15%

4 Capital Expenditures										
Base	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.8%	2.7%	2.6%
Optimistic	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.3%	2.2%	2.1%
Pessimistic	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.3%	3.2%	3.1%
China x Base	4.9%	3.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%

5 D&A										
Base	114.2%	112.0%	109.9%	107.8%	105.6%	103.5%	101.4%	99.3%	97.1%	95.0%
Optimistic	113.7%	111.5%	109.4%	107.3%	105.1%	103.0%	100.9%	98.8%	96.6%	94.5%
Pessimistic	114.7%	112.5%	110.4%	108.3%	106.1%	104.0%	101.9%	99.8%	97.6%	95.5%
China x Base	115.2%	114.7%	109.9%	107.8%	105.6%	103.5%	101.4%	99.3%	97.1%	95.0%

6 Net Working Capital											
365											
Net Working Capital	(26,772)	(26,861)	(27,646)	(28,915)	(30,212)	(31,535)	(32,879)	(34,240)	(35,611)	(36,003)	(35,654)
% of Revenue	-7%	-7%	-7%	-6%	-6%	-6%	-6%	-6%	-5%	-5%	-5%
Change in NWC	4,213	(89)	(784)	(1,269)	(1,298)	(1,323)	(1,344)	(1,360)	(1,371)	(393)	349
Key Assumptions											
Days Sales Outstanding	28	27	27	27	27	27	27	27	27	27	27
Days Inventory Held (DI)	11	10	10	10	10	10	10	10	10	10	10
Days Payable Outstandi	107	102	102	102	102	102	102	102	102	102	102
Cash Conversion Cycle	(68)	(65)	(65)	(65)	(65)	(65)	(65)	(65)	(65)	(65)	(65)
Calculated NWC											
Accounts Receivable - T	29,508	29,177	30,941	33,374	35,999	38,830	41,883	45,177	48,730	51,166	52,701
Inventories	6,331	6,140	6,419	6,825	7,255	7,710	8,192	8,701	9,241	9,551	9,681
Current Assets	35,839	35,317	37,360	40,199	43,253	46,539	50,075	53,878	57,971	60,717	62,382
Accounts Payable - Trad	62,611	62,179	65,006	69,113	73,465	78,074	82,954	88,118	93,581	96,721	98,036
Current Liabilities	62,611	62,179	65,006	69,113	73,465	78,074	82,954	88,118	93,581	96,721	98,036
Base	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Optimistic	97%	94.0%	91.0%	88.0%	85.0%	82.0%	79.0%	76.0%	73.0%	70.0%	70.0%
Pessimistic	103.00%	106.00%	109.00%	112.00%	115.00%	118.00%	121.00%	124.00%	127.00%	130.00%	130.00%
China x Base	120.0%	110.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%


Table 16: DCF - summary - Microsoft

0 Assumptions										
Company:		Valuation Date:		Share Price:						
Microsoft		10/18/2023		\$ 330.11						
All calculations in USD million, except per share prices										
										
Scenario	R_e	Equity Beta	Equity MRP	R_f	R_d	R_wacc	Tax rate	g	Days p.a.	Shares Outstanding
0	9.71%	0.976	5.00%	4.83%	4.88%	9.43%	15%	2.40%	365	7432
Base	0									
Optimistic	1									
Pessimistic	2									
China x Base	3									

1 DCF										
	1	2	3	4	5	6	7	8	9	10
Forecasted Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
FCF	70,092	82,408	97,996	116,538	138,384	164,101	189,744	215,684	240,149	258,427
Date	6/30/2024	6/30/2025	6/30/2026	6/30/2027	6/30/2028	6/30/2029	6/30/2030	6/30/2031	6/30/2032	6/30/2033
t	0.7	1.7	2.7	3.6	4.6	5.6	6.6	7.6	8.6	9.6
Discount factor	0.94	0.86	0.79	0.72	0.66	0.60	0.55	0.50	0.46	0.42
Discounted FCF	65,864	70,850	77,087	83,876	91,128	98,872	104,599	108,786	110,824	109,115
Sum Discounted FCF	920,999	37%								
Terminal Value (Gordon Growth)	3,763,862									
Discounted Terminal Value	1,589,210	63%								
Enterprise Value	2,510,209									
Net Debt	(51,297)									
Equity Value	2,561,506									
Number of shares	7,432									
Price target	344.66									
Over/Undervaluation	4.41%									

Scenario	Price	Weight	New price	Potential
0	344.66	0.25	347.80	5.36%
1	438.73	0.25		
2	269.69	0.25		
3	338.13	0.25		

Table 17: DCF - summary – Apple

Assumptions										
Company: Apple		Valuation Date: 18.10.23		Share Price: \$ 175.61						
All calculations in USD million, except per share prices										
Scenario	R_e	Equity Beta	Equity MRP	R_f	R_d	R_wacc	Tax rate	g	Days p.a.	Shares Outstanding
0	10.20%	1.074	5.00%	4.83%	4.96%	9.90%	15%	2.40%	365	15550
Base	0									
Optimistic	1									
Pessimistic	2									
China x Base	3									

DCF										
Forecasted Year	1 2024	2 2025	3 2026	4 2027	5 2028	6 2029	7 2030	8 2031	9 2032	10 2033
FCF	106,031	115,824	128,264	141,416	155,844	171,667	189,014	208,034	221,882	232,443
Date	30.09.24	30.09.25	30.09.26	30.09.27	30.09.28	30.09.29	30.09.30	30.09.31	30.09.32	30.09.33
Discount Factor	0.94	1.95	2.95	3.95	4.95	5.95	6.95	7.95	8.95	9.95
	0.92	0.83	0.76	0.69	0.63	0.57	0.52	0.47	0.43	0.39
Discounted FCF	97,054	96,348	97,084	97,395	97,662	97,886	98,068	98,211	95,312	90,853
Sum Discounted FCF	965,872	44%								
Terminal Value (Gordon Growth)	3,173,074									
Discounted Terminal Value	1,240,230	56%								
Enterprise Value	2,206,102									
Net Debt	(51,011)									
Equity Value	2,257,113									
Number of shares	15,550									
Price target	145.15									
Over/Undervaluation	-17.34%									

Scenario	Price	Weight	New price	Potential
0	145.15	0.25	138.57	-21.09%
1	183.27	0.25		
2	107.88	0.25		
3	117.98	0.25		

Table 18: DCF Sensitivity analysis - Apple

DCF Sensitivity Analysis - Apple											
WACC & Long-term growth rate - implied share price											
	8.65%	8.90%	9.15%	9.40%	9.65%	9.90%	10.15%	10.40%	10.65%	10.90%	11.15%
1.90%	\$168	\$162	\$156	\$150	\$145	\$140	\$135	\$131	\$127	\$123	\$119
2.00%	\$170	\$163	\$157	\$151	\$146	\$141	\$136	\$132	\$128	\$124	\$120
2.10%	\$171	\$165	\$158	\$152	\$147	\$142	\$137	\$133	\$128	\$124	\$121
2.20%	\$173	\$166	\$160	\$154	\$148	\$143	\$138	\$133	\$129	\$125	\$121
2.30%	\$175	\$168	\$161	\$155	\$149	\$144	\$139	\$134	\$130	\$126	\$122
2.40%	\$177	\$169	\$163	\$156	\$151	\$145	\$140	\$135	\$131	\$127	\$123
2.50%	\$178	\$171	\$164	\$158	\$152	\$146	\$141	\$136	\$132	\$128	\$124
2.60%	\$180	\$173	\$166	\$159	\$153	\$147	\$142	\$137	\$133	\$128	\$124
2.70%	\$182	\$175	\$167	\$161	\$154	\$149	\$143	\$138	\$134	\$129	\$125
2.80%	\$184	\$176	\$169	\$162	\$156	\$150	\$145	\$139	\$135	\$130	\$126
2.90%	\$187	\$178	\$171	\$164	\$157	\$151	\$146	\$140	\$136	\$131	\$127

WACC steps	0.25%
LTG steps	0.10%
Lower Quartile \$	132
Median \$	145
Upper Quartile \$	161

Table 19: DCF sensitivity – Microsoft

8 DCF Sensitivity Analysis - Microsoft											
WACC & Long-term growth rate - implied share price											
345	8.18%	8.43%	8.68%	8.93%	9.18%	9.43%	9.68%	9.93%	10.18%	10.43%	10.68%
1.90%	\$405	\$388	\$371	\$356	\$342	\$329	\$317	\$306	\$295	\$285	\$276
2.00%	\$410	\$392	\$375	\$360	\$346	\$332	\$320	\$308	\$298	\$288	\$278
2.10%	\$414	\$396	\$379	\$363	\$349	\$335	\$323	\$311	\$300	\$290	\$280
2.20%	\$419	\$400	\$383	\$367	\$352	\$338	\$325	\$314	\$302	\$292	\$282
2.30%	\$424	\$405	\$387	\$371	\$356	\$341	\$328	\$316	\$305	\$294	\$284
2.40%	\$429	\$410	\$391	\$375	\$359	\$345	\$331	\$319	\$307	\$296	\$286
2.50%	\$435	\$414	\$396	\$379	\$363	\$348	\$334	\$322	\$310	\$299	\$288
2.60%	\$440	\$419	\$400	\$383	\$366	\$351	\$337	\$324	\$312	\$301	\$290
2.70%	\$446	\$425	\$405	\$387	\$370	\$355	\$341	\$327	\$315	\$303	\$293
2.80%	\$452	\$430	\$410	\$391	\$374	\$358	\$344	\$330	\$318	\$306	\$295
2.90%	\$458	\$436	\$415	\$396	\$378	\$362	\$347	\$333	\$321	\$309	\$297

WACC steps	0.25%
LT G steps	0.10%
Lower Quartile	\$ 309
Median	\$ 345
Upper Quartile	\$ 387

Table 20: Peer companies - overview

Samsung	South Korea	Diversified multinational conglomerate	Consumer electronics, appliances, semiconductors
Alphabet	U.S.	Technology conglomerate	Internet-related products and services
Amazon	U.S.	E-commerce and technology company	Cloud computing, online retail, AI space
Meta	U.S.	Social media and technology company	Social networking services, virtual and augmented reality
Sony	Japan	Diversified entertainment and technology company	Electronics, gaming, and more
Nvidia	U.S.	Graphics processing units and AI computing company	AI technologies, applications in gaming, data centers, automotive
Adobe	U.S.	Software company	Creative software and digital marketing solutions
Oracle	U.S.	Enterprise software and cloud computing company	Database management, cloud services, B2B software solutions
Cisco	U.S.	Networking hardware, software, and telecommunication company	Development, manufacturing, and sale of networking equipment
Salesforce	U.S.	Cloud-based software company	Customer relationship management solutions and enterprise cloud computing services
IBM	U.S.	Diversified technology and consulting company	Hardware, software, cloud computing, AI, and services
SAP	Germany	Enterprise software company	B2B software applications, enterprise resource planning, CRM
VMWare	U.S.	Software company specializing in virtualization and cloud infrastructure	Virtualization software, cloud management

Table 21: Peer group comparables – Apple

Peer Group Comparables - Apple

Criteria for selection: **Global Technology Players -Consumer Electronics & Software by market cap**

(All numbers adjusted to USD by Bloomberg)

Name	Ticker	P/E ratio	P/B ratio	EV/EBITDA	EV/Sales TTM	Market Cap
Microsoft	MSFT	33.2	11.7	22.4	10.6	2,830
Samsung	5930	14.8	1.2	6.0	1.3	337
Alphabet	GOOGL	23.5	5.8	14.6	5.2	1,720
Amazon	AMZN	64.4	7.7	17.7	2.5	1,520
META	META	20.4	5.6	12.5	5.9	863
Sony	6758	17.0	2.3	8.6	1.5	110
Nvidia	NVDA	98.5	38.0	79.0	35.2	1,180
Adobe	ADBE	48.1	15.7	33.1	13.4	292
Oracle	ORCL	30.1	122.2	17.9	8.0	319
Cisco	CSCO	16.2	4.8	10.8	3.4	194
Lower Quartile		16.8	4.2	10.3	2.3	268
Median		26.8	6.8	16.1	5.6	600
Upper Quartile		52.2	21.3	25.1	11.3	1,570
Apple	AAPL	28.5	43.9	21.3	7.0	2,950
Deviation from Median		7%	549%	32%	26%	392%

Source: Bloomberg

Table 22: Peer group comparables – Microsoft

Peer Group Comparables - Microsoft

Criteria for selection: **Global Technology Players - Cloud Computing & Software by market cap**

(All numbers adjusted to USD by Bloomberg)

Name	Ticker	P/E ratio	P/B ratio	EV/EBITDA	EV/Sales TTM	Market Cap
Apple	AAPL	29.4	45.4	21.7	7.0	2,950
Alphabet	GOOGL	27.9	6.5	17.8	6.5	1,720
Amazon	AMZN	87.2	7.8	19.2	2.5	1,520
Oracle	ORCL	29.9	121.5	18.2	6.8	319
Salesforce	CRM	62.4	3.7	21.3	5.8	219
IBM	IBM	15.9	5.7	8.8	2.8	142
SAP	SAP	49.0	3.6	19.4	4.9	191
Adobe	ADBE	48.8	16.0	33.7	12.8	283
VMWare	VMW	45.3	25.1	18.6	5.4	62
Nvidia	NVDA	98.2	37.9	78.6	19.0	1,180
Lower Quartile		29.0	5.2	18.1	4.4	178.9
Median		47.0	11.9	19.3	6.2	300.6
Upper Quartile		68.6	39.8	24.7	8.4	1,570.0
MSFT	MSFT	34.0	11.9	23.5	11.3	2,830
Deviation from Median		-28%	0%	22%	84%	842%

Source: Bloomberg

Table 23: Multiples overview - Apple

2 P/E Ratio	
Current Share Price	\$ 175.61
EPS reported	6.16
EPS TTM	5.98 >> source: Bloomberg
Forward P/E	28.5
Trailing P/E	29.4

	pessimistic	base	optimistic	
Forward P/E	16.76	26.76	52.20	>> peer group
EPS reported	6.2	6.2	6.2	>> AAPL
Price Target	\$ 103	\$ 165	\$ 322	

3 P/B Ratio	
Current Share Price	\$ 175.61
Shares Outstanding	15,550
Total Assets	352,583
Total Liabilities	290,437
Book Value	62,146
Book Value per share	4.00
P/B ratio	43.94

	pessimistic	base	optimistic	
P/B ratio	4.15	6.77	21.30	>> peer group
Book Value per share	4.00	4.00	4.00	>> AAPL
Price Target	\$ 17	\$ 27	\$ 85	

4 EV/EBITDA Ratio	
Current Share price	\$ 175.61
Shares Outstanding	15,550
Market Cap	2,730,746
Debt	111,088
Cash & Equivalents	162,099
Enterprise Value	2,679,735 >> market cap + debt - cash
EBITDA	125,820
EV/EBITDA ratio	21.30

	pessimistic	base	optimistic	
EV/EBITDA	10.27	16.15	25.07	>> peer group
EBITDA	125,820	125,820	125,820	>> AAPL
Enterprise Value	1,292,706	2,031,460	3,154,817	
Shares Outstanding	15,550	15,550	15,550	
Price Target	\$ 83	\$ 131	\$ 203	

5 EV/Sales Ratio	
Enterprise Value	2,679,735
Total Sales 2023	383,285
EV/Sales ratio	6.99

	pessimistic	base	optimistic	
EV/Sales	2.27	5.55	11.28	>> peer group
Sales 2022	383,285	383,285	383,285	>> AAPL Sales 2023
Enterprise Value	871,827	2,128,629	4,324,878	
Shares Outstanding	15,550	15,550	15,550	
Price Target	\$ 56	\$ 137	\$ 278	

6 Multiples Average - Apple			
	Pessimistic	Base	Optimistic
Multiples average	\$ 64.8	\$ 114.9	\$ 221.9
>> excl. P/B ratio	\$ 80.8	\$ 144.1	\$ 267.5

Table 24: Football field chart – Apple

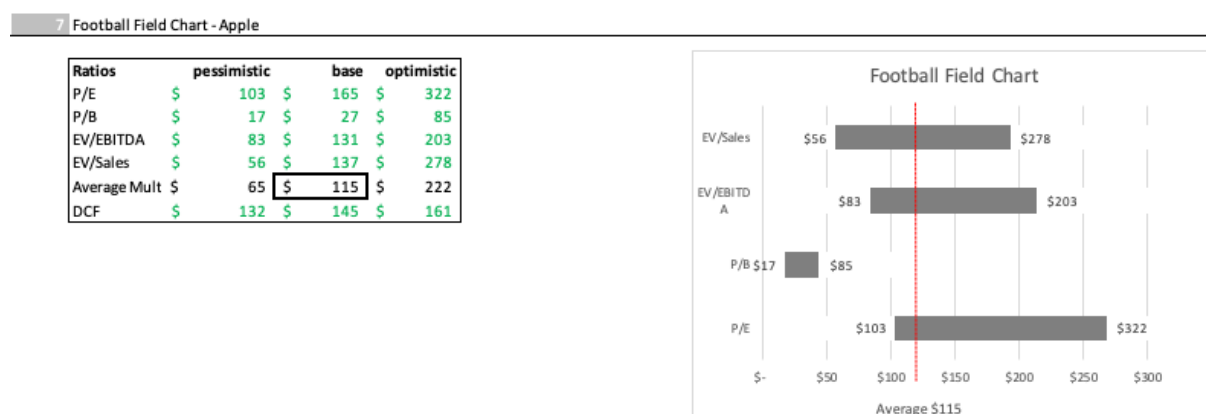


Table 25: Multiples overview – Microsoft

2 P/E Ratio	
Current Share Price	\$ 330.11
EPS reported	9.72
EPS TTM	9.78 >> source: Bloomberg
Forward P/E	33.96
Trailing P/E	33.75

	pessimistic	base	optimistic	
Forward P/E	29.03	47.04	68.56	>> peer group
EPS reported	9.72	9.72	9.72	>> MSFT
Price Target	\$ 282.15	\$ 457.25	\$ 666.41	

3 P/B Ratio	
Current Share Price	\$ 330.11
Shares Outstanding	7,432
Total Assets	411,976
Total Liabilities	205,753
Book Value	206,223
Book Value per share	27.75
P/B ratio	11.90

	pessimistic	base	optimistic	
P/B ratio	5.19	11.87	39.77	>> peer group
Book Value per	27.75	27.75	27.75	>> MSFT
Price Target	\$ 143.95	\$ 329.39	\$ 1,103.56	

4 EV/EBITDA Ratio	
Current Share price	\$ 330.11
Shares Outstanding	7,432
Market Cap	2,453,378
Total Debt	59,965
Cash & Equivalents	111,262
Enterprise Value	2,402,081 >> market cap + debt - cash
EBITDA	102,384
EV/EBITDA ratio	23.46

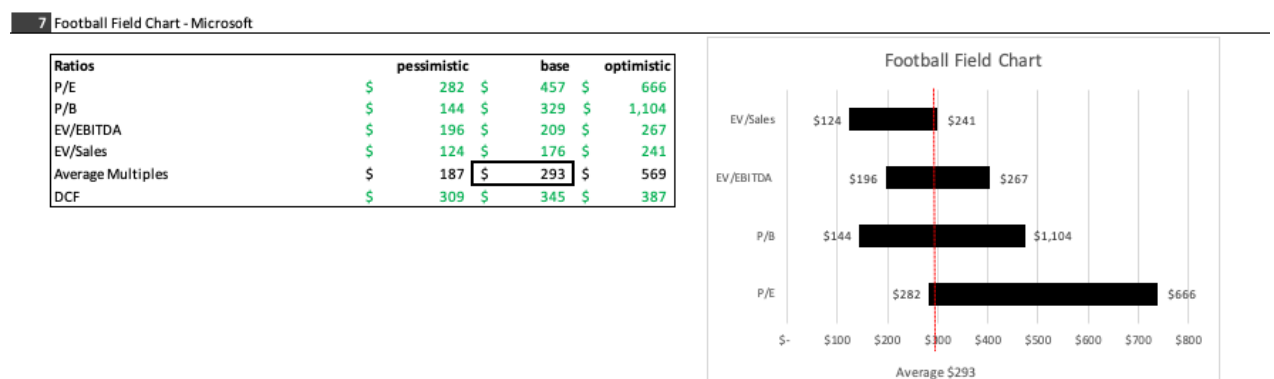
	pessimistic	base	optimistic	
EV/EBITDA	18.11	19.29	24.69	>> peer group
EBITDA	80,445	80,445	80,445	>> MSFT 15Y average EBITDA
Enterprise Valu	1,456,708	1,551,554	1,986,058	
Shares Outstan	7,432	7,432	7,432	
Price Target	\$ 196.00	\$ 208.77	\$ 267.23	

5 EV/Sales Ratio	
Enterprise Value	2,402,081
Total Sales 2023	211,915
EV/Sales ratio	11.34

	pessimistic	base	optimistic	
EV/Sales	4.37	6.16	8.44	>> peer group
Sales 2022	211,915	211,915	211,915	>> MSFT Sales 2023
Enterprise Valu	925,085	1,306,445	1,789,344	
Shares Outstan	7,432	7,432	7,432	
Price Target	\$ 124.47	\$ 175.79	\$ 240.76	

6 Multiples Average - Microsoft	
Multiples average	\$ 186.64 \$ 292.80 \$ 569.49

Table 26: Football field chart – Microsoft



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