

**MASTER OF SCIENCE IN
FINANCE**

**MASTERS FINAL WORK
PROJECT**

EQUITY RESEARCH:
INTEL CORPORATION

FRANCISCO BEJA SIMÕES SALGADO PIEDADE

OCTOBER 2019

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**SUPERVISOR:
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October 2019

Abstract

This analysis represents the valuation of Intel Corporation structured according to ISEG's Finance Master's Final Work Project. This Equity Research Report is aligned with the CFA Institute research report recommended guidelines. Intel Corporation was chosen due to the special interest of the author in the technological sector, in particular, in the semiconductor industry. Although supported by historical data and past decisions of the company, this valuation was fundamentally structured according to industry trends and projections for the foreseeable future. The valuation methodology chosen was an average of three models, Discounted Cash Flow Approach (DCF) at WACC method, Multiples and Dividend Discount Model (DDM). The valuation yielded a price target of \$55.53 with an upside potential of 6.61%. Considering the current price of \$52.09 and a high risk associated the final recommendation for Intel's common stock is "Reduce". Assumptions regarding the semiconductor market products were made through reliable sources of information such as Business Insider and TechCrunch websites, amongst others. Financial information was supported through websites such as Yahoo Finance and Bloomberg.

Resumo

Esta análise representa a valorização da empresa Intel Corporation de acordo com as normas do mestrado de Finanças do ISEG, em particular, das normas para apresentação de projeto para Trabalho Final de Mestrado. O relatório de avaliação aqui presente segue as estruturas recomendadas pelo Instituto CFA. A Intel foi a empresa escolhida pelo autor pelo seu interesse pessoal no setor tecnológico, em particular, pela indústria dos semicondutores. Embora esta análise tenha em consideração informação histórica e decisões anteriores da empresa, a avaliação da Intel foi preferencialmente assente em tendências futuras e projecções para a indústria semicondutora. A metodologia de avaliação escolhida foi uma média ponderada entre os Fluxos de Caixa Descontados (DCF), Múltiplos e Dividendos Descontados (DDM). O resultado da avaliação originou um preço-alvo de \$55.53 com um potencial de valorização de 6.61%. Tendo em conta o preço atual da ação da Intel de \$52.09 e um risco associado de grau elevado, a recomendação final para a ação da empresa Intel Corporation é de “Reduzir”. Os pressupostos assumidos relativamente à indústria semicondutora foram baseados em informação de fontes fidedignas, tais como os websites Business Insider e TechCrunch, entre outros. Informação financeira foi extraída de websites tais como Yahoo Finance e Bloomberg, entre outros.

Acknowledgements

Choosing a risky industry such as the semiconductors and a big company such as Intel that reports under US GAAP was both very challenging and very interesting. In the end, it can be said that this project highly contributed to my knowledge and education in the Masters in Finance programme.

To my friends and specially my family who helped me through the long hours of work and supported me.

A special dedication in memory of my grandmother Filomena who supported me through my entire educational path and unfortunately is no longer here to see the end of the journey.

To all the professors who lecture me during the Masters course, especially to Professor Ana Venâncio for being my supervisor.

Index

Abstract	ii
Resumo	iv
Acknowledgements	v
Index	vi
List of Figures	vii
List of Tables	ix
1. Research Snapshot	1
2. Business Description	2
3. Management and Corporate Governance	4
4. Industry Overview and Competitive Positioning	6
5. Financial Statements Forecast and Valuation Drivers	12
6. Investment Summary	15
7. Valuation	16
8. Investment Risks	20
Appendices	23
Appendix 1: Statement of Financial Position	23
Appendix 2: Income Statement	24
Appendix 3: Cash Flow Statement	25
Appendix 4: Key Financial Ratios	26
Appendix 5: Financial Statement Line Item Forecast Assumptions	27

List of Figures

- Figure 1. Intel's historical stock price and 2019YE price target
- Figure 2. Valuation Summary Units in USD
- Figure 3. Intel's logotype
- Figure 4. Intel's first product
- Figure 5. Intel's latest microprocessors
- Figure 6. Operating segments (% revenues)
- Figure 7. PC Centric Business Revenues in million USD
- Figure 8. Data Centric Business Revenues in million USD
- Figure 9. Intel's cash to stockholders in billion USD
- Figure 10. Aggregated CCG and DCG In percentage of revenues
- Figure 11. Intel's top-3 customers
- Figure 12. PC, Tablet and Smartphone time spent in digital media Units in minutes (MM)
- Figure 13. Global data center market Units in billion USD
- Figure 14. CPU's market share for Intel and AMD
- Figure 15. Cloud IT infrastructure based on value
- Figure 16. Top USA semiconductor companies Units in million USD, 2018
- Figure 17. Porter's Five Forces
- Figure 18. China's Real GDP growth (YoY)
- Figure 19. Singapore's Real GDP growth (YoY)
- Figure 20. USA's Real growth (YoY)
- Figure 21. Intel's revenues 2016-2023 In million USD
- Figure 22. Intel's forecasted performance Units in million USD
- Figure 23. Intel's cost of sales and operating expenses forecasted Units in million USD
- Figure 24. Intel's historical and forecasted CapEx Units in million USD
- Figure 25. Intel's historical and forecasted debt Units in millions USD
- Figure 26. Intel's forecasted cash-flow activities Units in millions USD
- Figure 27. Intel's dividend payments and stock repurchases Units in million USD
- Figure 28. Intel's multiples valuation output
- Figure 29. Intel's forecasted FCFF Units in million USD
- Figure 30. Intel's forecasted WACC, cost of equity and cost of debt Units in percentage
- Figure 31. Intel's cash returned to stockholders in per share values

Figure 32. Market risks

Figure 33. Political risks

Figure 34. Technological risks

List of Tables

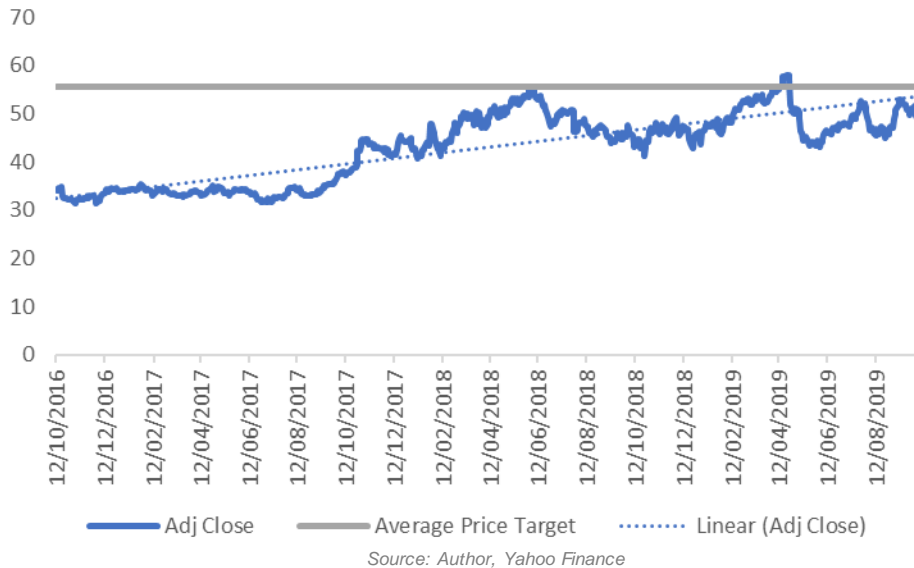
- Table 1. Analyst's Risk Assessment
- Table 2. Intel's stock information
- Table 3. Recommendation system
- Table 4. Intel's Board of Directors
- Table 5. Intel's management team
- Table 6. Intel's Stock Ownership Guidelines
- Table 7. Top PC manufacturers Units in thousands
- Table 8. Top semiconductor companies by revenue 2018
- Table 9. Intel's SWOT analysis
- Table 10. PEST analysis
- Table 11. Forecasted CapEx and respective allocation Units in million USD
- Table 12. Intel's DCF outputs Units in million USD, except #shares outstanding (million) and price target
- Table 13. Intel's FCFF detailed inputs
- Table 14. Intel's DDM valuation output Units per share
- Table 15 Valuation results Units in USD
- Table 16. Discount rate inputs Units in percentage except Beta
- Table 17. Intel's Equity and Debt weights
- Table 18. Terminal Period growth rate inputs Units in million USD except percentage values
- Table 19. Intel's Terminal FCFF forecast Units in million USD except percentages
- Table 20. Multiples valuation Prices in USD
- Table 21. Price Target's Sensitivity Analysis
- Table 22. WACC's Sensitivity Analysis

Intel: The Next Data-Centric Company

The final recommendation for Intel Corporation is REDUCE at 2019YE with a price target of \$55.53 and an upside potential of 6.61% relative to the current price of \$52.09.

Intel Corporation
REDUCE
 High risk
 15 October 2019
 USA

Figure 1 – Intel's historical stock price and 2019YE price target



Source: Author, Yahoo Finance

Table 1 - Analyst's Risk Assessment

Low	Medium	High
-----	--------	-------------

Source: Author

Table 2 – Intel's stock information

Indicator	Intel
Stock Ticker	INTC
Previous Close	51.11
52 Week Range	42.36-59.59
Market Capitalization (billion USD)	230.759
#Shares Outstanding (billion)	4.43

Source: Author, Yahoo Finance

The recommendation for Intel was achieved through an average of a Discounted Cash Flow valuation, a Dividend Discount valuation and a Multiples valuation.

The Discounted Cash Flow valuation yielded a price target of \$58.49 with an upside potential of 12.29%.

Using the Multiples market-based approach the obtained price target was \$55.42 with an upside potential of 6.39%.

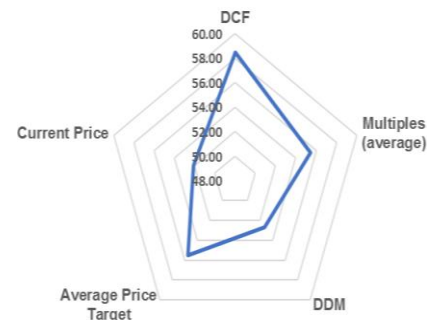
Finally, with the Dividend Discount Model the price target obtained was \$52.68 with an upside potential of 1.14%.

The summary of price targets can be found in Figure 2.

2019 will be a critical year for Intel, after the increased performance of last year against the negative reviews by analysts, on average. With the growth in the PC market practically close to zero and data market presenting high volatility, Intel will have to thrive in performance in order to surpass its close competitors and adjust its operations to offer clients the latest advances in chips technology.

Concerning risk assessment, as one of the top players in the semiconductor industry, Intel is exposed to the high risk of the technological sector. Additionally, Intel is also exposed to political factors such as the USA-China trade war. With China being the biggest customer of Intel, the escalation of the commercial relations between these two countries can affect Intel's operations widely. Aggregating all these issues, Intel is classified as **High risk**.

Figure 2 – Valuation Summary Units in USD



Source: Author

Table 3 – Recommendation system

Level of Risk	SELL	REDUCE	HOLD/NEUTRAL	BUY	STRONG BUY
High Risk	0%≤	>0% & ≤10%	>10% & ≤20%	>20% & ≤45%	>45%
Medium Risk	-5%≤	>-5% & ≤5%	>5% & ≤15%	>15% & ≤30%	>30%
Low Risk	-10%≤	>-10% & ≤0%	>0% & ≤10%	>10% & ≤20%	>20%

Intel Corporation

(NASDAQ: INTC)

Intel Corporation (Figure 3) is an USA multinational semiconductor firm headquartered in Santa Clara, California, offering technologies for computing, networking, data storage and communications. Founded in 1968 by Robert N. Noyce and Gordon E. Moore as “NM Electronics”, Intel was backed by Arthur Rock, a venture capitalist who raised \$2.5M for Intel and became the company’s first Chairman.

Intel became public in October 13, 1971 and is traded on the NASDAQ Global Select Market under the ticker INTC.

At 2018YE Intel employed over 107.400 workers, with 85% in technical roles. According to region, almost half of the workforce was employed in USA (48%). The remaining workforce was split between Asia-Pacific (29%), EMEA (20%) and Latin America and Canada (3%).

Intel was the biggest semiconductor company by sale until 2016, when it was surpassed by Samsung.

Intel was placed #14 in Forbes 2018 ranking for world’s most valuable brands and placed #46 in the 2018 Fortune 500, ranked by USA companies total revenue.

Early history and strategies

Originally, Intel was focused on memory chips. In early 1970s, Intel thrived with its DRAMs, launching its first product, the 3101 Schottky bipolar RAM (Figure 4), just one year after its incorporation. These memory products were cheaper and required less power than the previously used magnetic-core memory chips, achieving a revolution in the memory market. Later that decade, with the rise of Japanese companies such as Hitachi, Fujitsu and Nippon Electric, Intel lost its dominance and was forced to abandon this market.

During the 1980s, Intel shifted its focus from memory products to microprocessors, building with these products a reputation recognized until nowadays. Intel strategy was based on making new microprocessors faster than the previous models, making the new ones with more transistors in their cores. This phenomenon was known in 1965 as Moore’s Law, as Gordon Moore observed the number of transistors in a chip would approximately double annually. In 1975, Moore’s Law was updated to doubling biannually. Until now, this rule still holds.

In the 1990s Intel was already a market leader in the PC business, supplying chips for almost every PC manufacturer. Its status of PC market leader maintains presently with its 9th generation latest products (Figure 5), although with more resistance from other competitors.

In 2013, Intel set out the strategy to become a data centric company.

Accompanying the evolution of technology and data, the company evolved from a PC-centric company with a server business, to a data-centric company with an expanding portfolio of technology solutions that address customer needs across platform, storage, connectivity, and software.

Presently, Intel is pursuing its new goal, to be leading end-to-end platform provider for the new data world, while maintaining its dominance in the PC market.

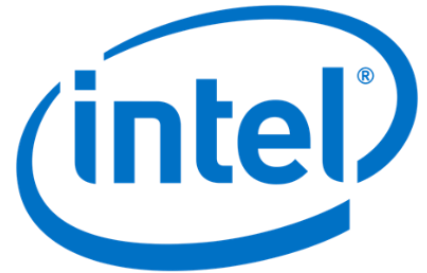
Products

Intel is a major player in the semiconductor industry and technology sector. Its business comprises designing, manufacturing and selling computer components and its related products. Some major products include microprocessors, chipsets, embedded processors and microcontrollers, flash memory, graphic, network and communication, systems management software, conferencing, and digital imaging products. The majority of the company’s products are designed for PCs and data centers.

Businesses

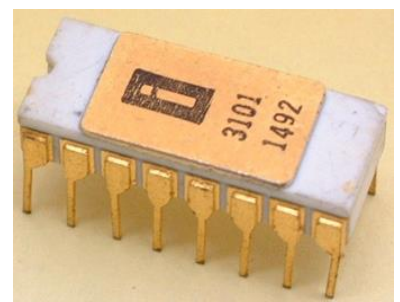
Intel currently divides its activities into five groups (Figure 6), distributed within two businesses, namely, PC-centric business and data-centric business.

Figure 3 – Intel’s logotype



Source: Author, company data

Figure 4 – Intel’s first product



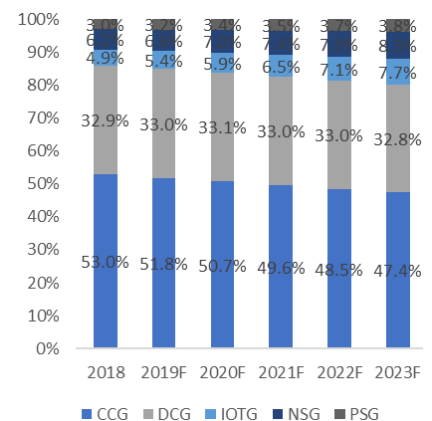
Source: Author, company data

Figure 5 – Intel’s latest microprocessors



Source: Author, company data

Figure 6 - Operating segments (% revenues)



Source: Author, annual reports

PC-Centric Business

The Client Computing Group (CCG) includes end-user platforms designed for notebooks and desktops and wireless and wired connectivity products. These group (Figure 7) comprises mainly CPUs and chipsets, SoC, mobile processors and graphics and memory products. CCG focus on higher growth segments of 2-in-1, thin-and-light, commercial, and gaming, as well as growing adjacencies such as WiFi and modem.

Data Centric Business

The Data Center Group (DCG) includes workload-optimized platforms and related products for enterprises, clouds and communication infrastructure market segments (Figure 8). DCG offers products for compute, storage, and network functions, focusing on three market segments: cloud service providers, enterprise and government, and communication service providers.

The Internet of Things Group (IOTG) includes high-performance compute solutions for targeted verticals and embedded applications for different market segments such as retailers, manufacturers, health care providers, energy companies, automakers, and governments. The products in this group allow customers to create, store, and process data generated by connected devices to accelerate business transformations. IOTG comprises products such as processors-based computing, wireless connectivity, FPGAs, Movidius VPU, and developer tools such as the OpenVINO software toolkit.

The Non-Volatile Memory Solutions Group (NSG) includes Intel® Optane technology and 3D NAND flash memory, primarily used in solid-state drives (SSDs). Some of the customers include enterprise and cloud-based data centers, users of business and consumer desktops and laptops, and a variety of Internet of Things application providers.

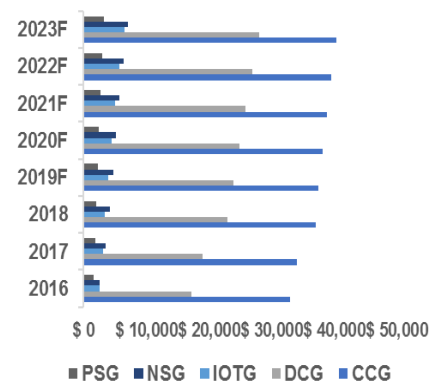
The Programmable Solutions Group (PSG) includes programmable semiconductors, primarily field-programmable gate arrays (FPGAs), and related products for a broad range of markets, such as communications, data center, industrial, and military. In this business segment is also included all other remaining businesses, including Mobileye.

Figure 7 – PC Centric Business Revenues in million USD



Source: Author, company's annual reports

Figure 8 – Data Centric Business Revenues in million USD



Source: Author, company's annual reports

Management and Corporate Governance

Intel's Corporate Governance (CG) structure is consistent with the Anglo-Saxon model, which comprises a Board of Directors and a Statutory Auditor (Ernst & Young LLC). The Board of Directors (Board) is responsible for oversight, counsel and direction regarding the management team, reassuring shareholder's interests are being fulfilled. Intel's Board currently has ten directors (Table 4), from which nine are independent, consistent with Intel's policy of having a majority of independent directors. Presently, Intel's Board has five standing committees, namely Audit (A) Compensation (C), Corporate Governance and Nominating (CG&N), Executive (E) and Finance (F). The composition of each committee can be found in Table 4. As Intel's general policy since its incorporation, the positions of Chairman and CEO are held by different persons to help oversight of the management team. Some of the policies currently active are the rigorous stock ownership guidelines (Table 6) for directors and officers of Intel, for example, limited number of boards for which a director can be a member of, annual evaluation of directors and officers and performance-based compensations for the management team.

As stated in the annual reports and in Intel's CG guidelines, the company's policy framework in place was designed to support the Board's responsibilities. The referred policies and guidelines are continuously reviewed and updated to assure they are suitable for Intel's best interests and its stakeholders.

Intel key members

Robert H. Swan was recently appointed as Chief Executive Officer and member of the Board of Directors since January 2019. Previously, Swan served as interim Chief Executive Officer, Executive Vice President and Chief Financial Officer after joining Intel in October 2016. Before Intel, Swan was Operating Partner at General Atlantic LLC and Senior Vice President, Finance and Chief Financial Officer of eBay Inc. Swan also served as an Executive Vice President and Chief Financial Officer of HP Enterprise Services, LLC from February 2003 to March 15, 2006. He earned his bachelor's degree in business administration from the University at Buffalo and his MBA degree from Binghamton University. He currently serves on the board of directors at eBay and was present as Director in several companies such as Skype Global and PayPal Holdings, amongst others.

Andy D. Bryant has been Chairman of Intel's Board of Directors since May 2012. Bryant holds a MBA degree with a concentration in finance from University of Kansas. After joining Intel in 1981 as a controller for the Commercial Memory Systems Operation. Bryant served in positions such as Vice Chairman of the Board of Directors, Chief Administrative Officer, Executive Vice President, Senior Vice President and Chief Financial Officer. Currently, Bryant is present on the board of directors of Columbia Sportswear Company and Mckensson Corporation.

Dr. Venkata S. M. Renduchintala is the Group President, Technology, Systems Architecture and Client Group and Chief Engineering Officer of Intel. Renduchintala holds a MBA degree and a Ph.D in digital communications from the University of Bradford. Before joining Intel in November 2015, Renduchintala was Co-President of Qualcomm CMDA Technologies. He currently serves on the board of directors of Accenture plc.

Steven R. Rodgers has been Intel's Executive Vice-President and General Counsel since January 2017. Rodgers obtained *Juris Doctor* degree from University of Utah. Joining Intel in 2000, Rodgers recently served as Senior Vice President and Corporate Vice President. Before Intel, Rodgers was a litigation partner at Brown & Bain, P.A.

Navin Shenoy has been Executive Vice President and General Manager of the Data Center Group since May 2017. Shenoy recently served as Senior Vice President and General Manager of Client Computing Group and General Manager of the Mobility Client Platform Division, joining Intel in 1995. Shenoy completed the

Table 4 – Intel's Board of Directors

Committee Membership	A	C	CG&N	E	F
Aneel Bhusri			•	•	
Andy D. Bryant					○
Reed E. Hundt		○			○
Omar Ishrak		○	○		
Risa Lavizzo-Mourey		○	○		
Tsu-Jae King Liu	○				•
Gregory D. Smith	•				○
Robert (Bob) H. Swan					○
Andrew Wilson		•			○
Frank D. Yeary	○		•		

- Chair/Co-Chair
- Member

Source: Author, company data

Table 5 – Intel's management team

EXECUTIVE OFFICERS OF THE REGISTRANT	OFFICE(S)
Andy D. Bryant	Chairman of the Board
Dr. Venkata S.M. Renduchintala	Group President, Technology, Systems Architecture and Client Group; Chief Engineering Officer
Steven R. Rodgers	Executive Vice President; General Counsel
Navin Shenoy	Executive Vice President; General Manager, Data Center Group
Robert H. Swan	Chief Executive Officer
Todd M. Underwood	Interim Chief Financial Officer; Vice President of Finance and Director, Corporate Planning and Reporting

Source: Author, annual reports

Table 6 – Intel's Stock Ownership Guidelines

Title	Min #shares
CEO	250,000
Executive Chairman & President	150,000
CFO	125,000
Executive Vice President	100,000
Senior Vice President	65,000
Corporate Vice President	35,000
Other VPs, Intel Fellows, and Senior Leaders	5,000 or 10,000

Source: Author, company data

Stanford Executive Program at Stanford University and bachelor's degree in electrical engineering from the University of Michigan.

Todd M. Underwood was appointed Intel's interim Chief Financial Officer as of January 2019. Since August 2016, Underwood has been Vice President of Finance and Director, Corporate Planning and Reporting of Intel. Underwood joined Intel in 1992. He holds a bachelor's degree in finance from the University of Oregon and earned his MBA degree from the University of Portland.

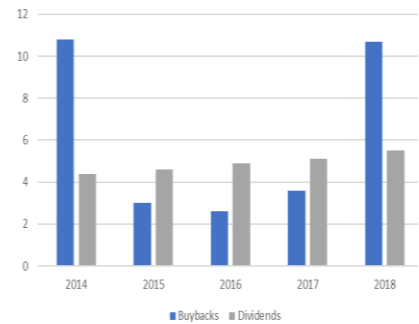
Dividends and share repurchases

One of Intel's financial capital allocation priority is to return cash to stockholders. Since 2016, dividend per share has increased at 7% CAGR, achieving the value of \$1.20 per share in 2018.

The company also has share repurchase programs to return cash to its shareholders. In 2018, Intel spent \$10.7B in stock repurchases.

Aggregating both dividends and share repurchases, Intel's returned \$16.2B to its stockholders in 2018 (Figure 9). This value represented a growth of 82% comparing with 2017.

Figure 9 – Intel's cash to stockholders in billion USD



Source: Author, company's annual reports

Corporate Responsibility

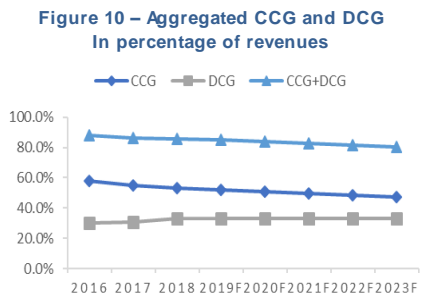
Intel's corporate responsibility holds on four pillars, namely:

- Environmental Sustainability, which focus on water saving and reduce emissions of pollute gases;
- Supply Chain Responsibility addresses the prevention of forced and bounded labor. The company engages with its suppliers that workers should not have to pay fees to obtain or keep employment. Since 2014, as a result of these commitments, Intel's suppliers have returned over \$14M in fees to workers.
- Diversity and Inclusion represents the commitment of the company to achieve its goal of full representation of women and underrepresented minorities in its USA workforce.
- Social Impact is addressed through Intel's employee's volunteer initiatives. In the last ten years, the company's workers have contributed with more than 10 million hours of service in the communities where Intel operates. Additionally, in celebration of the company's 50th anniversary, during 2018 Intel donated 1.5M hours of volunteer work with more than 68.000 employees contributing for that goal.

Industry Overview and Competitive Positioning

Intel's business groups outlook, drivers and trends

As previously mentioned, Intel is structured into five business groups. In this section, each group will be explored individually, to understand what their main drivers are and what special features they possess. Matching current market conditions and future trends with each of Intel's business specifications will provide the core and background to forecast cash-flows and value Intel. The focus of this analysis will be on the Client Computing Group (CCG) and in the Data Center Group (DCG), since they are the two reportable operating segments, aggregating 84% of Intel's revenues by 2018YE (Figure 10). The remaining segments don't meet the quantitative threshold to qualify as reportable operating segments, as stated in Intel's 2018 annual report. Nonetheless, they also must be accounted in this analysis, for a more representative view of Intel business.



Source: Author, annual reports

Client Computing Group

The **CCG** represents the majority of Intel's sources of revenue. Although representing 52% of the company's revenue 2018YE, it has been decreasing since 2013, when Intel set out the strategy to transform from a PC-centric to a data-centric company.

The performance of this group is highly correlated with the evolution of PC sales worldwide. According to Gartner (2018) worldwide PC shipments declined for the seventh consecutive year. The YoY decline rate in 2018 was 1.3%, less intense compared with the previous three years, according to the same source. Statista (2018) and IDC (2018) also support those numbers and predict the continuing decrease of PC sales worldwide until 2023.

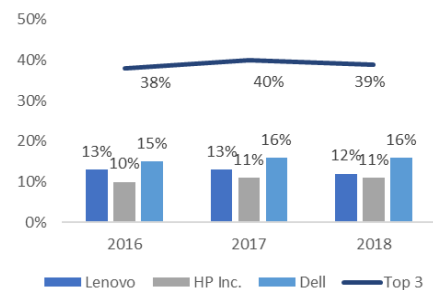
Table 7 – Top PC manufacturers Units in thousands

Company	2018	2018 market share	2017	2017 market share
Lenovo	58,467	22.5%	54,669	20.8%
HP Inc.	56,332	21.7%	55,179	21.0%
Dell	41,911	16.2%	39,793	15.1%
Apple	18,016	6.9%	18,963	7.2%
Acer Group	15,729	6.1%	17,087	6.5%
ASUS	15,537	6.0%	17,952	6.8%
Others	53,393	20.6%	59,034	22.5%
Total	259,385	100.0%	262,676	100.0%

Source: Gartner

Despite the market conditions regarding PC industry, the three biggest PC manufacturers, namely Lenovo Group Limited, HP Inc. and Dell Inc. are increasing their position in the market. Comparing results from 2017 to 2018, all three companies increased their market shares (Table 7). The same triad of companies represent Intel's biggest clients, accounting for 39% of Intel's net revenue 2018YE. In the previous years 2017 and 2016, the same triad accounted for, respectively, 40% and 38% of Intel's net revenue (Figure 11).

Figure 11 – Intel's top-3 customers



Source: Author, annual reports

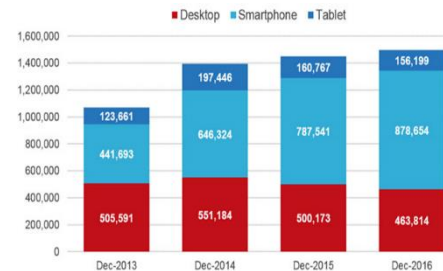
Facing decreasing demand for PC components, Intel still managed to increase revenues in CCG over the last four years. Desktop sales overall decreased continuously, following the market conditions of PC sales declining. The progress registered in this group was fueled by the increasing demand for high performance products and high growth segments like gaming and commercial. Benefiting from high degree of differentiation and brand power, Intel was able to benefit from increasing average selling price, even in decreasing volumes such as desktop.

The increasing usage of mobile devices such as smartphones and its chips are also highly correlated with Intel's PC-business. For workstation PCs, business PCs and other similar market segments, smartphones don't constitute a reliable substitute product. However, concerning leisure, travel and adaptability, smartphones are becoming a very powerful substitute to computers.

Represented in Figure 12 is the time spent in digital media using PC, tablet or smartphone for 2013-2016 period. It can be observed the increase usage of smartphone growing exponentially while PC usage has been declining. The new generation of smartphones are very fast and easy to use. Its chips, usually ARM-based, have lower power consumption, lower cost and high heat resistance, making them suitable for portable devices such as smartphones, tablets, smartwatches and other peripherals. In this area, ARM-based architectures are the main competitor of traditional x86 chips designed by Intel. Some of these chips products already are (or can be in a recent future) substitute products for PC chips. As an example, NVIDIA's best known GPUs have properties that make them a good proxy for traditional CPUs in tasks such as image and speech recognition.

To conclude the CCG group analysis, there is only one major item left to include. Adjacent technologies such as modems are included in this operating group. At this point 5G network is the main driver of this area. Presently with only a handful of 5G

Figure 12 – PC, Tablet and Smartphone time spent in digital media Units in minutes (MM)



Source: Media Metrix & Mobile Metrix USA

modern providers, Intel modem XMM 8060 is suitable not only for PCs but also for smartphones and connected cars. The progression of 5G networking and Intel's position towards its development is linked to the performance of CCG group and Intel overall.

Data Center Group

DCG is the second largest business group of Intel by revenue, representing 32% of Intel's net revenue 2018YE. In the last five years, DCG experienced a continuous growth in revenues at 9.8% CAGR. Intel goal to become a data centric company resulted in the expansion of data businesses and in its increase in percentage of revenues YoY. Growth was achieved through rising demand markets such as clouds and communications service providers. The importance of data is continuously increasing nowadays. The demand for process, analyze, store and move data is growing, matching the explosive evolution of digital services, artificial intelligence and data analytics. Figure 13 represents the forecasted growth in global data center market, achieving 11% CAGR from 2017-2023 period, according to Reuters (2019). Enterprises are becoming more digital with the need for data storage and accessibility growing constantly.

In this group, Intel offers its clients a variety of solutions to optimize their data centers, to compute, storage and network their data. From processors, memory and storage products and accelerators such as FPGAs, Intel offers products from the data center core to the network edge. Major clients of this group include cloud service providers, enterprises and government and finally communications service providers.

Dealing with customers data is a very sensitive issue with concerns like privacy and ethics. In the data business, security must be a prime feature of the solutions presented by companies such as Intel. According to Business Insider (2018), Intel chips infrastructure was discovered to have flaws, in January 2018. Several customers changed their chips suppliers to protect their data centers. For the client's perspective, it would be complex to change already installed chips. However, changing from Intel to AMD, the major Intel's competitor, would be easier since both companies share x86 chip design. CPU's market share for Intel and AMD can be found in Figure 14, since Q12004 to Q12019.

An alternative to this chip design are ARM-based chips if they can have enough power to match x86 chips. In this situation, software would need to be adjusted in the data center infrastructure, translating into higher switching costs. Some ARM-based chip designers are already working to mitigate this software switching costs, like Qualcomm and Cavium.

According to King (2018) on April 27th 2018, Intel chips controlled 99% of the market for data centers. This dominance was fueled by giant technological clients such as Alphabet (Google), Amazon and Microsoft. Following the same source, in the last quarter of 2018, demand in this market slowed, with the big clients being more cautious with their orders. According to Intel's CFO Bob Swan, this desacceleration in demand was driven by Intel's client's accumulated stocks with special focus on China softer demand for data centers chips.

Concerning data and its usage for enterprises, one major trend to consider is the open source software products. Using open source software provides higher compatibility between platforms inside the company at lower cost. This enables better communication between different areas of the same company and better access and maneuver of data. In Figure 15 the forecasted distribution value per cloud type can be found, showing an increase in public and private clouds. Some technological giants such as IBM and Microsoft have already made significant investments in this field in 2018. In June, GitHub was acquired by Microsoft for an amount of \$7.5B. This M&A process was set to ease data centers administrators and software developers on managing and sharing their codes within their organizations. Later that year, in October, IBM purchased Red Hat for \$34 B, showing IBM's intentions of gaining share in the cloud market.

As companies optimize their workloads based on big data, machine learning and artificial intelligence, improved hardware is also required to power the systems. Traditional CPUs offered by Intel are not suitable for this new technologies. Instead, other products are gaining popularity due to its adaptability to this kind of systems such as GPUs. In this area, NVIDIA's offer is very broad. Other

Figure 13 – Global data center market Units in billion USD

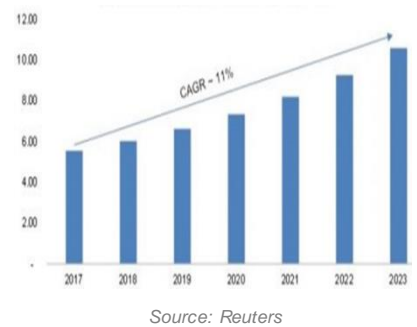


Figure 14 – CPU's market share for Intel and AMD

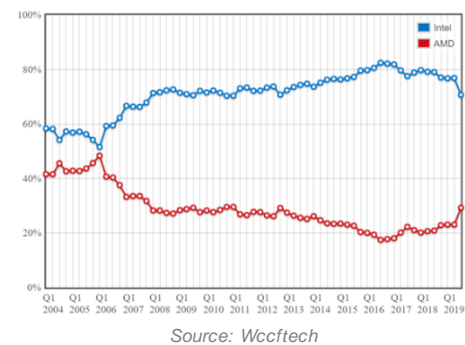
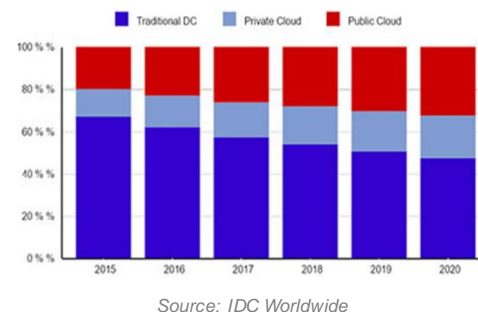


Figure 15 – Cloud IT infrastructure based on value



companies are also developing their own products. For instance, Google is developing tensor processing units, a new product to mitigate the flaws that traditional chips have with new data technologies.

To conclude, all these issues affect directly and indirectly how data is being managed, and how software and hardware must match in order to fully work in a system. This trends not only affect DCG, but also the remaining data groups of the business such as IOTG, NSG and PSG.

Semiconductor industry analysis

There are three groups of companies in the semiconductor industry according to their production model. The companies can be integrated device manufacturers (IDM), fabless companies or foundry companies. The biggest companies of the industry can be found in Table 8, according to 2018 revenue.

The **integrated device manufacturers (IDM)** design, manufacture and sell integrated circuits. These companies buy raw materials (the semiconductor material itself) and intervene in all the stages of production and assembly of its chips, delivering the final output to the customer. IDM-type biggest companies include Micron Technology, Samsung, SK Hynix and Texas Instruments (Texas I).

The **fabless semiconductor companies** like Qualcomm, Broadcom, AMD and NVidia outsource the production of its chips to “pure-play” semiconductor companies called **foundries**, like TSMC, GlobalFoundries and UMC. This production model allow fabless companies to concentrate their resources in R&D, benefiting from lower labor costs of the foundries, most of them located in Taiwan and China where the cost of labor is cheaper.

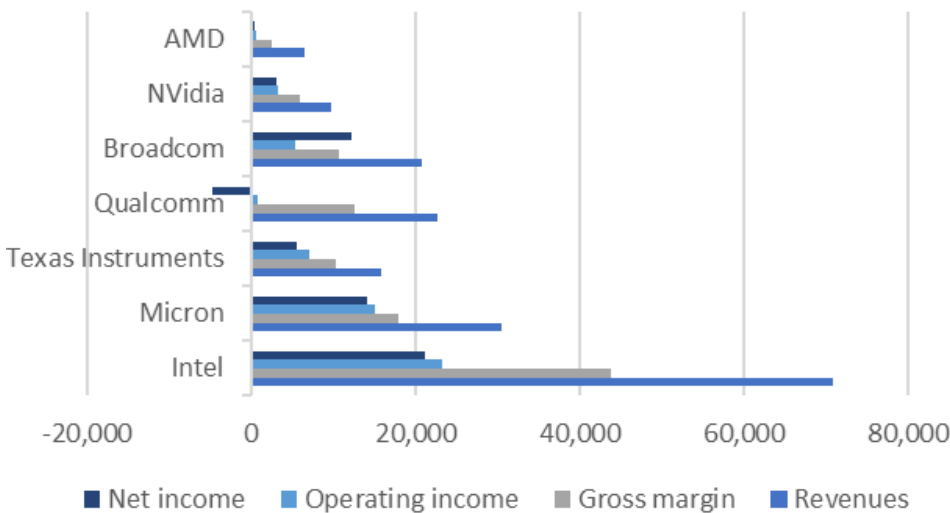
In Figure 16 can be found performance values for the top USA semiconductor companies regarding 2018.

Table 8 – Top semiconductor companies by revenue 2018

Company	Headquarters	Type
Qualcomm	USA	Fabless
Broadcom	USA	Fabless
Nvidia	USA	Fabless
Mediatek	Taiwan	Fabless
Micron	USA	IDM
Samsung	Korea	IDM
SK Hynix	Korea	IDM
Texas Instruments	USA	IDM
TSMC	Taiwan	Foundry
GlobalFoundries	USA	Foundry
UMC	Taiwan	Foundry

Source: Author, company's data

Figure 16 – Top USA semiconductor companies Units in million USD, 2018



Source: Author, Yahoo Finance

As previously mentioned, Intel services are divided into two main businesses, the PC-centric business and the data-centric business.

In the **PC-centric business**, Intel's chips face intense competition from Advanced Micro Devices (AMD). Intel and AMD have controlled the market of x86 architecture chips, with a combined market share of more than 90% in the last decade. Intel's dominance in the PC and laptop markets is decreasing, being challenged by AMD and NVIDIA (known for its GPUs). In addition, Intel also faces competition from products that substitute traditional computers, such as tablets, smartphones and other mobile devices such as smartwatches (Table 9). This mobile devices require less power and more efficient chips, usually based on ARM-architecture. ARM is a British company, owned by SoftBank Group, who licences the designs of its chips to leading companies in the mobile devices chip-making. Such companies include Apple, Samsung, Qualcomm and NVIDIA. With the transition from PC to smartphone in some segments, smartphone chips are being more demanded. For these chips, Samsung is the big player, making chips for its own brand and also for other brands in the market such as Apple.

In the **data-centric business**, Intel supplies platforms for its client's data centers, to power their servers, storage units and networks. In this business, Intel also faces once more the competition from AMD and NVIDIA, especially in products such as processors and accelerators. Regarding memory and storage products, there are other providers of NAND flash memory products besides Intel, namely, Samsung (market leader of memory chips), Micron and SK Hynix. For enterprises and cloud sector, Intel faces competition of IBM.

Concerning connectivity products, Intel is present in the very competitive market of 5G modems, along with Qualcomm (market leader of smartphone modems) and Samsung, amongst others.

Porter's Five Forces

Threat of new entrants (medium)

The semiconductors industry, like a technological sector in general, is characterized by a lot of IPs* like patents, copyrights, trademarks and other rights. Huge fixed costs are needed to start production are required in order to build a factory or to develop a new product. These two barriers to entrance make very difficult for a firm to enter in the market and compete with the already established companies. However, in recent past years, some semiconductor firms started to outsource production of its chips to foundries, taking benefit of their lower labor costs. In following years, not having a factory for production may not be a barrier to entrance in this industry. Moreover, it must be taken into consideration that big semiconductor firms can enter into other market segments and benefit from synergies in production costs and/or combining different products/packages.

Threat of substitute products/services (high)

IPs serve as barriers to entry in this industry. They also allow firms who invest significant amounts of their resources in R&D to keep comparative advantages of new technologies discovered or new products designed. However, being a highly competitive industry, comparative advantages don't hold for long periods of time. Rival companies are constantly developing new products. Every year, semiconductor companies must present new enhanced products to maintain their market shares, otherwise, competitors will benefit from it. Diversification is key in this industry. As new technologies are discovered, there is a high demand for faster and more efficient chips to support them. Only firms that can keep up with this rhythm can thrive in this industry.

Bargaining power of buyers (medium/low)

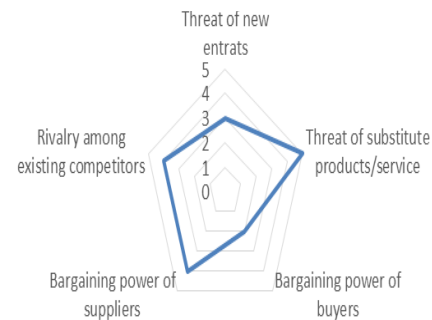
Although the switching costs for the buyers are low, the majority of the semiconductor's industry segments are controlled by two or three big firms. The

Table 9 – Intel's SWOT analysis

Strengths	- x86 microprocessors - Partnerships - Worldwide customers - Brand power
Weaknesses	- High dependence of clients/product - Low presence in mobile devices
Opportunities	- Increased demand for mobile devices, servers, data center and cloud
Threats	- Short life cycle of microprocessors - PC sales declining - AI and Big Data

Source: Author

Figure 17 – Porter's Five Forces



Source: Author
 0 - N/A
 1 - Low
 2 - Low/Medium
 3 - Medium
 4 - Medium/High
 5 - High

high degree of product differentiation and the fierce competition amongst buyers to get the best available chips in the market reduce the bargaining power of buyers in this industry. However, for some of the market leaders such as Intel or Samsung, there are a few number of big clients who represent significant percentages of their revenues, who might have some bargaining power.

Bargaining power of suppliers (medium/high)

For the IDMs, who manufacture and design their own chips, the bargaining power of suppliers is relatively low. Big semiconductor firms like Intel and Samsung, both IDMs, have many suppliers to mitigate the risk of depending on a few of them, reducing the influence that suppliers could eventually have on them. However, considering the fabless companies, who specialize on designing their chips and outsource production to the so called foundries, the suppliers have more power over them. Considering the big foundries, the majority of them are Asian-based companies. They benefit from lower labor costs, giving them a cost advantage and some leverage over their clients. Since there are only a few of major foundries, the switching costs for the fabless companies to change their foundries would be high. Only two or three companies could match the demand for chips for big clients such as Qualcomm, NVidia or AMD.

Rivalry among existing competitors (medium/high)

The high degree of product differentiation, the small number of big companies acting in the industry and the high technological factor associated with the products provide the semiconductors industry a medium/high level of rivalry. Product differentiation is key in this market, requiring huge amounts of capital spent in R&D to fulfill the increasing demand for better and faster chips. The technological improvements in production or design of chips are a great influence on semiconductor companies since they are dependent on the availability of technologies (technological factor).

Table 10 – PEST Analysis

Political		Economic	
-Trade wars between USA and China;		-Cyclical industry;	
-Different tax frameworks across countries;		-Labor cost advantage for Asian companies;	
-Licensing and IP rights protection;		Foreign exchange risk;	
Social		Technological	
-Rise in demand for mobile devices ;		-5G network;	
-Increase in data needs ;		-Blockchain;	
-Privacy and ethics regarding information and data;		-Overall high dependence on technological advances;	

Source: Author

Core Countries Macroeconomic Review

In geographical terms, Intel's biggest clients are China, Singapore and USA. The three countries combined generated near 69% of Intel's revenue for 2018YE. In the previous year, the same three countries represented 66% of Intel's revenue. In the following topics is addressed the macroeconomic outlook of these three countries to better understand how they can impact on Intel's performance.

China

The country where Intel generates the most revenues is China (including Hong Kong). On the last two decades, China experienced an average growth of 9% on a yearly basis concerning real GDP. This figure stands 5.2% above world average for the same period. Latest studies done by IMF (2019) show a decrease in China's real GDP, with a forecasted average of 5.8% growth for the next four years (Figure 18). The same research shows a convergence to world's average growth of 3.4% referring to the same period.

According to Chaoping Zhu (2019), global market strategist for JP Morgan Asset Management, the trade tension between USA and China is a key factor for this downward tendency of China's economy.

Narrowing the analysis to the particular case of semiconductor industry, in 2018 only 16% of the semiconductors used in China were produced in the country. From this 16%, only 8% were produced by Chinese firms. These data shows the high degree of China's dependence for foreign chips.

Singapore

Singapore ranks second in Intel's biggest clients. In the first decade of the 21st century Singapore experienced average growth of 6.2%. Recently, the country's economy shows signs of desaccelaration, with forecasts for real GDP growth of 1.3% for the next four years (Figure 19), according to IMF (2019).

In 2018, Singapore registered close to \$64.966M of semiconductor imports, from which approximately 6% came from USA, according to export.gov (2019).

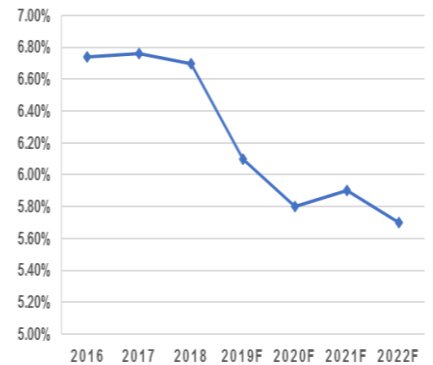
Singapore's economy is also being affected by USA-China commercial war. According to Singapore's Ministry of Trade and Industry (2019), the downturn in the country's economy was partly due to the escalation in the US-China trade conflict in the latest quarters of 2019.

USA

The third biggest client of Intel's products is USA. The China-USA trade war impacts are reflected in the IMF (2019) latest forecasts for USA's real GDP growth for the next four years (Figure 20). The figure shows the decrease in YoY growth rates for USA's economy.

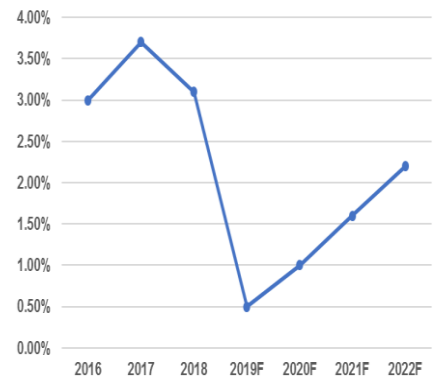
According to French (2019), chairman of Silicon Power Technology, China is responsible for the consumption of 40%-50% of the world's supply of semiconductors. The same author pointed that, if China is forced to consume semiconductor products from its own production, the economy will be harmed, since the internal supply can't match the overall demand for semiconductors. In 2018, the Chinese Government announced efforts to spend around \$100B in the upcoming decade in investments to develop technology in areas such semiconductors, Artificial Intelligence and quantum computing. This investment has the goal of catching up with USA technology.

Figure 18 – China's Real GDP growth (YoY)



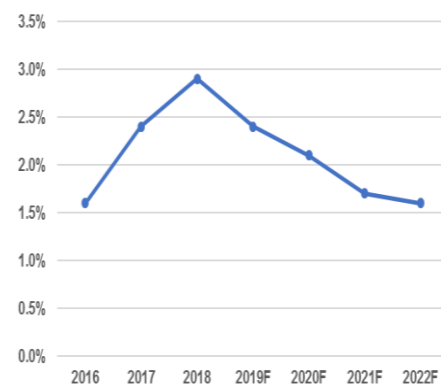
Source: Author, IMF

Figure 19 – Singapore's Real GDP growth (YoY)



Source: Author, IMF

Figure 20 - USA's Real growth (YoY)



Source: Author, IMF

Financial Statements Forecast and Valuation Drivers

In 2013, Intel set out the strategy to become a more data-centric company, while maintaining its leadership in the PC business. In order to assess Intel's business environment for the next five years, it is crucial to analyse two markets, the PC market and the data center market.

The PC market is mature and is starting to decline. The biggest computer OEMs are well established in the market, the production process is standardized and the in the last years there has been a decline in product sales.

On the opposite side, the data market is in a growing stage of the industry life cycle but with some uncertainty associated, as expected from technological sectors.

Revenues

To assess Intel's future sales, a market approach was applied. The company is a market leader in the PC business and data business, meaning that there is high and positive correlation between the segments and the company's growth. The assumption at this stage is that Intel's revenues will follow the market trends. The forecasted revenues can be found in Figure 21.

PC shipments have been decreasing since 2012. Latest studies state the extension of this growing trend for the next 5 years. However, inside the PC market, such as notebooks and detachable tablets, where Intel has a strong presence and has been increasing its position on, due to high degree of differentiation offered by its products. According to IDC (2018), traditional PCs and detachables such as 2-in-1 laptops will grow on a CAGR of 0.05% for the next five years. Being a dominant firm in the market, with a very differentiated product and with its top three clients being the three biggest PC producers worldwide (showing growth in its market share in the last two years), it will be assumed that Intel sales in this operating segment will grow until 2023YE at a CAGR of 0.05%.

While data has been a market showing exponential growth in the past recent years, there has been some doubt about its continuation. Recent news suggest signs of market deceleration fueled by overstocking of its biggest players such as Google, Facebook, Amazon and Microsoft. Intel's chips are a huge component of data centers and servers, being present in 98% of data center operations, according to Business Insider (2019) and control 99% of the market for server chips, according to data center knowledge website (2019). Despite that, recent data center market studies indicate the persistence of growth in the upcoming years. A very conservative CAGR of 4% until 2023YE was assumed for the data operating segment sales, according to predictions disclosed by IDC (2019).

For the non-reportable operating segments such as IOTG, NSG and PSG, sales growth rates related to Internet of Things market, memory market and global programmable market, respectively, were considered in order to fulfill revenue forecast. For the next five years, CAGR of 13.6%, 10.5% and 9%, respectively, were assumed. These figures were disclosed in reports by Datacenterdynamics (2019), MarketWatch (2019) and Businesswire (2019), respectively. A summary of Intel's forecasted results is stated in Figure 22.

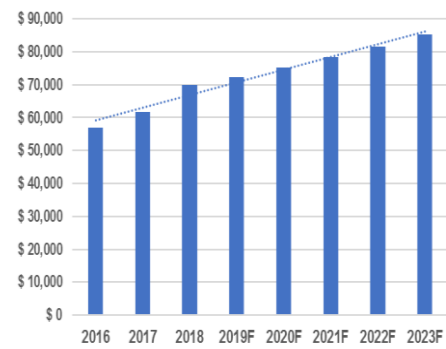
Operating Income

According to Reuters (2019), CEO Robert Swan said operating margins would remain relatively stable for the next years, and gross margins would decrease due to manufacturing problems related with 10nm chips.

For Operating Income, as percentage of sales for each specific operating segment, an average of the last three years was used to forecast until 2023YE.

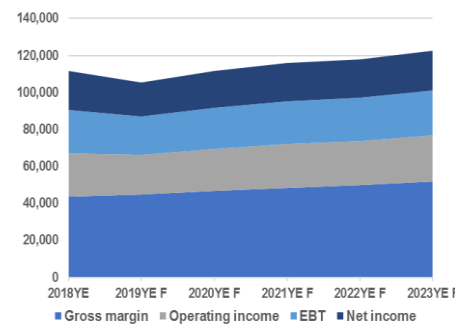
Concerning operating expenses such as R&D and MG&A (Figure 23) the same method was used but considering all operating segments as a whole, since isn't possible to allocate these costs to the different segments, as stated in 2018 annual report.

Figure 21 – Intel's revenue 2016-2023
In million USD



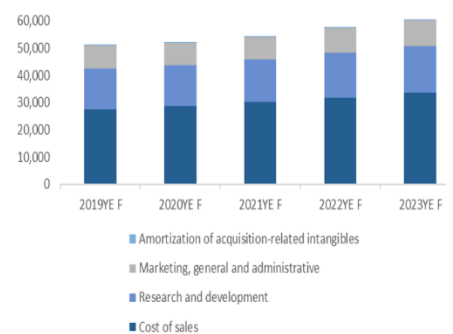
Source: Author, company's annual reports

Figure 22 – Intel's forecasted performance
Units in million USD



Source: Author, company's annual reports

Figure 23 – Intel's cost of sales and operating expenses forecasted
Units in million USD



Source: Author

Taxes

In the press release of 1Q2019 earnings report, Intel disclosed that is expecting to face an effective tax rate of 12% for 2019 period. For the 2019 forecast, that rate was assumed to be correct. For the remaining forecasted years, a constant effective tax rate of 10.96% was assumed, representing the average effective tax rate of semiconductor market companies worldwide given by Damodaran database.

CapEx

In 2019, CapEx is expected to reach \$15.5B. From 2019 onwards (Figure 24), the amount of CapEx will be fixed as a percentage of EBIT(1-t) yearly, according to the industry average given by Damodaran. The invested amount will be split between PP&E and Intangible Assets, following similar allocations concerning the last three years.

Depreciation was computed on a yearly basis considered similar percentages of past years of PP&E, gross. Amortization was forecasted using an estimative of future figures given by the company in its 2018 annual report.

Table 11 – Forecasted CapEx and respective allocation
Units in million USD

	2019YE F	2020YE F	2021YE F	2022YE F	2023YE F
CapEx	15,500	15,725	16,349	16,414	17,111
PP&E Investment	13,879	14,251	14,728	14,831	15,438
% of CapEx in PP&E	89.5%	90.6%	90.1%	90.4%	90.2%
Intangibles Investment	1,621	1,474	1,621	1,583	1,674
% of CapEx in Intangibles	10.5%	9.4%	9.9%	9.6%	9.8%
D&A	10,220	11,022	11,937	12,911	13,851

Source: Author, company's earnings presentations

Inventories, Payables and Receivables

Intel's inventory turnover has been reasonably constant in past years. It will be assumed that the company's strategy will remain unchanged regarding its stocks management. Inventories will be fulfilled in order to keep inventory turnover stable. The same procedure can be applied to accounts receivable and accounts payable, with concerns to receivables turnover and payables turnover, respectively. At this stage, the assumption is that Intel will try to keep its efficiency despite the slow decrease in gross margins for the next years, as anticipated by the company (Reuters 2019).

Debt

Considering the approach of Michael Rees (2008), long-term debt will change in line with the company's value. As a proxy for this variable, sales will be considered to reasonably measure the value evolution of Intel. In practical terms, the same YoY sales growth rate will be applied to long-term debt.

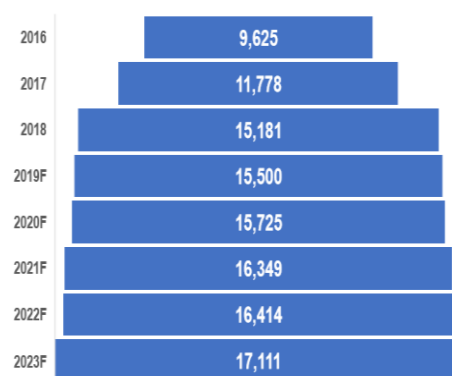
Repayments of long-term debt (both old debt and recent issues) will follow the same percentage rates of the last three years.

Concerning short-term debt, its value will be used to adjust short term financial/liquidity needs faced by the company.

Each year short-term debt will represent similar portion of current liabilities, averaged of the last three years.

The evolution of debt, both short-term and long-term, can be found in Figure 25.

Figure 24 – Intel's historical and forecasted CapEx
Units in million USD



Source: Author, company's annual reports

Figure 25 – Intel's historical and forecasted debt
Units in millions USD



Source: Author, company's annual reports

Cash and cash equivalents

Regarding cash and cash equivalents, it is assumed that Intel will keep a minimum cash balance in percentage of its current liabilities. Each year the minimum cash balance will be the same percentage of current liabilities, averaged of the last three years. This assumption holds on the premise that Intel will keep in its cash account, at least, the sufficient amount to cover its short term needs, that is, current liabilities.

If Intel isn't capable of generate enough cash for its costs incurred in a period, the "Trading assets" items will be used to cover any amount in need.

Concerning excess cash, often associated with technological companies, Intel will split any excess amounts on "other investing" and "other financing" activities.

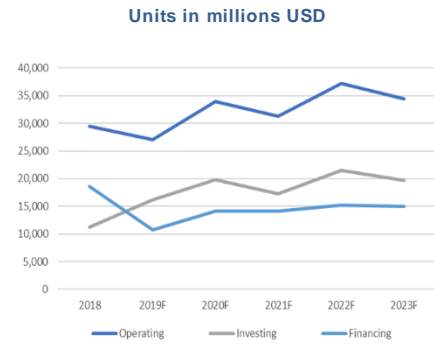
Dividends and stock repurchases

Returning earnings to its stockholders is a major concern for Intel. The amount of dividends paid is reasonably constant, not adjusting to short term fluctuations of results. The same growth rate of the last three years, on average, was assumed to forecast the dividend payments until 2023YE. As part of its distributions plan to stockholders, Intel also incurs in stock repurchases (Figure 27). For the period 2019-2023, the same percentage of earnings distributed was assumed equal, on average, considering the last three years. In practical terms, the remaining earnings left to distribute after the dividend payments are spent in stock repurchases.

Items excluded from the forecast

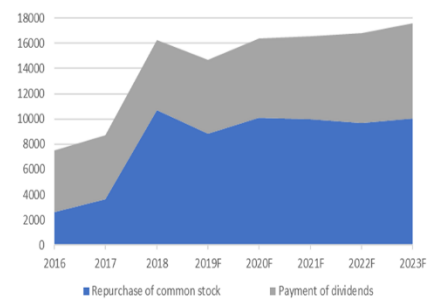
During the forecasted period, some items were left constant or assumed no material changes in its valuation, such as the case of impairment tests, restructuring fees, significant divestitures, amongst others. Non-recurring items, contingencies and provisions for legal disputes were also left out of the analysis.

Figure 26 – Intel's forecasted cash-flow activities



Source: Author, company's annual reports

Figure 27 – Intel's dividend payments and stock repurchases



Source: Author, company's annual reports

Investment Summary

Intel's current price holds at **\$52.09**. For 2019YE, the average of the three valuation methodologies used yielded a price target of **\$55.53** with an upside potential of **6.61%**.

With a high risk assessment, the final recommendation is **REDUCE**.

Valuation Approaches

Applying the DCF model, Intel's FCFF were computed for the forecasted period 2019-2023. For the Terminal Period, a different FCFF was estimated using normalized free-cash flows. Discounting all cash-flows using WACC rate the enterprise value of Intel was achieved (Table 12). In order to get the value for equity, net debt was deducted to enterprise value, achieving a **price target of \$58.49 with an upside potential of 12.29%**.

Table 13 – Intel's FCFF detailed inputs

FCFF	2018YE	2019YE F	2020YE F	2021YE F	2022YE F	2023YE F
Net Income	\$ 21,053	\$ 18,305	\$ 19,805	\$ 20,726	\$ 20,745	\$ 21,633
Non-cash charges	\$ 7,546	\$ 10,446	\$ 11,471	\$ 12,252	\$ 13,288	\$ 14,236
Depreciation	\$ 7,520	\$ 8,657	\$ 9,523	\$ 10,487	\$ 11,530	\$ 12,534
Amortization	\$ 1,565	\$ 1,563	\$ 1,499	\$ 1,450	\$ 1,381	\$ 1,317
Amortization of acquisition-related intangibles	\$ 200	\$ 204	\$ 212	\$ 221	\$ 230	\$ 241
(Gains) losses on equity investments, net	\$ 155	-\$ 22	-\$ 237	-\$ 94	-\$ 147	-\$ 144
After-tax interest expense	\$ 423	\$ 401	\$ 421	\$ 438	\$ 457	\$ 478
interest expense	\$ 468	\$ 456	\$ 473	\$ 492	\$ 513	\$ 536
effective tax rate	9.70%	12.00%	10.96%	10.96%	10.96%	10.96%
Investment in fixed capital	\$ 15,371	\$ 15,500	\$ 15,725	\$ 16,349	\$ 16,414	\$ 17,111
PP&E	\$ 15,181	\$ 13,879	\$ 14,251	\$ 14,728	\$ 14,831	\$ 15,438
Intangible assets	\$ 190	\$ 1,621	\$ 1,474	\$ 1,621	\$ 1,583	\$ 1,674
Investment in working capital	\$ 10,403	\$ 9,832	\$ 10,728	\$ 9,758	\$ 11,485	\$ 10,743
Currents assets	\$ 25,768	\$ 24,434	\$ 27,073	\$ 25,501	\$ 28,854	\$ 27,741
Current liabilities	\$ 15,365	\$ 14,603	\$ 16,345	\$ 15,742	\$ 17,369	\$ 16,998
Changes in WC	-\$ 19	-\$ 571	\$ 897	-\$ 970	\$ 1,726	-\$ 741
FCFF	13,670	14,223	15,076	18,037	16,350	19,977

Source: Author

Through Multiples Valuation, using market data of peer companies, an average price target of **\$55.42** supported the conclusion that Intel's stock is undervalued (Figure 28), with an upside potential of **6.39%**. Being classified as high risk, the final recommendation is **REDUCE**.

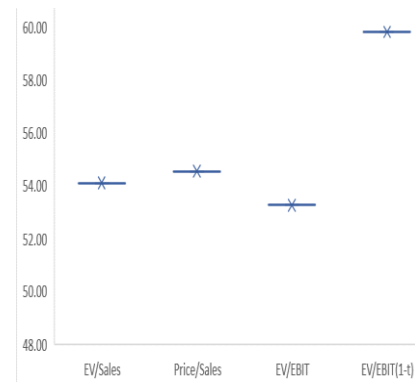
Applying the Dividend Discount Model (DDM) due to the regular dividend distribution and stock repurchase programs (Table 14) a price target of **\$52.88** was obtained with an upside potential of **1.14%**. The final recommendation remains constant at **REDUCE**.

Table 12 – Intel's DCF outputs
Units in million USD,
except
#shares outstanding (million) and price
target

Enterprise Value	\$ 288,618
Debt	\$ 27,637
Cash	\$ 3,176
Net Debt	\$ 24,461
Equity Value	\$ 264,157
# shares outstanding	4,516
Price Target	\$ 58.49

Source: Author

Figure 28 - Intel's multiples
valuation output



Source: Author, Damodaran database

Table 14 – Intel's DDM valuation output
Units per share

DDM Valuation	
PV (dividends and stock repurchases)	14.67
Terminal Period	58.65
PV (Terminal Period)	38.01
Price Target	52.68

Source: Author

Table 15 – Valuation results
Units in USD

Valuation Methods	
DCF	58.49
Multiples (average)	55.42
DDM	52.68
Average Price Target	55.53

Source: Author

Valuation

To value Intel, the preferred method used was Discounted Cash Flow model (DCF). In order to value Intel's Enterprise value, FCFF were obtained and discounted with WACC rate. This approach is suitable due to the similar and constant capital structure in the last recent years (approximately 50/50 split between Equity and Debt). The FCFF were obtained for the time period 2019-2023. A Terminal Value was forecasted under the assumption of going concern, that is, the company will continue to operate in the future and generate cash flows.

Free Cash Flow to the Firm (FCFF)

After the forecast of the financial statements, Intel's FCFF (Figure 29) were obtained using the following formula:

$$FCFF = NI + NCC + Interest(1 - tax\ rate) - CapEx - \Delta NWC$$

From Net Income, Non-Cash Charges must be added, in particular D&A, and gains (losses) on equity investments. After-tax interest expense must also be added back to Net Income. In order to arrive to FCFF final value, it must be deducted the investments in fixed capital (Capex) and the investment in net working capital (changes in NWC).

Weighted Average Cost of Capital (WACC)

To discount the FCFF, WACC will be used as a discount rate, reflecting time value of money, the semiconductor industry risk and the country (USA) risk. Intel's fundamentals will also be reflected in WACC rate (Figure 30), computed using the following formula (no preferred shares):

$$WACC = \frac{E}{V} * rE + \frac{D}{V} * rD * (1 - tax\ rate)$$

Cost of Debt (rD)

Since the cost of debt for a company is a very specific figure, it was ruled out any market approach. The required rate for Intel to get a loan depends on Intel's financial position and solvency, as well as the company ability to generate cash. In addition, it must be considered the business environment of the company and its history with debt payments. To summarize all this variables, the rate considered as cost of debt was the interest rate charged by banks to Intel in the last year (2018), given by the interest expense over the amount of debt in that period. This assumptions holds on the premise that Intel's debt holders see no change in the company's ability to pay its long-term obligations, as it can be observed in Intel's financial ratios. In practical terms, Intel cost of debt observed in 2018 will hold for the forecasted period, that is, 1.78%.

Cost of Equity (rE)

To estimate the cost of equity (rE), a pure CAPM model was used (Table 16), under the standard CAPM assumptions that investors are risk averse, investment is based on mean-variance optimization and the relevant risk is systematic. The following formula represents the computation of cost of equity:

$$rE = rf + \beta * MRP$$

-Risk-free rate (rf): a long-term treasury government bond, in the same currency as Intel cash flows, and no default risk. To simplify, the 10-year US Treasury bond yield was assumed as risk-free rate with value of 1.675%.

Figure 29 – Intel's forecasted FCFF
Units in million USD

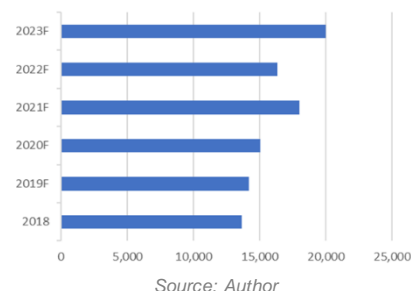


Figure 30 – Intel's forecasted WACC, cost of equity and cost of debt
Units in percentage

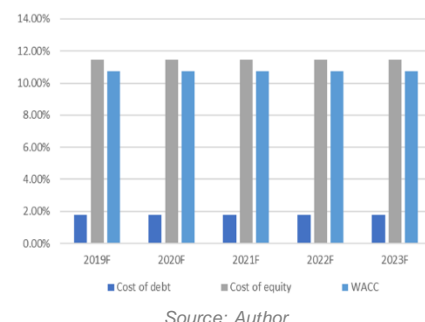


Table 16 – Discount rate inputs
Units in percentage except Rate

Cost of capital	2019F-2023F
Risk-free	1.68%
Beta	1.64
ERP	5.96%
Cost of equity	11.45%
Cost of debt	1.78%
WACC	10.75%

Source: Autor, Damodaran database, Bloomberg

-Beta (β): the beta value gives the exposure of the company to market risk. By definition, it must be a market value. From Damodaran database, for the semiconductor global market, a beta of 1.64 was assumed.

-Market Risk Premium (MRP): MRP is, by definition, a market value. It gives the required premium above the risk-free rate for investing in the stock, given its exposure to risk. From Damodaran database, for USA companies, a MRP of 5.96% was considered.

Aggregating all variables, the cost of equity (r_E) obtained was 11.45%.

Regarding r_E and r_D , the forecasted values mention above are assumed to remain constant from 2019-2023, under the assumptions already stated that no extraordinary and non-recurring events will happen that drastically change Intel's position in the market. Variations in some of this inputs and its effects will be given more detail in the section of Investment Risks.

Considering the already stated values for cost of equity and cost of debt, adding the weights of equity and debt derived from market values (Table 17) and considering the effective tax rate also mentioned above, WACC rate of 10.75% was obtained.

Terminal Period

The terminal value of a company is the expected value of its business under the assumption that it will continue to operate and generate cash flows in the future. The terminal period FCFF was normalized, deducted from non-recurring events, and averaged with respect to the period 2019-2023. The same period was used to estimate the growth in FCFF for the terminal period. In practical terms, the growth in the future after 2023 will be generated by items in the 2019-2023 period, in particular, the ROE and the reinvestment rate. Multiplying this two last variables is obtained the value of growth (Table 18) that is expected to happen in Intel's terminal FCFF.

Table 18 – Terminal Period growth rate inputs
Units in million USD except percentage values

	2019YE F	2020YE F	2021YE F	2022YE F	2023YE F	2019-2023
Capex	\$ 15,500	\$ 15,725	\$ 16,349	\$ 16,414	\$ 17,111	\$ 81,099
D&A	\$ 10,220	\$ 11,022	\$ 11,937	\$ 12,911	\$ 13,851	\$ 59,941
ΔNWC	-\$ 571	\$ 897	-\$ 970	\$ 1,726	-\$ 741	\$ 340
EBIT	\$ 21,279	\$ 22,953	\$ 23,863	\$ 23,958	\$ 24,976	\$ 117,029
Tax rate	12.00%	10.96%	10.96%	10.96%	10.96%	10.96%
Reinvestment rate	25.15%	27.40%	16.20%	24.51%	11.33%	20.63%
ROE	23.12%	23.98%	23.90%	22.88%	22.83%	23.34%
g	5.82%	6.57%	3.87%	5.61%	2.59%	4.82%

Source: Author

For the terminal period, the WACC rate was assumed equal to the explicit period WACC.

Finally, to discount terminal FCFF, a growing perpetuity formula was used, taking into account that this specific formula gives the discounted value for year N, using the cash flow from year N+1.

Table 17 – Intel's Equity and Debt weights

	Market Value	Book Value
EV	92.96%	47.9%
DV	7.04%	52.1%

Source: Yahoo Finance, company's annual reports

Table 19 – Intel’s Terminal FCFF forecast
Units in million USD except percentages

	2019YE F	2020YE F	2021YE F	2022YE F	2023YE F	Terminal Period
EBIT	\$ 21,279	\$ 22,953	\$ 23,863	\$ 23,958	\$ 24,976	
Tax rate	12.00%	10.96%	10.96%	10.96%	10.96%	10.96%
EBIT(1-tax rate)	\$ 18,725	\$ 20,437	\$ 21,248	\$ 21,332	\$ 22,239	\$ 23,226
YoY		9.14%	3.97%	0.40%	4.25%	4.44%
D&A	\$ 10,220	\$ 11,022	\$ 11,937	\$ 12,911	\$ 13,851	\$ 14,945
YoY		7.85%	8.30%	8.16%	7.28%	7.90%
ΔNWC	-\$ 571	\$ 897	-\$ 970	\$ 1,726	-\$ 741	\$ 901
YoY		-256.98%	-208.18%	-277.97%	-142.94%	-221.52%
Capex	\$ 15,500	\$ 15,725	\$ 16,349	\$ 16,414	\$ 17,111	\$ 17,542
YoY		1.45%	3.97%	0.40%	4.25%	2.52%
FCFF						\$ 19,729

Source: Author

After discounting all the mentioned cash flows (Table 19) with the appropriate rates the Enterprise value is reached. To transform into Equity value, net debt is subtracted. For the non-operating assets, cash and cash equivalents was the only account considered and was valued as BV, under the assumption that cash has zero (or near zero) interest returns.

Considering the Equity value obtained of \$264,145M and the number of shares outstanding of 4,516M the price target of \$58.49 per share was achieved.

Market-based valuation (comparables)

To complement the DCF valuation, a relative valuation through multiples/comparables was performed. Although semiconductor industry is a global market, in terms of company fundamentals and strategies, different geographical areas have different characteristics. In order to narrow the range of potential comparables, only US firms were considered in this valuation method, since the operational structures are different across countries. The accounting principles structured followed can also be different. In order to select peer companies, to have a sample with the most similar companies of Intel, foreign companies were excluded of the peer group.

Additionally only positive EBITDA firms were selected.

Accessing Damodaran database, 72 firms matched this requests and were used to obtain the multiples values. From the 72 firms it's important to highlight the presence of Texas Instruments, Broadcom, Qualcomm, AMD, NVidia and Micron, the top US semiconductor firms. Five of these companies are present in the top-10 world biggest semiconductor firms by revenue, which gives confidence in the sample being representative of the market. Both price and enterprise value multiples were used. An average multiples price target of \$55.42 was obtained, supporting the DCF valuation and recommendation. In the Table 20 are summarized the results of the relative valuation.

Table 20 – Multiples valuation
Prices in USD

	Multiples	Price target
EV/Sales	3.71	54.09
Price/Sales	3.4	54.54
EV/EBIT	12.45	53.25
EV/EBIT(1-t)	16.09	59.80
Average		55.42

Source: Author, Damodaran database

Dividend Discount Model (DDM)

Intel had a reasonably stable dividend payment over the last five years. The company is committed in returning cash to its stockholders, not only in dividend payments but also through share repurchase programs.

Taking this information into account, is suitable to apply a Dividend Discount Model.

The same cost of equity previously computed was used to discount the cash flows, in particular, 11.45%.

To account for share repurchase programs, it was considered the total cash returned to stockholder per share (Figure 31), both dividend payments and stock repurchase payments.

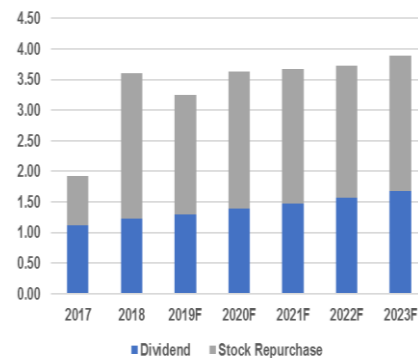
To account for the terminal period, the same value of cash returned to stockholders in 2023YE was assumed to remain constant for the future period. A perpetuity formula was applied to discount the terminal value, with the same growth rate computed in the DCF method, with the value of 4.82%.

The yielded Present Value was \$52.68, very close to the current price of \$52.09.

Conclusion

Considering the three valuation methodologies, DCF, DDM and Multiples, an average price target of \$55.53 was obtained to value Intel.

Figure 31 – Intel's cash returned to stockholders
In per share values



Source: Author, company's annual reports

Investment risks

In this section, the major risks faced by Intel will be divided into sub-categories and analyzed separately. According to their source, Intel can face three types of risk, market risk, political risk and technological risk.

Market risks

Intel is exposed to different market risks (Figure 32) such as interest rates, currency exchange rates, commodity prices and equity prices.

Commodity prices are, in this author opinion, the minor risk in this category. According to annual reports of Intel, the company has put in place management programs that mitigate this risk taking into consideration future transactions and commodity price fluctuations, such as the use of derivatives, in particular, commodity swap contracts. Additionally, Intel have a wide portfolio of commodity suppliers to prevent supplier concentration and reduce their bargaining power.

Concerning **equity prices risk**, Intel has investments such as equity derivative instruments and marketable equity securities. As of 29 December 2018, the fair value of Intel's portfolio of equity investments was \$1.4 billion, including \$1.1 billion investment in ASML, one of the biggest producers of photolithography semiconductor systems, who concentrated the majority of Intel's investment in marketable equity securities. Regarding equity derivative instruments, substantially all of investment was made in IMFT, totalizing \$1.6 billion. However, as of January 2019, Micron stated in a press release its intention to buy Intel's minority interest in IMFT, by exercising a call option for \$1.5 billion.

Relative to **interest rate risk**, Intel's exposure is through outstanding debt and fixed-rate investment portfolio. The adopted measure to minimize this risk is entering into interest rate contracts, with the active part being U.S. dollar three-month LIBOR-based returns and the passive part being fixed-rate debt investment with remaining maturities higher than six months.

Specifying the floating rate debt (including the swapped contracts), according to Intel, a 1% increase in interest rates would result in a variation of interest expense in \$215 million in 2018. The same impact was lower in 2017, since the estimated impact was around \$140 million.

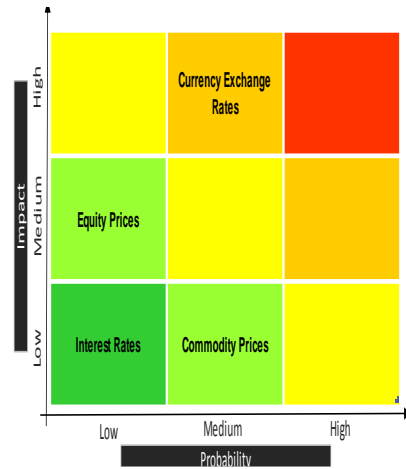
Finally, **currency exchange risk** is the most significant market risk to take into account. The majority of Intel's revenue is transacted in US dollars. Concerning costs, the company has operating and capital expenditures in foreign currencies such as Euro, Yen, Shekel and Yuan. A weakened dollar can translate into an increase in some expenses such as payroll, utilities, tax, and marketing expenses, that are paid locally. To mitigate currency exchange rate risk, Intel signs currency forwards or option contracts to reduce its exposure to non-US currencies.

Political risks

In this section is important to mention that Intel has as top clients the countries China and Singapore. Threatening Intel's market share and business position in Asia is **China-USA trade war**. China alone was responsible for 23.5% to 26.6% of Intel's revenue in the last three years. An escalation of commercial relationships between USA and China in the future can impact severely Intel's results.

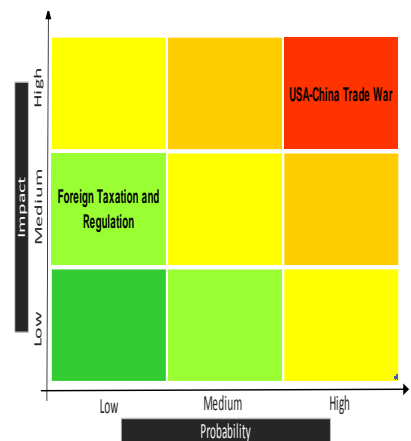
Along with the advances in technology, **legislation concerning taxes and regulation** is also evolving to adapt laws to new type of technological services provided (Figure 33). EU has been applying fines to companies such as Google and investigating Amazon and Facebook regarding competition rules, taxes and data protection. Such companies are the biggest clients of Intel's chips for data centers. A change in taxation for this companies, even a small one, can have a

Figure 32 - Market risks



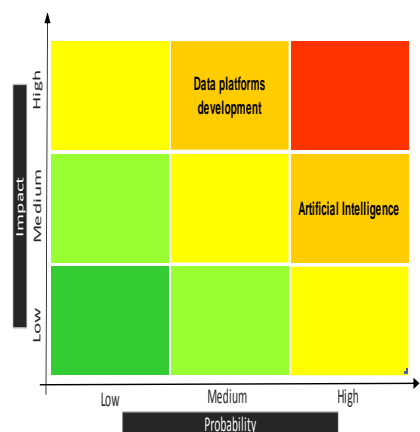
Source: Author, company's risk disclosures

Figure 33 - Political risks



Source: Author, company's risk disclosures

Figure 34 - Technological risks



Source: Author

significant impact in Intel's revenue and overall results, since data center operations represent around 30% of Intel's revenues in the last three years.

Technological risks

Being a semiconductor company, Intel has and always had a high degree of technological factor associated with its products (Figure 34). The development of new products is depend on the development of new technologies, and vice versa. This relation is valid for all semiconductor firms in a way that every year there is a risk of one single company presenting a new product that will make all other products obsolete or out-of-date. To Intel, one company worth mentioning is NVidia. NVidia has been developing GPU products that can, at some extent, substitute traditional CPUs produced by companies such Intel or AMD. The technological trend for "smaller and faster" is growing and Intel's chips may not be as easily adaptable to these changes. According to Moore's Law, states that the number of transistors on a microchip doubles every two years. This exponential growth was declared by Moore himself as "it can't continue forever. It is the nature of exponential functions".

At this point, chips are being very difficult to turn faster, in particular, microprocessors, and at the same time smaller, which gives confidence to say that we are reaching to the steepest part of the exponential function.

Concerning data, as already explained in previous sections, Intel's chips face the competition of more developed chips such as NVidia's products. These last chips are more suitable than Intel's chips when dealing with Big Data and Artificial Intelligence, two concepts that are shaping the way firms deal with their information and data and how they process it.

Risks to price target

To test the susceptibility of some key variables in Intel's valuation it was performed a sensitivity analysis. The tested variables were the WACC rate and the growth (g) of the terminal period FCFF. Changes of 5% were made in both variables and the results are showed in the following Table 21:

Table 21 – Price target's Sensitivity Analysis

Enterprise Value	\$ 288,618	Change in WACC rate by 5%										
		8.32%	8.76%	9.22%	9.71%	10.22%	10.75%	11.29%	11.86%	12.45%	13.07%	13.72%
Change in growth (g) of Terminal Period by 5%	3.73%	382,771	350,505	322,101	296,936	274,514	254,435	237,213	221,583	207,352	194,353	182,449
	3.92%	396,676	361,866	331,444	304,662	280,934	259,792	241,737	225,415	210,605	197,122	184,809
	4.13%	412,720	374,865	342,056	313,381	288,138	265,773	246,768	229,660	214,196	200,168	187,398
	4.35%	431,408	389,862	354,198	323,286	296,269	272,486	252,385	234,379	218,174	203,529	190,246
	4.57%	453,422	407,332	368,206	334,618	305,505	280,061	258,692	239,651	222,598	207,254	193,390
	4.82%	479,698	427,910	384,523	347,692	316,072	288,666	265,811	245,571	227,541	211,397	196,874
	5.06%	509,850	451,165	402,728	362,120	327,626	297,998	273,481	251,910	232,807	215,789	200,551
	5.31%	546,699	479,076	424,256	378,971	340,978	308,686	282,198	259,068	238,718	220,694	204,639
	5.57%	592,692	513,153	450,074	398,884	356,562	321,030	292,181	267,204	245,392	226,201	209,204
	5.85%	651,636	555,636	481,565	422,747	374,967	335,432	303,712	276,521	252,978	232,419	214,329
	6.15%	729,787	609,998	520,777	451,826	397,006	352,429	317,165	287,283	261,666	239,486	220,115

Source: Author

It can be observed, as expected, that small percentage variations in terminal period growth rate have more impact in Intel's valuation than the same variations in WACC.

Concerning WACC, we can see in the Table 22 below the effect of 5% changes in cost of equity and cost of debt and its impact in the overall WACC rate.

Table 22 – WACC’s Sensitivity Analysis

WACC		Change in cost of equity (rE) by 5%										
10.75%		8.86%	9.33%	9.82%	10.33%	10.88%	11.45%	12.02%	12.62%	13.25%	13.92%	14.61%
Change in cost of debt (rD) by 5%	1.37%	8.32%	8.75%	9.21%	9.69%	10.20%	10.73%	11.26%	11.82%	12.41%	13.02%	13.67%
	1.45%	8.33%	8.76%	9.22%	9.70%	10.20%	10.73%	11.27%	11.82%	12.41%	13.03%	13.67%
	1.52%	8.33%	8.76%	9.22%	9.70%	10.21%	10.74%	11.27%	11.83%	12.42%	13.03%	13.68%
	1.60%	8.34%	8.77%	9.22%	9.71%	10.21%	10.74%	11.28%	11.83%	12.42%	13.04%	13.68%
	1.69%	8.34%	8.77%	9.23%	9.71%	10.22%	10.75%	11.28%	11.84%	12.43%	13.04%	13.69%
	1.78%	8.35%	8.78%	9.24%	9.72%	10.22%	10.75%	11.29%	11.84%	12.43%	13.05%	13.69%
	1.86%	8.35%	8.78%	9.24%	9.72%	10.23%	10.76%	11.29%	11.85%	12.44%	13.05%	13.70%
	1.96%	8.36%	8.79%	9.25%	9.73%	10.23%	10.76%	11.30%	11.86%	12.44%	13.06%	13.71%
	2.06%	8.36%	8.80%	9.25%	9.73%	10.24%	10.77%	11.30%	11.86%	12.45%	13.06%	13.71%
	2.16%	8.37%	8.80%	9.26%	9.74%	10.25%	10.78%	11.31%	11.87%	12.45%	13.07%	13.72%
	2.27%	8.38%	8.81%	9.27%	9.75%	10.25%	10.78%	11.32%	11.87%	12.46%	13.08%	13.72%

Source: Author

Appendices

Appendix 1: Statement of Financial Position

CONSOLIDATED BALANCE SHEETS									
(In Millions, Except Par Value)	Dec 31, 2016	Dec 30, 2017	Dec 29, 2018	2019YE F	2020YE F	2021YE F	2022YE F	2023YE F	
Assets									
Current assets:									
Cash and cash equivalents	\$ 5,560	\$ 3,433	\$ 3,019	3,176	3,248	3,137	3,564	3,417	
Short-term investments	3,225	1,814	2,788	2,609	2,404	2,600	2,538	2,514	
Trading assets	8,314	8,755	5,843	5,245	6,251	4,761	6,141	5,201	
Accounts receivable	4,690	5,607	6,722	5,883	7,207	6,414	7,788	7,050	
Inventories	5,553	6,983	7,253	7,299	7,754	8,138	8,615	9,054	
Other current assets	2,956	2,908	3,162	3,398	3,457	3,588	3,773	3,923	
Total current assets	35,508	29,500	28,787	27,611	30,321	28,637	32,417	31,159	
Property, plant and equipment, net	36,171	41,109	48,976	54,198	58,926	63,167	66,467	69,371	
Equity investments	6,180	8,579	6,042	6,020	5,805	5,948	5,895	5,898	
Other long-term investments	4,716	3,712	3,388	3,939	3,680	3,669	3,762	3,704	
Goodwill	14,099	24,389	24,513	24,513	24,513	24,513	24,513	24,513	
Identified intangible assets, net	9,494	12,745	11,836	11,894	11,869	12,041	12,243	12,599	
Other long-term assets	7,159	3,215	4,421	5,654	5,283	5,803	5,891	6,238	
Total assets	\$ 113,327	\$ 123,249	\$ 127,963	\$ 133,829	\$ 140,397	\$ 143,778	\$ 151,189	\$ 153,481	
Liabilities, temporary equity, and stockholders' equity									
Current liabilities:									
Short-term debt	\$ 4,634	\$ 1,776	\$ 1,261	1,976	2,212	2,131	2,351	2,301	
Accounts payable	2,475	2,928	3,824	2,991	4,175	3,358	4,605	3,776	
Accrued compensation and benefits	3,465	3,526	3,622	3,538	3,562	3,574	3,558	3,565	
Other accrued liabilities	6,090	7,535	7,919	8,074	8,608	8,810	9,207	9,658	
Total current liabilities	20,302	17,421	16,626	16,579	18,557	17,873	19,720	19,298	
Debt	20,649	25,037	25,098	25,660	26,648	27,728	28,910	30,205	
Contract liabilities			2,049	2,264	2,502	2,765	3,055	3,376	
Income taxes payable, non-current		4,069	4,897	4,754	4,754	3,520	3,520	591	
Deferred income taxes	1,730	3,046	1,665	1,665	1,665	1,665	1,665	1,665	
Other long-term liabilities	3,538	3,791	2,646	3,325	3,254	3,075	3,218	3,182	
Total liabilities	\$ 46,219	\$ 53,364	\$ 52,981	\$ 54,248	\$ 57,380	\$ 56,625	\$ 60,088	\$ 58,317	
Commitments and Contingencies (Note 21)									
Temporary equity	882	866	419	419	419	419	419	419	
Stockholders' equity:									
Common stock, \$0.001 par value, 10,000 shares authorized; 4,516 shares issued and outstanding (4,687 issued and outstanding in 2017) and capital in excess of par value	25,373	26,074	25,365	25,365	25,365	25,365	25,365	25,365	
Accumulated other comprehensive income (loss)	106	862	(974)	0	0	0	0	0	
Retained earnings	40,747	42,083	50,172	53,797	57,233	61,369	65,318	69,380	
Total stockholders' equity	66,226	69,019	74,563	79,162	82,598	86,734	90,683	94,745	
Total liabilities, temporary equity, and stockholders' equity	\$ 113,327	\$ 123,249	\$ 127,963	\$ 133,829	\$ 140,397	\$ 143,778	\$ 151,189	\$ 153,481	

Appendix 2: Income Statement

CONSOLIDATED STATEMENTS OF INCOME								
Years Ended (In Millions, Except Per Share Amounts)	Dec 31, 2016	Dec 30, 2017	Dec 29, 2018	2019YE F	2020YE F	2021YE F	2022YE F	2023YE F
Net revenue	\$ 59,387	\$ 62,761	\$ 70,848	\$ 72,435	\$ 75,224	\$ 78,272	\$ 81,608	\$ 85,264
Cost of sales	23,154	23,663	27,111	27,591	28,605	30,165	31,816	33,546
Gross margin	36,233	39,098	43,737	44,844	46,619	48,107	49,792	51,718
Research and development	12,685	13,035	13,543	14,788	15,120	15,558	16,428	17,083
Marketing, general and administrative	8,377	7,452	6,750	8,573	8,334	8,464	9,175	9,418
Restructuring and other charges	1,744	384	(72)	0	0	0	0	0
Amortization of acquisition-related intangibles	294	177	200	204	212	221	230	241
Operating expenses	23,100	21,048	20,421	23,565	23,666	24,243	25,833	26,742
Operating income	13,133	18,050	23,316	21,279	22,953	23,863	23,958	24,976
Gains (losses) on equity investments, net	506	2,651	(125)	(22)	(237)	(94)	(147)	(144)
Interest and other, net	(703)	(349)	126	(456)	(473)	(492)	(513)	(536)
Income before taxes	12,936	20,352	23,317	20,801	22,243	23,277	23,298	24,296
Provision for taxes	2,620	10,751	2,264	2,496	2,438	2,551	2,553	2,663
Net income	\$ 10,316	\$ 9,601	\$ 21,053	\$ 18,305	\$ 19,805	\$ 20,726	\$ 20,745	\$ 21,633
Earnings per share—Basic	\$ 2.18	\$ 2.04	\$ 4.57	\$ 3.97	\$ 4.30	\$ 4.49	\$ 4.50	\$ 4.69

Appendix 3: Cash Flow Statement

CONSOLIDATED STATEMENTS OF CASH FLOWS

Years Ended (In Millions)	Dec 31, 2016	Dec 30, 2017	Dec 29, 2018	2019YE F	2020YE F	2021YE F	2022YE F	2023YE F
Cash and cash equivalents, beginning of period	\$ 15,308	\$ 5,560	\$ 3,433	\$ 3,019	\$ 3,176	\$ 3,248	\$ 3,137	\$ 3,564
Cash flows provided by (used for) operating activities:								
Net income	10,316	9,601	21,053	18,305	19,805	20,726	20,745	21,633
Adjustments to reconcile net income to net cash provided activities:								
Depreciation	6,266	6,752	7,520	8,657	9,523	10,487	11,530	12,534
Share-based compensation	1,444	1,358	1,546	1,636	1,656	1,733	1,816	1,887
Amortization of intangibles	1,524	1,377	1,565	1,563	1,499	1,450	1,381	1,317
(Gains) losses on equity investments, net	(432)	-2,583	155	(22)	(237)	(94)	(147)	(144)
Loss on debt conversion and extinguishment	—	476	260	0	0	0	0	0
(Gains) losses on divestitures	—	(387)	(497)	0	0	0	0	0
Deferred taxes	257	1,548	-1,749	0	0	0	0	0
Changes in assets and liabilities:								
Accounts receivable	65	(781)	-1,714	(839)	1324	(794)	1374	(738)
Inventories	119	-1,300	(214)	46	455	384	477	439
Accounts payable	182	191	211	(833)	1183	(816)	1246	(829)
Accrued compensation and benefits	291	311	(260)	(84)	24	12	(16)	7
Customer deposits and prepaid supply agreements	—	1,105	1,367	1336	1420	1461	1532	1596
Income taxes payable and receivable	1,382	5,230	148	(2182)	(2971)	(2509)	(2762)	(2855)
Other assets and liabilities	394	(788)	41	(554)	300	(699)	55	(383)
Total adjustments	11,492	12,509	8,379	8,725	14,177	10,613	16,486	12,831
Net cash provided by operating activities	21,808	22,110	29,432	27,030	33,982	31,340	37,231	34,464
Cash flows provided by (used for) investing activities:								
Additions to property, plant and equipment	(9625)	(11778)	(15181)	(13879)	(14251)	(14728)	(14831)	(15438)
Acquisitions, net of cash acquired	(15470)	(14499)	(190)	(1621)	(1474)	(1621)	(1583)	(1674)
Available-for-sale debt investments	(768)	2774	(680)	372	(464)	186	31	(83)
Trading assets	(1339)	270	2608	0	(1006)	1489	(1379)	940
Purchases of equity investments	(963)	(1619)	(874)	22	0	(143)	0	(2)
Sales of equity investments	1080	5236	2802	0	215	0	53	0
Proceeds from divestitures	—	3124	548	0	0	0	0	0
Other investing	1268	730	(272)	(1046)	(2821)	(2499)	(3838)	(3393)
Net cash used for investing activities	-25,817	-15,762	-11,239	-16,152	-19,802	-17,315	-21,548	-19,649
Cash flows provided by (used for) financing activities:								
Increase (decrease) in short-term debt, net	(15)	12	460	715	236	(82)	220	(50)
Issuance of long-term debt, net of issuance costs	2734	7716	423	739	4438	3580	5621	1695
Repayment of debt and debt conversion	(1500)	(8080)	(3026)	(304)	(4213)	(3116)	(5406)	(692)
Proceeds from sales of common stock through employee	1108	770	555	0	0	0	0	0
Repurchase of common stock	(2587)	(3615)	(10730)	(8811)	(10116)	(9950)	(9692)	(10012)
Payment of dividends to stockholders	(4925)	(5072)	(5541)	(5869)	(6254)	(6640)	(7103)	(7559)
Other financing	(554)	(206)	(748)	(428)	(2388)	(2271)	(3378)	(2995)
Net cash provided by (used for) financing activities	-5,739	-8,475	-18,607	-10,720	-14,108	-14,135	-15,257	-14,961
Net increase (decrease) in cash and cash equivalents	-9,748	-2,127	(414)	157	72	-111	427	-146
Cash and cash equivalents, end of period	\$ 5,560	\$ 3,433	\$ 3,019	\$ 3,176	\$ 3,248	\$ 3,137	\$ 3,564	\$ 3,417

Appendix 4: Key Financial Ratios

Intel

Key Financial Ratios							
Liquidity Ratios	2017	2018	2019F	2020F	2021F	2022F	2023F
Current Ratio	1.69	1.73	1.67	1.63	1.60	1.64	1.61
Quick Ratio	1.02	0.94	0.96	0.97	0.96	0.96	0.96
Cash Ratio	0.70	0.53	0.51	0.51	0.44	0.49	0.45
Efficiency Ratios	2017	2018	2019F	2020F	2021F	2022F	2023F
Total Asset Turnover	0.53	0.56	0.55	0.55	0.55	0.55	0.56
Working Capital Turnover	3.19	3.89	4.23	4.35	4.70	4.51	4.68
Fixed Asset Turnover	1.62	1.57	1.40	1.33	1.28	1.26	1.26
Receivables Turnover	12.19	11.49	11.49	11.49	11.49	11.49	11.49
Payables Turnover	9.29	8.11	8.11	8.11	8.11	8.11	8.11
Inventory Turnover	3.78	3.81	3.79	3.80	3.80	3.80	3.80
Days Sales Outstanding	29.94	31.76	30.85	31.30	31.08	31.19	31.13
Days Payables Outstanding	45.16	51.48	48.32	49.90	49.11	49.51	49.31
Days Inventory Outstanding	96.68	95.83	96.26	96.04	96.15	96.10	96.12
Cash Conversion Cycle	81.46	76.11	78.78	77.45	78.11	77.78	77.95
Profitability Ratios	2017	2018	2019F	2020F	2021F	2022F	2023F
Gross Profit Margin	0.62	0.62	0.62	0.62	0.61	0.61	0.61
Operating Profit Margin	0.29	0.33	0.29	0.31	0.30	0.29	0.29
Net Profit Margin	0.15	0.30	0.25	0.26	0.26	0.25	0.25
ROA	0.08	0.17	0.14	0.14	0.15	0.14	0.14
ROCE	0.17	0.21	0.18	0.19	0.19	0.18	0.19
ROE	0.14	0.28	0.23	0.24	0.24	0.23	0.23
EPS	2.04	4.57	3.97	4.30	4.49	4.50	4.69
Dividends payout	0.53	0.26	0.32	0.32	0.32	0.34	0.35
SG&A/Sale	0.12	0.10	0.12	0.11	0.11	0.11	0.11
Solvency Ratios	2017	2018	2019F	2020F	2021F	2022F	2023F
Debt-to-Assets	0.20	0.20	0.19	0.19	0.19	0.19	0.20
Debt-to-Capital	0.49	0.50	0.50	0.51	0.52	0.53	0.54
Debt-to-Equity	0.96	0.99	1.01	1.05	1.09	1.14	1.19
Financial Leverage	0.44	0.44	0.43	0.42	0.42	0.42	0.41
Debt to EBITDA	0.69	0.60	0.62	0.62	0.62	0.63	0.63
Value Creation and Cash Flow Ratios	2017	2018	2019F	2020F	2021F	2022F	2023F
Debt Coverage	0.82	1.12	0.98	1.18	1.05	1.19	1.06
Cash to Income	2.30	1.40	1.48	1.72	1.51	1.79	1.59
Dividend Payment	4.36	5.31	4.61	5.43	4.72	5.24	4.56

Appendix 5: Financial Statement Line Item Forecast Assumptions

FSLI	Assumption/Notes
CCG revenue	Platform growing at 0.5% CAGR and Adjacent growing at 13.42%
DCG revenue	4% CAGR
IOTG revenue	13.6% CAGR
NSG revenue	10.5% CAGR
PSG revenue	9% CAGR
All other	Residual projects and divestitures. No material value in the valuation
Operating Income	Same percentage of revenue, averaged of last 3 years
Operating Costs	Same percentage of revenue, averaged of last 3 years
Total gains (losses) on equity investments, net	Sum of impairment charges and equity investment sales averaged of last 3 years
Effective tax rate	For 2019 equal to 10.96% (Intel estimate). Following years equal to industry average of 10.96%
CapEx	For 2019 equal to €15.5B (Intel estimate). Following years in same percentage of EBIT equal to industry average of 68.51%
PP&E	Amount of CapEx invested in PP&E in equal percentage of total CapEx, averaged of last 3 years
Intangibles	The remaining CapEx is invested in intangible assets
Depreciations	Same percentage of PP&E gross, averaged of last three years
Inventory	Intel will try to keep Inventory turnover constant, averaged of the last three years
Account receivable	Intel will try to keep Receivables turnover constant, averaged of the last three years
Account payable	Intel will try to keep Payables turnover constant, averaged of the last three years
Dividends	YoY growth of dividends in accordance with last three years average
Share-based compensation	Growing according with sales growth
Long-term debt	Changes in line with company's value (sales used as proxy)
Income taxes payable	Derived from 2018 annual report estimates
Contractual obligations	Refer to NSG operating segment. Will increase according to NSG's sales.
Other long-term investments	Variation according to sales's growth
Customer deposits and prepaid supply agreements	Variation according to sales's growth
Debt repayments	Same percentage of Debt, averaged of last two years
Amortization of acquisition-related intangibles	In same percentage of sales, averaged of last two years
Earnings distributed	Same average percentage of net income regarding last three years
Stock repurchases	Residual distribution of earnings after dividend payments
Short-term Debt	In equal percentage of current liabilities, averaged of last three years
Minimum Cash Balance	In equal percentage of current liabilities, averaged of last three years
Other assets and liabilities	Variation according to sales's growth

Abbreviations

β – Beta

CapEx – Capital Expenditures

CPU – Central Processing Unit

D - Debt

DCF – Discounted Cash Flow

DRAM – Dynamic Random-Access Memory

D&A – Depreciation and Amortization

E - Equity

EBITDA – Earnings Before Interest, Taxes, Depreciation and Amortization

EBIT – Earnings Before Interest and Taxes

ERP – Equity Risk Premium

EV – Enterprise Value

FCFF – Free Cash Flow to the Firm

FPGA - Field-Programmable Gate Array

GAAP – Generally Accepted Accounting Principles

GPU – Graphic Processing Unit

IP – Intellectual Property

M&A – Merger and Acquisition

NWC – Net Working Capital

RAM – Random Access-Memory

rD – Cost of Debt

rE – Cost of Equity

r_f – Risk-free Rate

ROE – Return on Equity

PC – Personal Computer

PP&E – Property, Plant and Equipment

SoC – System on a Chip

SSD – Solid State Drive

T – Effective Tax Rate

VPU – Virtual Processing Unit

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