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HARMONY IN DIVERSITY ACQUISITIONS:
UNRAVELING THE INVESTMENT TAPESTRY OF
BROADCOM INC.

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Abstract

This thesis delves into the multifaceted realm of equity research and valuation, focusing on Broadcom Inc., a multinational technological corporation with multiple business areas. The research explores into the complexities of corporate valuation, applying comprehensive methodology to evaluate Broadcom's financial position, growth trajectory, and investment attractiveness. It includes a thorough examination of the company's strengths, weaknesses, opportunities, and threats, utilizing its diverse product portfolio and strategic positioning. Furthermore, the thesis examines future possibilities, potential investment dangers, and mitigation techniques relevant to prospective investors. This study weaves innovative techniques to analyzing semiconductor and infrastructure software solutions, understanding their role in changing investment landscapes. By synthesizing multifaceted analyses, this study endeavors to reach the intrinsic value of Broadcom Inc. while offering scholarly insights and strategic guidance to stakeholders, investors, and academia.

Keywords

Corporate valuation; Technology; Software; Semiconductors

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This report is part of the Broadcom Inc. Equity research report (annexed), developed by João Ramos and Vasco Napoleão and should be read as an integral part of it.

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Introduction

The integral study thoroughly dissects and analyses Broadcom Inc.'s financial environment, offering a complete review centred on the company's financial performance, growth prospects, and strategic posture within the dynamic technology sector. Where Broadcom Inc. stands as a prominent player in the semiconductor and Software industry, renowned for its innovative technologies and expansive product portfolio.

This thesis endeavours to conduct an in-depth equity research analysis, shedding light on the intrinsic value of Broadcom Inc. through rigorous research and analysis with financial measures, market trends, and industry dynamics tools. The report is organised logically and includes parts dedicated to the company and the industry atmosphere, succeeded by financial performance measurements such as revenue analysis, profitability ratios, and cash flow dynamics. It also looks at the company's liquidity, solvency, and capital structure, providing a comprehensive picture of its financial strength. Moreover, valuation targets are built through the discounted cash flows model and Comparable Company Analysis/Relative valuation, completing our recommendations concerning Buy, Sell, or Hold positions. All combined with detailed assumptions, sensitivity analysis and future outcomes.

This provides a well-grounded assessment for potential investors, stakeholders, and financial analysts and answers questions such as, what are the key drivers influencing Broadcom Inc.'s financial performance and competitive advantage within the semiconductor industry? How do market trends and industry dynamics impact the valuation of Broadcom Inc.? What recommendations can be made based on the valuation findings for potential investors and stakeholders?

This particular individual report intends to offer a thorough picture of Broadcom Inc.'s operational and financial aspects. This study concentrates on history, business, and distribution overview, followed by historical financial analysis, the weighted average cost of capital, DCF, sensitivity and scenario analysis and final recommendations. While Vasco's part encompasses intellectual property, business strategy, shareholder structure, industry overview, forecasting assumptions and multiples valuation. These two pieces strive to give a thorough thesis explaining Broadcom Inc.'s complex character, presenting a full grasp of the company's status and its prospects for continued development and success.

This thesis holds significant implications for various stakeholders. For investors, it offers valuable insights into the potential returns and risks associated with Broadcom Inc. For financial analysts, it provides a methodological framework for conducting thorough equity research and valuation. Furthermore, the findings of this study contribute to the broader discourse on corporate valuation in the technology sector.

1. Management & Company Overview

1.1 History and Background of Broadcom Inc.

Broadcom Inc., founded in 1961 as HP Associates, was a division of Hewlett-Packard. In 1999, it became Agilent Technologies, which was later acquired by KKR and Silver Lake Partners in 2005, and Avago Technologies was founded. In 2016, Broadcom Corporation was bought by Avago Technologies, forming Broadcom Limited. In 2017, Broadcom Limited acquired Brocade Communications Systems, enhancing its position in the data center networking market. In 2018, Broadcom attempted a hostile takeover of Qualcomm for \$117 billion, but was blocked by President Trump due to national security concerns. In 2018, Broadcom relocated its legal address to Delaware and renamed itself Broadcom Inc. After the failed acquisition, Broadcom expanded into the infrastructure software market by acquiring CA Technologies for \$18.9 billion and the enterprise security business of Symantec Corporation for \$10.7 billion in cash. These two strategic acquisitions marked the beginning of Broadcom's expansion into the infrastructure software market, aligning with the growing demand for software solutions.

Broadcom's current President, CEO, and Director is Hock E. Tan, who has been in the position since March 2006. Kristen M. Spears has been CFO and CAO since December 2020, while Mark D. Brazeal has been Chief Legal and Corporate Affairs officer since December 2021. Charlie B. Kawwas has been the President of Semiconductor Solutions Group since July 2022.

1.2 Business Overview

Broadcom Inc. is a global technology leader that develops a wide range of semiconductor and infrastructure software solutions. The company has design, product, and software engineering resources in the U.S., Asia, Europe, and Israel with, as of 2022, approximately 20000 employees. Broadcom's research and development focus is on addressing niche opportunities in target markets, utilizing its extensive portfolio of patents and intellectual property to integrate multiple technologies and create system-on-chip (SoC) components (Fig.1) and software solutions, delivering high-performance and mission-critical functionality. The company's mission statement to connect all and connect everything emphasizes its commitment to innovation, quality, and customer satisfaction.

... attempt at a hostile takeover of Qualcomm ...

... expansion into the infrastructure software market ...

... Broadcom's Executive Officers ...



Figure 1: Ethernet Network adapters and switches

Source: Broadcom Inc.

... global technology leader ...



Source: (Flaningam 2023)



Source: Broadcom Inc.



Source: Broadcom Inc.

... products are sold to a network of distributors ...



Source: Broadcom Inc.

1.3 Customer, Sales and Distribution

Broadcom sells its products through direct sales teams and a carefully selected network of distributors and channel partners globally. The mix between direct and indirect sales channels is common in the industry and contributes to global exposition for most competitors like Oracle, Nvidia or Cisco (Oracle Corporation 2023; Nvidia Corporation 2023; Cisco Systems Inc. 2023). Distributors and original equipment manufacturers (OEMs) account for the majority of semiconductor sales, accounting for 56% and 53% of net revenue in fiscal years 2022 and 2021, respectively. Broadcom anticipated that aggregate sales to its top five end customers via all channels accounted for about 35% of its net revenue and that Apple Inc. is responsible

... connections with major global electronic component wholesalers ...

for 20% (Broadcom Inc 2022) during the same period. For comparison reasons, Qualcomm's revenues from Apple and Samsung each comprised 10% or more of their consolidated revenues. This aspect differs from other competitors like Nvidia or Cisco whose client base is more broad and non-dependable (Cisco Systems Inc. 2023; Nvidia Corporation 2023). Other Broadcom clients include Amazon, Samsung and Dell.

To serve customers globally, Broadcom has developed connections with major global electronic component wholesalers, supported by regional distributors with customer relationships based on their specific product lines. Just in the Asia region, there are +20 official distributors, +10 in Europe and the Middle East, and +7 in the Americas region (Broadcom Inc. 2023). All are scattered through different areas and countries, maximizing client reach (Fig.6). Broadcom's direct sales staff supports big OEM clients and has expert product and service knowledge, allowing them to market offers at crucial levels across a customer's company.

Many key client partnerships have existed for many years and are frequently the result of years of collaborative product development. Time-critical delivery of products to many locations throughout the world pushes Broadcom to establish sales offices in several countries. Primary warehouse in Malaysia and dedicated regional customer support call centres where it addresses customer issues and handles logistics and other order fulfilment requirements. Positioning well to support customers across all geographies during the design, technology transfer, and manufacturing stages.

Software customers worldwide include banks, insurance companies, government agencies, global IT service providers, telecommunication providers, transportation companies, manufacturers, technology companies, retailers, educational organizations, and healthcare institutions. Generally, it consists of large enterprises that have computing environments from multiple vendors and are highly complex. Broadcom continues to prioritize improving relationships and extending penetration with current core, mainframe-centric, and Symantec endpoint clients, as well as expanding acceptance of their enterprise software products among these customers. This enterprise-wide license model is expected to provide customers with reduced complexity, increased flexibility, and an easier renewal process, thereby driving revenue growth.

Net Revenue by Region (\$ millions)

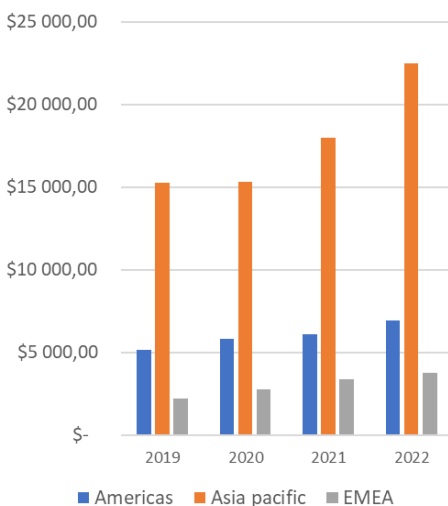


Figure 6: Broadcom's revenue by region

Source: Broadcom Inc.

... software solutions customers include ...

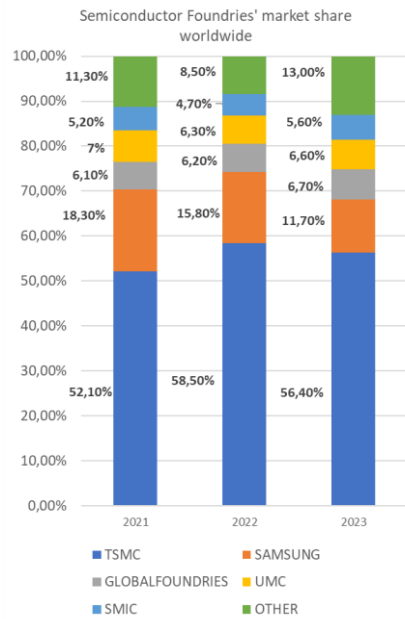


Figure 7: Foundries market share based on revenue worldwide 2021-2023

Source: Statista



Figure 8: FBAR devices

Source: Broadcom Inc.



Figure 9: Fiber Optic Modules and Components

Source: Broadcom Inc.

1.4 Manufacturing

The company focuses on maintaining an efficient global supply chain and a variable, low-cost operating model. They outsource a majority of their manufacturing operations to foundries, including front-end wafer manufacturing to external factories like TSMC and assembly and test operations to third-party manufacturers like Advanced Semiconductor Engineering, Foxconn Technology Group, Amkor Technology, and Siliconware Precision Industries Co., Ltd. The same third-party outsourcing process is followed by competitors like Nvidia, Oracle, Cisco or Qualcomm while others such as Intel use their own facilities for most products (Cisco Systems Inc. 2023; Nvidia Corporation 2023; Intel Corporation 2022; Qualcomm Inc. 2023; Oracle Corporation 2023). Corroborated by Broadcom and most competitors' governance and annual reports, we can see dependence and lack of diversity of suppliers, especially TSMC which accounts for 68% of originated global semiconductors revenue (Flaningam 2023), which can drive increased wafer prices and adversely affect the results of operations, including product gross margins (Fig.7). Broadcom uses their internal fabrication facilities for products, such as film bulk acoustic resonator (FBAR) filters for wireless communications and vertical-cavity surface and side emitting lasers-based gallium arsenide (GaAs) and indium phosphide (InP) for Fiber optic communications (Fig.8 & 9), while outsourcing commodity processes like the standard CMOS. The company's main operations are in the U.S. and Singapore, with a long history of operating in Asia, where they manufacture and source most of their products and materials. Asia is the primary region for development, foundries, and testing in the industry and, material resources for semiconductors are almost entirely obtained from there. It is common ground for big names who also take advantage of the region's resources including Nvidia, Qualcomm and Intel.

Manufacturing operations use a variety of semiconductors, electromechanical components, assemblies, and raw materials. It purchases materials from hundreds of suppliers worldwide, often on a purchase-order basis. To address supply chain disruptions, they may use techniques like redesigning products for alternative components, making incremental or lifetime purchases, or qualifying multiple sources. Their long-term relationships with suppliers allow them to proactively manage technology development and product discontinuance plans, and potentially extend lead times, limit supplies, increase prices, or cease production of necessary parts.

2. Historical Financial Analysis

2.1 Financial Statements Analysis

Income Statement

When assessing historical financial statements, we compelled our explanations with and without reformulated data. For the income statement, we integrated both the original accounting statements division and a core, non-core and financial division. The latter represents a more precise understanding of main business accounts and out-the-scope ones.

An analysis of Broadcom's historical financial statements shows consistent revenue growth, with a 5-year (2018-2022) CAGR of 9,75% and the company's net income has also grown at an astonishing 4-year CAGR of 43% in part with the company's margins improvement. We took out 2018 due to an atypical high net income result related to a big negative effective tax rate, in compliance with the 2017 tax reform act. In 2022 total net revenue reached an all-time high of \$33 billion, where the semiconductor solutions segment was the main revenue contributor, accounting for 77% and a 5-year CAGR of 6,25% (Fig.10). The infrastructure software segment has a CAGR of 32,92% which showcases Broadcom's efforts to diversify its core businesses fuelled by major segment acquisitions. The cost of revenue is very consistent in value in the sense that over the last 5 years it ranged between \$10 to \$11 billion (Fig.11) and so its margin on total revenue has been lowering from 48% in 2018 to 33,5% in 2022. The cost of products sold consists primarily of the costs for semiconductor wafers and other materials, as well as the costs of assembling and testing those products and materials. Operating expenses have been steadily decreasing its weight in total revenue since 2019 when it hit a 5-year high caused by the company's last big acquisitions of CA Technologies Inc and Symantec Enterprise Security Business. This is because the corresponding operating expense fluctuations arise mainly from amortization of acquisition-related intangible assets and restructuring, impairment, and disposal charges. The latter consists primarily of compensation costs associated with employee exit programs, alignment of global manufacturing operations, rationalizing product development program costs and facility and lease abandonments. R&D spending remains an important part of the company since investing extensively ensures products retain their technology leadership, resulting in Broadcom spending around 15% to 20% of their total net revenue each year. Interest expense remains

NET REVENUE (\$ millions)

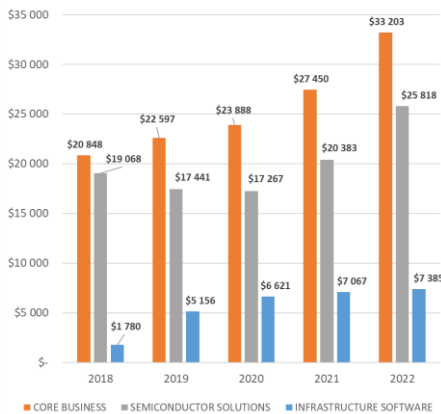


Figure 10: Total revenue segmentation 2018-2022

Source: Analyst and Broadcom Inc.

Cost of revenue vs Net revenue (\$ millions)

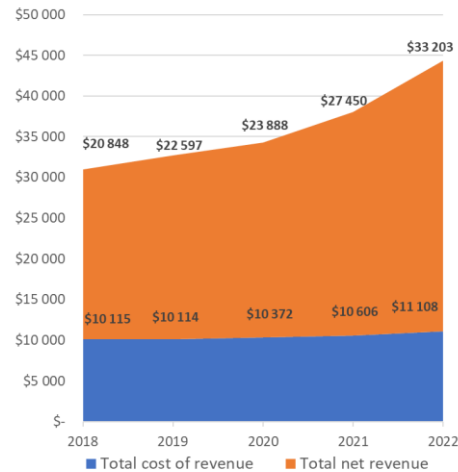


Figure 11: Total revenue and total cost of revenue comparison

Source: Analyst and Broadcom Inc.

Goodwill and Intangible assets (\$ millions)

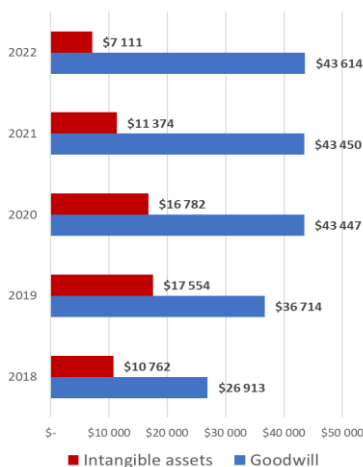


Figure 12: Broadcom's Intangible assets and goodwill 2018-2022

Source: Analyst and Broadcom Inc.

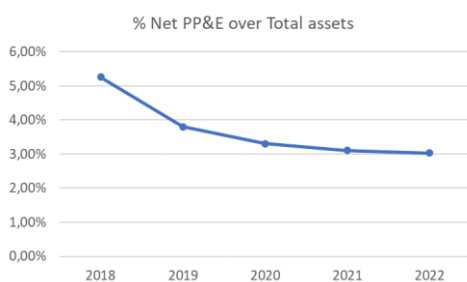


Figure 13: Broadcom's Net PP&E weight on total assets 2018-2022

Source: Analyst and Broadcom Inc.

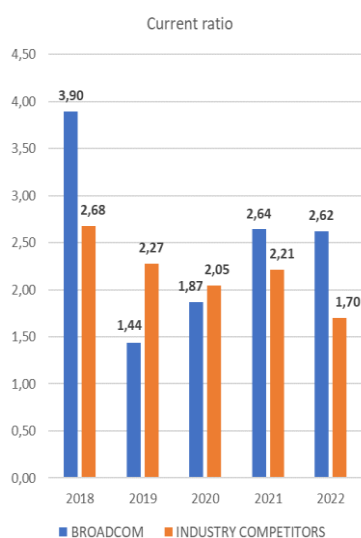


Figure 14: Current ratio comparison between Broadcom and Industry competitors

Source: Analyst estimates

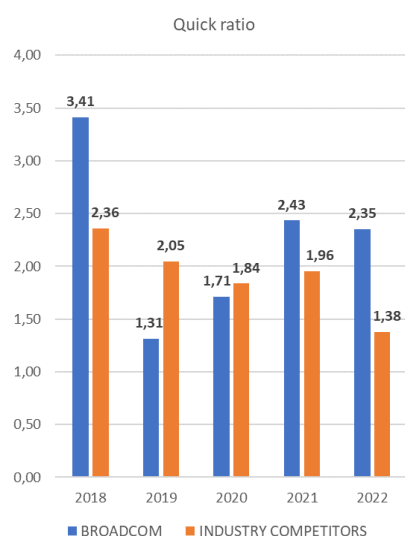


Figure 15: Quick ratio comparison between Broadcom and Industry competitors

Source: Analyst estimates

stable, minor variations were primarily due to higher or lower losses on extinguishment of debt. Overall, the company has demonstrated consistent financial performance and strong metrics growth.

Balance Sheet

Simultaneously, we compelled our explanations with and without reformed data while evaluating the balance sheet. This combines the original accounting statements as well as the invested capital, net debt and equity divisions. The latter reflects a more detailed grasp of business assets and liabilities that come from both debt and equity financing. Broadcom has a strong balance sheet, with a healthy cash balance and manageable debt-to-equity ratio. When reformulating for invested capital, Net debt and equity we can perceive more in depth the stability of the company. Main changes come from, predominantly, net debt. Increases in long-term debt arise from acquisitions-related debt while excess cash remains at a constant operating cash need of only 2,5% of total revenue. Goodwill has been the biggest value account on balance for recent years, in compliance with the company's long list of acquisitions, totalling 87% of total invested capital in 2022 (Fig.12). Intangible assets have been decreasing since 2019, the same year of the Symantec Corporation Enterprise Security Business acquisition which brought in \$5,4 billion worth of intangible assets. No new big and substantial intangible assets gross carrying amount has been added, meaning that amortization starts weighting down their net book value (Fig.12). Net PP&E ranged from \$2,2 to 2,6 billion over the last 5 years, increasing primarily from machinery and equipment (Fig.13). Overall, the company has demonstrated a solid financial position, finishing 2022 with \$22,7 billion in equity, \$50,5 billion in liabilities and about \$73,2 billion in assets.

2.2 Ratio Analysis

Liquidity

Throughout the period from 2018 to 2022, Broadcom Inc. demonstrated a nuanced command over its short-term financial commitments, emblematic of astute liquidity management. Commencing in 2018, the company manifested a robust liquidity stance with a current ratio of 3,90, underscoring its capacity to satisfy imminent obligations with the abundance of current assets. This prudence extended further with a quick ratio of 3,41 (Fig.14 & 15), affirming a judicious liquidity cushion without reliance on inventory. Over subsequent years, the organization's liquidity position was reduced by half, caused by

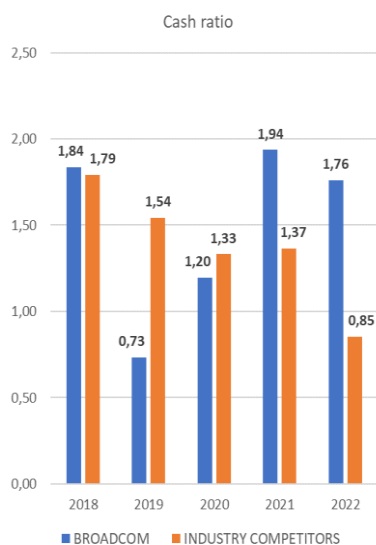


Figure 16: Cash ratio comparison between Broadcom and Industry competitors

Source: Analyst estimates

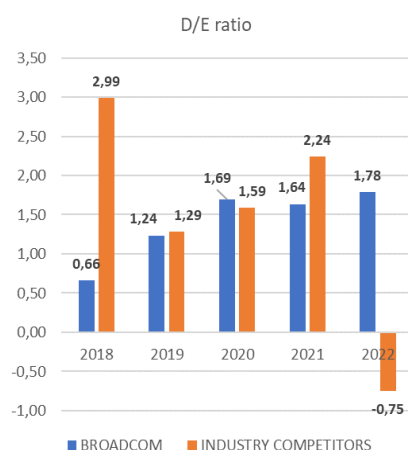


Figure 17: Debt-to-Equity ratio comparison between Broadcom and Industry competitors

Source: Analyst estimates

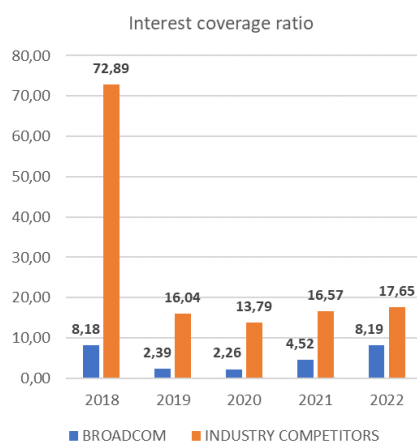


Figure 18: Interest coverage ratio comparison between Broadcom and Industry competitors

Source: Analyst estimates

more current liabilities associated with the current portion of unsecured senior notes becoming due and an increase in contract liabilities. Contract liabilities are recognized when the company receives consideration, or an amount of consideration is due from the customer and a future obligation to transfer products or services. The annus horribilis of 2020, fraught with global economic turbulence and COVID-19, bore witness to Broadcom's agile liquidity management, as reflected in holding its current ratio at 1,87 and a commensurate quick ratio of 1,71 (Fig.14 & 15). These metrics epitomized liquidity fortitude in the face of adversity that quickly increased these ratios the year after with a strong average growth of current assets of 23% for the next 3-year period, with emphasis on cash reserves growth.

Contextualizing these metrics, industry averages over the same period reveal a noteworthy performance trajectory. On average, companies within the same sector also demonstrated higher liquidity ratios in 2018, followed by a decrease until 2020 (Fig.14, 15 & 16). The cash ratio, a metric gauging the extent of Broadcom's ability to meet immediate liabilities solely with cash and cash equivalents, demonstrated a steady ascent like the other ratios, from 1,20 in 2020 to 1,76 in 2022. Higher than the industry average of 0,85 in 2022. As economic conditions convalesced in 2021 and 2022, the current ratio ascended to 2,62, embodying a fortified capacity to meet immediate financial obligations, while the quick ratio mirrored this ascent at 2,35. These trends not only substantiate Broadcom's unwavering commitment to surpassing industry liquidity benchmarks, whose values do not surpass the 2,0 marks but also serve as a resilient foundation for shrewd financial manoeuvring in an inherently dynamic tech market.

▪ Solvency & Capital Structure

A comprehensive study of Broadcom Inc.'s financial resiliency from 2018 to 2022 indicates a systematic approach to long-term financial health which is a company's capacity to satisfy its commitments when they come due. A fundamental solvency statistic, the debt-to-equity ratio, implies a balance between debt financing and shareholder equity. Broadcom claimed a conservative total debt-to-equity ratio of 0,66 in 2018, indicating a minor sensible dependence on debt for capital funding. This continued rising in succeeding years, owing to the company's rigorous debt management to handle bigger amounts of debt from acquisitions. Within industry standards, the average debt-to-equity ratio hovered around 1,47 throughout the 5 years (Fig.17) while Broadcom averaged 1,40, reaching its peak in 2022 with 1,78. Taking more advantage of debt financing to expand over competitors that

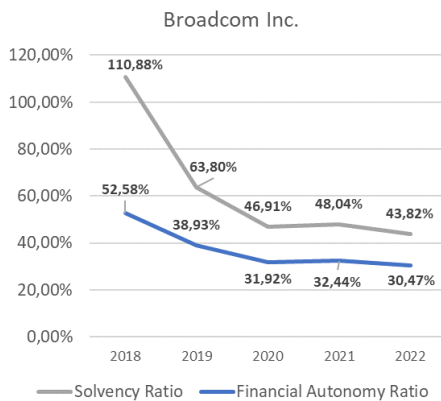


Figure 19: Broadcom's solvency and financial autonomy ratios 2018-2022

Source: Analyst estimates

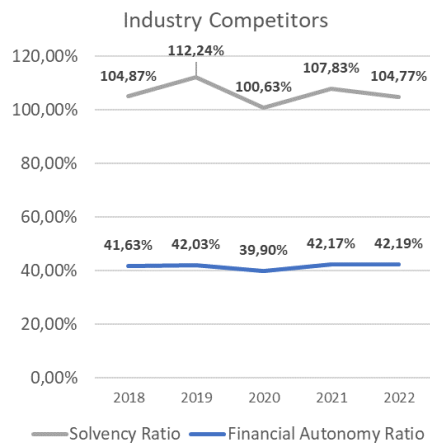


Figure 20: Competitors' solvency and financial autonomy ratios 2018-2022

Source: Analyst estimates

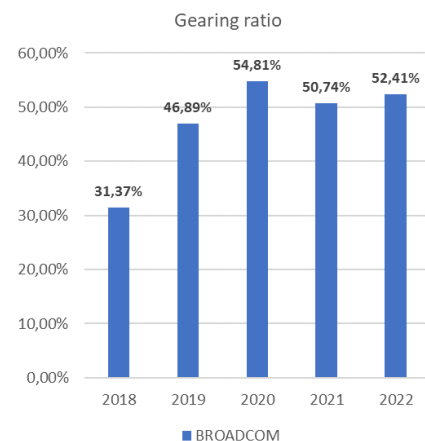


Figure 21: Broadcom's gearing ratio 2018-2022

Source: Analyst estimates

year but on average it stays inside the industry level. Another important solvency measure, the interest coverage ratio, reveals Broadcom's strong capacity to discharge its interest commitments. The firm had an interest coverage ratio of 8,17 in 2018, indicating a good margin of safety. This ratio fluctuated somewhat over the years, peaking at 8,19 in 2022, confirming Broadcom's well-off financial stability in servicing its debt payments. During the same period, industry peers had an even higher interest coverage ratio of 17,65, indicating very good positioning with double the security margin over Broadcom (Fig.18).

In terms of the financial autonomy ratio, which specifies the proportion of total assets that are backed by equity, it consistently declined. It underscores Broadcom's dependence towards its creditors. Equity dipped and assets went up in value mostly from the acquisition's goodwill which was financed through debt. These increasing liabilities meant higher financial risk against potential financial distress and a heightened capacity to meet long-term obligations. Broadcom's strategic focus on maintaining its interest coverage high not only instils confidence in investors but also bolsters the company's capacity to manage debt in economic fluctuations and pursue growth initiatives with vigour. Furthermore, a review of the solvency ratio, which reveals the amount of equity over total liabilities, demonstrated again Broadcom's dependence on creditors with a 2022 value of 43%, the lowest from the 2018-22 period (Fig.19). The corporation maintained the liabilities weight typically higher than rivals in the industry. Competitors demonstrate that despite having some obligations towards creditors, about 42% in 2022, for their assets, they present, in total, a much higher equity value over liabilities (Fig.20). This could imply that Broadcom may be using too much debt to finance its operations than through equity, if not for most liabilities' origin in acquisition-related debt. In summary, Broadcom Inc. showcases a robust financial foundation. The company's dedication to a balanced capital structure, characterized by a significant reliance on debt financing, positions it unfavourably in terms of long-term financial stability. However, this approach is safeguarded by Broadcom's capacity to navigate dynamic market conditions with safe margins over its interest-paying responsibilities and also by its liquidity. Looking at the gearing ratio, a measure of how much invested capital operations are funded using net debt, we can then see Broadcom only uses half (52%) of debt to run the business (Fig.21). The CEO even acknowledged in different occasions and press conferences, namely during the attempt to acquire Qualcomm, that one of the company's ideals is to quickly repay its debt.

Holding period

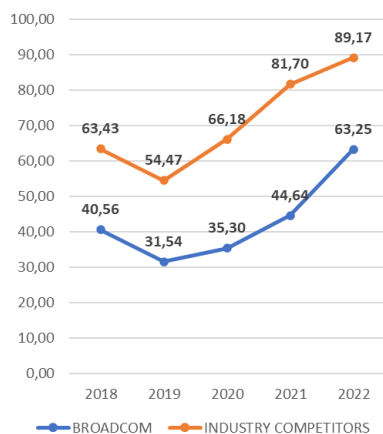


Figure 22: Holding period comparison between Broadcom and industry competitors.

Source: Analyst and Broadcom Inc.

Collection period

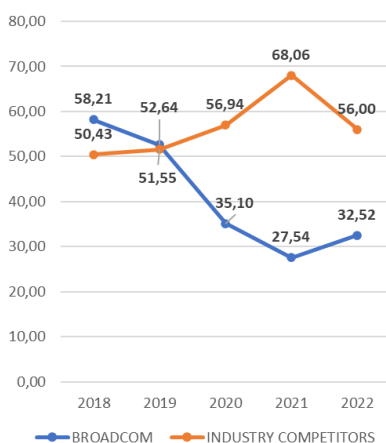


Figure 23: Collection period comparison between Broadcom and industry competitors.

Source: Analyst and Broadcom Inc.

Payment period

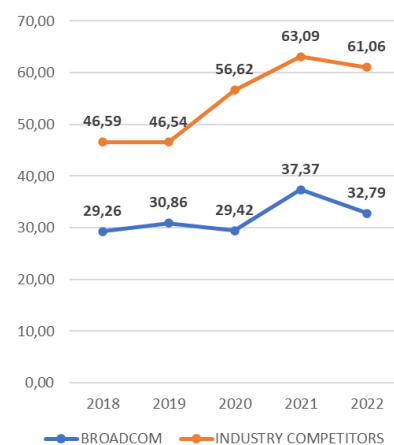


Figure 24: Payment period comparison between Broadcom and industry competitors.

Source: Analyst and Broadcom Inc.

■ Cash flow management

The cash conversion cycle (CCC), a comprehensive measure of cash management efficiency, captures the time between cash expenditures for inventories and cash inflows from their sales. Broadcom demonstrated a CCC of 70 days in 2018, demonstrating agility in working capital management and within the 67-day level that took its competitors on average. This efficiency increased further, ending in an astounding 63 days by 2022 demonstrating the company's ability to optimize cash flows (Fig.25). In comparison, industry competitors faced a significantly higher average CCC of 84 days during the same period, highlighting Broadcom's superior cash flow management methods (Fig.25). Over the last 5 years, Broadcom was better or at par with its industry competitors in 2 aspects of the CCC, holding and collection periods. However, the payment period has always been below average, not signalling a bad indicator since it is a company policy to pay its supplies early and rapidly. Last fiscal year of 2022 the values were, respectively, 63, 33 and 33 days for holding, collection and payment periods (Fig.22, 23 & 24). While the industry average values were, respectively, 89, 56 and 61 days. This means the company is more effective at quickly converting its inventory into cash and this can indicate a relative operational advantage especially when establishing agreements regarding payment with clients. In essence, Broadcom's cash flow management exhibited a strategic balance between operational efficiency and prudent capital allocation.

■ Profitability

Broadcom's Gross Profit Margin, a measure of operational efficiency, has been consistently strong, starting at 51,48% and in a continuous uptrend to 66,55% in 2022 (Fig.26). This demonstrates a wise approach to pricing tactics and cost control, both of which have been critical in maintaining profitability levels as revenue grows and the cost of revenue keeps going down. Notably, this statistic routinely surpassed industry benchmarks, which averaged 62,91%. Furthermore, the Operating Profit Margin, a vital indicator of profitability after operating expenditures, increased. It gradually increased from 2019, where it fell almost 10 percentage points to 15,24%, to 42,84% in 2022 (Fig.27). This demonstrates Broadcom's ability to reduce operating expenses weight, which remained rather constant while revenues rose, which eventually contributed to increased profitability. These numbers outperformed the industry in 2022, with only 18,5% (Fig.27). Likewise, the Net Profit Margin, which reflects profit retention after all costs and taxes, was strong, averaging

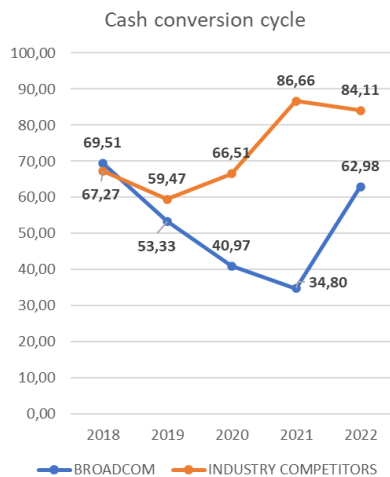


Figure 25: CCC comparison between Broadcom and industry competitors.

Source: Analyst and Broadcom Inc.

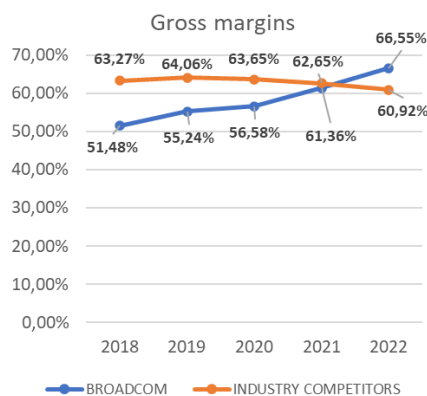


Figure 26: Gross profit margin comparison between Broadcom and industry competitors

Source: Analyst and Broadcom Inc.

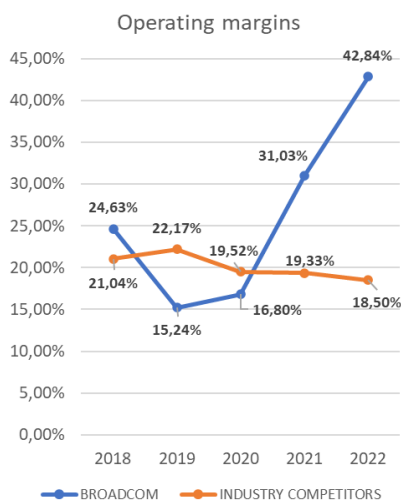


Figure 27: Operating profit margin comparison between Broadcom and industry competitors

Source: Analyst and Broadcom Inc.

29% with an upsurge since 2019 after the abnormal result in 2018. This consistent profitability demonstrates the company's strong ability to create returns, even when market dynamics become difficult to manage, much above the industry last 5 years norm of 17,76% (Fig.28). These data, which constantly outperform industry standards, illustrate Broadcom's excellent operational efficiency, allowing it to position itself advantageously within the sector. This consistent financial performance reflects a well-balanced and strategic financial management strategy, which is a characteristic of Broadcom's financial stability and development potential.

■ Returns

The Returns Analysis illuminates Broadcom Inc.'s ability to generate returns for its stakeholders by evaluating the key return indicator, Return on Invested Capital (ROIC). As previously explained Broadcom has a big focus and strategic planning towards acquisitions to diversify and grow its business. As such, our ROIC analysis gathers both with and without goodwill returns to evaluate such impact on the company. With goodwill, Broadcom's total ROIC showed a noteworthy uptrend pattern from 2020 to 2022. Beginning with 8% and ending with 24,6%, the corporation demonstrated a constant capacity to use its capital efficiently, encompassing both equity and debt, to create returns. Broadcom's core business operational margin, a key component of core ROIC, in 2019 was 18,24% and continued to improve, culminating at 38,06% in 2022 (Fig.29). Impressive growth is also backed by notable efficiency in utilizing its assets to generate revenue with an asset turnover of 59% in 2022. The main driver behind this core business component return growth was how much the revenue outgrew almost all costs, as these have been gradually decreasing their weight on net revenue and dictates how much assets are needed to sustain such revenue growth (Fig.31). The one aspect bringing total ROIC down was the non-core business part that showcased a negative ROIC, starting well at 9,44% in 2019 and -9,43% in 2022 (Fig.31). Despite this, non-core business does not set a bad return with economic meaning since its results are considered secondary. Without goodwill and looking at pure organic growth we can claim a much bigger total ROIC due to a higher core business ROIC and a significantly lower invested capital, whose asset turnover increases exponentially and operational margin remains the same (Fig.30). From 134% in 2019 to 270% in 2022, establishing the total ROIC of 2022 at 142% (Fig.32). This sustained improvement in both pure and with goodwill ROIC signifies Broadcom's adeptness in balancing

profitability with asset utilization, a crucial aspect of its sustainable financial performance.

3. Valuation

3.1 Weighted Average Cost of Capital (WACC)

Broadcom works in a highly competitive market with significant technical breakthroughs, therefore, understanding its cost of capital serves as a standard for assessing possible investments and initiatives, assisting management in making value-adding decisions. The Weighted Average Cost of Capital (WACC) represents the risk faced and indicates the average rate of return required to satisfy its creditors, shareholders, and other capital suppliers. This is the discount rate to which we discounted our projected free cash flows to the present because WACC base discount models work best, and estimate a more accurate price target, for companies like Broadcom which have an ideal capital structure (Koller, Goedhart, and Wessels 2020a). By using the same rate to discount all future cash flows it is assumed that the company's capital structure is to be kept constant. The WACC is calculated using three key components: the cost of equity, the after-tax cost of debt, and the ratio of equity to debt in the company's target capital structure. The market value of equity is employed and for the market value of debt, we used its book value as a proxy. The equity market value was calculated by multiplying the share price by the number of outstanding shares and because most of the bond prices traded are relatively steady and considered "stale", the book value of debt was viewed as a solid proxy for market value.

The cost of equity was calculated using the Capital Asset Pricing Model (CAPM) which establishes a relationship between the expected return of an asset given its risk and the return on risk-free assets. In simpler terms, determining if an investment provides a reasonable return for the degree of risk. As of November 14th, 2023, the yield on a 10-year U.S. government T-note bond, considered a proxy for the risk-free rate, stood at 4,49%(FRED 2023). The equity risk premium (ERP), the difference between expected market return and the risk-free rate, required by us, given the economic conditions and historical data, is 4,87% derived from the findings by Aswath Damodaran (Damodaran 2023). Historical returns are utilized in the conventional approach to determining the equity risk premium, with the difference in annual returns on stocks versus bonds over a long period comprising the predicted risk premium. The value of 4,87% that we choose is

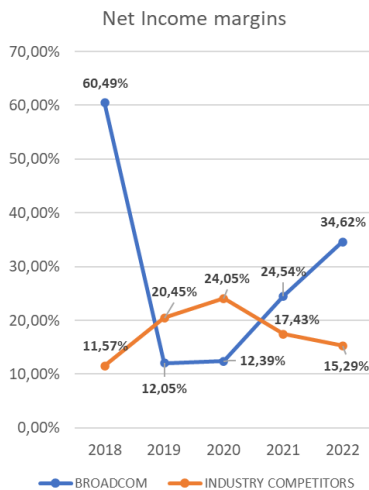


Figure 28: Net profit margin comparison between Broadcom and industry competitors

Source: Analyst and Broadcom Inc.

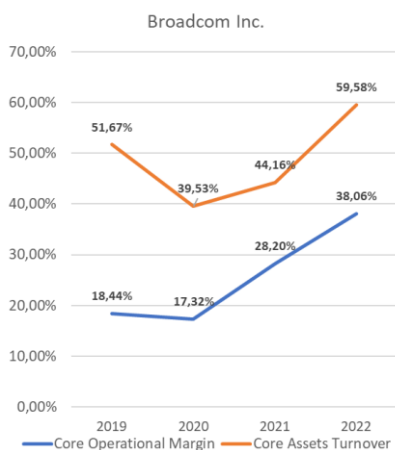


Figure 29: Core ROIC margins including goodwill (1-year lag)

Source: Analyst estimates

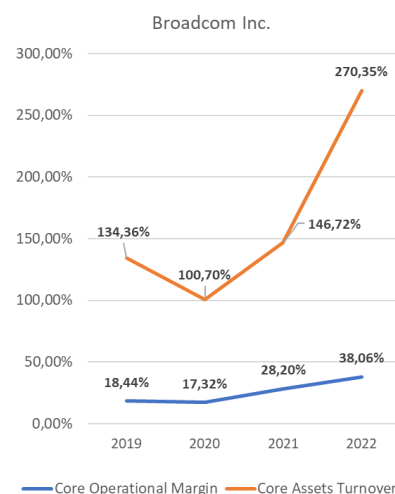


Figure 30: Core ROIC margins without goodwill (1-year lag)

Source: Analyst estimates

Broadcom Inc.

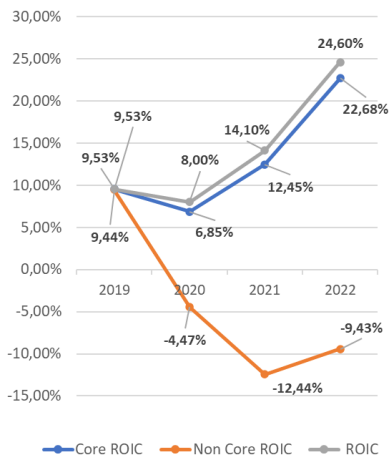


Figure 31: ROIC analysis including goodwill (1-year lag)

Source: Analyst estimates

Broadcom Inc.

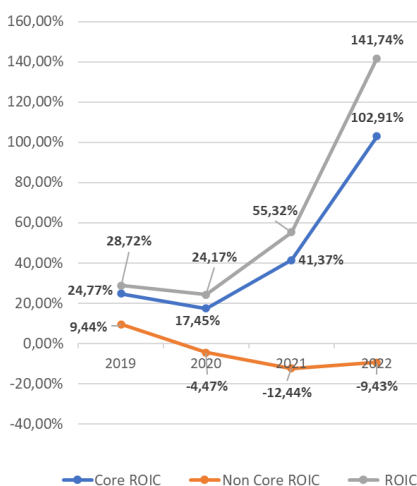


Figure 32: ROIC analysis without goodwill (1-year lag)

Source: Analyst estimates

Implied ERP



Figure 33: Historical Implied ERP (1961-2022)

Source: Aswath Damodaran

the average ERP from the year 2000 to 2022, in consideration of the uncertain economic conditions being faced that place the premium almost at 6% in 2023 we did not consider this value (Fig.33). To adjust the ERP for Industry/Company risk, we did a regression analysis based on historical stock price movements against the market portfolio, Standard&Poor 500 for the U.S., to get the levered equity beta (β). The measurement period for the regressions includes 60 data points, five years of monthly returns. We regressed against Broadcom itself and its industry competitors individually (Fig.34). Broadcom's beta was estimated at 1,13 and the median value for all competitors was 1,02. Afterwards, we unlevered each, based on their respective debt-to-equity ratio and statutory tax rate, to feasibly compare each accounting for the different capital structures involved. Broadcom's unlevered beta is 1,05 which aligns with the competitor median and indicates a near-correlated level of sensitivity to market fluctuations. By levering again this beta with Broadcom's target capital structure of 15% debt and 85% equity, captured by the competitor's average debt-to-equity ratio of 15% and also by Broadcom's market-valued structure for past years, we obtain a beta of 1,13 and a cost of equity of 10% (Fig.34 & 35).

The cost of debt relies on Broadcom's existing investment grade bonds, with a credit rating of BBB (Fitch Ratings 2023), with an average yield to maturity (YTM) of 6,25%. This incorporates both the risk-free rate and a premium for lending to Broadcom compared to a risk-free investment (ICE Data Indices, FRED, and Bank Of America 2023). Adapting for the 21% tax rate we get an after-tax cost of debt of 4,94% (Fig.35). For companies with investment-grade debt (rated at BBB or better), the probability of default is so low that we believe this inconsistency is immaterial and therefore implies YTM is the best method, especially when compared with the estimation error surrounding the cost of equity. Additionally, if bond prices are "stale" its use will lead to an outdated YTM. Likewise, the cost of debt is rarely estimated in practice with the CAPM because infrequent trading makes the estimation of beta impossible (Koller, Goedhart, and Wessels 2020b).

To finalize, we adjust the cost of debt and equity to their respective weights on the target capital structure and get a WACC of 9,24% (Fig.35).

3.2 Discounted Cash Flows Model

The Discounted cash flow is a valuation method based on expected future cash flows forecasted according to our chosen drivers/assumptions mentioned before and discounted with the calculated WACC to our year zero,

Company	Levered Beta	Debt/Equity	Unlevered Beta
QUALCOMM	1,225	10,82%	1,13
INTEL	0,898	29,52%	0,73
CISCO	0,963	3,52%	0,94
IBM	0,764	42,63%	0,57
SERVICE NOW	1,006	1,69%	0,99
ORACLE	1,022	28,08%	0,84
MARVELL TECHNOLOGIES	1,401	8,53%	1,31
ANALOG DEVICES	1,150	7,83%	1,08
NVIDIA	1,687	0,94%	1,67
Median	1,02	9%	0,99
Average	1,12	15%	1,03

Figure 34: Industry peers' levered beta, D/E ratio and final unlevered betas

Source: Analyst estimates

BROADCOM	
Target Capital Structure	
Debt to Total Capitalization	15,00%
Equity to Total Capitalization	85,00%
Debt / Equity	17,65%
Cost of Equity CAPM Calculation	
Risk Free Rate	4,49%
Equity Risk Premium	4,87%
Levered Beta	1,13
Cost of Equity	10,00%
Cost of Debt Calculation	
Bond rating	BBB-
Rating default premium	1,76%
Cost of debt	6,25%
Tax Rate	21,00%
After-Tax Cost of Debt	4,94%
WACC	9,24%

Figure 35: Broadcom WACC calculations

Source: Analyst estimates

Valuation	
Core Business DCF	\$ 257 016,44
Core Business Discounted Terminal Value	\$ 348 546,30
Value of Core Business	\$ 605 562,74
Value of Non-Core Business	\$ -4 007,89
Enterprise Value	\$ 601 554,85
Value of Net Debt	\$ 40 991,93
Equity Value	\$ 560 562,92
per share	\$ 1 312,79
Market Capitalization (14th november)	\$ 401 830,00
per share	\$ 941,05
# of shares outstanding (millions)	427
Difference (Upside)	39,50%
annual dividend declared	\$ 21,00
Total shareholder return (Traditional method)	41,73%
Total shareholder return (Enhanced method)	45,24%

Figure 36: Broadcom's Valuation Summary

Source: Analyst estimates

2024. The final perpetual cash flow, the continuing or terminal value, is based on the growth rate and the return on new invested capital (RONIC).

Using the WACC of 9,24% and the model's growth rate of 3,76%, equivalent to the core Free cash flow growth rate in the last forecasted year, and a RONIC of 369%, the core free cash flow terminal value in 2035 is \$921,378 billion. The RONIC big value is explained by how the infrastructure software segment will grow to almost being the majority revenue earner without needing as much invested capital. This segment operates mostly on a software service/subscription base which, rationally, does not necessitate a big amount of capital, or assets, to produce results. Consequently, the company's overall return (NOPAT) variation is unproportionally bigger each year than the change in invested capital, causing the RONIC to be so high.

Following that, we arrived at a total discounted core value of \$605,562 billion. non-core captions were assessed at 2024 book value and added. The final enterprise value is then \$601,554 billion. Adding the 2024 Net financial Debt (\$-40,991 billion), we get Broadcom's equity value of \$560,562 billion. With a steady number of outstanding shares of 427 million, an anticipated price of \$1312,79 per share was attained for 2024 (Fig.36).

This price target falls within other analysts' estimates of a \$800-\$1400 interval, whose valuations have been getting an upward revision due to a lower probability of economic downturn than expected.

3.3 Sensitivity and Scenario Analysis

Initially, we performed a sensitivity analysis on the WACC, by changing the values of the Equity Risk Premium (ERP) and of the levered Beta, by +/- 0,5% and +/- 0,05, respectively. By doing so, we arrived at a minimum WACC value of 7,95% and a maximum value of 10,70%. Furthermore, we utilized those WACC values combined with the growth rate to analyse the price target sensitivity to these changing variables. As seen in the (Fig.37), the growth rate values have a 0,5% variation from each value starting in our estimated rate. A different and specific value that we wanted to use, 3,74%, is the annual expected GDP growth rate worldwide. The analysis demonstrates a max and minimum range of \$954 to \$2132, and we conclude that current economic conditions, with high-interest rates to fight inflation, have increased the cost of capital mainly from a higher risk-free rate perspective. A "normal" cost of capital would be around 7% to 8% and the price target could reach the \$1500 level. Nevertheless, for now, a fair price target distribution interval is \$1118 to \$1511 (Fig.38).

	BETA				
	1,03	1,08	1,13	1,18	1,23
Err	3,87%	7,95%	8,11%	8,28%	8,44%
	4,37%	8,39%	8,57%	8,76%	8,94%
	4,87%	8,83%	9,03%	9,24%	9,45%
	5,37%	9,26%	9,49%	9,72%	9,95%
	5,87%	9,70%	9,95%	10,20%	10,45%

Figure 37: Sensitivity Analysis on the WACC

Source: Analyst estimates

The following scenario analysis (Fig.39) provides a detailed view of Broadcom Inc.'s future trajectories, examining potential business outcomes under different market situations and operational environments. The analysis uses a realistic baseline with our previously defined assumptions. It offers quantitative insights into key factors like revenue growth, R&D investment, margins, and operational expenditures, providing stakeholders and investors with a nuanced understanding of potential trajectories and their implications for Broadcom Inc.'s strategic decision-making in the tech industry.

Optimistic Scenario: Revenue Growth is expected at 12% annually until steady state due to successful product launches, increased market share in high-growth sectors like 5G infrastructure and expanded virtualization solutions. R&D Investment increased by 20% from baseline to 24% of revenue annually to support innovation, product diversification, and technological advancements. Resulting in gross Margin improvement of 5% (500 basis points over baseline) due to operational efficiencies, optimized cost structures, and higher-margin product sales. Additionally, the core result before taxes margin increased by 7% over baseline through streamlined operations, improved productivity, and efficient supply chain management. Resulting in a price target of \$1410,60 (Fig.39).

Pessimistic Scenario: Revenue slower growth at 5%, until steady state, annually due to increased competition, economic downturns, or market saturation in key segments. Reduced R&D spending by 15% to 17% of revenue to counter cost pressures and challenging market conditions. Gross Margin contracted by 600 basis points from baseline due to pricing pressures, increased operating costs, and margin compression in competitive markets. Operating expenses increased, reducing core operational margin by 600 basis points due to supply chain disruptions, higher labour costs, or regulatory compliance challenges. Results in a share price of \$955,65.

	WACC				
	7,95%	8,57%	9,24%	9,95%	10,70%
GROWTH RATE	\$ 1 312,79	\$ 1 565,76	\$ 1 374,28	\$ 1 212,00	\$ 1 073,55
	\$ 1 678,81	\$ 1 456,90	\$ 1 272,94	\$ 1 118,87	\$ 988,61
	\$ 1 755,59	\$ 1 511,86	\$ 1 312,79	\$ 1 148,08	\$ 1 010,22
	\$ 1 918,40	\$ 1 625,45	\$ 1 393,46	\$ 1 206,20	\$ 1 052,61
	\$ 2 132,20	\$ 1 768,81	\$ 1 492,12	\$ 1 275,52	\$ 1 102,14

Figure 38: Sensitivity Analysis on the Share Price

Source: Analyst estimates

Pessimistic scenario		Price target
Revenue growth	5%/year until 2030	-> \$ 955,65
Gross margin	-6% reduced from baseline	
R&D	17% of revenue	
Core result before taxes margin	-6% reduced from baseline	
Optimistic scenario		Price target
Revenue growth	12%/year until 2030	-> \$ 1 410,60
Gross margin	+5% added from baseline	
R&D	24% of revenue	
Core result before taxes margin	+7% added from baseline	

Figure 39: Scenario Analysis on price target

Source: Analyst estimates

4. Investment recommendations

4.1 Buy, Sell or Hold recommendation

Based on the comprehensive equity research and valuation performed on Broadcom Inc., as well as the expected price target analysis, potential investors should strongly consider a "Buy" position. Our valuation provides a bullish prognosis for Broadcom's future. When compared to the market price of November 14th (\$941), intrinsic value generated from our study implies a significant potential upside of 39,5%. When considering transactions with

shareholders, declared 2024 annual dividends of \$21, the total return would be 41,73% but if we use the full 2024 spectrum of all types of transactions it would be 45,24% (Fig.36). This "Buy" recommendation intends to advise investors seeking long-term value and development potential in their investment selections, based on the company's strong financial performance, innovative skills, and predicted market expansion.

4.2 Future Prospects

Broadcom Inc. exhibits promising prospects driven by several factors. The company's diverse product portfolio, spanning semiconductor and infrastructure software solutions, positions it strategically for the digital transformation age. The continuous progress of telecommunications technologies, enterprise software, data storage and management, security software, automation and, significantly, artificial intelligence provide significant growth opportunities for Broadcom, given its vital position in delivering critical components for these breakthroughs. On top of that, strategic acquisitions like the pending VMware one, and alliances like Broadcom's plan to invest in a European Union (EU) funded chip programme in Spain, part of the EU's semiconductor strategy to boost its own chip industry and reduce reliance on U.S. and Asian suppliers (Reuters 2023), have strengthened Broadcom's worldwide authority. Providing opportunities for increased market share and revenue streams, especially in the virtualization sector. Based on our projections, infrastructure software could account for 50% of total revenue in the future, balancing business risk aligned with bigger semiconductors competition. Broadcom's experience in connectivity solutions and semiconductor advancements matches with rising trends as digitalization becomes increasingly common. Its importance in a changing technological world is further cemented by rising demand for high-performance computing, data storage, and networking solutions.

Ultimately, we believe that one of the most important aspects of Broadcom's attractiveness to investors is its positioning in multiple technology divisions. The healthy way Broadcom has been conducting its operations and finances coupled with all the diverse strategic acquisitions points to a consolidation in several markets and various cash-making branches. Allowing the company to eliminate some systematic risks and anticipate a strong increase in revenue and earnings per share. Highlighting Broadcom's excellent future performance trajectory but also strong economic growth following recent turmoil over COVID-19 and worldwide inflationary events.

Deflationary measures making the desired impact...

...more optimistic horizon towards growth.

Is AI fully priced in?

... can new AI technology solutions bring the industry to unimageable highs?

5. References

- Broadcom Inc. 2022. "2022 Annual Report on Form 10-K."
- Broadcom Inc. 2023. "Find a Partner or Distributor." 2023. <https://www.broadcom.com/how-to-buy/partner-distributor-lookup>.
- Cisco Systems Inc. 2023. "2023 Annual 10-k Report."
- Damodaran, Aswath. 2023. "Equity Risk Premiums (ERP): Determinants, Estimation and Implications - The 2023 Edition." *SSRN Electronic Journal*, March. <https://doi.org/10.2139/SSRN.4398884>.
- Fitch Ratings. 2023. "Broadcom Inc. Credit Ratings :: Fitch Ratings." 2023. <https://www.fitchratings.com/entity/broadcom-inc-96473152>.
- Flaningham, Eric. 2023. "An Overview of the Semiconductor Industry - A Primer on the Various Market Segments & Market Leaders across the Industry." <https://www.aitechinvesting.com/p/an-overview-of-the-semiconductor>.
- FRED. 2023. "Market Yield on U.S. Treasury Securities at 10-Year Constant Maturity, Quoted on an Investment Basis." 2023. <https://fred.stlouisfed.org/series/DGS10/>.
- ICE Data Indices, LLC, Federal Reserve Bank of St. Louis FRED, and Bank Of America. 2023. "ICE BofA BBB US Corporate Index Effective Yield." 2023. <https://fred.stlouisfed.org/series/BAMLC0A4CBBBEY/>.
- Intel Corporation. 2022. "2022 Annual 10-k Report."
- Koller, Tim, Marc Goedhart, and David Wessels. 2020a. *Valuating: Measuring and Managing the Value of Companies 7th Edition*. Mckinsey & Company Inc.
- . 2020b. *Valuating: Measuring and Managing the Value of Companies 7th Edition*. Mckinsey & Company Inc.
- Nvidia Corporation. 2023. "2023 Annual 10-k Report."
- Oracle Corporation. 2023. "2023 Annual 10-k Report."
- Qualcomm Inc. 2023. "2023 Annual 10-k Report."
- Reuters. 2023. "Broadcom to Invest in a \$1 Billion EU-Funded Chip Programme in Spain." 2023.

BROADCOM INC.

TECHNOLOGY & TELECOMMUNICATIONS

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COMPANY REPORT

15 DECEMBER 2023

Broadcom Inc. Equity Research Report

Harmony in diversity acquisitions: Unravelling the investment tapestry of Broadcom Inc.

- Broadcom exhibited a robust **10% year-over-year revenue growth** and is expected to generate **\$55 billion in total revenue in FY2024**. In the same year semiconductor solutions are expected to start throttling their growth to 20%, generating around \$30 billion, while finally achieving a balance between supply and demand, whose problems started in 2020 with COVID-19 and further with regulatory and trade tensions.
- VMware's acquisition builds heavy momentum and improved margins in the infrastructure software segment. Leading different and newer sectors with immense growth potential that will **propel segment revenue by 176% in 2024 and an estimated total market share of 2,13% for Broadcom**. Revenue forecasts indicate a future trajectory where this segment will surpass semiconductor solutions.
- Historical growing results and strong balance accompanied by cost-cutting measures and profitability improvement throughout the years give Broadcom financial health. **Good liquidity, firm solvency and effective cash management compared to peers but slightly more debt usage than competitors, mainly from acquisitions.**
- The drivers behind Broadcom's continuous growth are its diversified portfolio, commitment to technological advancement, operational excellence and cost management, strategic acquisitions, established market leadership in key segments like wireless communication chips and ability to anticipate market needs and adapt.

Company description

Broadcom Inc., founded in 1961 as a semiconductor developer, has become a global technology leader specializing in semiconductor and infrastructure software solutions. The company's portfolio includes networking, broadband, storage, and industrial sectors. Emphasizing innovation in wireless technology, data, enterprise storage, and cybersecurity, known for its strong R&D investments and market-leading inventions playing an important role worldwide.

Recommendation: **BUY**

Vs Previous Recommendation -

Price Target FY24: **1312,79 \$**

Vs Previous Price Target -

Price (as of 5-Feb-24) **1129,74 \$**

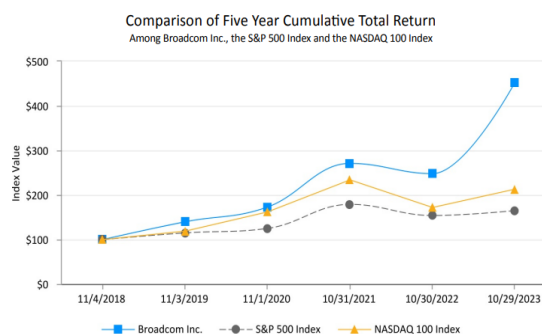
Bloomberg: AVGO:US

52-week range (\$) 540,92-1149,88

Market Cap (\$m) 528 878

Outstanding Shares (m) 427

Source: Bloomberg, Yahoo Finance



Source: Broadcom Inc.

(Values in \$ millions)	2022A	2023E	2024F
Revenues	33 203	37 177	58 088
%growth	21%	12%	56%
Adjusted EBITDA	18 828	22 874	34 390
%margin	57%	62%	59%
Comprehensive Income	11 291	15 103	22 884
%margin	34%	41%	39%
Invested capital	50 068	49 953	64 819
ROIC	23%	30%	43%

Source: Broadcom Inc. and analyst estimates

THIS REPORT WAS PREPARED EXCLUSIVELY FOR ACADEMIC PURPOSES BY JOÃO RAMOS & VASCO NAPOLEÃO, MASTER IN FINANCE STUDENTS OF THE NOVA SCHOOL OF BUSINESS AND ECONOMICS. THE REPORT WAS SUPERVISED BY A NOVA SBE FACULTY MEMBER, ACTING IN A MERE ACADEMIC CAPACITY, WHO REVIEWED THE VALUATION METHODOLOGY AND THE FINANCIAL MODEL. (PLEASE REFER TO THE DISCLOSURES AND DISCLAIMERS AT END OF THE DOCUMENT)

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1. Management & Company Overview

1.1 History and Background of Broadcom Inc.

Broadcom Inc., founded in 1961 as HP Associates, was a division of Hewlett-Packard. In 1999, it became Agilent Technologies, which was later acquired by KKR and Silver Lake Partners in 2005, and Avago Technologies was founded. In 2016, Broadcom Corporation was bought by Avago Technologies, forming Broadcom Limited. In 2017, Broadcom Limited acquired Brocade Communications Systems, enhancing its position in the data centre networking market. In 2018, Broadcom attempted a hostile takeover of Qualcomm for \$117 billion but was blocked by President Trump due to national security concerns. In 2018, Broadcom relocated its legal address to Delaware and renamed itself Broadcom Inc. After the failed acquisition, Broadcom expanded into the infrastructure software market by acquiring CA Technologies for \$18.9 billion and the enterprise security business of Symantec Corporation for \$10.7 billion in cash. These two strategic acquisitions marked the beginning of Broadcom's expansion into the infrastructure software market, aligning with the growing demand for software solutions.

Broadcom's current President, CEO, and Director is Hock E. Tan, who has been in the position since March 2006. Kristen M. Spears has been CFO and CAO since December 2020, while Mark D. Brazeal has been Chief Legal and Corporate Affairs officer since December 2021. Charlie B. Kawwas has been the President of Semiconductor Solutions Group since July 2022.

1.2 Business Overview

Broadcom Inc. is a global technology leader that develops a wide range of semiconductor and infrastructure software solutions. The company has design, product, and software engineering resources in the U.S., Asia, Europe, and Israel with, as of 2022, approximately 20000 employees. Broadcom's research and development focus is on addressing niche opportunities in target markets, utilizing its extensive portfolio of patents and intellectual property to integrate multiple technologies and create system-on-chip (SoC) components (Fig.1) and software solutions, delivering high-performance and mission-critical functionality. The company's mission statement to connect all and connect everything emphasizes its commitment to innovation, quality, and customer satisfaction.

... attempt at a hostile takeover of Qualcomm ...

... expansion into the infrastructure software market ...

... Broadcom's Executive Officers ...



Figure 1: Ethernet Network adapters and switches

Source: Broadcom Inc.

... global technology leader ...



Figure 3: Fibre channel directors and switches

Source: Broadcom Inc.

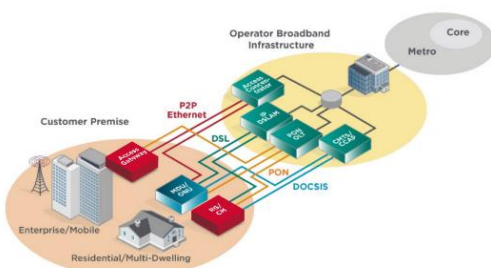


Figure 4: Broadband Infrastructure

Source: Broadcom Inc.

... products are sold to a network of distributors ...



Figure 5: Different products offered to smartphones

Source: Broadcom Inc.

The company specializes in developing semiconductor devices, focusing on complex digital and mixed signal complementary metal oxide semiconductor (CMOS)-based and analogue III-V-based products. With a history of innovation, they offer thousands of products used in end products like enterprise and data centre networking, home connectivity, set-top boxes, broadband access, telecommunication equipment, smartphones, data centre servers, storage systems, factory automation, power generation, alternative energy systems, and electronic displays. They differentiate themselves through high-performance design and integration capabilities in the fabless chip firm's ecosystem (Fig.2). Essentially, the semiconductor industry can be broken into two segments, Design and manufacturing. A company that designs semiconductors but doesn't manufacture them is considered a fabless firm. A company that only does manufacturing, based on the designs provided by fabless firms, is called a foundry. A company that does both the design and manufacturing of semiconductors is an Integrated Device Manufacturer or IDM (Fig.2).

Infrastructure software solutions enable customers to plan, develop, automate, manage, and secure applications across various platforms. Many Fortune 500 companies and government agencies rely on Broadcom's solutions to manage and secure their on-premises and hybrid cloud environments. Their portfolio of industry-leading infrastructure and security software is designed to modernize, optimize, and secure complex hybrid environments, enabling scalability, agility, automation, insights, resilience, and security. It also offers fibre channel storage area networking (FC SAN) products and related software in the form of modules, switches, and subsystems (Fig. 3).

1.3 Costumer, Sales and Distribution

Broadcom sells its products through direct sales teams and a carefully selected network of distributors and channel partners globally. The mix between direct and indirect sales channels is common in the industry and contributes to global exposition for most competitors like Oracle, Nvidia or Cisco (Oracle Corporation 2023; Nvidia Corporation 2023; Cisco Systems Inc. 2023). Distributors and original equipment manufacturers (OEMs) account for the majority of semiconductor sales, accounting for 56% and 53% of net revenue in fiscal years 2022 and 2021, respectively. Broadcom anticipated that aggregate sales to its top five end customers via all channels accounted for about 35% of its net revenue and that Apple Inc. is responsible

... connections with major global electronic component wholesalers ...

for 20% (Broadcom Inc 2022) during the same period. For comparison reasons, Qualcomm's revenues from Apple and Samsung each comprised 10% or more of their consolidated revenues. This aspect differs from other competitors like Nvidia or Cisco whose client base is more broad and non-dependable (Cisco Systems Inc. 2023; Nvidia Corporation 2023). Other Broadcom clients include Amazon, Samsung and Dell.

To serve customers globally, Broadcom has developed connections with major global electronic component wholesalers, supported by regional distributors with customer relationships based on their specific product lines. Just in the Asia region, there are 20 official distributors, 10 in Europe and the Middle East, and 7 in the Americas region (Broadcom Inc. 2023c). All are scattered through different areas and countries, maximizing client reach (Fig.6). Broadcom's direct sales staff supports big OEM clients and has expert product and service knowledge, allowing them to market offers at crucial levels across a customer's company.

Many key client partnerships have existed for many years and are frequently the result of years of collaborative product development. Time-critical delivery of products to many locations throughout the world pushes Broadcom to establish sales offices in several countries. Primary warehouse in Malaysia and dedicated regional customer support call centres where it addresses customer issues and handles logistics and other order fulfilment requirements. Positioning well to support customers across all geographies during the design, technology transfer, and manufacturing stages.

Software customers worldwide include banks, insurance companies, government agencies, global IT service providers, telecommunication providers, transportation companies, manufacturers, technology companies, retailers, educational organizations, and healthcare institutions. Generally, it consists of large enterprises that have computing environments from multiple vendors and are highly complex. Broadcom continues to prioritize improving relationships and extending penetration with current core, mainframe-centric, and Symantec endpoint clients, as well as expanding acceptance of their enterprise software products among these customers. This enterprise-wide license model is expected to provide customers with reduced complexity, increased flexibility, and an easier renewal process, thereby driving revenue growth.

Net Revenue by Region (\$ millions)

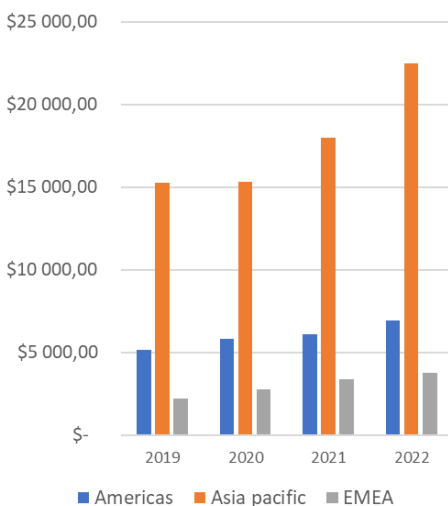


Figure 6: Broadcom's revenue by region

Source: Broadcom Inc.

... software solutions customers include ...

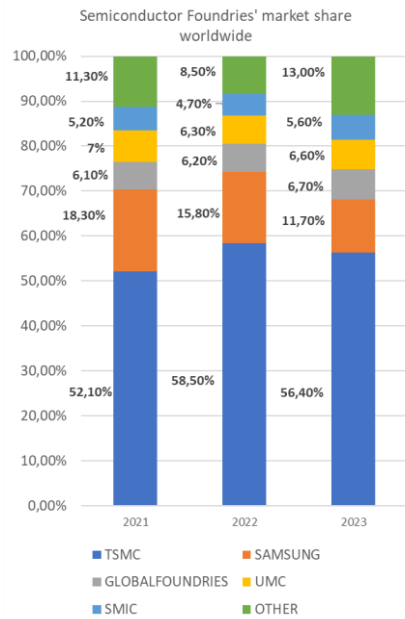


Figure 7: Foundries market share based on revenue worldwide 2021-2023

Source: Statista



Figure 8: FBAR devices

Source: Broadcom Inc.



Figure 9: Fiber Optic Modules and Components

Source: Broadcom Inc.

1.4 Manufacturing

The company focuses on maintaining an efficient global supply chain and a variable, low-cost operating model. They outsource a majority of their manufacturing operations to foundries, including front-end wafer manufacturing to external factories like TSMC and assembly and test operations to third-party manufacturers like Advanced Semiconductor Engineering, Foxconn Technology Group, Amkor Technology, and Siliconware Precision Industries Co., Ltd. The same third-party outsourcing process is followed by competitors like Nvidia, Oracle, Cisco or Qualcomm while others such as Intel use their own facilities for most products (Cisco Systems Inc. 2023; Nvidia Corporation 2023; Intel Corporation 2022; Qualcomm Inc. 2023; Oracle Corporation 2023). Corroborated by Broadcom and most competitors' governance and annual reports, we can see dependence and lack of diversity of suppliers, especially TSMC which accounts for 68% of originated global semiconductors revenue (Flaningam 2023), which can drive increased wafer prices and adversely affect the results of operations, including product gross margins (Fig.7). Broadcom uses their internal fabrication facilities for products, such as film bulk acoustic resonator (FBAR) filters for wireless communications and vertical-cavity surface and side emitting lasers-based gallium arsenide (GaAs) and indium phosphide (InP) for Fiber optic communications (Fig.8 & 9), while outsourcing commodity processes like the standard CMOS. The company's main operations are in the U.S. and Singapore, with a long history of operating in Asia, where they manufacture and source most of their products and materials. Asia is the primary region for development, foundries, and testing in the industry and, material resources for semiconductors are almost entirely obtained from there. It is common ground for big names who also take advantage of the region's resources including Nvidia, Qualcomm and Intel.

Manufacturing operations use a variety of semiconductors, electromechanical components, assemblies, and raw materials. It purchases materials from hundreds of suppliers worldwide, often on a purchase-order basis. To address supply chain disruptions, they may use techniques like redesigning products for alternative components, making incremental or lifetime purchases, or qualifying multiple sources. Their long-term relationships with suppliers allow them to proactively manage technology development and product discontinuance plans, and potentially extend lead times, limit supplies, increase prices, or cease production of necessary parts.

1.5 Intellectual Property

... success relies on ability to protect its Intellectual Property

...

Broadcom's success relies partly on the company's ability to protect its Intellectual Property (IP) through patents, copyrights, trademarks, and contractual protection with its customers, employees, and suppliers. As of October 2022, the company held 17035 patents with an additional 618 pending patents (Broadcom Inc 2022). The company's current patent expiration dates range from 2022 to 2041 and it is important to note that none of the patents set to expire soon are expected to remain in the company's IP Portfolio.

The industries in which Broadcom competes are marked by the presence of numerous patents, copyrights, trademarks, and trade secrets, as well as the aggressive pursuit and enforcement of intellectual property rights. Rejection based on count 102 and 103, lack of novelty and obviousness respectively, are the most common and over the years Broadcom had numerous competitors trying to advance their research based on their patents (Fig.10) (GreyB 2023). Some customer agreements require indemnification for third-party infringement claims, which can damage customer relationships and dissuade potential customers. If a company faces IP rights claims, it may need to defend itself in court, cease manufacturing, pay damages, invest resources in non-infringing technology, and seek a license that may not be commercially available. All these potential obstacles weigh heavily on Broadcom and that is why customers generally do not have access to the source code for products, except for software components subject to open-source licenses. On-premises customers have access to executable code, while Software as a Service (SaaS) customers have access to the functionality of the offerings. Some clients may benefit from source code escrow agreements under certain abrupt circumstances.

Companies using Broadcom's Patents to Advance their Research

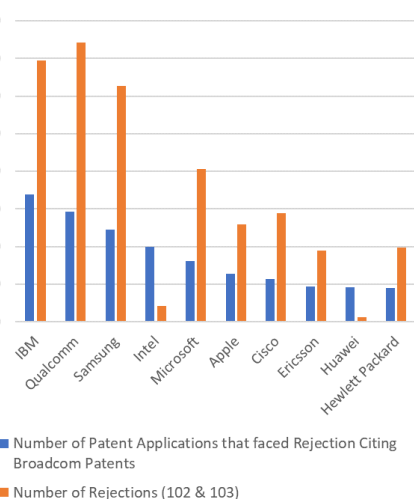


Figure 10: Rejections upon trying to use Broadcom's patents by other companies.

Source: GreyB Insights and Stats; Bloomberg

1.7 Business Strategy

Broadcom aims to combine top-tier technology leadership in semiconductor manufacturing and infrastructure software solutions, on one sales and administrative platform, delivering a variety of infrastructure technology products to premier business and government customers worldwide. The company's main growth strategy is to actively pursue financed acquisitions of leading businesses and technologies and to invest extensively in Research and Development (R&D), to ensure that their products maintain their technology leadership, therefore enhancing its competitiveness in the industry. Acquisitions and mergers have a statistical history of not returning

... pursue finance acquisitions and invest heavily in R&D ...



Figure 11: Enterprise security solutions

Source: Broadcom Inc.



Figure 12: Broadcom's earnings per share through 2017-2022

Source: Analyst and Broadcom Inc.



A Trusted Partner

CA is the worldwide leader in the aggregated markets of Application Development Mainframe Tools + IT Operations Management Mainframe Tools, based on 2016 Market Share.

Figure 13: CA Technologies market excellence report

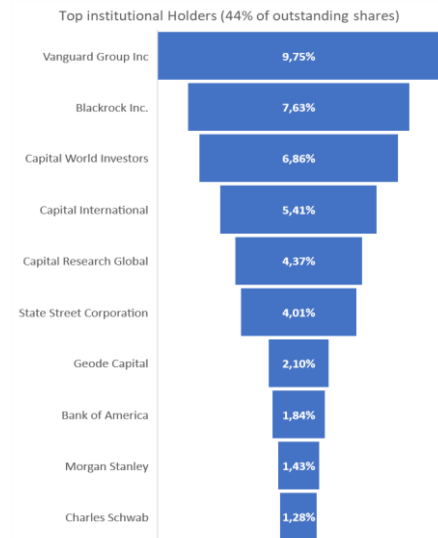
Source: Gartner, Market Share: All Software Markets, 2016 report published

the potential value they should as studied and analysed by managers beforehand. As explained and researched by Robert F. Bruner (F. Bruner 2004), most transactions fit the perspective of "does pay, but...", with the majority of targets, bidders, and merged businesses passing these criteria. Buyers in M&A deals, on the other hand, should brace themselves for disappointment due to the broad distribution of announced returns and the mean being close to zero. The poor post-merger performance is concerning, but further study is needed to identify whether this is due to mergers or market dynamics. Synergies, efficiencies, and value-creating growth are tough to achieve, and the reach of dealmakers surpasses their grasp.

Acknowledging this, our conclusions on Broadcom's success with its strategic acquisitions rely mostly upon a diversification tool, spreading business risk and minimizing it, while acquiring key assets. Hock E. Tan wants to pursue more deals, even in the semiconductor industry, and he also insists that all business/product divisions are mostly independent of each other. Each pursues the goal of being the number one in their respective markets and for that, certain tech assets and synergies are beneficial towards reaching that goal (Bradshaw 2023). For example, the infrastructure software segment grew with the Brocade acquisition whose Fiber channel assets were critical to providing interconnection, bandwidth and high-speed switching between servers and storage devices and later, the Symantec security business levered Broadcom's position within the cybersecurity market with expertise and executable offerings to do so (Fig.11). Another example is the CA technologies deal, whose company provided on average \$2,1 million in savings for its customers. Including 70% of Fortune 30 companies (CA Technologies 2016). Backed with earnings per share (EPS), the key metric of deal gained value, which shows continuous growth indicating accretive and value-added acquisitions (Fig.12) during the most important one's period between 2017 to 2022. The 2018 high is an abnormal value later explained in this report. This strategy does provide return and other competitors like Nvidia, IBM and Intel are trying to follow this same process of extending their offerings to new markets but without many acquisitions but instead with human capital.

All in all, this business model results in a very diversified portfolio of leading technology products, which drive sustainable operating and financial results. Strengthening Broadcom to pursue many markets and the ability to grow new revenue streams and efficient operations.

1.8 Shareholder Structure



Broadcom Inc. is listed on the Nasdaq Global Select Market under the symbol AVGO. As of November 2022, there were 1,060 holders of record for the company's common stock, and 417,886,140 shares outstanding. It is important to note that some of these holders are banks, brokers and other financial institutions that hold shares on behalf of individuals, therefore, the total number of beneficial holders is significantly larger.

The top institutional holders of Broadcom's stock are Vanguard Group Inc., Blackrock Inc., Capital World Investors, Capital International Investors, and Capital Research Global Investors (Fig.14) (Yahoo Finance 2023). The top mutual fund holders are Vanguard Total Stock Market Index Fund, Washington Mutual Investors Fund, Vanguard 500 Index Fund, American Balanced Fund, and Growth Fund of America Inc (Yahoo Finance 2023d).

During the fiscal quarter that ended October 2022, Broadcom paid approximately \$274 million in taxes related to the vesting of net-settled equity awards, originally owed by the employees. To cover this expense, around 1 million shares were withheld from employees at an average price of \$502,62 per share. The shares may be deemed as "issuer purchases" of shares. In FY2022, the company repurchased and retired approximately 12 million shares of common stock for \$7 billion, under a stock repurchase program. Furthermore, the board of directors authorized yet another repurchase program, to repurchase up to \$10 billion of their common stock during the FY2023 (Broadcom Inc 2022). This suggests a continued commitment to return value to its shareholders through stock repurchase.

Source: Yahoo Finance

... commitment to return value to shareholders through stock repurchase ...

2. Industry Overview

2.1 Semiconductor Solutions

▪ Business Segment Description

Semiconductors are designed to perform various functions such as processing, amplifying and selectively filtering electronic signals, controlling electronic system functions, and processing, transmitting, and storing data. The markets in which this industry operates are the Broadband, Networking, Wireless, Storage and Industrial markets. These include discrete devices to complex sub-systems, including multiple device types and firmware for analogue and digital systems. In some cases, mechanical hardware for interfaces with optoelectronic or capacitive sensors.

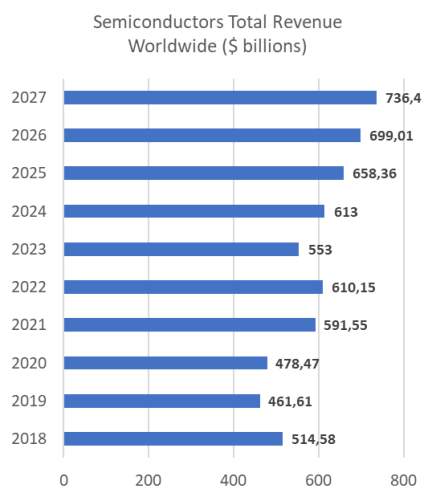


Figure 15: Semiconductors - Revenue 2018- 2027

Source: Statista

Semiconductor solutions, such as those provided by Broadcom, aim to improve electronic devices and systems across sectors. These solutions are critical for improving device performance, providing seamless communication, and encouraging innovation. Contributing to technical improvements, cost efficiencies, and industry changes in industries such as automotive, healthcare, telecommunications, and consumer electronics by providing devices with increased speed, efficiency, and connection capabilities.

▪ Industry analysis

The semiconductor industry is a highly cyclical and highly competitive one, that is affected by several factors such as large fluctuations in product supply demand, rapid technological change, evolving industry standards, constant new product introductions and short product life cycles. Occasionally, these factors, combined with changes in general economic conditions, lead to substantial fluctuations in the industry.

In recent years, the industry has experienced significant impacts from the COVID-19 pandemic, encompassing both positive and negative effects. As manufacturing plants were forced to shut down, and vehicle sales declined when COVID-19 first appeared, companies were compelled to reduce their orders for semiconductors. Furthermore, given that the initial effects of COVID-19 were observed in China and Taiwan, which are key chip-producing regions, it had a significant ripple effect on supply chains. Shortly after the start of the pandemic, the reduced demand was quickly taken up by consumer electronics, which benefited from the increase in notebooks and tablets demand, originating from the start of home working and learning. Additionally, there was an increase in semiconductor demand from telecommunication companies, as they sought to meet the requirements of remote working and online entertainment. In 2020, the automotive sector's demand returned to pre-pandemic levels, originating a worldwide chip shortage that subsequently affected other industries. The shortage was exacerbated by increasing demand and the stockpiling of chips due to geopolitical tensions between the U.S. and China. Consequently, the semiconductor industry experienced substantial growth (23,63%) from 2020 to 2021 (Fig.15). The ongoing shortage has shown no signs of stopping, implying that the industry will continue to grow at a rapid pace. However, due to the global economic situation worsening in 2023, it is expected a weaker demand coming from consumer-driven markets, leading to potential oversupply. The effect of the pandemic was also reflected in Broadcom's share price, going from a 2020 low of \$192,22 on March 16th, to \$437,85 on

**Reduced demand quickly
taken up by consumer
electronics ...**

**Worldwide chip shortage
originated by an increase in
the automotive sector's
demand ...**

Semiconductor market shares Worldwide

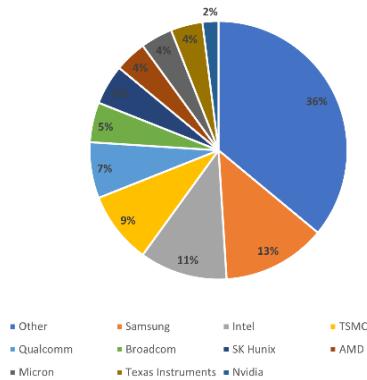


Figure 16: Semiconductors – Market Shares

Source: Statista

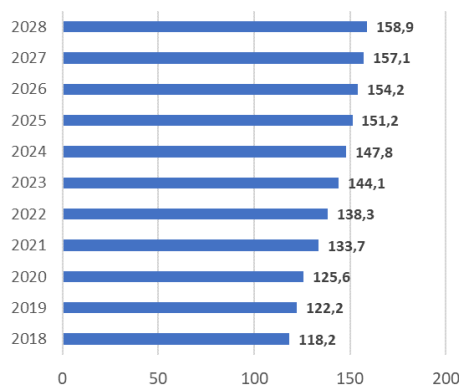
System Infrastructure Software total revenue
Worldwide
(\$ billions)

Figure 17: System Infrastructure Software - Revenue 2018-2028

Source: Statista

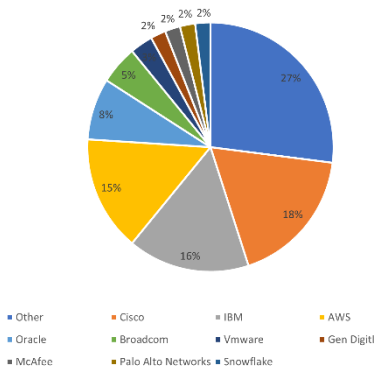
System Infrastructure Software market shares
Worldwide

Figure 18: System Infrastructure Software – Market Shares

Source: Statista

the 30th of December of the same year, an increase of 127,79% (Yahoo Finance 2023a).

The semiconductor industry is expected to generate a revenue of \$553 billion in 2023, a 9,37% decline from 2022. Nevertheless, the industry is expected to grow at a steady growth rate in the following years, with a Compound annual growth rate (CAGR) of 7,42% between 2023 and 2027 (Statista Market Insights 2023d). China is set to maintain its position as the world's leading country in revenue generated in the Semiconductors market in 2023, projected to generate around \$179,5 billion. The United States comes in second, with a projected generated revenue of \$70,18 billion, followed by Japan with a projected generated revenue of \$48,52 billion. The key players in the industry are Samsung, Intel, TSMC, Qualcomm, and Broadcom (Fig.16) (Statista Market Insights 2023d).

2.2 Infrastructure Software

▪ Business Segment Description

The System Infrastructure Software market includes a diverse range of tools that help manage an organization's physical and virtual infrastructure, including operating systems, middleware, virtualization, networking, storage, and security. More recently, Broadcom delved into the Cybersecurity market, following their acquisition of Symantec's enterprise security business in 2020 and the virtualization one with the upcoming VMware acquisition.

On one hand, infrastructure software solutions enable clients to design, run, manage, connect, and secure applications in a variety of scenarios by offering market-leading DevOps, AIOps, Security, and Data Management System solutions. These assist enterprises in adopting open technologies, integrating their mainframes into cloud infrastructures, and increasing the value of their mainframe assets. While distributed software solutions help global organisations optimise software planning, development, and delivery, allowing them to improve their mission-critical digital services. They bring together business, development, and operational teams to help customers innovate, improve customer experience, and increase profitability.

Another component as mentioned, is cybersecurity software, which assists organisations and governments in safeguarding people and data across any app, device, or network. Employs extensive threat intelligence gathered from a global network of security engineers, threat analysts, researchers, and powerful AI and machine-learning engines to safeguard data, link authorised

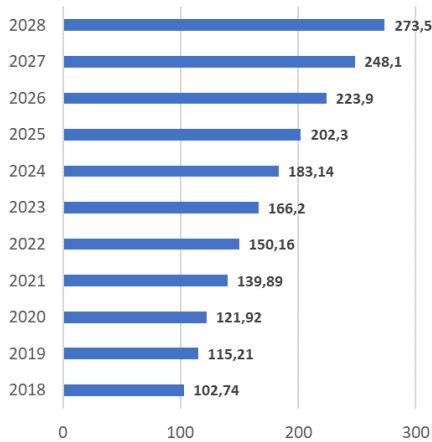
Cybersecurity total Revenue Worldwide
 (\$ billions)


Figure 19: Cybersecurity - Revenue 2018-2028

Source: Statista

Cybersecurity market shares Worldwide

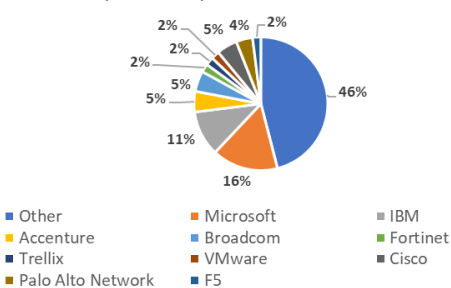


Figure 20: Cybersecurity – Market Shares

Source: Statista

Data Center Revenue Worldwide (\$ billions)

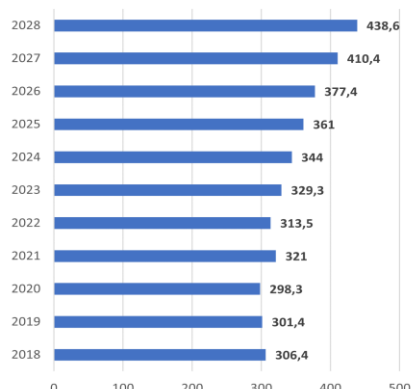


Figure 21: Data Centre - Revenue 2018-2028

Source: Statista

users to trusted apps, and identify and respond to advanced targeted assaults. Demand for cybersecurity has been increasing in recent years, particularly driven by the trend of digital transformation.

Overall, through software-based solutions, there is the delivery of dependable and simplified administration, to maximise uptime, simplify storage area networking deployment and management, and provide great visibility and insight into the storage network.

■ Industry analysis

As a result of the increasing demand for IT infrastructure to meet data consumption requirements and, consequently, a heightened focus on compliance and security concerns, the System Infrastructure Market has presented a steady growth rate over the last few years, although at a slower pace than other segments in the market.

The largest region in terms of total revenue is North America, where the market involves a few big players, and smaller companies that specialize in niche markets (Statista Market Insights 2023d). It is then followed by China, where the highest growth rate is expected, due to the increasing adoption of cloud-based solutions. The United Kingdom and Germany are the largest markets in Europe. The System Infrastructure Software market worldwide is expected to grow at a CAGR of 1,97% until 2028 (Fig.17). The key players in the industry are Cisco, IBM, AWS, Oracle, and Broadcom (Fig.18) (Statista Market Insights 2023f).

Due to the trend of digital transformation, that originally started during the COVID-19 pandemic, as organizations were forced to shift to remote work and virtualized IT environments, companies are increasingly vulnerable to cyber-attacks due to their reliance on technology for operational activities. The potential implications of these cyber-attacks are unmeasurable, ranging from substantial financial losses to potential regulatory fines, and damage to the company's reputation. Therefore, cybersecurity has become a priority for businesses following the digital transformation trend. Protecting sensitive data and fortifying digital infrastructure are integral components of modern business operations. Consequently, the global Cybersecurity market has been growing at a CAGR of 10,35% over the last 7 years, going from a revenue of \$83,32 billion in 2016 to roughly \$166 billion in 2023. The market is expected to grow at a similar CAGR of 10,48% until 2028 (Fig.19). The key players in the industry are Microsoft, IBM, Accenture, Broadcom, and Cisco (Fig.20) (Statista Market Insights 2023b).

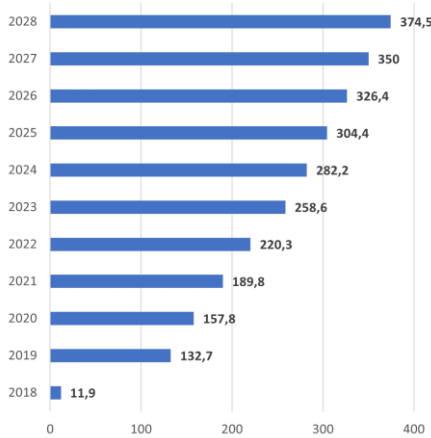
Software as a Service Revenue
 Worldwide (\$ billions)


Figure 22: Software as a Service - Revenue 2018-2028

Source: Statista

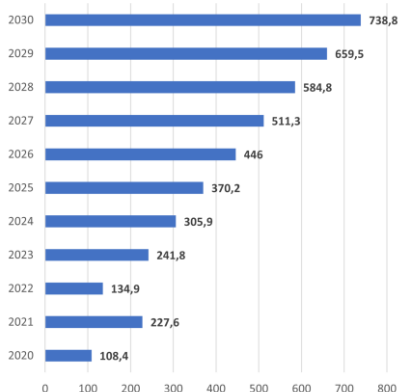
 Artificial Intelligence Revenue
 Worldwide (\$ billions)


Figure 23: Artificial Intelligence - Revenue 2018- 2028

Source: Statista

The Data Centre segment has also shown significant growth following the ongoing digital transformation trend and increasing cloud usage and big data. However, the segment is highly dependent on the global economic conditions and adoption rates of new technologies and applications, as setting up data centres represents a high one-off cost for companies and the public sector. Investments in this sector were delayed because of the COVID-19 pandemic, potentially leading to catch-up effects in the following years. This segment is expected to grow at a CAGR of 6,12% until 2028 (Fig.21) (Statista Market Insights 2023c).

Initially, data security posed a significant challenge to the Software as a Service (SaaS) market, where the recent acquisition of Broadcom, CA Technologies, operates. The possibility of choosing between private and hybrid cloud deployment played a key role in mitigating these concerns and overcoming the negative impact on the segment. Over the following 5-year timespan, the segment is expected to grow at a rate of 5% in technologically advanced regions such as Europe, North America, and Australia. For technologically emerging countries in Africa and Asia, the segment is expected to grow at a rate of more than 10%. Overall, this segment is expected to grow at a CAGR of 7,69% until 2028 (Fig.22) (Statista Market Insights 2023e).

The Artificial Intelligence (AI) market has shown significant growth over the years and shows no signs of stopping. The industry's growth is a result of the increasing availability of big data, as AI algorithms require substantial amounts of data to learn and improve, the growing demand for automation and optimization in different industries, such as finance, manufacturing and transportation, the increasing use of virtual assistants, and large investments from technology companies, research institutions, and governments. Because of this, the AI market is expected to grow at a considerably high CAGR of 17,30% until 2030 (Fig.23) (Statista Market Insights 2023a).

2.3 Competition

The infrastructure software and semiconductor industries are characterized by constant technology changes, evolving industry standards, changes in consumer requirements, aggressive pricing strategies and innovative delivery methods. This dynamic environment creates a high level of competition in these markets and a wide range of competitors. The competition spans from large international organizations offering a diverse product portfolio to smaller firms focusing on very specific markets/solutions. Furthermore, the

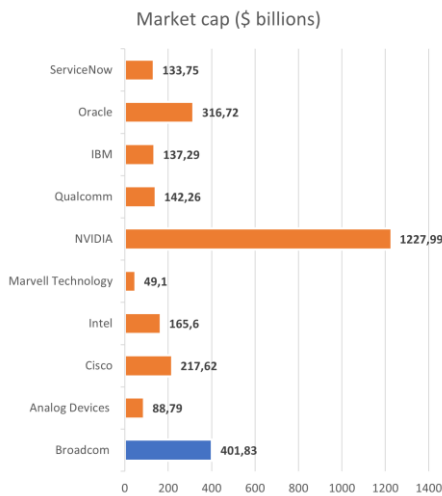


Figure 24: Broadcom and Competitors' Market Capitalization

Source: Macrotrends

EPS (\$)

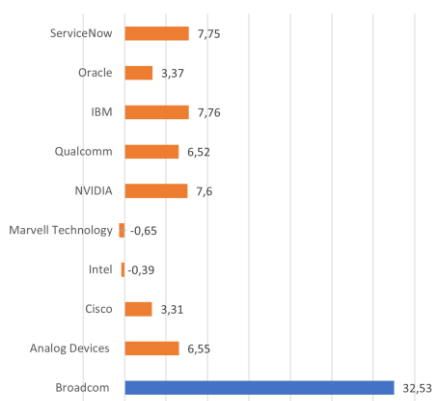


Figure 25: Broadcom and Competitors' Earnings per share TTM

Source: Yahoo Finance

PE Ratio

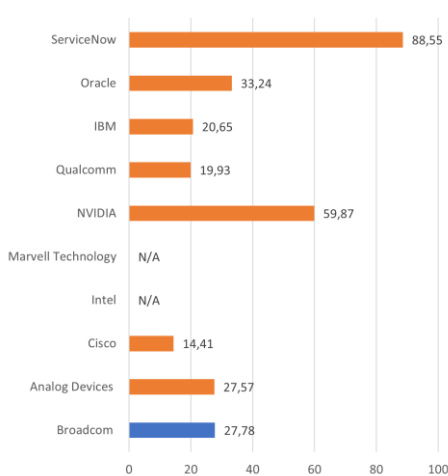


Figure 26: Broadcom and Competitors' price-to-earnings per share ratio TTM

Source: Yahoo Finance

competitive landscape is evolving due to a trend of industry consolidation.

Some competitors have merged with or have been acquired by other competitors, while others have formed strategic alliances. It is expected that this trend will continue, and competition will increase, as existing competitors enhance their product portfolio and new companies enter the market.

In the semiconductor industry, Broadcom Inc.'s main competitors are Analog Devices Inc., Cisco Systems Inc., Intel Corporation, Marvell Technology Inc., NVIDIA Corporation, and Qualcomm Inc. The main competitors in the infrastructure software industry are IBM Corporation, Cisco Systems Inc., Oracle Corporation and ServiceNow Inc. (Broadcom Inc. 2022).

When compared to its mentioned competitors, as of November 14th, Broadcom Inc holds the second largest market capitalization, only falling behind NVIDIA (Fig.24). In 2023, Broadcom's market capitalization grew from \$231,35 billion to \$401,83, as of November 14th, a remarkable increase of 73,69% This is largely due to two main events, a multibillion-dollar deal with Apple, where Broadcom will develop 5G radio frequency components, and the completion of the VMware acquisition. Apple announced the deal on the 23rd of May of this year, and in the three following days, Broadcom's market cap rose by 18,39%. From November 1st until the completion of the VMware deal, on November 22nd, Broadcom's market cap increased by 13,96%. (Macrotrends 2023)

Broadcom presents a trailing twelve-month (TTM) earnings per share (EPS) of \$32,53, the highest out of all its competitors (Fig.25). The company's EPS has increased by 40% over the last year, attributed to both growing revenues and improved EBIT margin. Additionally, insiders have a considerable \$5,1 billion invested in the company, suggesting that the executives' decision-making is closely aligned with the interests of the shareholders. In industries with high growth potentials, such as the technology industry, it is common for companies to have high PE ratios, due to investor's expectations of future earnings growth. Broadcom's PE ratio (TTM) is 27,78, which is slightly below its peers' average of 36,5 (Fig.26). (Yahoo Finance 2023b)

In 2022, the company allocated a total of \$4,919 million for R&D, a figure that falls below the industry peers' average of \$6,136 million (Fig.27). While the absolute amount alone may not be indicative of the quality of investments, when supplemented with Broadcom's high revenue growth over recent years, it provides meaningful insight into the company's capability to make sound investments.

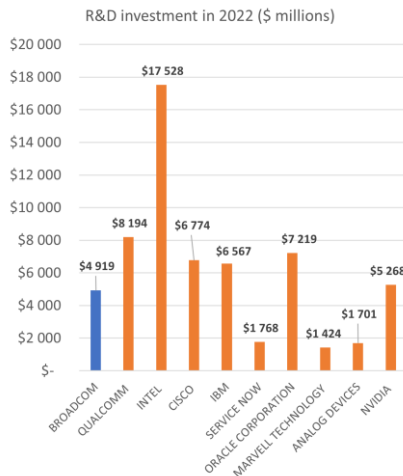


Figure 27: Broadcom and Competitors' R&D investment in 2022

Source: Yahoo Finance

... tech superiority and breakthroughs....

Leadership in diverse markets...supported on acquisitions.

All in all, Broadcom appears to be in a strategic position to grow, based on its high profitability, having recently made significant deals, and aligning executive decisions with shareholders' interests, reflecting a commitment to maximize shareholder value.

2.5 SWOT Analysis

Based on the company and industry overview we can now build an assertive competitive landscape of Broadcom and analyse its potential advantages and international reach.

Strengths

1. Broadcom's diverse product portfolio, which includes networking, internet, storage, and industrial technologies, provides durability and stability across numerous industries and helps the company reduce its dependence on any one industry providing a stable revenue stream.
2. Broadcom is well-known for its technological expertise and ongoing innovation, and it spends heavily on R&D, creating a rich pipeline of sophisticated goods with over 17000 patents in U.S. and Foreign Patents and Applications.
3. Automation of activities brought consistency of quality to Broadcom products and has enabled the company to scale up and scale down based on the demand conditions in the market in part due to the strong distribution network. Over the years Broadcom has built a reliable distribution network that can reach the majority of its potential market.
4. Strategic Acquisitions: Proven track record of increasing product offerings, expanding market reach, and realising economies of scale through strategic acquisitions. It has built expertise at entering new markets and making a success of them.
5. Financial Performance: Consistent revenue growth, excellent profit margins, and effective financial management indicate that the company is in good financial health.

Weaknesses

1. Customer Concentration: Relying on a few important clients for a substantial amount of income, like Apple and Huawei, exposes them to market performance and expectations where any disruption in these relationships could have a significant impact on the company's revenue.
2. Integration Issues: With so many acquisitions, issues such as cultural differences and technological assimilation inhibit smooth transitions and,

consequently, more employee termination costs. These heavy restructuring duties result in spending more on training and development of its employees but also a negative image towards big layoffs.

- Broadcom has faced legal problems with antitrust legislation and patent infringements, generating legal and reputational risks.

▪ Opportunities

- Expansion of communications and connectivity Technologies: Increasing demand for 5G and 6G technology and Internet of Things devices provides enormous growth prospects, aligning with Broadcom's experience in connection solutions.
- Cloud Computing: As cloud-based services become more popular, opportunities for Broadcom's networking and storage solutions open up, leveraging its infrastructure software solutions to cater to this market.
- Collaboration with tech titans and strategic alliances might broaden Broadcom's market reach and technical achievements. Some might extend Broadcom's strong distribution network or even exploit its enterprise software solutions for new operations. This also relies on Broadcom's already existing global IT infrastructure partners like IBM, Fujitsu, Dell, and HP (Broadcom Inc. 2023d) and software ones like Deloitte, Capgemini and Cognizant (Broadcom Inc. 2023a).
- Entry into new markets or diversification into new categories might result in extra income sources. Opening of new markets because of government agreements and collaborations (Reuters 2023b), the adoption of new technology standards and even government free trade agreements have provided Broadcom an opportunity to enter new emerging markets.
- New and patented technology like the new AI networking chip (Broadcom Inc. 2023a; Reuters 2023a), provides an opportunity for Broadcom to practice a differentiated pricing strategy in the new market. It will enable the firm to maintain its loyal customers with great service and lure new customers through other value-oriented propositions.

▪ Threats

- Broadcom's Market rivalry: Intense rivalry between established businesses and young startups in the semiconductor sector threatens market share and pricing power.
- Global Economic Conditions: Economic swings, global trade disputes and regulatory challenges may influence demand and income. Broadcom's

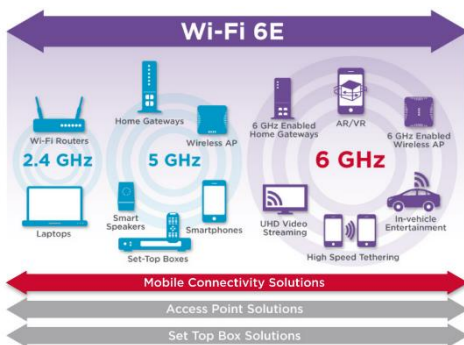


Figure 28: WI-FI ecosystem solutions

Source: Broadcom Inc.

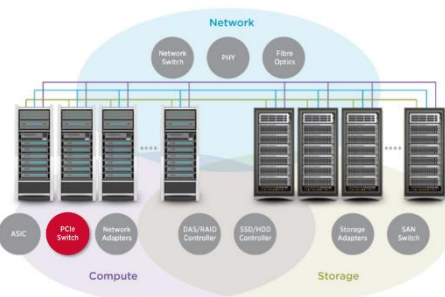


Figure 29: Data centre solutions

Source: Broadcom Inc.

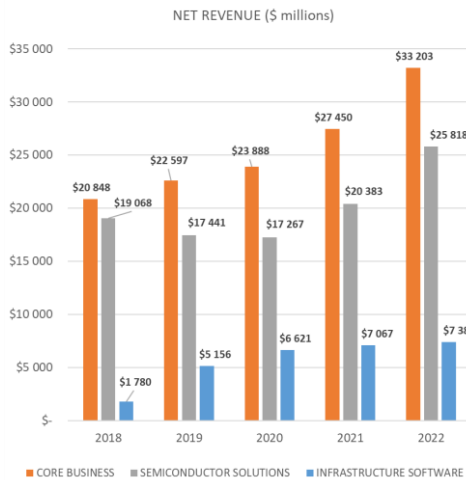


Figure 30: Broadcom's net revenue 2018-2022

Source: Analyst and Broadcom Inc.
 Cost of revenue vs Net revenue (\$ millions)

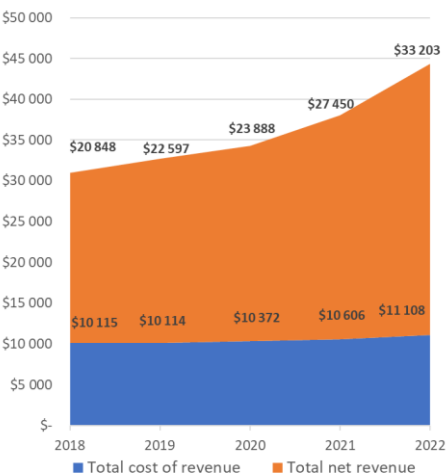


Figure 31: Total revenue and total cost of revenue comparison

Source: Analyst and Broadcom Inc.

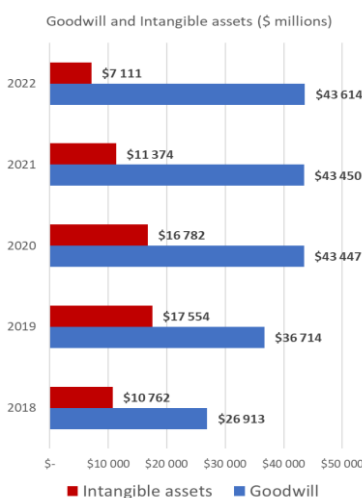


Figure 32: Broadcom's Intangible assets and goodwill 2018-2022

Source: Analyst and Broadcom Inc.

dependence on key customers in China and the US exposes greatly the company to these geopolitical risks.

3. Evolving legislation, trade rules, and geopolitical uncertainty provide problems for global operations and supply chain management.
4. Technological Changes: To remain competitive, rapid technical improvements and the risk of obsolescence demand ongoing innovation and R&D investment.
5. Economic Downturn: Any economic downturn in some markets can impact the demand for Broadcom's products, which are often used in capital-intensive industries. Combined with a shortage of skilled workforce, it represents a threat to steady growth of profits for Broadcom.

3. Historical Financial Analysis

3.1 Financial Statements Analysis

Income Statement

When assessing historical financial statements, we compelled our explanations with and without reformulated data. For the income statement, we integrated both the original accounting statements division and a core, non-core and financial division. The latter represents a more precise understanding of main business accounts and out-the-scope ones.

An analysis of Broadcom's historical financial statements shows consistent revenue growth, with a 5-year (2018-2022) CAGR of 9,75% and the company's net income has also grown at an astonishing 4-year CAGR of 43% in part with the company's margins improvement. We took out 2018 due to an atypical high net income result related to a big negative effective tax rate, in compliance with the 2017 tax reform act. In 2022 total net revenue reached an all-time high of \$33 billion, where the semiconductor solutions segment was the main revenue contributor, accounting for 77% and a 5-year CAGR of 6,25% (Fig.30). The infrastructure software segment has a CAGR of 32,92% which showcases Broadcom's efforts to diversify its core businesses fuelled by major segment acquisitions. The cost of revenue is very consistent in value in the sense that over the last 5 years it ranged between \$10 to \$11 billion (Fig.31) and so its margin on total revenue has been lowering from 48% in 2018 to 33,5% in 2022. The cost of products sold consists primarily of the costs for semiconductor wafers and other materials, as well as the costs of assembling and testing those products and materials. Operating expenses have been steadily decreasing its weight in total revenue since 2019 when it

% Net PP&E over Total assets

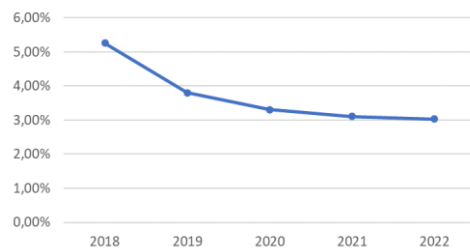


Figure 33: Broadcom's Net PP&E weight on total assets 2018-2022

Source: Analyst and Broadcom Inc.

Current ratio

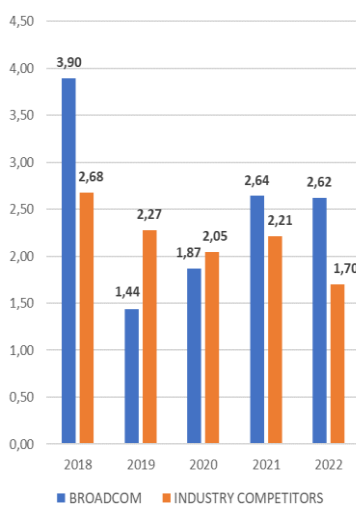


Figure 34: Current ratio comparison between Broadcom and Industry competitors

Source: Analyst estimates

Quick ratio

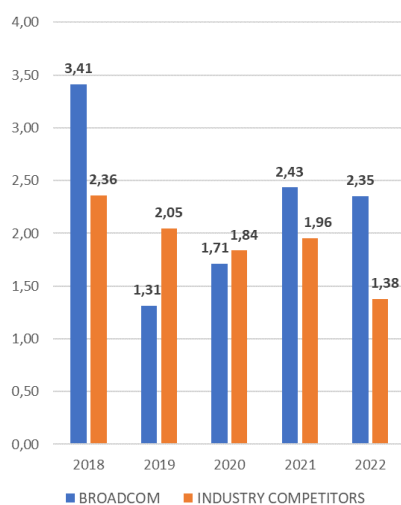


Figure 35: Quick ratio comparison between Broadcom and Industry competitors

Source: Analyst estimates

hit a 5-year high caused by the company's last big acquisitions of CA Technologies Inc and Symantec Enterprise Security Business. This is because the corresponding operating expense fluctuations arise mainly from amortization of acquisition-related intangible assets and restructuring, impairment, and disposal charges. The latter consists primarily of compensation costs associated with employee exit programs, alignment of global manufacturing operations, rationalizing product development program costs and facility and lease abandonments. R&D spending remains an important part of the company since investing extensively ensures products retain their technology leadership, resulting in Broadcom spending around 15% to 20% of their total net revenue each year (Fig.27). Interest expense remains stable, minor variations were primarily due to higher or lower losses on extinguishment of debt. Overall, the company has demonstrated consistent financial performance and strong metrics growth.

■ Balance Sheet

Simultaneously, we compelled our explanations with and without reformed data while evaluating the balance sheet. This combines the original accounting statements as well as the invested capital, net debt and equity divisions. The latter reflects a more detailed grasp of business assets and liabilities that come from both debt and equity financing.

Broadcom has a strong balance sheet, with a healthy cash balance and manageable debt-to-equity ratio. When reformulating for invested capital, Net debt and equity we can perceive more in depth the stability of the company. Main changes come from, predominantly, net debt. Increases in long-term debt arise from acquisitions-related debt while excess cash remains at a constant operating cash need of only 2,5% of total revenue. Goodwill has been the biggest value account on balance for recent years, in compliance with the company's long list of acquisitions, totalling 87% of total invested capital in 2022 (Fig.32). Intangible assets have been decreasing since 2019, the same year of the Symantec Corporation Enterprise Security Business acquisition which brought in \$5,4 billion worth of intangible assets. No new big and substantial intangible assets gross carrying amount has been added, meaning that amortization starts weighting down their net book value (Fig.32). Net PP&E ranged from \$2,2 to 2,6 billion over the last 5 years, increasing primarily from machinery and equipment (Fig.33). Overall, the company has demonstrated a solid financial position, finishing 2022 with \$22,7 billion in equity, \$50,5 billion in liabilities and about \$73,2 billion in assets.

3.2 Ratio Analysis

▪ Liquidity

Throughout the period from 2018 to 2022, Broadcom Inc. demonstrated a nuanced command over its short-term financial commitments, emblematic of astute liquidity management. Commencing in 2018, the company manifested a robust liquidity stance with a current ratio of 3,90, underscoring its capacity to satisfy imminent obligations with the abundance of current assets. This prudence extended further with a quick ratio of 3,41 (Fig.34 & 35), affirming a judicious liquidity cushion without reliance on inventory. Over subsequent years, the organization's liquidity position was reduced by half, caused by more current liabilities associated with the current portion of unsecured senior notes becoming due and an increase in contract liabilities. Contract liabilities are recognized when the company receives consideration, or an amount of consideration is due from the customer and a future obligation to transfer products or services. The annus horribilis of 2020, fraught with global economic turbulence and COVID-19, bore witness to Broadcom's agile liquidity management, as reflected in holding its current ratio at 1,87 and a commensurate quick ratio of 1,71 (Fig.34 & 35). These metrics epitomized liquidity fortitude in the face of adversity that quickly increased these ratios the year after with strong average growth of current assets of 23% for the next 3-year period, with emphasis on cash reserves growth.

Contextualizing these metrics, industry averages over the same period reveal a noteworthy performance trajectory. On average, companies within the same sector also demonstrated higher liquidity ratios in 2018, followed by a decrease until 2020 (Fig.34, 35 & 36). The cash ratio, a metric gauging the extent of Broadcom's ability to meet immediate liabilities solely with cash and cash equivalents, demonstrated a steady ascent like the other ratios, from 1,20 in 2020 to 1,76 in 2022. Higher than the industry average of 0,85 in 2022. As economic conditions convalesced in 2021 and 2022, the current ratio ascended to 2,62, embodying a fortified capacity to meet immediate financial obligations, while the quick ratio mirrored this ascent at 2,35. These trends not only substantiate Broadcom's unwavering commitment to surpassing industry liquidity benchmarks, whose values do not surpass the 2,0 marks but also serve as a resilient foundation for shrewd financial manoeuvring in an inherently dynamic tech market.

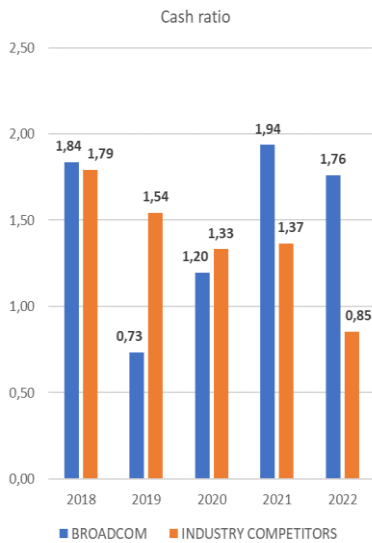


Figure 36: Cash ratio comparison between Broadcom and Industry competitors

Source: Analyst estimates

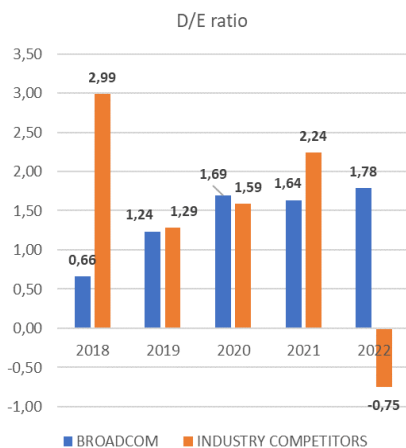


Figure 37: Debt-to-Equity ratio comparison between Broadcom and Industry competitors

Source: Analyst estimates

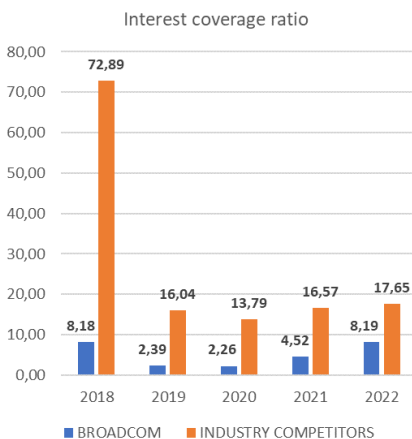


Figure 38: Interest coverage ratio comparison between Broadcom and Industry competitors

Source: Analyst estimates

Broadcom Inc.

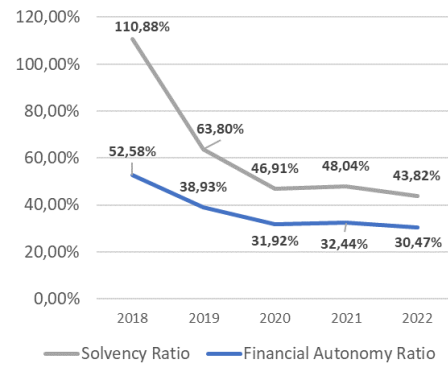


Figure 39: Broadcom's solvency and financial autonomy ratios 2018-2022

Source: Analyst estimates

Industry Competitors

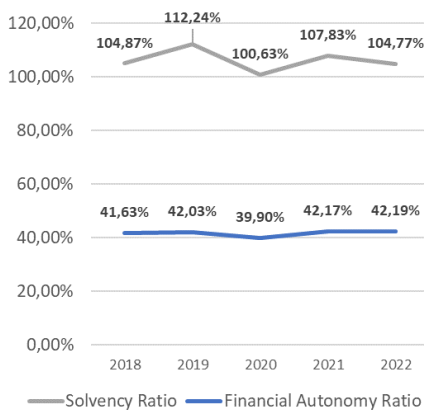


Figure 40: Competitors' solvency and financial autonomy ratios 2018-2022

Source: Analyst estimates

Gearing ratio

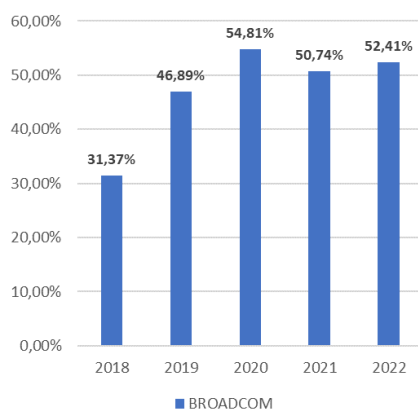


Figure 41: Broadcom's gearing ratio 2018-2022

Source: Analyst estimates

■ Solvency & Capital Structure

A comprehensive study of Broadcom Inc.'s financial resiliency from 2018 to 2022 indicates a systematic approach to long-term financial health which is a company's capacity to satisfy its commitments when they come due.

A fundamental solvency statistic, the debt-to-equity ratio, implies a balance between debt financing and shareholder equity. Broadcom claimed a conservative total debt-to-equity ratio of 0,66 in 2018, indicating a minor sensible dependence on debt for capital funding. This continued rising in succeeding years, owing to the company's rigorous debt management to handle bigger amounts of debt from acquisitions. Within industry standards, the average debt-to-equity ratio hovered around 1,47 throughout the 5 years (Fig.37) while Broadcom averaged 1,40, reaching its peak in 2022 with 1,78. Taking more advantage of debt financing to expand over competitors that year but on average it stays inside the industry level. Another important solvency measure, the interest coverage ratio, reveals Broadcom's strong capacity to discharge its interest commitments. The firm had an interest coverage ratio of 8,17 in 2018, indicating a good margin of safety. This ratio fluctuated somewhat over the years, peaking at 8,19 in 2022, confirming Broadcom's well-off financial stability in servicing its debt payments. During the same period, industry peers had an even higher interest coverage ratio of 17,65, indicating very good positioning with double the security margin over Broadcom (Fig.38).

In terms of the financial autonomy ratio, which specifies the proportion of total assets that are backed by equity, it consistently declined. It underscores Broadcom's dependence towards its creditors. Equity dipped and assets went up in value mostly from the acquisition's goodwill which was financed through debt. These increasing liabilities meant higher financial risk against potential financial distress and a heightened capacity to meet long-term obligations. Broadcom's strategic focus on maintaining its interest coverage high not only instils confidence in investors but also bolsters the company's capacity to manage debt in economic fluctuations and pursue growth initiatives with vigour. Furthermore, a review of the solvency ratio, which reveals the amount of equity over total liabilities, demonstrated again Broadcom's dependence on creditors with a 2022 value of 43%, the lowest from the 2018-22 period (Fig.39). The corporation maintained the liabilities weight typically higher than rivals in the industry. Competitors demonstrate that despite having some obligations towards creditors, about 42% in 2022, for their assets, they present, in total, a much higher equity value over liabilities (Fig.40). This

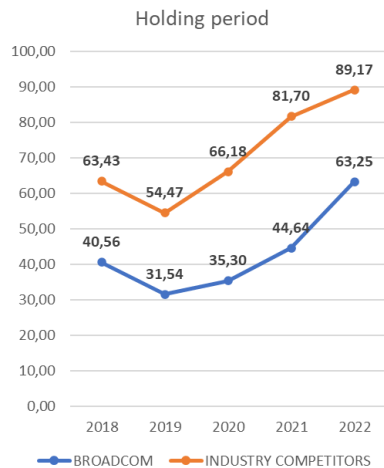


Figure 42: Holding period comparison between Broadcom and industry competitors.

Source: Analyst and Broadcom Inc.

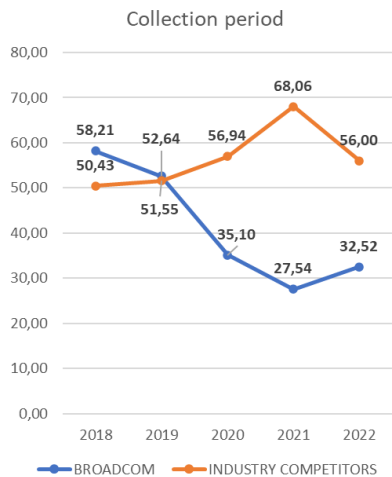


Figure 43: Collection period comparison between Broadcom and industry competitors.

Source: Analyst and Broadcom Inc.

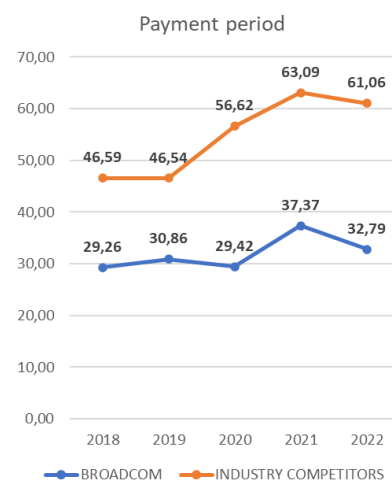


Figure 44: Payment period comparison between Broadcom and industry competitors.

Source: Analyst and Broadcom Inc.

could imply that Broadcom may be using too much debt to finance its operations than through equity, if not for most liabilities' origin in acquisition-related debt.

In summary, Broadcom Inc. showcases a robust financial foundation. The company's dedication to a balanced capital structure, characterized by a significant reliance on debt financing, positions it unfavourably in terms of long-term financial stability. However, this approach is safeguarded by Broadcom's capacity to navigate dynamic market conditions with safe margins over its interest-paying responsibilities and also by its liquidity.

Looking at the gearing ratio, a measure of how much invested capital operations are funded using net debt, we can then see Broadcom only uses half (52%) of debt to run the business (Fig.41). The CEO even acknowledged in different occasions and press conferences, namely during the attempt to acquire Qualcomm, that one of the company's ideals is to quickly repay its debt.

■ Cash flow management

The cash conversion cycle (CCC), a comprehensive measure of cash management efficiency, captures the time between cash expenditures for inventories and cash inflows from their sales. Broadcom demonstrated a CCC of 70 days in 2018, demonstrating agility in working capital management and within the 67-day level that took its competitors on average. This efficiency increased further, ending in an astounding 63 days by 2022 demonstrating the company's ability to optimize cash flows (Fig.45). In comparison, industry competitors faced a significantly higher average CCC of 84 days during the same period, highlighting Broadcom's superior cash flow management methods (Fig.45). Over the last 5 years, Broadcom was better or at par with its industry competitors in 2 aspects of the CCC, holding and collection periods. However, the payment period has always been below average, not signalling a bad indicator since it is a company policy to pay its supplies early and rapidly. Last fiscal year of 2022 the values were, respectively, 63, 33 and 33 days for holding, collection and payment periods (Fig.42,43 & 44). While the industry average values were, respectively, 89, 56 and 61 days. This means the company is more effective at quickly converting its inventory into cash and this can indicate a relative operational advantage especially when establishing agreements regarding payment with clients. In essence, Broadcom's cash flow management exhibited a strategic balance between operational efficiency and prudent capital allocation.

Cash conversion cycle

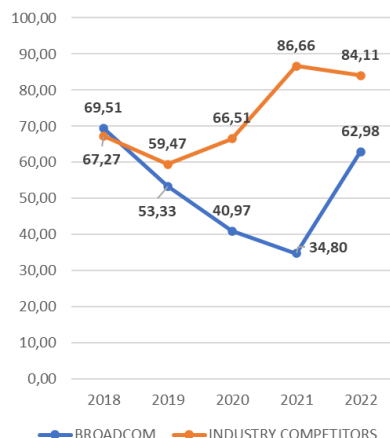


Figure 45: CCC comparison between Broadcom and industry competitors.

Source: Analyst and Broadcom Inc.

Gross margins

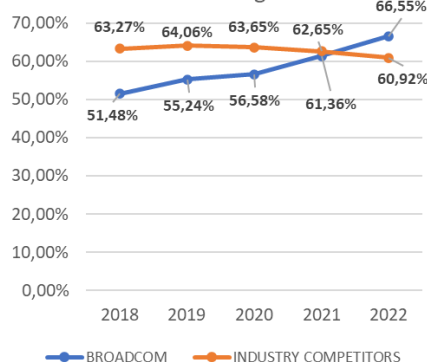


Figure 46: Gross profit margin comparison between Broadcom and industry competitors

Source: Analyst and Broadcom Inc.

Operating margins

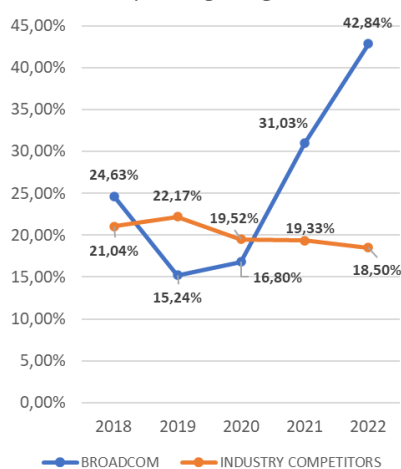


Figure 47: Operating profit margin comparison between Broadcom and industry competitors

Source: Analyst and Broadcom Inc.

■ Profitability

Broadcom's Gross Profit Margin, a measure of operational efficiency, has been consistently strong, starting at 51,48% and in a continuous uptrend to 66,55% in 2022 (Fig.46). This demonstrates a wise approach to pricing tactics and cost control, both of which have been critical in maintaining profitability levels as revenue grows and the cost of revenue keeps going down. Notably, this statistic routinely surpassed industry benchmarks, which averaged 62,91%. Furthermore, the Operating Profit Margin, a vital indicator of profitability after operating expenditures, increased. It gradually increased from 2019, where it fell almost 10 percentage points to 15,24%, to 42,84% in 2022 (Fig.47). This demonstrates Broadcom's ability to reduce operating expenses weight, which remained rather constant while revenues rose, which eventually contributed to increased profitability. These numbers outperformed the industry in 2022, with only 18,5% (Fig.47). Likewise, the Net Profit Margin, which reflects profit retention after all costs and taxes, was strong, averaging 29% with an upsurge since 2019 after the abnormal result in 2018. This consistent profitability demonstrates the company's strong ability to create returns, even when market dynamics become difficult to manage, much above the industry last 5 years norm of 17,76% (Fig.48).

These data, which constantly outperform industry standards, illustrate Broadcom's excellent operational efficiency, allowing it to position itself advantageously within the sector. This consistent financial performance reflects a well-balanced and strategic financial management strategy, which is a characteristic of Broadcom's financial stability and development potential.

■ Returns

The Returns Analysis illuminates Broadcom Inc.'s ability to generate returns for its stakeholders by evaluating the key return indicator, Return on Invested Capital (ROIC). As previously explained Broadcom has a big focus and strategic planning towards acquisitions to diversify and grow its business. As such, our ROIC analysis gathers both with and without goodwill returns to evaluate such impact on the company. With goodwill, Broadcom's total ROIC showed a noteworthy uptrend pattern from 2020 to 2022. Beginning with 8% and ending with 24,6%, the corporation demonstrated a constant capacity to use its capital efficiently, encompassing both equity and debt, to create returns. Broadcom's core business operational margin, a key component of core ROIC, in 2019 was 18,24% and continued to improve, culminating at 38,06% in 2022 (Fig.49). Impressive growth is also backed by notable

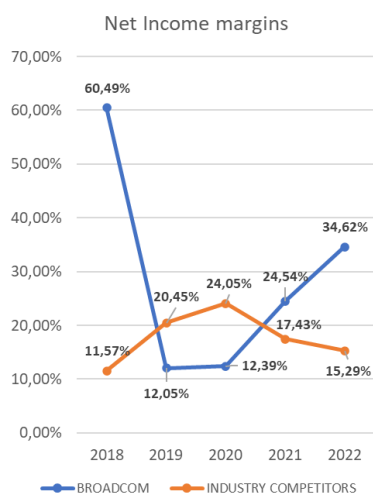


Figure 48: Net profit margin comparison between Broadcom and industry competitors

Source: Analyst and Broadcom Inc.

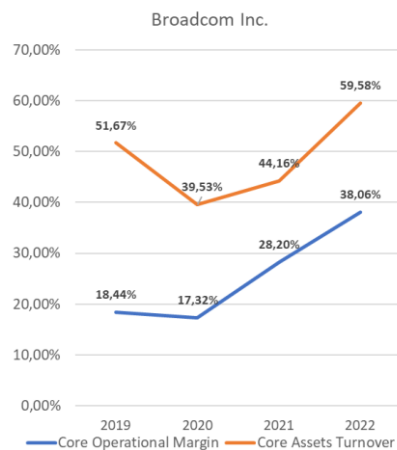


Figure 49: Core ROIC margins including goodwill (1-year lag)

Source: Analyst estimates

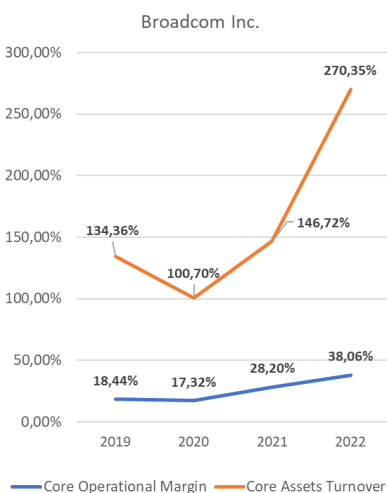


Figure 50: Core ROIC margins without goodwill (1-year lag)

Source: Analyst estimates

efficiency in utilizing its assets to generate revenue with an asset turnover of 59% in 2022. The main driver behind this core business component return growth was how much the revenue outgrew almost all costs, as these have been gradually decreasing their weight on net revenue and dictates how much assets are needed to sustain such revenue growth (Fig.49). The one aspect bringing total ROIC down was the non-core business part that showcased a negative ROIC, starting well at 9,44% in 2019 and -9,43% in 2022 (Fig.51). Despite this, non-core business does not set a bad return with economic meaning since its results are considered secondary. Without goodwill and looking at pure organic growth we can claim a much bigger total ROIC due to a higher core business ROIC and a significantly lower invested capital, whose asset turnover increases exponentially and operational margin remains the same (Fig.50). From 134% in 2019 to 270% in 2022, establishing the total ROIC of 2022 at 142% (Fig.52). This sustained improvement in both pure and with goodwill ROIC signifies Broadcom's adeptness in balancing profitability with asset utilization, a crucial aspect of its sustainable financial performance.

4. Valuation

4.1 Drivers and Forecasting Assumptions

Our analysis concluded that Broadcom's main drivers stem from leveraging strategic acquisitions to gain access to new markets and consistent investments in R&D, which allows the company to sustain its revenue growth by introducing innovative solutions aligned with market demands. This is underpinned by its diversified product portfolio that mitigates risks and allows the company to cater to multiple high-growth markets simultaneously. Cost-cutting initiatives, such as simplifying processes and supply chain optimisation, play a vital role in sustaining competitive margins. Effective inventory management and production efficiency boost margins even more, allowing Broadcom to respond quickly to market swings and adapt swiftly to changing client demands. Furthermore, licencing agreements and technical improvements help to strengthen Broadcom's income streams. These topics were the principal guide towards our next forecasting assumptions.

Our forecast has a total of 13 years, starting from the year 2023/2024 and ending in the year 2035, and reaching a steady state in 2030. Besides the past 5 years (2018-2022) fillings, we additionally used 3 quarters ended and an unconsolidated annual 2023 fillings to forecast some accounts while

Broadcom Inc.

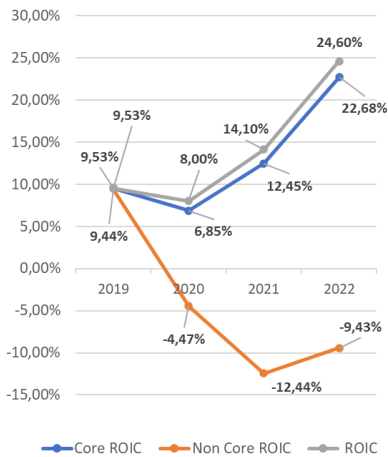


Figure 51: ROIC analysis including goodwill (1-year lag)

Source: Analyst estimates

Broadcom Inc.

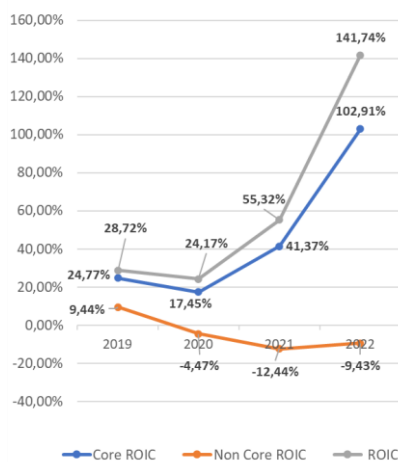


Figure 52: ROIC analysis without goodwill (1-year lag)

Source: Analyst estimates

others reflect only on the past annual filings. And used the VMware 2023 annual filing as well to add and infer about some accounts onto the 2024 forecast that do not derive from revenue, which already incorporated VMware acquisition. We used a top-down approach to forecast revenues, examining market growth and the company's market share projections for the upcoming years. It is important to note that since Broadcom Inc. operates in two different segments, namely semiconductor solutions and infrastructure software, revenue forecasts must be conducted separately for each segment due to distinct market growth and the company's market share projections in each.

To forecast Broadcom's revenue in the semiconductor sector in 2023, we used the revenues from the first three-quarters available on Broadcom's reports and assumed that the revenues coming from the last quarter of 2023 would grow at the same rate as the 3rd Quarter, this is 5%. Summing the values from the four quarters we reach a total revenue of \$28302,6 million, which means that Broadcom's market share will increase from 4,23% in 2022 to 5,12% in 2023. The increase in market share can be attributed to the company's ability to increase revenues, while the industry witnesses a downfall. We then projected the market share to converge to 4,5% until 2030, due to competitors entering the market. To project the segment market growth until the year 2027, we used forecasts from Bloomberg, which suggest a CAGR of 7,759%. The following year we project the market growth rate to be an average of the last 5 years (5,39%), which then converges to 3,47% in 2030. After the year 2030, we assume that the market is going to grow at the same rate as the average gross domestic product (GDP) growth rate between 1961 and 2022, according to data from the World Bank (World Bank Group n.d.).

For the infrastructure software segment, we calculated Broadcom's 2022 market share by dividing the company's revenue attributed to this segment, by the total revenue of the infrastructure software market according to Bloomberg, and we reached an estimate of 0,78%. We then estimated this number to reach 2,13% in 2024, due to the increase in revenue, and therefore market share, coming from the acquisition of VMware. To reach an estimated market share of 2,13%, we summed our 2023 Broadcom's infrastructure software market projected revenue of \$8875,87 million, with the total FY 2023 revenue from VMware and compounded it using the appropriate market growth rate, reaching an estimated 2024 revenue of \$24500 million. We then assumed that this market share would converge to

3% until 2030, due to the company's historic performance and growth strategy that involves acquiring other companies, specifically in the infrastructure software market.

... diverse infrastructure offerings...

As for the infrastructure software segment which encompasses many diverse markets, the CAGR from 2023 to 2028 was computed by averaging the growth rates of industries that Broadcom operates within the segment, namely Data Centre, Public Cloud, Internet of Things, Cybersecurity, System Infrastructure Software and Artificial Intelligence. The computed CAGR was determined to be 10,29%. This number then converges to 3,47% until 2030, following the same logic as the semiconductor industry.

The cost of sales was estimated as a percentage of the total net revenue, using the average from the last 6 years. This value then converges to 20% in 2030, as we believe that the company will improve efficiency in the steady state, influenced in part by the acquisition of VMware. Notably, VMware currently demonstrates gross margins exceeding 80% (Fig.53) and the company even accounts most of its cost of revenue as operating expenses due to the nature of its offerings being based on licenses, services and subscriptions within software applications. The restructuring charges were estimated using a moving average, as this expense is related to restructuring activities following acquisitions and not revenue. Total amortization of acquisition-related intangible assets from years 2023 and 2024 was retrieved from Broadcom's annual reports as expected amortization expense. After that it was forecasted as a percentage of intangible assets, using the average from the year 2018 to 2024, because values keep getting revised and updated. Research & development and selling, general & administrative were forecasted as a percentage of total net revenue, using the average from the last 6 years.

Other income, on the non-core businesses, was estimated using a moving average from the last 6 years because the values did not reflect any pattern with revenue, cost or any other driver and no main aspect involved in the year-to-year variation. Initially, interest expense was forecasted as a percentage of the previous year's debt level, using an average from the last 6 years, avoiding circularity. However, as there was available information on the company's loans and rates, we decided to separate total debt into existing debt, and new debt. Interest expense on existing debt, was calculated using contractual rates, stated on the company's reports. Projected interest expense was calculated using the December market interest rate of 5,24% (Financial Times 2023) over the projected new debt change each year.

Profitability	2021	2022	2023
Gross margin	82,64%	82,33%	81,41%
Operating margin	20,29%	18,57%	15,15%
Net income margin	17,49%	14,16%	9,84%

Figure 53: VMware's profitability margins

Source: Analyst estimates

(\$ millions)	2023
ASSETS	
Cash and cash equivalents	\$ 5 100,00
Short-term investments	\$ -
Accounts receivable, net Of allowance of \$9 and \$10	\$ 2 510,00
Due from related parties	\$ 2 078,00
Other current assets	\$ 543,00
Total current assets	\$10 231,00
Property and equipment, net	\$ 1 623,00
Deferred tax assets	\$ 6 157,00
Intangible assets, net	\$ 478,00
Goodwill	\$ 9 598,00
Due from related parties	\$ 208,00
Other assets	\$ 2 942,00
Total assets	\$31 237,00
LIABILITIES AND STOCKHOLDERS' EQUITY	
Accounts payable	\$ 267,00
Accrued expenses and other	\$ 2 568,00
Customer deposits	\$ 1 087,00
Current portion of long-term debt	\$ 1 000,00
Unearned revenue	\$ 7 079,00
Due to related parties	\$ 390,00
Total current liabilities	\$12 391,00
Long-term debt	\$ 9 440,00
Unearned revenue	\$ 5 664,00
Income tax payable	\$ 287,00
Operating lease liabilities	\$ 845,00
Due to related parties	\$ 648,00
Other liabilities	\$ 428,00
Total liabilities	\$29 703,00
Total stockholders' equity	\$ 1 534,00
Total liabilities and stockholders' equity	\$31 237,00

Figure 54: VMware's 2023 Balance sheet

Source: VMware

From the balance sheet, as mentioned, in some accounts we added the VMware's values (Fig.54). Operating cash was forecasted as a percentage of net revenue, using the average from the last 6 years of 2,5%. Receivables, payables, and inventory were forecasted, respectively, using the previous 5-year average of the collection, holding and payment periods. Also considering values obtained from competitors' average periods for the last 5 years. Other current assets, net PPE, employee compensation and benefits, total contract liabilities, and short-term and long-term lease liabilities related to operating leases, were all forecasted as a percentage of net revenue, using the average of the last 5 years. Goodwill and Intangible assets were forecasted to be equal to their respective average of the last 5 years, since acquired revenues, the typical drivers for these items, are difficult to forecast, and we believe that Broadcom shows no sign of changing their current growth method from acquisitions. All the items that were considered Non-Core Invested Capital were forecasted as a percentage of net revenue, using the average from the last 5 years.

After building the forecast, the core result or net operating profit after taxes (NOPAT) was obtained and, to get our core Free cash flows, we added back the depreciation which was forecasted as the average 6-year percentage of the prior year's Net PPE of 235,66%. Then we subtracted the change in working capital, projected each year accordingly to the belonging accounts from the balance sheet and finalized by subtracting the Capital Expenditures (CAPEX). The latter was calculated based on the variation in each year of Net PPE plus the depreciation expense. To confirm, the core FCF were the same when calculating with NOPAT minus increase in invested capital (Appendix).

4.2 Weighted Average Cost of Capital (WACC)

Broadcom works in a highly competitive market with significant technical breakthroughs, therefore, understanding its cost of capital serves as a standard for assessing possible investments and initiatives, assisting management in making value-adding decisions. The Weighted Average Cost of Capital (WACC) represents the risk faced and indicates the average rate of return required to satisfy its creditors, shareholders, and other capital suppliers. This is the discount rate to which we discounted our projected free cash flows to the present because WACC base discount models work best, and estimate a more accurate price target, for companies like Broadcom which have an ideal capital structure (Koller, Goedhart, and Wessels 2020a).

Technology and software sectors have seen a continuous WACC uptrend in recent years.

The cost of debt is lower than the cost of equity because debt is considered less risky by investors...

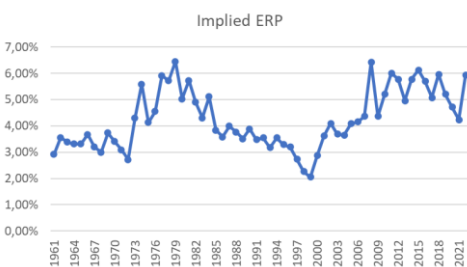


Figure 55: Historical Implied ERP (1961-2022)

Source: Aswath Damodaran

Company	Levered Beta	Debt/Equity	Unlevered Beta
QUALCOMM	1,225	10,82%	1,13
INTEL	0,898	29,52%	0,73
CISCO	0,963	3,52%	0,94
IBM	0,764	42,63%	0,57
SERVICE NOW	1,006	1,69%	0,99
ORACLE	1,022	28,08%	0,84
MARVELL TECHNOLOGIES	1,401	8,53%	1,31
ANALOG DEVICES	1,150	7,83%	1,08
NVIDIA	1,687	0,94%	1,67
Median	1,02	9%	0,99
Average	1,12	15%	1,03

Figure 56: Industry peers' levered beta, D/E ratio and final unlevered betas

Source: Analyst estimates

By using the same rate to discount all future cash flows it is assumed that the company's capital structure is to be kept constant.

The WACC is calculated using three key components: the cost of equity, the after-tax cost of debt, and the ratio of equity to debt in the company's target capital structure. The market value of equity is employed and for the market value of debt, we used its book value as a proxy. The equity market value was calculated by multiplying the share price by the number of outstanding shares and because most of the bond prices traded are relatively steady and considered "stale", the book value of debt was viewed as a solid proxy for market value.

The cost of equity was calculated using the Capital Asset Pricing Model (CAPM) which establishes a relationship between the expected return of an asset given its risk and the return on risk-free assets. In simpler terms, determining if an investment provides a reasonable return for the degree of risk. As of November 14th, 2023, the yield on a 10-year U.S. government T-note bond, considered a proxy for the risk-free rate, stood at 4,49%(FRED 2023). The equity risk premium (ERP), the difference between expected market return and the risk-free rate, required by us, given the economic conditions and historical data, is 4,87% derived from the findings by Aswath Damodaran (Damodaran 2023). Historical returns are utilized in the conventional approach to determining the equity risk premium, with the difference in annual returns on stocks versus bonds over a long period comprising the predicted risk premium. The value of 4,87% that we choose is the average ERP from the year 2000 to 2022, in consideration of the uncertain economic conditions being faced that place the premium almost at 6% in 2023 we did not consider this value (Fig.55). To adjust the ERP for Industry/Company risk, we did a regression analysis based on historical stock price movements against the market portfolio, Standard&Poor 500 for the U.S., to get the levered equity beta (β). The measurement period for the regressions includes 60 data points, five years of monthly returns. We regressed against Broadcom itself and its industry competitors individually (Fig.56). Broadcom's beta was estimated at 1,13 and the median value for all competitors was 1,02. Afterwards, we unlevered each, based on their respective debt-to-equity ratio and statutory tax rate, to feasibly compare each accounting for the different capital structures involved. Broadcom's unlevered beta is 1,05 which aligns with the competitor median and indicates a near-correlated level of sensitivity to market fluctuations. By leveraging again this beta with Broadcom's target capital structure of 15% debt and 85%

equity, captured by the competitor's average debt-to-equity ratio of 15% and also by Broadcom's market-valued structure for past years, we obtain a beta of 1,13 and a cost of equity of 10% (Fig.57).

BROADCOM	
Target Capital Structure	
Debt to Total Capitalization	15,00%
Equity to Total Capitalization	85,00%
Debt / Equity	17,65%
Cost of Equity CAPM Calculation	
Risk Free Rate	4,49%
Equity Risk Premium	4,87%
Levered Beta	1,13
Cost of Equity	10,00%
Cost of Debt Calculation	
Bond rating	BBB-
Rating default premium	1,76%
Cost of debt	6,25%
Tax Rate	21,00%
After-Tax Cost of Debt	4,94%
WACC	9,24%

Figure 57: Broadcom WACC calculations

Source: Analyst estimates

The cost of debt relies on Broadcom's existing investment grade bonds, with a credit rating of BBB (Fitch Ratings 2023), with an average yield to maturity (YTM) of 6,25%. This incorporates both the risk-free rate and a premium for lending to Broadcom compared to a risk-free investment (ICE Data Indices, FRED, and Bank Of America 2023). Adapting for the 21% tax rate we get an after-tax cost of debt of 4,94% (Fig.57). For companies with investment-grade debt (rated at BBB or better), the probability of default is so low that we believe this inconsistency is immaterial and therefore implies YTM is the best method, especially when compared with the estimation error surrounding the cost of equity. Additionally, if bond prices are "stale" its use will lead to an outdated YTM. Likewise, the cost of debt is rarely estimated in practice with the CAPM because infrequent trading makes the estimation of beta impossible (Koller, Goedhart, and Wessels 2020b).

To finalize, we adjust the cost of debt and equity to their respective weights on the target capital structure and get a WACC of 9,24% (Fig.57).

4.3 Discounted Cash Flows Model

The Discounted cash flow is a valuation method based on expected future cash flows forecasted according to our chosen drivers/assumptions mentioned before and discounted with the calculated WACC to our year zero, 2024. The final perpetual cash flow, the continuing or terminal value, is based on the growth rate and the return on new invested capital (RONIC).

Using the WACC of 9,24% and the model's growth rate of 3,76%, equivalent to the core Free cash flow growth rate in the last forecasted year, and a RONIC of 369%, the core free cash flow terminal value in 2035 is \$921,378 billion. The RONIC big value is explained by how the infrastructure software segment will grow to almost being the majority revenue earner without needing as much invested capital. This segment operates mostly on a software service/subscription base which, rationally, does not necessitate a big amount of capital, or assets, to produce results. Consequently, the company's overall return (NOPAT) variation is unproportionally bigger each year than the change in invested capital, causing the RONIC to be so high.

Following that, we arrived at a total discounted core value of \$605,562 billion. non-core captions were assessed at 2024 book value and added. The final

Valuation	
Core Business DCF	\$ 257 016,44
Core Business Discounted Terminal Value	\$ 348 546,30
Value of Core Business	\$ 605 562,74
Value of Non-Core Business	\$ -4 007,89
Enterprise Value	\$ 601 554,85
Value of Net Debt	\$ 40 991,93
Equity Value	\$ 560 562,92
per share	\$ 1 312,79
Market Capitalization (14th november)	\$ 401 830,00
per share	\$ 941,05
# of shares outstanding (millions)	427
Difference (Upside)	39,50%
annual dividend declared	\$ 21,00
Total shareholder return (Traditional method)	41,73%
Total shareholder return (Enhanced method)	45,24%

Figure 58: Broadcom's Valuation Summary

Source: Analyst estimates

enterprise value is then \$601,554 billion. Adding the 2024 Net financial Debt (\$-40,991 billion), we get Broadcom's equity value of \$560,562 billion. With a steady number of outstanding shares of 427 million, an anticipated price of \$1312,79 per share was attained for 2024 (Fig.58).

This price target falls within other analysts' estimates of a \$800-\$1400 interval, whose valuations have been getting an upward revision due to a lower probability of economic downturn than expected.

4.4 Multiples/Comparable Company Analysis

Complementing our DCF Valuation, we decided to use a relative form of valuation, the comparable company analysis. This form of relative valuation uses ratios of publicly traded companies that operate in the same industry, located in the same geography, and with similar sizes. We used the previously mentioned competitors, as stated in Broadcom's latest 2022 annual report. These are companies that operate in the Semiconductor Solutions and Infrastructure Software markets, with headquarters located in the United States and similar sizes, with revenues ranging from \$4 billion to \$65 billion.

We used 3 different multiples to assess Broadcom's value when compared to its peers, namely EV/Revenue, EV/EBITDA, and P/E. As indicated by Koller (Koller, Goedhart, and Wessels 2020a), we used forward-looking multiples to reach an estimated enterprise and equity value for Broadcom. This is because past returns are affected by one-time items such as acquisitions, or diversions in significant parts of their operations. By using forward-looking multiples, we are avoiding one-time items and being consistent with the principles of valuation - particularly that a company's value equals the present value of future cash flows. The multiples used were retrieved from Bloomberg on the 9th of November (Koller, Goedhart, and Wessels 2020b). Although we estimated the company's equity value based on 3 different multiples, it is important to note that the EV/EBITDA provides the most relevant and accurate prediction. This is because the P/E ratio is distorted by different capital structures, nonoperating assets and nonoperating income statement items, which are not helpful indicators of a company's future cash flows. Additionally, the EV/Revenue ratio does not incorporate a company's profitability, which is crucial for determining a company's true worth.

We arrived at an industry median value of 7,2x for the EV/Revenue, 14,6x for the EV/EBITDA ratio, and 20,2x for the P/E ratio (Fig.59). Computing the implied share price for each multiple, we arrive at a share price of \$885,51 for

Operating Statistics: (in millions, except percentages)			
Company Name	FY24		
	EV/Revenue	EV/EBITDA	P/E
QUALCOMM	3,7 x	10,4 x	13,0 x
INTEL	3,0 x	11,1 x	20,3 x
CISCO	3,4 x	9,2 x	12,8 x
IBM	2,9 x	11,9 x	14,8 x
SERVICE NOW	11,7 x	34,7 x	49,3 x
ORACLE CORPORATION	7,2 x	14,6 x	20,2 x
MARVELL TECHNOLOGY	8,9 x	25,7 x	34,2 x
ANALOG DEVICES	8,1 x	15,5 x	19,9 x
NVIDIA	21,4 x	37,4 x	43,6 x
Maximum	21,4 x	37,4 x	49,3 x
75th Percentile	8,9 x	25,7 x	34,2 x
Median	7,2 x	14,6 x	20,2 x
25th Percentile	3,4 x	11,1 x	14,8 x
Minimum	2,9 x	9,2 x	12,8 x

Figure 59: Industry peers' Forward-looking multiples

Source: Analyst estimates

Implied Per Share Value at a Range of Multiples:					
EV/Revenue	\$ 295,10	\$ 364,48	\$ 885,51	\$ 1 118,14	\$ 2 814,56
EV/EBITDA	\$ 523,75	\$ 651,71	\$ 888,21	\$ 1 627,84	\$ 2 411,02
P/E	\$ 688,14	\$ 790,50	\$ 1 084,19	\$ 1 831,28	\$ 2 643,76

Figure 60: Broadcom Inc. Implied Share Price at a Range of Multiples

Source: Analyst estimates

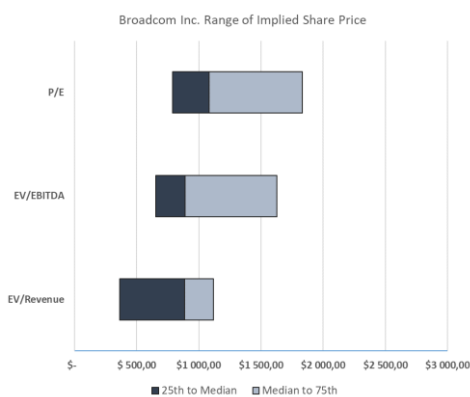


Figure 61: Broadcom Inc. Range of Implied Share Price

Source: Analyst estimates

the EV/Revenue ratio, \$888,21 for the EV/EBITDA ratio, and \$1084,19 for the P/E ratio as of 9th of November (Fig.60). The EV/EBITDA, the most accurate one, is relatively smaller than our DCF price target, but still within price interval estimates, due to a lower EV value of \$418,8 billion compared to the DCF's \$560,5 billion. Therefore, since the forward-looking multiples are under constant modifications and lately, we are seeing an upward revision on multiples from the lower-than-expected probability of economic downturn, we decided to also progress our analysis to the 75% percentile multiple. That implies a share price of \$1118,14 for the EV/Revenue ratio, \$1627,84 for the EV/EBITDA ratio, and \$1831,28 for the P/E ratio. To avoid any over-positive outlook and biases the price target should fall between the 50% and 75% percentile multiples (Fig.60 & 61).

Concluding this relative analysis, we believe that some competitors under and over-performing, along with positive revisions, do not suggest a precise price interval for Broadcom. Additionally, Broadcom's strategy and diversification do make the DCF price target higher in our perspective and assumptions. In the next part of sensitivity analysis, we delve more into that but the overall combination of the two valuation methods gives insight that Broadcom's price is estimated at around \$1000-\$1400.

4.5 Sensitivity and Scenario Analysis

Initially, we performed a sensitivity analysis on the WACC, by changing the values of the Equity Risk Premium (ERP) and of the levered Beta, by +/- 0,5% and +/- 0,05, respectively. By doing so, we arrived at a minimum WACC value of 7,95% and a maximum value of 10,70%. Furthermore, we utilized those WACC values combined with the growth rate to analyse the price target sensitivity to these changing variables. As seen in (Fig.62), the growth rate values have a 0,5% variation from each value starting in our estimated rate. A different and specific value that we wanted to use, 3,74%, is the annual expected GDP growth rate worldwide. The analysis demonstrates a max and minimum range of \$954 to \$2132, and we conclude that current economic conditions, with high-interest rates to fight inflation, have increased the cost of capital mainly from a higher risk-free rate perspective. A "normal" cost of capital would be around 7% to 8% and the price target could reach the \$1500 level. Nevertheless, for now, a fair price target distribution interval is \$1118 to \$1511 (Fig.63).

The following scenario analysis (Fig.64) provides a detailed view of Broadcom Inc.'s future trajectories, examining potential business outcomes

ERP	BETA				
	1,03	1,08	1,13	1,18	1,23
3,87%	7,95%	8,11%	8,28%	8,44%	8,61%
4,37%	8,39%	8,57%	8,76%	8,94%	9,13%
4,87%	8,83%	9,03%	9,24%	9,45%	9,65%
5,37%	9,26%	9,49%	9,72%	9,95%	10,18%
5,87%	9,70%	9,95%	10,20%	10,45%	10,70%

Figure 62: Sensitivity Analysis on the WACC

Source: Analyst estimates

GROWTH RATE	WACC				
	7,95%	8,57%	9,24%	9,95%	10,70%
2,97%	\$ 1 565,76	\$ 1 374,28	\$ 1 212,00	\$ 1 073,55	\$ 954,66
3,47%	\$ 1 678,81	\$ 1 456,90	\$ 1 272,94	\$ 1 118,87	\$ 988,61
3,76%	\$ 1 755,59	\$ 1 511,86	\$ 1 312,79	\$ 1 148,08	\$ 1 010,22
4,26%	\$ 1 918,40	\$ 1 625,45	\$ 1 393,46	\$ 1 206,20	\$ 1 052,61
4,76%	\$ 2 132,20	\$ 1 768,81	\$ 1 492,12	\$ 1 275,52	\$ 1 102,14

Figure 63: Sensitivity Analysis on the Share Price

Source: Analyst estimates

under different market situations and operational environments. The analysis uses a realistic baseline with our previously defined assumptions. It offers quantitative insights into key factors like revenue growth, R&D investment, margins, and operational expenditures, providing stakeholders and investors with a nuanced understanding of potential trajectories and their implications for Broadcom Inc.'s strategic decision-making and future performance in the tech industry.

Optimistic Scenario: Revenue Growth is expected at 12% annually until steady state due to successful product launches, increased market share in high-growth sectors like 5G infrastructure and expanded virtualization solutions. R&D Investment increased by 20% from baseline to 24% of revenue annually to support innovation, product diversification, and technological advancements. Resulting in gross Margin improvement of 5% (500 basis points over baseline) due to operational efficiencies, optimized cost structures, and higher-margin product sales. Additionally, core result before taxes margin increased by 7% over baseline through streamlined operations, improved productivity, and efficient supply chain management. Resulting in a price target of \$1410,60 (Fig.64).

Pessimistic Scenario: Revenue slower growth at 5%, until steady state, annually due to increased competition, economic downturns, or market saturation in key segments. Reduced R&D spending by 15% to 17% of revenue to counter cost pressures and challenging market conditions. Gross Margin contracted by 600 basis points from baseline due to pricing pressures, increased operating costs, and margin compression in competitive markets. Operating expenses increased, reducing core operational margin by 600 basis points due to supply chain disruptions, higher labour costs, or regulatory compliance challenges. Results in a share price of \$955,65.

Pessimistic scenario			Price target
Revenue growth	5%/year until 2030	-2	\$ 955,65
Gross margin	-6% reduced from baseline		
R&D	17% of revenue		
Core result before taxes margin	-6% reduced from baseline		
Optimistic scenario			Price target
Revenue growth	12%/year until 2030	-2	\$ 1 410,60
Gross margin	+5% added from baseline		
R&D	24% of revenue		
Core result before taxes margin	+7% added from baseline		

Figure 64: Scenario Analysis on price target

Source: Analyst estimates

5. Investment recommendations

5.1 Buy, Sell or Hold recommendation

Based on the comprehensive equity research and valuation performed on Broadcom Inc., as well as the expected price target analysis, potential investors should strongly consider a "Buy" position. Our valuation provides a bullish prognosis for Broadcom's future. When compared to the market price of November 14th (\$941), the intrinsic value generated from our study implies a significant potential upside of 39,5%. When considering transactions with shareholders, declared 2024 annual dividends of \$21, the total return would be

41,73% but if we use the full spectrum of all types of transactions it would be 45,24% (Fig.58). This "Buy" recommendation intends to advise investors seeking long-term value and development potential in their investment selections, based on the company's strong financial performance, innovative skills, and predicted market expansion.

5.3 Future Prospects

Broadcom Inc. exhibits promising prospects driven by several factors. The company's diverse product portfolio, spanning semiconductor and infrastructure software solutions, positions it strategically for the digital transformation age. The continuous progress of telecommunications technologies, enterprise software, data storage and management, security software, automation and, significantly, artificial intelligence provide significant growth opportunities for Broadcom, given its vital position in delivering critical components for these breakthroughs. On top of that, strategic acquisitions like the pending VMware one, and alliances like Broadcom's plan to invest in a European Union (EU) funded chip programme in Spain, part of the EU's semiconductor strategy to boost its own chip industry and reduce reliance on U.S. and Asian suppliers (Reuters 2023), have strengthened Broadcom's worldwide authority. Providing opportunities for increased market share and revenue streams, especially in the virtualization sector. Based on our projections, infrastructure software could account for 50% of total revenue in the future, balancing business risk aligned with bigger semiconductors competition. Broadcom's experience in connectivity solutions and semiconductor advancements matches with rising trends as digitalization becomes increasingly common. Its importance in a changing technological world is further cemented by rising demand for high-performance computing, data storage, and networking solutions.

Ultimately, we believe that one of the most important aspects about Broadcom's attractiveness to investors is its positioning in multiple divisions of the aforementioned technologies. The healthy way Broadcom has been conducting its operations and finances coupled with all the diverse strategic acquisitions points to consolidation in several markets and various cash-making branches. Allowing the company to eliminate some systematic risks and anticipate a strong increase in revenue and earnings per share. Highlighting Broadcom's excellent future performance trajectory but also strong economic growth following recent turmoil over COVID-19 and worldwide inflationary events.

Deflationary measures making the desired impact...

...more optimistic horizon towards growth.

Is AI fully priced in?

... can new AI technology solutions bring the industry to unimageable highs?

6. References

- Bradshaw, Tim. 2023. "Broadcom Chief Hock Tan Seeks More Acquisitions after \$69bn VMware Deal - Financial Times," 2023. <https://www.ft.com/content/0a4013b6-b3b9-49fd-87a9-bd0da5e229b1>.
- Broadcom Inc. 2022. "2022 Annual Report on Form 10-K."
- Broadcom Inc. 2023a. "Broadcom Introduces Industry's First Switch With On-Chip Neural Network." 2023. <https://investors.broadcom.com/news-releases/news-release-details/broadcom-introduces-industrys-first-switch-chip-neural-network>.
- . 2023b. "Broadcom Software Global Partners (GSIs and GSPs)." 2023. <https://www.broadcom.com/how-to-buy/software-partners/global-partners>.
- . 2023c. "Find a Partner or Distributor." 2023. <https://www.broadcom.com/how-to-buy/partner-distributor-lookup>.
- CA Technologies. 2016. "Take Charge of Your Mainframe With DevOps."
- Cisco Systems Inc. 2023. "2023 Annual 10-k Report."
- Damodaran, Aswath. 2023. "Equity Risk Premiums (ERP): Determinants, Estimation and Implications - The 2023 Edition." *SSRN Electronic Journal*, March. <https://doi.org/10.2139/SSRN.4398884>.
- F. Bruner, Robert. 2004. *Applied Mergers and Acquisitions*. 1st ed.
- Financial Times. 2023. "Latest Bond Rates, Interest Rates, Libor and Interbank Rates - FT.Com." 2023. <https://markets.ft.com/data/bonds>.
- Fitch Ratings. 2023. "Broadcom Inc. Credit Ratings :: Fitch Ratings." 2023. <https://www.fitchratings.com/entity/broadcom-inc-96473152>.
- Flaningam, Eric. 2023. "An Overview of the Semiconductor Industry - A Primer on the Various Market Segments & Market Leaders across the Industry." <https://www.aitechinvesting.com/p/an-overview-of-the-semiconductor>.
- FRED. 2023. "Market Yield on U.S. Treasury Securities at 10-Year Constant Maturity, Quoted on an Investment Basis." 2023. <https://fred.stlouisfed.org/series/DGS10/>.
- GreyB. 2023. "Broadcom Patents – Key Insights and Stats." 2023. <https://insights.greyb.com/broadcom-patents/>.
- ICE Data Indices, LLC, Federal Reserve Bank of St. Louis FRED, and Bank Of America. 2023. "ICE BofA BBB US Corporate Index Effective Yield." 2023. <https://fred.stlouisfed.org/series/BAMLC0A4CBBBEY/>.
- Intel Corporation. 2022. "2022 Annual 10-k Report."
- Koller, Tim, Marc Goedhart, and David Wessels. 2020a. *Valuating: Measuring and Managing the Value of Companies 7th Edition*. Mckinsey & Company Inc.
- . 2020b. *Valuating: Measuring and Managing the Value of Companies 7th Edition*. Mckinsey & Company Inc.
- Macrotrends. 2023. "Broadcom Market Cap 2010-2023." <https://www.macrotrends.net/stocks/charts/AVGO/broadcom/market-cap>.
- Nvidia Corporation. 2023. "2023 Annual 10-k Report."
- Oracle Corporation. 2023. "2023 Annual 10-k Report."
- Qualcomm Inc. 2023. "2023 Annual 10-k Report."
- Reuters. 2023a. "Broadcom Adds Silicon AI Features to Speed New Trident Networking Chip." 2023. <https://www.reuters.com/technology/broadcom-adds-silicon-ai-features-speed-new-trident-networking-chip-2023-11-30/>.
- . 2023b. "Broadcom to Invest in a \$1 Billion EU-Funded Chip Programme in Spain." 2023.
- . 2023c. "Broadcom to Invest in a \$1 Billion EU-Funded Chip Programme in Spain." 2023.

Statista Market Insights. 2023a. “Artificial Intelligence | Statista Market Forecast.”

<https://www.statista.com/outlook/tmo/artificial-intelligence/worldwide>.

———. 2023b. “Cybersecurity | Statista Market Forecast.”

<https://www.statista.com/outlook/tmo/cybersecurity/worldwide>.

———. 2023c. “Data Center | Statista Market Forecast.” <https://www.statista.com/outlook/tmo/data-center/worldwide>.

———. 2023d. “Semiconductors - Worldwide | Statista Market Forecast.” 2023.

<https://www.statista.com/outlook/tmo/semiconductors/worldwide>.

———. 2023e. “Software as a Service | Statista Market Forecast.”

<https://www.statista.com/outlook/tmo/public-cloud/software-as-a-service/worldwide>.

———. 2023f. “System Infrastructure Software - Global | Market Forecast.” 2023.

<https://www.statista.com/outlook/tmo/software/system-infrastructure-software/worldwide>.

World Bank Group. n.d. “World Development Indicators | DataBank.” Accessed December 11, 2023.

<https://databank.worldbank.org/reports.aspx?source=2&series=NY.GDP.MKTP.KD.ZG&country=#>.

Yahoo Finance. 2023a. “Broadcom Share Price Chart.” -.

———. 2023b. “EPS and PE Ratio .” <https://finance.yahoo.com/>.

———. 2023c. “Holders of Broadcom’s Shares.”

<https://finance.yahoo.com/quote/AVGO/holders?p=AVGO&guccounter=1>.

7. Appendix

Exhibit 1: Historical and Forecasted Income statement

	(In millions, except per value)	HISTORICAL PERIOD				FORECASTED PERIOD											
		2020A	2021A	2022A	2023E	2024F	2025F	2026F	2027F	2028F	2029F	2030F	2031F	2032F	2033F	2034F	2035F
CORE BUSINESS																	
Semiconductor solutions:																	
Net revenue	\$	17 267,00	20 383,00	25 818,00	28 302,60	33 558,38	37 065,74	37 275,20	38 278,44	39 593,07	40 564,66	41 162,08	42 590,40	44 068,29	45 597,46	47 179,69	48 816,83
Infrastructure software:																	
Net revenue	\$	6 621,00	7 067,00	7 385,00	8 875,87	24 530,58	28 896,53	33 901,26	39 629,99	46 178,73	51 996,64	56 533,37	58 495,08	60 524,86	62 625,07	64 798,16	67 046,65
Cost of sales	\$	6 518,00	7 162,00	8 256,00	9 272,00	14 077,03	15 519,59	16 244,16	17 230,84	18 364,76	19 165,37	19 539,09	20 217,10	20 918,63	21 644,51	22 395,57	23 172,70
Purchase accounting effect on inventory	\$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Restructuring charges (COGS)	\$	35,00	17,00	5,00	4,00	26,33	17,47	13,96	13,35	15,02	17,23	15,41	14,99	15,20	15,57	15,68	15,37
Total Amortization of acquisition-related intangible assets (COGS included)	\$	6 220,00	5 403,00	4 359,00	3 247,00	2 392,00	5 055,13	5 055,13	5 055,13	5 055,13	5 055,13	5 055,13	5 055,13	5 055,13	5 055,13	5 055,13	5 055,13
Research and development	\$	4 968,00	4 854,00	4 919,00	5 253,00	11 617,79	13 192,45	14 235,29	15 581,69	17 154,36	18 512,26	19 539,09	20 217,10	20 918,63	21 644,51	22 395,57	23 172,70
Selling, general and administrative	\$	1 935,00	1 347,00	1 382,00	1 592,00	3 299,44	3 746,65	4 042,81	4 425,19	4 871,83	5 257,47	5 549,09	5 741,64	5 940,88	6 147,02	6 360,33	6 581,03
Total before taxes	\$	4 212,00	8 667,00	14 282,00	17 810,47	26 676,36	28 430,98	31 585,10	35 602,23	40 310,70	44 553,84	47 997,64	49 839,52	51 744,68	53 715,79	55 755,57	57 866,56
Statutory taxes	\$	884,52	1 820,07	2 999,22	3 740,20	5 602,04	5 970,51	6 632,87	7 476,47	8 465,25	9 356,31	10 079,51	10 466,30	10 866,38	11 280,32	11 708,67	12 151,98
Core Tax Adjustments	\$	811,08	892,98	1 355,31	1 710,07	2 671,88	3 034,02	3 273,85	3 583,50	3 945,19	4 257,48	4 493,63	4 649,56	4 810,90	4 977,84	5 150,57	5 329,29
Result after taxes	\$	4 138,56	7 739,91	12 638,09	15 780,34	23 746,20	25 494,50	28 226,08	31 709,27	35 790,64	39 455,02	42 411,77	44 022,78	45 689,20	47 413,31	49 197,47	51 043,87
NON CORE BUSINESS																	
Impairment on investment	\$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Restructuring, impairment and disposal charges	\$	198,00	148,00	57,00	244,00	267,00	275,00	198,17	198,19	206,56	231,49	229,40	223,13	214,49	217,21	220,38	222,68
Litigation settlements	\$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other income (expense), net	\$	206,00	131,00	-54,00	512,00	194,17	202,53	198,62	197,39	208,45	252,19	208,89	211,34	212,81	215,18	218,14	219,76
Non Core result before taxes	\$	8,00	-17,00	-111,00	268,00	-72,83	-72,47	0,45	-0,81	1,89	20,70	-20,51	-11,79	-1,68	-2,03	-2,24	-2,92
Statutory taxes	\$	1,68	-3,57	-23,31	56,28	-15,30	-15,22	0,09	-0,17	0,40	4,35	-4,31	-2,48	-0,35	-0,43	-0,47	-0,61
Non Core Tax adjustments	\$	219,87	500,61	323,28	392,25	612,87	695,93	750,95	821,97	904,93	976,57	1 030,73	1 066,50	1 103,51	1 141,80	1 181,42	1 222,41
Loss from discontinued operations, net of income taxes	\$	-1,00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Change in unrealized gain on derivative instruments	\$	-	-	-	37,00	-	-	-	-	-	-	-	-	-	-	-	-
Change in actuarial loss and prior service costs associated with defined benefit plans	\$	24,00	-8,00	25,00	-	-	-	-	-	-	-	-	-	-	-	-	-
Non Core result	\$	249,19	479,18	297,59	603,97	555,33	638,68	751,30	821,33	906,43	992,92	1 014,53	1 057,18	1 102,18	1 140,19	1 179,65	1 220,10
FINANCING RESULT																	
Interest expense	\$	-1 777,00	-1 885,00	-1 737,00	-1 622,00	-1 793,93	-580,52	-1 090,01	-1 117,37	-1 152,97	-1 153,88	-1 159,31	-1 297,83	-1 422,64	-1 180,18	-1 030,06	-1 031,53
Financing result before taxes	\$	-1 777,00	-1 885,00	-1 737,00	-1 622,00	-1 793,93	-580,52	-1 090,01	-1 117,37	-1 152,97	-1 153,88	-1 159,31	-1 297,83	-1 422,64	-1 180,18	-1 030,06	-1 031,53
Statutory taxes	\$	-373,17	-395,85	-364,77	-340,62	-376,73	-121,91	-228,90	-234,65	-242,12	-242,31	-243,46	-272,54	-298,75	-247,84	-216,31	-216,62
Dividends on preferred stock	\$	-297,00	-299,00	-272,00	-	-	-	-	-	-	-	-	-	-	-	-	-
Financing result	\$	-1 700,83	-1 788,15	-1 644,23	-1 281,38	-1 417,21	-458,61	-861,11	-882,72	-910,84	-911,56	-915,86	-1 025,29	-1 123,88	-932,34	-813,74	-814,91
Total Comprehensive Income	\$	2 686,92	6 430,94	11 291,45	15 102,93	22 884,32	25 674,57	28 116,27	31 647,87	35 786,22	39 536,37	42 510,44	44 054,68	45 667,49	47 621,16	49 563,38	51 449,07

Exhibit 2: Historical and Forecasted Balance sheet

Core Invested Capital																	
Operating cash	\$ 595	\$ 684	\$ 828	\$ 925,74	\$ 1,446,41	\$ 1,642,46	\$ 1,772,29	\$ 1,939,92	\$ 2,135,72	\$ 2,304,78	\$ 2,432,62	\$ 2,517,03	\$ 2,604,37	\$ 2,694,74	\$ 2,788,25	\$ 2,885,00	
Trade accounts receivable, net	\$ 2,297	\$ 2,071	\$ 2,958	\$ 3,154,00	\$ 6,684,21	\$ 7,590,18	\$ 8,190,17	\$ 8,964,81	\$ 9,869,63	\$ 10,650,89	\$ 11,241,67	\$ 11,631,75	\$ 12,035,38	\$ 12,453,00	\$ 12,885,12	\$ 13,332,24	
Inventory	\$ 1,003	\$ 1,297	\$ 1,925	\$ 1,898,00	\$ 2,044,06	\$ 2,253,53	\$ 2,358,74	\$ 2,502,01	\$ 2,666,66	\$ 2,782,92	\$ 2,837,18	\$ 2,935,63	\$ 3,037,50	\$ 3,142,90	\$ 3,251,96	\$ 3,364,80	
Other current assets	\$ 977	\$ 1,055	\$ 1,205	\$ 1,606,00	\$ 2,019,93	\$ 2,293,71	\$ 2,475,02	\$ 2,709,11	\$ 2,982,55	\$ 3,218,64	\$ 3,397,17	\$ 3,515,05	\$ 3,637,02	\$ 3,763,23	\$ 3,893,81	\$ 4,028,93	
Property, plant and equipment, net	\$ 2,509	\$ 2,348	\$ 2,223	\$ 2,154,00	\$ 5,376,71	\$ 6,105,46	\$ 6,588,08	\$ 7,211,20	\$ 7,939,03	\$ 8,567,46	\$ 9,042,68	\$ 9,356,46	\$ 9,681,13	\$ 10,017,07	\$ 10,364,66	\$ 10,724,31	
Goodwill	\$ 43,447	\$ 43,450	\$ 43,614	\$ 43,653,00	\$ 49,229,83	\$ 41,002,98	\$ 41,002,98	\$ 41,002,98	\$ 41,002,98	\$ 41,002,98	\$ 41,002,98	\$ 41,002,98	\$ 41,002,98	\$ 41,002,98	\$ 41,002,98	\$ 41,002,98	
Intangible assets, net	\$ 16,782	\$ 11,374	\$ 7,111	\$ 3,867,00	\$ 11,719,67	\$ 11,309,95	\$ 11,309,95	\$ 11,309,95	\$ 11,309,95	\$ 11,309,95	\$ 11,309,95	\$ 11,309,95	\$ 11,309,95	\$ 11,309,95	\$ 11,309,95	\$ 11,309,95	
Accounts payable	\$ 836	\$ 1,086	\$ 998	\$ 1,210,00	\$ 1,253,27	\$ 1,381,70	\$ 1,446,21	\$ 1,534,06	\$ 1,635,01	\$ 1,706,29	\$ 1,739,56	\$ 1,799,92	\$ 1,862,38	\$ 1,927,00	\$ 1,993,87	\$ 2,063,06	
Employee compensation and benefits	\$ 877	\$ 1,066	\$ 1,202	\$ 935,00	\$ 1,932,04	\$ 2,193,91	\$ 2,367,33	\$ 2,591,24	\$ 2,852,77	\$ 3,078,59	\$ 3,249,35	\$ 3,362,11	\$ 3,478,77	\$ 3,599,48	\$ 3,724,39	\$ 3,853,62	
Total Contract liabilities	\$ 3,443	\$ 3,185	\$ 3,341	\$ 5,272,63	\$ 5,987,28	\$ 6,460,56	\$ 7,071,61	\$ 7,785,35	\$ 8,401,62	\$ 8,867,64	\$ 9,175,35	\$ 9,493,73	\$ 9,823,16	\$ 10,164,03	\$ 10,516,72		
Operating lease right-of-use asset	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Operating lease liability	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Noncurrent deferred tax assets, net	\$ -	\$ 668	\$ 573	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Noncurrent deferred tax liabilities	\$ 329	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Short-term lease liabilities - operating leases	\$ 100	\$ 83	\$ 74	\$ -	\$ 194,45	\$ 220,80	\$ 238,26	\$ 260,79	\$ 287,11	\$ 309,84	\$ 327,03	\$ 338,37	\$ 350,12	\$ 362,26	\$ 374,83	\$ 387,84	
Long-term lease liabilities - operating leases	\$ 527	\$ 460	\$ 389	\$ -	\$ 1,041,19	\$ 1,182,31	\$ 1,275,77	\$ 1,396,43	\$ 1,537,38	\$ 1,659,07	\$ 1,751,10	\$ 1,811,86	\$ 1,874,73	\$ 1,939,78	\$ 2,007,10	\$ 2,076,74	
Total Core Invested Capital	\$ 62,156,50	\$ 55,731,29	\$ 53,286,71	\$ 55,112,74	\$ 68,827,24	\$ 61,232,27	\$ 61,909,11	\$ 62,785,85	\$ 63,808,89	\$ 64,682,20	\$ 65,329,57	\$ 65,781,25	\$ 66,248,60	\$ 66,732,16	\$ 67,232,51	\$ 67,750,22	
Non Core Invested Capital																	
Other long-term assets	\$ 1,300	\$ 1,812	\$ 1,797	\$ 2,340,00	\$ 1,449,83	\$ 1,573,64	\$ 1,712,08	\$ 1,780,76	\$ 1,775,55	\$ 1,771,98	\$ 1,677,31	\$ 1,715,22	\$ 1,738,82	\$ 1,743,27	\$ 1,737,02	\$ 1,730,60	
Other current liabilities	\$ 1,111	\$ 1,137	\$ 1,407	\$ 3,652,00	\$ 1,511,67	\$ 1,684,40	\$ 1,763,73	\$ 1,878,41	\$ 2,003,76	\$ 2,098,04	\$ 1,768,39	\$ 1,885,67	\$ 1,902,47	\$ 1,926,86	\$ 1,931,67	\$ 1,916,29	
Other long-term liabilities	\$ 4,076	\$ 3,834	\$ 3,614	\$ 3,847,00	\$ 4,034,17	\$ 4,118,53	\$ 3,920,62	\$ 3,894,72	\$ 3,904,84	\$ 3,953,31	\$ 3,971,03	\$ 3,960,51	\$ 3,934,17	\$ 3,916,43	\$ 3,943,38	\$ 3,949,80	
Restructuring liabilities	\$ 34	\$ 4	\$ 6	\$ -	\$ 88,11	\$ 100,06	\$ 107,97	\$ 118,18	\$ 130,11	\$ 140,40	\$ 148,19	\$ 153,33	\$ 158,65	\$ 164,16	\$ 169,86	\$ 175,75	
Total Non Core Invested Capital	\$ -3,853	\$ -3,155	\$ -3,218	\$ -5,159	\$ -4,008	\$ -4,129	\$ -3,864	\$ -3,874	\$ -4,003	\$ -4,139	\$ -3,914	\$ -3,978	\$ -3,939	\$ -3,956	\$ -3,968	\$ -3,960	
Net Debt																	
Excess of cash	\$ 7,023	\$ 11,479	\$ 11,588	\$ 13,263,26	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Current portion of long-term debt	\$ 827	\$ 290	\$ 440	\$ 1,608	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Long-term debt	\$ 40,235	\$ 39,440	\$ 39,075	\$ 37,621	\$ 37,666	\$ 37,171	\$ 35,519	\$ 32,382	\$ 29,737	\$ 27,332	\$ 26,726	\$ 20,726	\$ 17,470	\$ 17,470	\$ 17,470	\$ 17,470	
New debt	\$ -	\$ -	\$ -	\$ -	\$ 3,325,93	\$ 19,600,92	\$ 8,705,28	\$ 5,729,99	\$ 3,144,30	\$ 965,52	\$ 261,97	\$ 5,240,97	\$ 8,609,74	\$ 8,561,85	\$ 8,573,29	\$ 8,601,01	
Preferred stock dividend obligation	\$ 27	\$ 27	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Total Net debt	\$ -34,066	\$ -28,278	\$ -27,927	\$ -25,966	\$ -40,992	\$ -17,570	\$ -26,814	\$ -26,652	\$ -26,593	\$ -26,366	\$ -26,464	\$ -25,967	\$ -26,080	\$ -26,032	\$ -26,043	\$ -26,071	
Equity																	
Result	\$ 24,237	\$ 24,298	\$ 22,142	\$ 23,988,00	\$ 28,827,43	\$ 39,532,95	\$ 31,231,09	\$ 32,259,65	\$ 33,218,25	\$ 34,176,74	\$ 34,951,61	\$ 35,836,65	\$ 36,225,69	\$ 36,744,46	\$ 37,221,06	\$ 37,719,47	
Net income	\$ 2,686,92	\$ 6,430,94	\$ 11,291,45	\$ 15,102,93	\$ 22,884,32	\$ 25,674,57	\$ 28,116,27	\$ 31,647,87	\$ 35,786,22	\$ 39,536,37	\$ 42,510,44	\$ 44,054,68	\$ 45,667,49	\$ 47,621,16	\$ 49,563,38	\$ 51,440,07	
Transactions with shareholders	\$ -4,979,92	\$ -6,369,94	\$ -13,447,45	\$ -18,030,64	\$ -23,044,89	\$ -9,969,05	\$ -36,418,14	\$ -30,619,31	\$ -34,832,62	\$ -38,572,88	\$ -41,735,57	\$ -43,169,64	\$ -45,274,46	\$ -47,106,38	\$ -49,086,79	\$ -50,950,65	
Payout ratio	185,34%	99,05%	119,09%	119,39%	100,70%	38,83%	129,53%	96,75%	97,34%	97,56%	98,18%	97,99%	99,14%	98,92%	99,04%	99,03%	
Total invested capital	\$ 58,303,50	\$ 52,576,29	\$ 50,068,71	\$ 49,953,74	\$ 64,819,36	\$ 57,103,03	\$ 58,044,81	\$ 58,911,65	\$ 59,805,95	\$ 60,543,23	\$ 61,415,64	\$ 61,803,62	\$ 62,309,43	\$ 62,776,31	\$ 63,264,34	\$ 63,790,48	
Net debt plus Equity check	\$ 58,303,50	\$ 52,576,29	\$ 50,068,71	\$ 49,953,74	\$ 64,819,36	\$ 57,103,03	\$ 58,044,81	\$ 58,911,65	\$ 59,805,95	\$ 60,543,23	\$ 61,415,64	\$ 61,803,62	\$ 62,309,43	\$ 62,776,31	\$ 63,264,34	\$ 63,790,48	
VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	VERDADEIRO	

Exhibit 3: Core FCF

(In millions, except per value)	HISTORICAL PERIOD					FORECASTED PERIOD												
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
CORE																		
Result	\$ 4,954,46	\$ 4,165,89	\$ 4,138,56	\$ 7,739,91	\$ 12,638,09	\$ 15,780,34	\$ 23,746,20	\$ 25,494,50	\$ 28,226,08	\$ 31,709,27	\$ 35,790,64	\$ 39,455,02	\$ 42,411,77	\$ 44,022,78	\$ 45,689,20	\$ 47,413,31	\$ 49,197,47	\$ 51,043,87
Invested Capital	\$ 43,731,71	\$ 60,435,31	\$ 62,156,50	\$ 55,731,29	\$ 53,286,71	\$ 55,112,74	\$ 68,827,24	\$ 61,232,27	\$ 61,909,11	\$ 62,785,85	\$ 63,808,89	\$ 64,682,20	\$ 65,329,57	\$ 65,781,25	\$ 66,248,60	\$ 66,732,16	\$ 67,232,51	\$ 67,750,22
Change in IC	\$ 16,703,60	\$ 1,721,18	\$ -6,425,20	\$ -2,444,59	\$ 1,826,04	\$ 13,714,50	\$ -7,594,98	\$ 676,84	\$ 876,74	\$ 1,023,04	\$ 873,30	\$ 647,37	\$ 451,68	\$ 467,35	\$ 483,57	\$ 500,35	\$ 517,71	
Core FCF	\$ -12,537,71	\$ 2,417,37	\$ 14,165,11	\$ 15,082,67	\$ 13,954,31	\$ 10,031,70	\$ 33,089,48	\$ 27,549,24	\$ 30,832,52	\$ 34,767,59	\$ 38,581,71	\$ 41,764,40	\$ 43,571,10	\$ 45,221,85	\$ 46,929,74	\$ 48,697,12	\$ 50,526,16	
g		-15,92%	-0,66%	87,02%	63,28%	24,86%	50,48%	7,36%	10,71%	12,34%	12,87%	10,24%	7,49%	3,80%	3,79%	3,77%	3,76%	3,75%
ROIC		9,53%	6,85%	12,45%	22,68%	29,61%	43,09%	37,04%	46,10%	51,22%	57,00%	61,83%	65,57%	67,39%	69,46%	71,57%	73,72%	75,92%
RONIC			-0,16%	209,24%	-76,23%	-128,54%	436,24%	12,75%	-35,97%	514,62%	465,52%	358,18%	338,57%	248,86%	368,94%	368,91%	368,96%	369,02%

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Report Recommendations

Buy	Expected total return (including expected capital gains and expected dividend yield) of more than 10% over 12-month period.
Hold	Expected total return (including expected capital gains and expected dividend yield) between 0% and 10% over 12-month period.
Sell	Expected negative total return (including expected capital gains and expected dividend yield) over a 12-month period.

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