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Equity Valuation: Samsung Electronics

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Master in Finance

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Resumo

O objetivo deste projeto de mestrado consiste em estimar o valor justo da Samsung Electronics a 28 de dezembro de 2023, de modo a determinar o valor das suas ações, analisar se foram transacionadas a um preço justo, e apresentar uma recomendação de investimento, para esta data, consoante os resultados da avaliação.

A Samsung Electronics foi fundada em 1969 e é atualmente uma empresa mundial responsável pela produção de uma ampla variedade de dispositivos eletrónicos direcionados a consumidores e produtores.

O valor justo desta empresa é determinado através de dois métodos: o método de Fluxo de Caixa Descontado e a avaliação Relativa.

De modo a suportar as estimativas das ações da empresa, foi realizada uma análise macroeconómica das condições económicas globais e regionais, além de indicadores relevantes. Adicionalmente, também foram analisados fatores específicos da empresa, como áreas de negócio, desempenho financeiro e setores de atuação. Assim, estas análises garantem que as estimativas estejam baseadas numa compreensão abrangente do contexto em que a Samsung Electronics opera.

Deste modo, após o valor intrínseco destas ações ser determinado pelos métodos anteriormente referidos, podemos concluir que o valor justo destas ações era inferior ao seu valor de mercado, uma vez que, estavam a ser transacionadas a 78.500,00 KRW na data de 28 de dezembro de 2023. Assim, a nossa recomendação de investimento, para esta data, é vender, uma que, estas ações estavam a ser sobrevalorizadas.

Palavras-Chave: Samsung Electronics, Dispositivos eletrónicos, avaliação, Método dos Fluxos de caixa descontados, avaliação relativa

Classificação JEL: G30; G32.

Abstract

The purpose of this master's project is to estimate the fair value of Samsung Electronics on December 28th of 2023, in order to determine the value of its shares, to analyse whether they were traded at a fair price, and provide an investment recommendation, for this date, based on the valuation results.

Samsung Electronics was founded in 1969 and is currently a worldwide company responsible for the production of a wide variety of electronic devices targeted to consumers and producers.

The fair value of this company is determined using two methods: the Discounted Cash Flow (DCF) method and Relative valuation.

To support the estimates on the company's shares, a macroeconomic analysis of the global and regional economic conditions, as well as relevant indicators, was conducted. Additionally, specific company factors such as business areas, financial performance, and sectors of operation were analysed. These analyses ensure that the estimates are based on a comprehensive understanding of the context in which Samsung Electronics operates.

After determining the intrinsic value of these shares using the methods previously mentioned, we can conclude that the fair value was lower than the market value, as they were traded at 78,500.00 KRW on December 28, 2023. Therefore, our investment recommendation for this date is to sell, since these shares were being overvalued.

Keywords: Samsung Electronics, electronic devices, Equity Valuation, Discounted Cash Flow method, Relative Valuation

JEL Classification: G30; G32.

Glossary

AHGR: Average Historical growth rate

APV: Adjusted present value

CAGR: Compound annual growth rate

CAPEX: Capital Expenditures

CAPM: Capital Asset Pricing Model

CCE: Cash and Cash Equivalents

CE: Consumer Electronics

CII: Cumulative inflation index

CPU: Central processing Unit

CRP: Country risk Premium

DCF: Discounted Cash Flow

D&A: Depreciations and Amortizations

DDI: Display driver IC

DDM: Dividend Discount Model

D/E: Debt-to-Equity ratio

DRAM: Dynamic random-access memory

D/S: Device Solutions

DX: Device eXperience

EBIT: Earnings before Interest and Taxes

EBITDA: Earnings before Interest, Taxes, Depreciations and Amortization

EQV: Equity Value

ERP: Equity risk Premium

EV: Enterprise Value

FCFF: Free cash Flow to the firm

FCFE: Free cash Flow to Equity

GDP: Gross Domestic Product

GPU: Graphic processing Unit

IM: IT and Mobile communications

IMF: International Monetary Fund

ISP: Image signal processors

IPS: In-Plane Switching

KRW: Korean Won

LED: Light emitting diode

MRP: Market Risk Premium

MX: Mobile eXperience

NOA: Non-Operating Assets

NOPLAT: Net Operating Profit Less Adjusted Taxes

OLED: Organic light emitting diode

OPEX: Operational expenses

P/B: Price-to-book Value

P/E: Price-to-Earnings Ratio

PMOLED: Passive Matrix OLED

P/S: Price-to-Sales Ratio

PPE: Property, plant and equipment

PV: Present Value

PVITS: Present Value of the Interest Tax-Shield

QD-OLED: Quantum dot organic light emitting diode

RAM: Random access memory

R&D: Research and Developments

ROA: Return on Assets

ROE: Return on Equity

ROIC: Return on Invested Capital

ROM: Read only memory

SDC: Subsidiaries of Samsung Display

SoCs: System on a chip

TFT-LCD: Thin film transistor liquid crystal display

TV: Terminal Value

TWS: True wireless stereo

USD: United States Dollar

VAT: Value added tax

V/S: Value to sales Ratio

WACC: Weighted Average Cost of Capital

WC: Working Capital

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Introduction

Samsung Electronics, a subsidiary of Samsung Group, was founded in 1969, and is currently a leading South Korean manufacturer of various consumer electronics and IT products. Additionally, its global presence spans Europe, Americas, Africa, Asia-Pacific, and the Middle East.

This Master's project main objective is to estimate the fair value of Samsung Electronics on December 28th of 2023, and consequently, its share price, using several methods, to assess whether Samsung Electronics' shares were being traded at a fair price, at this date, based on the comparison made between the market price of Samsung Electronics' shares, and its intrinsic value.

That said, we start by making a literature review, in which we will discuss important concepts, methods, and theories, such as the Discounted Cash Flow Model, the Multiples Approach, and other methods, which allow us to understand how to determine the intrinsic value of a company.

Next, in order to have a better understanding of the company, we make a company overview of Samsung Electronics, namely its history, its business segments, that is, its commercialised products, a financial analysis of the company's performance over the last years, and lastly, an industry and macroeconomic analysis, to assess the scenario in which the company operates.

Afterwards, we will proceed with the valuation of Samsung Electronics, through the use of the Multiples approach, and the Discounted Cash Flow approach, namely, the Free Cash Flow to Firm, in which we will define fundamental assumptions, to determine the intrinsic value of Samsung Electronics, and consequently, the fair price of its shares. Moreover, a sensitivity analysis will be made to analyse the effects on the intrinsic value of Samsung Electronics' shares, from changes in the fundamental assumptions made in our valuation.

Lastly, after estimating the intrinsic value of these shares through these methods, we can observe that these shares were being overvalued at the end of the year of 2023, since their market value was higher than its intrinsic value.

1. Literature Review

This chapter presents a comprehensive literature review on equity valuation, examining the theoretical foundations and empirical studies that have shaped our understanding of valuing companies and its stocks. It explores key valuation models, such as discounted cash flow (DCF) and relative valuation methods, and analyses their applicability, strengths, and limitations.

1.1. Valuation

Valuation plays an important role in several fields of Finance, such as, in Corporate Finance, and Portfolio Management, since it enables us to determine the best financing, investment, and dividend decisions, that allows a firm to increase its value (Damodaran, 2006). Hence, valuation is fundamental whenever we need to make important decisions, because it allows to estimate the fair value of a firm, and the factors that have a strong influence in its value.

Analysts commonly use various complex financial models to estimate fair values, each with different assumptions, which can explain why valuations for the same asset or firm vary (Damodaran, 2012).

Thus, key valuation methods include the Discounted Cash Flow (DCF) approach, which values an asset or firm based on the present value of expected future cash flows, Relative valuation, which compares a company or asset to similar ones, and the Contingent Claim valuation, which uses option pricing models to estimate value.

1.2. Discounted Cash Flow

According to Damodaran (2006), the DCF method enables us to value companies by discounting the Cash Flows the company is able to generate. Thus, four approaches are mentioned by the author, namely, the Free Cash Flow to the Firm (FCFF), the Free Cash Flow to Equity (FCFE), the Dividend Discount Model (DDM), and the Adjusted Present Value (APV).

1.2.1. Free Cash Flow to the Firm Method

The FCFF consists of the cash flow that is available to all creditors and shareholders, after the payment of all operating expenses, and the execution of all the necessary investments in fixed capital and working capital (Steiger, 2008). In order to compute the FCFF, we need to apply the following formula (Damodaran, 2014b), that includes the Net operating profit after taxes

(NOPAT), the Depreciations and Amortizations (D&A), the Capital Expenditures (CAPEX), and changes in the Working Capital (WC), as shown below.

$$FCFF = NOPAT + D\&A - Capex - Changes\ in\ WC \quad (1)$$

Additionally, this method states that the enterprise value is obtained through the sum of the discounted FCFF of all the years of the explicit forecast period, and the Terminal Value (TV), at the Weighted Average Cost of Capital (WACC), which in this case corresponds to the discount rate, as mentioned in the following formula (Pinto et al., 2007):

$$Firm\ value = \sum_{t=1}^{n} \frac{FCFF_t}{(1+WACC)^t} + \frac{TV}{(1+WACC)^n} \quad (2)$$

where,
t = Period
n = Last year of explicit forecast period

Lastly, to compute the Equity value we need to subtract the market value of debt, to the enterprise value, and add the value of the non-operating assets (NOA) in case the company has essential NOA (Pinto et al., 2007).

$$Equity\ value = \ Firm\ value - Market\ value\ of\ debt + NOA \quad (3)$$

1.2.1.1. Terminal Value (TV)

The TV corresponds to the discounted perpetual cash flows, that arise after the explicit forecast period, to the last year of this period. Since there is a high difficulty in estimating these cash flows, due to the uncertainty associated, a constant perpetual growth rate *(g)* for these cash flows is assumed, for the years after the explicit forecast period, as we can observe in the formula presented next (Pinto et al., 2007):

$$Terminal\ Value = \frac{FCFF_{n+1}}{(WACC - g)} \quad (4)$$

Considering that these cash flows are not yet discounted to the valuation date, we need to discount the TV at the WACC and for n years, in order to sum this value with the present value of the remaining FCFF.

1.2.1.2. Weighted Average Cost of Capital (WACC)

According to Fernandez (2011), the weighted average cost of Capital (WACC) consists of the weighted average of the after-tax cost of debt (r_d) and the required return to equity, also known as cost of equity (r_e). Additionally, it is also the discount rate that allows the computation of the net present value of the FCFF, since it corresponds to the required rate of return demanded by equity and debt holders, and it reflects the risk associated to these cash flows.

Thereby, in order to compute the WACC, we must include in our calculations, the (r_e), the (r_d), the corporate tax rate (t_c), and the market values of Debt and Equity (Pinto et al., 2007):

$$WACC = \frac{Equity}{Equity + Debt} r_e + \frac{Debt}{Equity + Debt} r_d (1 - t_c) \quad (5)$$

1.2.1.3. Cost of equity (r_e)

The (r_e) corresponds to the required rate to equity, and it can be determined in several ways, being one of them the Capital Asset Pricing Model (CAPM) (Kenton, 2023).

According to the CAPM, the (r_e) refers to the sum of the compensation to investors of the time value of money which corresponds to the risk-free interest rate (r_f), and the compensation for bearing the market risk represented by the market risk premium, which in turn, corresponds to the difference between the Expected Market return (r_m) and the (r_f). Moreover, the market risk premium needs to be adjusted by the beta multiplier (β), in order to reflect the sensitivity of a certain security's returns to market returns fluctuations (Larabee & Voss, 2012). Lastly, it is also important to include the Country Risk Premium (CRP), since it reflects the risk exposure to a certain country (Damodaran, 2019), as presented in the equation below:

$$r_e = r_f + \beta(r_m - r_f) + CRP \quad (6)$$

1.2.1.4. Risk free rate (r_f)

In what concerns the (r_f), it corresponds to the rate of return of investments on risk-free assets, which in turn, are certain, and do not vary, regardless of the scenarios, and have no correlation with risky investment (Damodaran, 2008). Typically, yields on Government bonds are used as risk-free rates, because these assets are considered to be risk-free, as opposed to corporate bonds, due to the fact that governments have an influence on the money supply.

Moreover, whenever we are using the risk-free rates in our valuation, it is important to consider the currency effects, since the risk-free rates differ across currencies, due to different inflation rates, whereas currencies with lower inflation rates tend to have lower risk-free rates, in comparison with high inflation currencies.

Lastly, it is important to highlight some existing difficulties in estimating the risk-free rate mentioned by Damodaran (2008), such as the possibility of not having long term traded government bonds, or situations where the governments have difficulties in meeting their debt obligations, which adds more risk to their bonds.

Starting with the first limitation, some Governments, especially in sub-Saharan Africa, and South America, choose to issue long term bonds in countries with more mature markets, instead of their own market with their local currency, which makes it challenging to find the risk-free rate for that country. Thereby, a possible solution for this constraint consists of estimating the discount rates in that specific mature market and then convert the cash-flows of our valuation, to the currency of that market.

Regarding the second limitation, many economies, especially in emerging markets tend to default on their debt borrowings, which makes it more difficult to identify the risk-free rate. Thus, a solution for this limitation consists of determining the amount of market interest rate on the Government bond of that specific country that corresponds to the default risk, and then subtract the default risk, in order to obtain the risk-free rate.

1.2.1.5. Beta multiplier (β)

The (β) is used in the CAPM model to assess how sensitive a certain security's returns are to fluctuations in the market returns, for example, if a certain stock has a beta of 3.0, we can conclude that the market risk of this stock is three times higher than the risk associated to the

average stock in the market, and that this stock's returns have a higher sensitivity to variations in the market returns, than if the beta of this stock were 0.5.

Thereby, according to Damodaran (2014b), the (β) can be obtained through historical data on market prices for individual assets, whereby the beta used in the CAPM model can be estimated through the formula present below:

$$\beta = \frac{\sigma_{(r_j, r_m)}}{(\sigma_{rm})^2} \tag{7}$$

where,

$\sigma_{(rj,rm)}$ = Covariance of the stock returns (R_j) and the market returns (R_m)

$(\sigma_{rm})^2$ = Variance of the market returns

Hence, whenever we need to estimate the beta parameter through the historical market data on market prices for individual assets, we need to take into account two important aspects. The first is the stock's return interval, since stock returns are accessible on a daily, weekly, monthly, and annual frequency. The second aspect is the choice of the market index that is going to be used to estimate the stock's beta, whereas it is commonly used an index that best suits the investor who is analysing that stock.

Additionally, Damodaran (2014a) also states that the beta parameter can also be obtained through important decisions that a company makes, such as, the degree of financial leverage that is going to be used in the business, which in turn, consists of a strategy that allows an increase in the investment's profitability, using borrowed funds, that is, debt (Hayes, 2014). As a result, the beta of a firm is expected to increase in response to increases in the financial leverage of a firm, keeping everything else constant, since there is a higher variance associated with the earnings per share, which will make the returns of investments in the firm more volatile.

Thereby if shareholders assume the entire risk of the company, and if there are tax benefits associated with the use of debt, then the levered beta that will be used in the CAPM model to estimate the (r_e), is computed through the following formula (Damodaran, 2014a):

$$\beta_L = \beta_U \times (1 + (1 - t) \times \frac{D}{E}) \tag{8}$$

where,

β_L= Levered Beta

β_U= Unlevered Beta

t= Corporate Tax rate
D/E = Debt to Equity Ratio

That said, we can observe that a higher leverage, which in turn, is demonstrated by the (D/E) ratio, affects not only the firm's beta, since the firm will carry a higher risk, but also the tax payments a company incurs, since the interest payments on debt will create tax benefits.

Regarding the unlevered beta of a firm, which is also referred to as the asset beta, its value is derived from the firm's assets, and it is influenced by a company's operating leverage and in which industries the company is engaged in.

Hence, the beta of a firm depends on the riskiness of the industry it operates in, and the risk resulting from the financial leverage of the company, whereas the financial leverage exacerbates the risk incurred by a company. Consequently, companies that operate in industries with a relatively low risk, are usually more willing to assume a higher level of financial leverage, as opposed to companies that conduct their operations in riskier industries, which in turn are less willing to consider financial leverage (Damodaran, 2012).

1.2.1.6. Market risk premium

In what concerns the Market Risk Premium (MRP), it corresponds to the difference between the (r_m) and (r_f), and it is used to measure the compensation investors get for being exposed to the market risk. Thereby, in order to calculate the compensation for the market risk, we need to adjust the stock market risk premium whenever there is a mismatch between the risk of a specific stock, and the risk of the overall market, which is made by multiplying a beta factor (β) to the MRP (Larabee & Voss, 2012).

The MRP, also known as the equity risk premium (ERP), is important because it reflects an investor perspective on risk of a certain market or economy, and how it should be valued, having a strong impact on the expected return of risky investments.

Additionally, the ERP is influenced by several factors, identified by Damodaran (2021), such as, the investors' risk aversion, available information, markets liquidity, and others.

Starting with the investor's risk aversion, which implies that the ERP is higher for investors more risk averse, being the investor's age an important factor in the risk aversion, since older investors tend to be more risk averse.

In what concerns the available information, differences regarding the available information among markets affects the compensation demanded by investors for bearing the market risk.

Thereby, whenever investments are made in markets with low transparency, that is, with small amounts of the company's available information, such as for example, markets in Russia, the ERP needs to be higher to compensate the lack of information accessible to investors, as opposed to markets that contain more information about their companies.

Lastly, in what concerns the markets liquidity, it is notable that the ERP varies depending on the market's liquidity. Thus, markets with lower liquidity, tend to have a higher ERP, since there is a smaller amount of funds flowing in these markets.

In order to estimate the ERP, there are two important approaches identified by Damodaran (2021), apart from the one mentioned above.

The first consists of obtaining the ERP based on a survey made to investors to get a better understanding of what they believe the ERP should be, since it reflects the remuneration required by investors for bearing the risk of investing in risky assets.

Alternatively, the ERP can be obtained by comparing the past returns on equities with the returns of investments on risk-free assets and use this premium as an estimate for the future value of the ERP.

1.2.1.7. Country Risk Premium

The CRP is an important component that needs to be included in the CAPM whenever we are estimating the (r_e), since it incorporates the risk exposure to a certain economy.

According to Damodaran (2019), the risk exposure of a country is different among economies and is affected by several factors.

The first factor mentioned by the author, is the life cycle of an economy, whereas emerging economies that are currently experiencing an early growth, have small markets, and businesses relatively underdeveloped, present a higher risk exposure, in comparison to mature economies, which commonly correspond to developed economies, as observed in previous recessions, such as for example, the 2008 financial crisis, and the financial crisis caused by COVID-19, where emerging economies registered higher economic losses (Raga, 2020).

Another factor that has an impact on the country risk is the political risk, that is, the effects of a political system in a country risk exposure. According to this factor, countries with higher level of corruption, low transparency, and a greater propensity for physical conflicts present a higher risk exposure, due to its negative impacts on the economic growth.

Lastly, the economic structure of a country also presents a strong impact on a country's risk, since economies with a commodity, or a service that represents a high portion of a

country's GDP, are more exposed to risk, due to the fact that a possible decrease in the demand for this service, or a reduction in the value of this commodity, can negatively impact the country's GDP, as opposed to countries with a more diversified economy, that is, economies whose income sources derives from several sectors.

In order to include the CRP in the CAPM, we first need to measure the country risk, and then estimate the CRP, as stated by Damodaran (n.d.). This approach will, ultimately, help us to determine the asset's exposure to the country risk premium, through the CAPM.

Starting with the measurement of the country risk, typically they are measured through the allocation of a rating, to the country's debt made by a rating agency, such as, Moody's, S&P, and others. This allocation allows us to have a better understanding of the default risk of a certain country, and it can be influenced by several factors, such as, the stability on a country's budget, its currency, its trade balances, and other important factors. Additionally, whenever these ratings are assigned, they also incorporate a default spread over the US Treasury bond, which helps us estimate the country risk premium.

Thereby, after the country risk is determined, we are able to compute the country risk premium, which will, posteriorly, be used in the CAPM to estimate the (r_e), using the country default spread, the volatility of the equity market in a country (σ_{Equity}), and the volatility of the country bond ($\sigma_{Country\ Bond}$), as presented below (Damodaran, n.d.).

$$CRP = Country\ default\ spread \times \left(\frac{\sigma_{Equity}}{\sigma_{Country\ Bond}}\right) \quad (9)$$

1.2.1.8. Cost of Debt (r_d)

The Cost of Debt represents the effective rate that a company pays on all its debt, which can arise from loans, bonds, and others. Additionally, the Cost of Debt is used to measure the funding cost a company incurs whenever it plans to raise funds to finance projects, and it is influenced by the riskless rate, also known as the risk-free rate, and the default risk of the company (Damodaran, 2014b).

Thereby, the cost of debt can be obtained through the sum of the risk-free rate and the default spread associated to the default risk of a company, which is adjusted by the tax benefits of using debt (Damodaran, 2014a):

$$After-tax\ cost\ of\ debt = (risk-free\ rate + Default\ spread)(1 - Marginal\ tax\ rate) \quad (10)$$

Regarding the default spread, it can be determined through the recent borrowing history, in which we can obtain the default spreads, previously charged to a company, and use them to compute the cost of debt, or by estimating a synthetic rating, in which a firm is assigned to a rating based in its financial ratios, and the default spread retrieved for that rating.

Lastly, it is also important to highlight that the cost of debt previously mentioned, refers to the after-tax cost of debt, which differs from the pretax cost of debt through the tax advantage that is associated with debt, since interest payments are tax deductible, creating a tax benefit, and making the pretax cost of debt higher than the after-tax cost of debt.

1.2.2. Free Cash Flow to Equity (FCFE) Method

The FCFE consists of the cash flow available to equity holders after the payment of principal payments, interests, and operating expenses, and the execution of all the necessary investments in fixed assets and working capital (Pinto et al., 2007). Thereby, the FCFE can be computed through the equation below (Damodaran, 2014a):

$$FCFE = net\ income - capex + D\&A - changes\ in\ WC + New\ debt\ issued - debt\ repayments \quad (11)$$

However, unlike the FCFF, the cash flows computed through the FCFE method and the TV are not discounted at the WACC, but at the (r_e), because whenever a firm has debt, the cash flows available to shareholders carry a higher risk, since they include the payment of interest to its creditors, and the debt variation, thereby they need to be discounted at the cost of equity (Larabee & Voss, 2012).

Thus, the Equity Value corresponds to the sum of the present value of the perpetual stream of FCFE, and the value of NOA (Pinto et al., 2007):

$$Equity\ Value = \sum_{t=1}^{n} \frac{FCFE_t}{(1+r_e)^t} + \frac{FCFE_{n+1}}{(r_e-g)} \frac{1}{(1+r_e)^n} + NOA \quad (12)$$

1.2.3. Dividend Discount Model

The Dividend Discount Model is an approach that allow us to determine the intrinsic value of a company's shares, by discounting the stream of cash flows that shareholders expect to receive, that is, its dividends, at the (r_e) (Larabee & Voss, 2012).

In order to estimate the value of the future dividends shareholders expect to receive, it is commonly assumed that the future dividends will grow at a constant rate (g), in perpetuity, which needs to be lower than the (r_e), since the price of a share cannot be negative. Additionally, the sum of the expected rate of inflation and the real growth rate of the economy needs to be higher than the growth rate of the dividends, since, in the long run the firm cannot become larger than the economy. Thus, the current price of stock can be obtained through the formula presented next (Larabee & Voss, 2012):

$$P_0 = \frac{Div_0(1+g)}{r_e - g} = \frac{Div_1}{r_e - g} \tag{13}$$

Under this assumption, it is also important to consider that the rate of return of the reinvested earnings is constant, which happens whenever a firm has a constant dividend payout rate, that is, it reinvests its earnings at a constant rate.

Concluding, the dividend discount model can be quite useful due to the simplicity of the model, and the fact that is commonly used in stable companies with a history of consistent dividend payments. However, it presents some limitations such as the fact that it generates inaccurate results whenever we are estimating the intrinsic value of a company whose dividend payments are irregular and hard to predict (Dividend University, n.d).

1.2.4. Adjusted Present Value

According to Berk & DeMarzo (2017), the adjusted Present value (APV) is another valuation method that allow us to estimate the fair value of a company through the sum of its value without leverage, that is, the unlevered value of the company (V_U), with the Present Value of the Interest Tax-Shield (PVITS), that corresponds to the tax benefits associated with the use of debt.

Additionally, it is important to consider the bankruptcy risk since the use of debt increases the risk a company incurs of declaring bankruptcy (Damodaran, 2014a). Thereby, we need to subtract the expected bankruptcy costs, in the sum of the unlevered value of the company with the present value of the interest tax shield, as presented in the formula below.

$$V_L = V_U + PVITS - Expected\ bankruptcy\ costs \quad (14)$$

The value of an unlevered company (V_U) corresponds to the value of a company that has no debt, and it is obtained by discounting all the expected FCF's, the firm will generate in the future at the unlevered cost of capital (r_u), as presented in the formula below (Berk & DeMarzo, 2017).

$$V_U = \sum_{t=1}^{n} \frac{FCF_t}{(1+r_u)} \quad (15)$$

Regarding the (V_U), Larabee & Voss (2012) states that it can also be determined by discounting the FCFF a firm generates, at the unlevered WACC, which corresponds to the (r_e) when a firm conducts its business without debt. Thereby, the unlevered WACC can be calculated through the following formula:

$$Unlevered\ WACC = r_f + \beta_A \times MRP \quad (16)$$

where,

r_f = Risk-free rate

β_A = Asset Beta

MRP = Market risk premium

In what concerns the tax benefits of using debt, which are referred as the interest tax-shields, they depend on the tax rate of a firm, which is assumed to remain unchanged over time. Thus, the interest tax-shields are obtained by multiplying the interest payments on debt in each year, to the tax rate of the firm (Fernandez, 2002).

Finally, in order to obtain the PVITS, they need to be discounted at the cost of debt since it reflects the riskiness of this cash flow, as mentioned by Damodaran (2014a).

$$Tax\ savings = \frac{t_c \times r_d \times D}{r_d} \quad (19)$$

Lastly, we need to determine the bankruptcy costs, which are related to the costs of declaring bankruptcy, whereas they incorporate the direct costs of going bankrupt, such as, the hiring of outside professionals to help with a possible financial restructuring (Berk & DeMarzo, 2017). Moreover, they also include the indirect costs, that are not directly related with the

bankruptcy, such as, the loss of customers, suppliers, and others, since they can arise from the conviction that a company might declare bankruptcy.

Thereby, Damodaran (2014a) states that the bankruptcy costs are calculated through the multiplication of the probability of bankruptcy (π_a), with the present value of the bankruptcy costs.

$$PV\ of\ Expected\ bankruptcy\ Costs = \pi_a \times PV\ of\ bankruptcy\ costs \quad (20)$$

Regarding the probability of bankruptcy, there are two ways to compute it, whereas the first consists of the estimation of a bond rating at every debt level and assign each rating to a probability of default.

Alternatively, the probability of bankruptcy can be estimated through the use of a statistical model, such as for instance the PROBIT model, whereas we would consider the empirical observation at every debt level of several firms. Next, we would need to have information regarding the characteristics of firms that have declared bankruptcy and firms that have not declared it, during a specific time period, and thus we would be able to estimate the likelihood of bankruptcy based on these characteristics, using this model.

Concluding, the use of the APV method has some advantages, such as the fact that, it considers the effects of financing, by discounting the interest tax-shields (Damodaran 2012). Additionally, this method presents a certain amount of flexibility, since it can be used to estimate the fair value of different types of companies, that is, firms with different capital structures, growth rates, and others. Lastly, we can observe that this method is, relatively, easier to use in cases where a firm's capital structure is not constant, since it involves the estimation of future interest payments, instead of determining the debt-to-value ratio, which can be challenging to calculate whenever we need to estimate the value of a firm (Larabee & Voss, 2012).

On the other hand, the APV method presents some limitations, for instance, the fact that it requires a precise information regarding the financing operations of a company, for instance, the terms of its debt, which can be challenging to obtain this information, particularly for private companies.

1.3. Relative Valuation

According to Damodaran (2014a), in Relative Valuation the value of a certain asset is obtained through the market's current price for identical assets. However, before these assets' prices are

compared, we need to consider some existing differences between comparable firms, and they need to be standardized, by using multiples, including those mentioned in annex A.

The first method is the earnings multiples, which tell us that the value of an asset can be standardized regarding the earnings it generates, that is, the value of an asset is perceived as a multiple of its generated earnings. Thereby, the (EV/EBITDA) and the Price-Earnings (P/E) Ratio are the most commonly used, since they allow us to determine the enterprise value and the value of a stock, respectively, and are computed through the ratio of the Enterprise value and the EBITDA, and share price and the Earnings per share, respectively.

Other method used to standardize the value of an asset is the Book Value Multiple, in which, the accounting value of an asset is obtained through accounting rules, and it depends on the purchase price and accounting rectifications, such as, depreciations, which occurred since the acquisition date. Thereby, the Price-to-Book (P/B) ratio is commonly used to value companies, since it uses the market price and the book value of a share, and therefore it allows us to assess whether a company is being undervalued or overvalued.

Lastly, the revenues multiples can also be used to standardize the value of an asset, in which it is used the ratio of the value of an asset to the generated revenues. Thus, the more commonly used ratios for this multiple are the Price to Sales ratio (P/S), and the Value to Sales (V/S). Additionally, it is notable that using revenues multiples has advantages, in relation to the multiples, previously mentioned, such as the fact that it can be easier to compare firms from different industries, and with different accounting rules.

Hence, whenever we are using the multiples approach, the choice of comparable firms is typically the starting point whereby, companies with identical cash flows, risk, and growth potential, to the firm that is being valued, are considered, which are typically companies from the same industry, and after, we choose the multiple that is going to be used to determine the value of a company.

However, the multiples approach can lead to inaccurate results due to some limitations this approach presents. In the first place, this method does not consider the existence of different growth rates, or capital structures, among comparable firms whenever we are using the industry average (Goedhart et al., 2020). Secondly, the influence of the market sentiment on multiples in relative valuation can lead to asset valuations that are either excessively high or unduly low, depending on the overvaluation or undervaluation of comparable firms in the market (Damodaran, n.d).

1.4. Contingent Claim analysis

According to this method, companies have the option to engage in a certain project or an operation, that will affect its value, by investing, a certain amount, in a specific time. Thus, if a company decides to not invest in that moment, it will create the option to invest later, that always has an associated value, regardless of this opportunity being exploited or not, and it will be exercised depending on several factors, such as, markets conditions, the available information, and other factors (Luehrman, 1997). Additionally, we can observe that these options are frequently used by firms that operate in fast-growing markets, firms with innovative technologies, firms that specialize in the development of new ideas and products, and others.

That said, in order to determine the value of these options, the Black-Scholes option pricing model (1972) was developed, whereby, it was assumed that there were no dividends, and it was not possible to exercise these options early, that is, before the expiration date. Afterwards, the Binomial model was also created to value these options through a discrete time variant approach, since the Black-Scholes option pricing model determined the value of these options in a continuous time variant approach (Damodaran, 2012).

2. Company Overview

Samsung electronics, a subsidiary of Samsung Group, was founded in 1969. The company is based in South Korea and has 233 subsidiaries responsible for the production and sale of its wide products range, in which 35 are located in South Korea, and the remaining in several regions, such as the United States, Europe, Middle East, Africa and Asia.

The company is divided into four divisions, namely, the Device eXperience (DX), Device Solutions (DS), the Subsidiaries of Samsung Display (SDC), and the Harman division.

That said, the DX division is responsible for the production and sale of electronic devices destined for final consumers, such as, smartphones, computers, televisions, and others. Regarding the DS division, it is responsible for the manufacturing and sale of semiconductors, including the Dynamic random-access memory (DRAM), the NAND flash, and mobile apps. In what concerns the SDC division, its main responsibilities include the manufacturing and sale of display panels, such as, mobile OLED panels. Finally, the Harman division, it was acquired in 2017, by Samsung Electronics, and it manufactures and sells several products, namely digital cockpits, car audio products, and portable speakers.

Additionally, the company's corporate Headquarters are divided according to the divisions and are located across several regions in South Korea.

Lastly, according to Samsung Electronics' latest annual report, the company reported revenues amounting to 258,935,494 million KRW and an EBITDA of 8,905,097 million KRW. Besides this, the company's market value of equity is 533,244,536 million KRW, in which we can conclude that Samsung Electronics is a large company.

2.1. History

As previously mentioned before, Samsung Electronics was created in 1969. The company's first line of products consisted of black-and-white televisions, that preceded a wide range of products that were first domestically commercialized and later exported abroad.

At the end of the 1970s, and in the early 1980s, Samsung Electronics was able to expand its operations to Germany, Portugal, and the United States of America, and in 1983, it started the production of personal computers, more precisely of the SPC-1000 model, and it developed a 64 kb memory DRAM.

During the 1990s, the company positioned itself as a world leader in the semiconductors industry due to its strength in DRAM technology, and in 1992 it developed its first mobile phone system.

Posteriorly, At the end of the 90s, the South Korean economy was affected by the Asian Financial Crisis, impacting exports and GDP across Asia. Thus, Samsung Electronics overcame this crisis through strong commitment to innovation, strict restructuring, and effective responses to the radical changes of the digital convergence era.

After the 2008 financial crisis, Samsung Electronics made a strong commitment in its culture of creativity, autonomy, and open innovation. Furthermore, during this period the company was involved in several Mergers and Acquisitions transactions, such as, the merger with Samsung LED in 2012.

Lastly, in 2019 the company celebrated its 50th anniversary, and in the meantime, it continues to reaffirm its position as a leader in the system semiconductor industry, memory semiconductors, Televisions, and smartphones, at the same time it makes advances in other fields, such as Artificial Intelligence, and 5G.

2.2. Business Segments

2.2.1. DX Division

The DX Division has the primary purpose of the manufacturing and sale of several electronic devices destined for final users.

The list of electronic devices includes products such as, for example, televisions, refrigerators, computers, smartphones, air conditioners, network systems, monitors, and washing machines, whereas the televisions and the smartphones are the most relevant products, mainly due to the continuous growth in its industries, (Samsung Electronics, 2023).

Finally, we can observe that this division plays an important role in the company since, the 2023 revenues of the DX Division accounted for 66% of the total revenues of the company.

2.2.2. DS Division

The main purpose of the DS Division consists of the production and commercialization of Memory (storage) semiconductors, and System LSI (logical processing) semiconductors, (Samsung Electronics, 2023).

Regarding the memory semiconductor, it is divided into two types, whereas the first type corresponds to the RAM (Random access memory), which is also called volatile memory, since

the data is erased whenever the source of power is turned off, and it is commonly used for temporary loading and storage of application programs. On the other hand, we have the ROM (Read only memory) memory, which is not volatile, since the data is maintained, regardless of the power is switched off, and it is used in Intelligent Cards (IC), input/output system, and others.

In what concerns the System LSI semiconductors, there are several devices that can be used for many occasions, such as, SoCs (System on a chip) that can be used in image sensors, DDIs (Display driver ICs) for OLED, and mobile devices, which in turn incorporate CPUs (Central processing Unit), GPUs (Graphic processing Unit), ISPs (image signal processors) and modems.

Additionally, the company has a Foundry Business that manufactures customized semiconductors for other companies. This business has grown notably due to increased investment costs and the complexity of semiconductor manufacturing.

Lastly, the DS Division has a significant contribution to the company's revenues, since in 2023, this division's revenues accounted for 26% of the company's total revenues.

2.2.3. SDC Division

The SDC division is responsible for the production and sale of screens for electronic devices, whereas it is commonly used active-matrix technology, such as, OLED (Organic light emitting diode), QD-OLED (Quantum dot organic light emitting diode), and TFT-LCD (Thin film transistor liquid crystal display).

Regarding the OLED panels, they are frequently used in smartphones due to the advantages of including organic materials, such as sharp contrast and colour, fast response rates, and high colour gamut. Furthermore, OLED panels address the limitations of LCD panels, and are becoming more widely used in various applications such as foldable devices, rollable displays, automotive displays, and more, which contributes to the growth of this market.

In what concerns the QD-OLED, it represents a refinement in OLED display technology, by employing quantum dots that emit colours upon receiving an electrical signal, instead of depending on a backlight. Furthermore, it is notable that QD-OLED displays are gaining attention with the expectations of dominating the premium TV and monitor markets.

Thus, according to the latest annual business report issued by the company, this division's revenues represent 12% of the company's total revenues.

2.2.4. Harman Division

The Harman Division operates in the lifestyle audio industry, and the automobile sector, which includes key areas, such as, digital cockpits, car audio, and telematics, (Samsung Electronics, 2023).

This company's division aims to manufacture automotive components that have the ability to provide more customized and convenient in-cabin experience. Considering the recent moving trend towards vehicles that are defined and controlled by software, manufacturers are exploring diverse opportunities by embracing centralized architectures and enhancing software functionalities, which will boost fast advances in automobile components, and an increase in the competition among suppliers.

On the other hand, regarding the lifestyle audio sector, it incorporates two main areas including the professional audio solutions area, and the consumer audio that provides audio products, such as, headphones, portable speakers, TWS (True wireless stereo), and whose market is expected to grow significantly, in segments, such as, Wi-fi home speakers, TWS headphones, and gaming speakers professional audio solutions.

Finally, according to the latest annual business report, the Harman division's revenues represent 6%[1] of the company's revenues.

2.3. Financial Analysis

2.3.1. Profitability Ratios

As presented demonstrated in the table 2.1., Samsung Electronics' revenues had a growing tendency in 2021 and 2022, followed by a 14% decline in the subsequent year. This drop resulted from decreased revenues across all business segments except for the Harman division, impacting the company's profitability ratios used to analyse its earnings generation capacity over time.

Starting with the margin ratios, the company registered a decrease in its growth rate of these ratios, over the last few years, reaching a negative growth at the end of the period in analysis, as a result of a lower of efficiency and profitability, and lower values in the Gross profit, EBITDA and Net income values in relation to total revenues.

Regarding the Return ratios, Samsung Electronics consistently maintained a Return on Assets (ROA) above 5% throughout the period under analysis, indicating an effective profit

[1] The total sum of the percentage of the revenues of the business segments exceeds 100%, because it includes internal transactions between divisions, that overlap.

generation using its assets. Similarly, the Return on Equity (ROE) remained at or above 10%, except for the year of 2023, suggesting a less effective use of the shareholder's equity for profit generation in that year. Furthermore, the Return on Invested Capital (ROIC) reached its maximum value in 2022, indicating that Samsung Electronics became less efficient in allocating capital to generate profits after that year.

Table 2.1. Profitability Ratios. *Source: Own calculations based on Samsung Electronics (2023)*

		2020	2021	2022	2023
Total Revenues	**Revenues (M₩)**	236,806,988	279,604,799	302,231,360	258,935,494
	Growth rate	-	18.1%	8.1%	-14.3%
Margin Ratios	**Gross Margin**	39.0%	40.5%	37.1%	30.3%
	Growth rate	-	3.8%	-8.3%	-18.3%
	EBITDA Margin	28.5%	30.8%	27.3%	17.5%
	Growth rate	-	8.1%	-11.4%	-35.9%
	Net profit margin	11.2%	14.3%	18.4%	6.0%
	Growth rate	-	28.0%	29.0%	-67.5%
Return Ratios	**ROA**	7.0%	9.4%	12.4%	3.4%
	Growth rate	-	34.0%	32.7%	-72.6%
	ROE	9.6%	13.9%	17.1%	4.1%
	Growth rate	-	45.2%	23.0%	-76.0%
	ROIC	9.2%	12.8%	16.1%	4.2%
	Growth rate	-	39.1%	25.8%	-73.9%

2.3.2. Liquidity Ratios

In what concerns the liquidity ratios three important financial indicators were used, which allow us to assess the company's capacity to pay its short-term debt obligations.

Starting with the Current ratio, we can observe that the company had the ability to pay its short-term obligations using its current assets, since this ratio has always been above 1, in the last years, as showed in the figure below. Regarding the Quick ratio, Samsung Electronics' Quick ratio slightly fluctuated during the period under analysis, reaching a maximum value of 2.20 in 2020, and a minimum value of 1.91 in 2023, which means that the company reached its maximum capacity to use its current assets to pay its short-term obligations, that is, the company had enough assets that could be easily liquidated to pay its current liabilities, in the year of 2020. Lastly, Samsung Electronics always presented a Cash ratio below 1, during the period under analysis, which tell us that the company had a low ability to pay its currents liabilities using Cash and Cash equivalents.

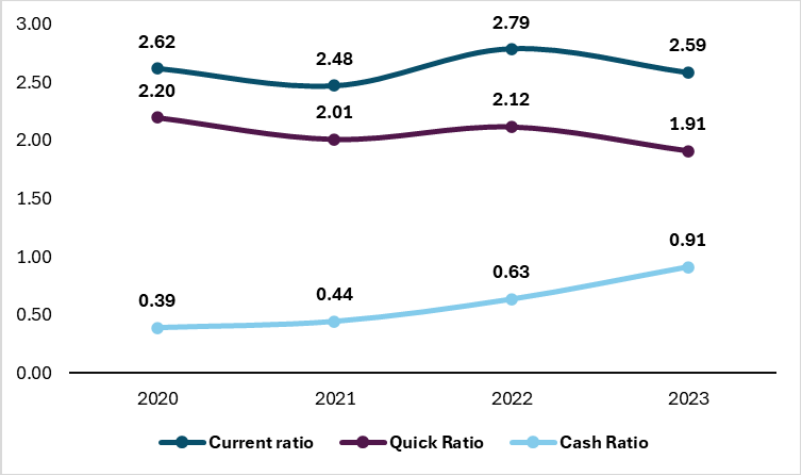

Figure 2.1. Liquidity Ratios. *Samsung Electronics Interim Business Report, end-3thQuarter*

2.3.3. Solvability Ratios

Lastly, in order to assess the company's solvency, that is, the company's capacity to pay its long-term debt obligations, the Interest Coverage Ratio, the Debt to Assets (D/A) Ratio, and the Debt-to-Equity (D/E) Ratio were used.

Starting with Interest Coverage Ratio, in the past four years Samsung Electronics has consistently maintained high Interest Coverage Ratios, indicating a low risk of bankruptcy and its ability to meet interest obligations. Regarding the (D/A) and (D/E) ratios, their decrease during this period, indicates a reduction of the debt levels relative to assets and equity, suggesting minimal financing of assets by debt and low financial leverage.

Table 2.2. Solvability Ratios. *Samsung Electronics Interim Business Report, end-3thQuarter 2023, and Refinitiv Eikon*

Solvency ratios				
	2020	2021	2022	2023
Interest Coverage Ratio	63.90	120.10	56.90	7.20
Debt to Assets Ratio	0.05	0.05	0.02	0.02
Debt to Equity Ratio	0.07	0.06	0.03	0.03

2.3.4. Samsung Electronics' Financial Health

Thus, we can conclude that Samsung Electronics' financial health remains stable despite a 14% revenue decline in 2023, in which the company was able to maintain the ROA and ROE above 5% and 10%, respectively. Regarding the liquidity, it remained robust, with a Current Ratio and a Quick Ratio above 1, while solvency indicators showed reduced debt levels and low financial leverage. That said, these factors suggest that Samsung Electronics presents a solid financial health.

3. Industry Overview

The revenues of Samsung Electronics are derived from the sale of several key products, including the smartphone, televisions, monitors, memory semiconductors, display panels, audio equipment, car audio, and digital cockpit, since they have a significant share in the revenues of the company's divisions. Thereby, the company's revenues strongly depend on the market evolution of these products.

3.1. Smartphone

Regarding the smartphone industry, which is dominated by giants such as, Samsung, Apple, Huawei, and Xiaomi, (Mordor intelligence, 2021), is fiercely competitive and in constant development, and expanding in terms of both diversity of models and industry size, since the number of users is increasing significantly.

Despite the challenges from the COVID-19 pandemic, factors such as, production costs reduction, design advancements, and the adoption of 4G/5G technologies are contributing to its current rapid expansion.

Thus, according to Statista (2023), the Smartphone industry is expected to continue to grow at a CAGR of 3.53% until 2028, whereas this growth will be marked by a rise in new smartphone releases, a market expansion in Asian countries, and the dominant presence of China in this market, since it will remain a leader in the manufacturing of smartphones.

3.2. Televisions

In what concerns the television industry, it has seen a substantial growth, driven by the development of modern televisions, and increasing user numbers. The consumer demand has pushed manufacturers to innovate, resulting in the continuous evolution of smart TVs with larger screens, streaming services, and better resolutions.

However, the industry faces challenges, such as, an intense competition from major players like Samsung Electronics, Sony, LG, and Hisense, all competing for market dominance.

Hence, according to The Business research company (2024), the Televisions industry is expected to grow at a CAGR of 3.3% by 2028, being this growth marked by the Leadership of the United States of America and Canada in this market, and the continuous development of new television models.

3.3. Monitors

The monitor's industry comprises the commercialization of monitors to intermediate and end consumers, and it is characterized by its steady growth, over the last years. This industry is also characterized by the large number of companies that operate in this market besides Samsung Electronics, such as, Apple, Microsoft Corporation, and Siemens AG that contribute to the competitiveness if this market.

Additionally, we can also observe the recent development of modern monitors by these companies, to expand their market reach, such as 4K monitors with In-Plane Switching (IPS) Black technology, that is, an IPS panel that offers an augmented colour and contrast, to deal with the lack of this colour and contrast of traditional IPS panels.

Thus, according to The Business research Company (2024), this industry is projected to grow at a 3.0% CAGR by 2028, whereas factors like the increase of the internet penetration and rising media streaming are driving this growth.

3.4. Memory Semiconductors

After the COVID-19 pandemic, the semiconductor memory industry experienced a rapid growth, fuelled by the increased implementation in various electronic devices such as smartphones, aerospace systems, and monitors. Thus, a rise in the demand for these products has positive effects in the semiconductor memory industry.

The memory semiconductor industry is characterized by its high competitiveness, where large companies, besides Samsung Electronics, such as, Micron Technology, ROHM, SK Hynix, and other companies, conduct their business.

Thereby, Research and Markets (2024) projects a 5.9% CAGR by 2029, with North America leading due to enhanced competitiveness in DRAM and 3D-NAND, while the Asia-Pacific region exhibits the fastest growth.

3.5. Display panels

The display panels industry has registered a steady evolution, with recent developments focused on meeting the consumer expectations, through the development of flexible displays which reduce power consumption and enhance resolution.

Regarding the industry future trends, it is expected for OLED to hold a significant market position, due to the growing demand of these panels, and the strong commitment to innovation by large companies in this industry, such as, Sony Corporation, Panasonic Corporation,

Samsung Electronics, in order to increase their market share, in relation to their competitors. Additionally, the Asia-Pacific market of display panels is expected to grow significantly, more specifically in India, as a result of a higher consumer income which increases the demand of these panels, and the rising manufacturing of display panels in India.

Thus, according to Mordor Intelligence (n.d), the industry is projected to grow at a CAGR of 3.68% between 2024 and 2029.

3.6. Audio Equipment

The Audio equipment industry refers to the commercialization of electronic devices with the capacity to play, record, or modify sound, which includes devices for home entertainment to amplifiers for musical instruments, audio systems integrated into vehicles, and others. This industry is also characterized by its high competitiveness, since it is dominated by key players, including, Yamaha Corporation, Harman International, Kenwood Corporation, and others.

That said, this industry experienced significant advancements through the development of virtual and augmented reality headsets, along with TWS technology featuring advanced functionalities like active noise cancellation and spatial audio playback, which are raising consumer expectations regarding audio quality and microphone performance.

Thereby, the Audio equipment industry is expected to grow at a CAGR of 4.7% by 2028, according to the Business Research (2024), being this growth marked by a growing trend in the demand and the rise of this market in the Asia-Pacific region.

3.7. Digital Cockpit

Regarding the digital cockpit industry, it encompasses the production and sale of electronic systems within vehicle interiors, offering features like navigation, connectivity, and infotainment to enhance user experience, safety, and convenience.

A notable trend in this sector is the increasing demand for personalization and customization, allowing users to tailor settings such as screen layouts, seating adjustments, and driving modes to their preferences, thereby improving satisfaction and engagement.

In the digital cockpit industry, the competition is intense, since it is led by established companies specialized in this field, with a significant presence across multiple industries and global regions, and that are constantly innovating, in order to develop new technologies that satisfy the costumers needs, and to outperform the competition. Thus, important players in this

sector, include Huawei Technologies Co., Ltd., Harman International, Continental AG, Visteon Corporation, Denso Corporation, and others.

Hence, according to Mordor Intelligence (n.d.), this industry is estimated to grow at a CAGR of 10.56% until 2029, whereas the Asia-Pacific is also expected to be the largest market during this period.

4. Macroeconomic Outlook

This chapter presents a comprehensive analysis of the macroeconomic outlook in which Samsung Electronics operates, whereas important economic indicators, such as, the real GDP growth rate and the inflation rate were analysed, which will be useful for our valuation.

4.1. Real GDP Growth Rate

In the recent years, the real GDP Growth rate was strongly affected by the COVID-19 pandemic in 2020, and more recently, the war in Ukraine, in 2022.

In 2020, the pandemic caused a global GDP decline of approximately 3%, with different impacts across economies, as presented in Figure 4.1., due to their structural characteristics. Besides this, we can observe that the South Korean economy was the least affected by this crisis, compared with the European and the American economies, since it only registered a decreased in the real GDP of 1%, approximately. The subsequent year registered a real GDP recovery, particularly in the American region with an approximately 8% GDP growth, due to several factors, including the gradual removal of restrictions, previously imposed by governments, and a significant rise in the private consumption.

However, the Ukraine conflict in 2022 disrupted this progress, mainly due to contractionary monetary policies from Central Banks, in response to heightened inflation rates, resulting in a global GDP growth setback of approximately 3%, with the European economy most affected.

Lastly, according to the projections made by the IMF (2023), the real GDP growth rate is expected to stabilize after 2023, in South Korea, Europe and America, since their real GDP Growth rate will remain around 2%, 2%, and 3%, respectively.

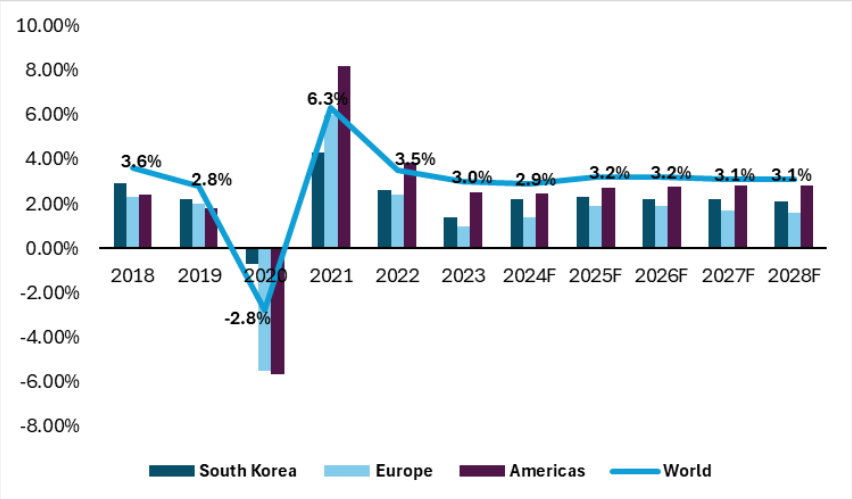

Figure 4.1. Real GDP Growth. *IMF World Economic Outlook, October 2023*

4.2. Inflation Rate

Recently, South Korea and the economies where Samsung Electronics operates suffered significant changes in the inflation rates changes due to the COVID-19 pandemic and later, the beginning of the Russia-Ukraine conflict.

The COVID-19 pandemic forced governments worldwide to implement expansionary fiscal policies, alongside central banks implementing measures like interest rate cuts to stimulate economic growth. In 2021, global inflation soared to approximately 6.3%, with South Korea registering rates of approximately 3.7%, driven by factors such as, food and energy price shocks, increased private consumption, supply chain disruptions, and labour market dynamics.

In the following year, the conflict between Russia and Ukraine exacerbated these inflationary pressures, particularly affecting energy, and food markets, leading to a decreased supply and a significant surge in inflation rates. Europe experienced the most significant impact, with inflation rates nearly reaching 11%, while South Korea, less exposed to the conflict, registered rates around 5%.

Lastly, the inflation rate slowed down in 2023, as illustrated in the Figure 4.2., being this a result of the contractionary monetary policies adopted by Central Banks, and according to the forecasts made by the IMF (2023), the inflation rate is expected to have a downward trend, and to stabilize after the year of 2025.

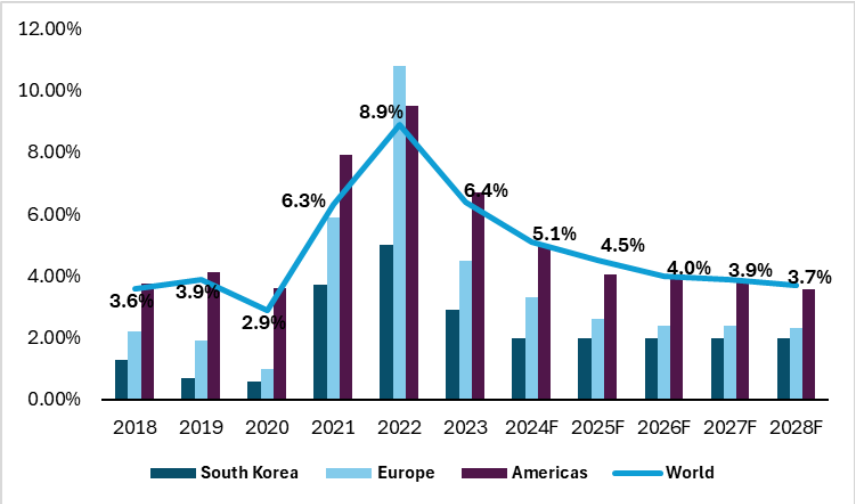

Figure 4.2. Inflation Rate. *IMF World Economic Outlook, October 2023*

5. Valuation

In order to estimate the fair value of Samsung Electronics, and its shares, two important methodologies were used, namely the DCF Method, more precisely, the FCFF approach, and the Relative Valuation, specifically, the Multiples Approach.

Starting with the FCFF approach, this method was used since it allows us to have a better understanding of the company's ability to generate value for all stakeholders. Additionally, it allows us to make a scenario analysis by considering several scenarios to assess the impact of changes on key valuation inputs, on the company's valuation.

Regarding the Multiples approach, it was used because it is a practical method, and the multiples that are used in our valuation are made using market data, from publicly traded companies. Additionally, this approach provides a relative valuation framework, which allows us to compare the target company's valuation with its industry peers.

5.1. Valuation Assumptions

In order to estimate the intrinsic value of Samsung Electronics we need to first define important assumptions regarding relevant aspects of our valuation, for the explicit forecast period, which in this case corresponds to the period between 2024 and the end of 2028, included, and the years after that period. That said, the following section covers key assumptions that will support our valuation.

5.1.1. Revenues

In what concerns the company’s revenues, we can observe that they depend on the evolution of the revenues of the company’s four main divisions, previously mentioned before, and a segment which is referred to as “others”, that includes internal transactions between divisions, that overlap.

That said, for the explicit forecast period it was assumed that the growth rate of the revenues of each division, would be calculated through the Equation (21), which incorporates the average historical growth rate from 2020 to 2023 of each division, and the cumulative World inflation index, given in annex D, since it takes into consideration the accumulated inflation over time, which in turn reflects the impact of inflation on the company’s revenues since the base year, which in this case is 2023.

Besides this, this growth rate also includes the CAGR of the industry of the major products of each division, previously mentioned. Therefore, in the case of the DX Division it was

included the average CAGR of the Smartphone, Televisions and monitors, the DS Division the CAGR of memory Semiconductors, the SDC Division the CAGR of Display panels, and the Harman Division the average CAGR of audio equipment and digital cockpit.

$$Revenues\ growth\ rate_n = \big((1 + AHGR) * (1 + CAGRIMP) - 1\big) * CII_n \quad (21)$$

where,

AHGR=Average Historical growth rate from 2020 to 2023

CAGRIMP= CAGR of industry of major products

CII_n= Cumulative inflation index of year n

In what concerns the "others" segment's growth rate, it was computed through the multiplication of the average historical growth rate between 2020 and 2023, with the cumulative inflation index of each year.

Thus, Table 5.1 illustrates the revenues forecast of each division and the "others" segment, for the explicit forecast period.

Table 5.1. Revenues Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

Revenues	Forecasts				
	2024F	2025F	2026F	2027F	2028F
DX Division	184,799,628.33	201,623,973.47	220,714,266.05	242,427,092.83	267,158,331.72
Growth Rate (%)	8.7%	9.1%	9.5%	9.8%	10.2%
DS Division	70,634,897.95	75,118,573.37	80,077,589.44	85,570,148.33	91,656,608.34
Growth Rate (%)	6.1%	6.3%	6.6%	6.9%	7.1%
SDC Division	32,426,611.05	34,008,908.83	35,734,797.16	37,618,996.57	39,675,936.01
Growth Rate (%)	4.7%	4.9%	5.1%	5.3%	5.5%
Harman Division	18,060,869.73	22,903,145.90	29,320,002.37	37,863,280.12	49,326,174.92
Growth Rate (%)	25.5%	26.8%	28.0%	29.1%	30.3%
Others	(23,836,018.91)	(24,725,143.75)	(25,684,326.13)	(26,719,578.15)	(27,836,406.08)
Growth Rate (%)	3.6%	3.7%	3.9%	4.0%	4.2%
Total Revenues	282,085,988.15	308,929,457.82	340,162,328.89	376,759,939.70	419,980,644.91

5.1.2. Cost of Sales

Regarding the cost of sales, it was assumed that its amount for the explicit forecast period would be derived from a fixed percentage of revenues, which is, approximately, 63.3%, as presented in annex E, that consists of the average of the historical ratio of the Cost of Sales/Revenues between the years of 2020 and 2023.

Table 5.2. Cost of sales Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Cost of Sales	178,473,590.39	195,457,242.94	215,218,035.30	238,373,056.37	265,718,457.29

5.1.3. Wages and Salaries, and Post-employment benefits

In what concerns the wages and salaries, and the Post-employment benefits which, it was considered that its amount would also be, a fixed percentage of the revenues, that would correspond to the average of the historical ratio between these costs and the revenues deflated, and adjusted by the cumulative world inflation index of the previous year, since the amount of wages and salaries, and post-employment benefits are negotiated between workers and employers, considering the inflation rate of the previous year.

Table 5.3. Wages and salaries, and post-employment benefits Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Wages and salaries	7,536,040.39	8,300,561.10	9,183,691.70	10,181,542.77	11,371,426.24
Wages and salaries/Revenues	2.8%	2.8%	2.8%	2.8%	2.8%
Post-Employment Benefit	304,714.62	335,627.49	371,336.27	411,683.70	459,795.82
Post-Employment Benefit/Revenues	0.1%	0.1%	0.1%	0.1%	0.1%

5.1.4. Operational Expenses

Considering the operational expenses (OPEX) of the company, which include commissions, advertising, sales promotion, transportation, service, Research and development, and others, it was assumed that they would depend on the revenue's growth, since they are costs related with company's main operations. Thereby, the amount of these costs, showed below, will be a fixed percentage of the revenues, which is, 23.3%, approximately, that corresponds to the average of the historical ratio of these costs and the revenues, as showed in annex H.

Table 5.4. OPEX Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
OPEX	65,657,255.21	71,905,238.49	79,174,882.05	87,693,201.90	97,753,087.87

5.1.5. Depreciation and Amortization

In what the Depreciation and Amortization (D&A) are concerned, it was considered that, as with the OPEX amount, it would consist of a fixed percentage of the revenues, which is 0.8%, approximately, as illustrated in annex I, since it corresponds to the average of the historical ratio of the D&A/Revenues between 2020 and 2023.

Table 5.5. Depreciation and amortization Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
D&A	2,303,234.93	2,522,412.13	2,777,428.83	3,076,248.69	3,429,146.19

5.1.6. Other non-operating income

Regarding the other non-operating income item, it includes the income derived from Dividends, Rent, Gains on disposal of property, plant and equipment (PPE), and others.

Starting with the Dividend income, which in turn, results from investments in financial assets at the fair value, it was assumed that it would amount for a fixed percentage of the financial assets at the fair value, as demonstrated in annex J, which will consist of the average of the Dividend income/Financial assets at fair value historical ratio, which is approximately, 2%.

However, since the value of the financial assets at fair value for the explicit forecast period is unknown, an assumption was created, which in turn consists of the fact that the financial assets at fair value will grow at the average growth rate during the years of 2020 and 2023, which is, approximately, -12%, as referred in annex K.

Table 5.6. Financial assets at fair value, and dividend income Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Financial assets at fair value	7,863,763.79	6,938,283.95	6,121,723.06	5,401,262.55	4,765,592.44
Dividend income	138,875.36	122,531.24	108,110.64	95,387.19	84,161.15

Regarding the Rental income, which refers to the revenue generated by leasing or renting property, it was assumed that its amount would be a fixed percentage of PPE, which will correspond to the average of Rental income/PPE, between 2020 and 2023, since this source of income comes from PPE.

Considering that the value of PPE for the explicit forecast period is unknown, it was assumed that the growth rate for these asset class during the explicit forecast period, would be the average growth rate between 2020 and 2023, which is approximately, 12%.

Table 5.7. PPE, and Rental income Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
PFE	209,445,662.39	234,264,451.44	262,024,205.13	293,073,420.46	327,801,890.42
Rental income	192,037.08	214,793.00	240,245.43	268,713.92	300,555.85
Rental income/ PPE	0.1%	0.1%	0.1%	0.1%	0.1%

Similarly, the assumption that supports the amount of the Gains on disposals of PPE, consists of the fact that it amounts for a fixed percentage of the PPE, which is 0.12%, approximately, that consists of the average ratio of Gains on disposals of PPE/ PPE, as referred in annex N.

Table 5.8. PPE, and Rental income Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
PFE	209,445,662.39	234,264,451.44	262,024,205.13	293,073,420.46	327,801,890.42
Gain on disposal of PPE	260,362.67	291,214.99	325,723.25	364,320.64	407,491.73

Lastly, besides these non-operating sources of incomes, the company presents other sources of income, also not related with the company's mains operations, which are assumed to grow at the average growth rate between 2020 and 2023.

Table 5.9. Other income Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Other income	788,692.16	817,060.24	846,448.69	876,894.20	908,434.78
Average Growth rate	4%	4%	4%	4%	4%

Thus, after computing each one of these components, we are able to determine the total amount of the non-operating income.

Table 5.10. Total Other non-operating income Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Other non-operating income	1,379,967.27	1,445,599.48	1,520,528.01	1,605,315.94	1,700,643.50

5.1.7. Other non-operating expense

On the other hand, the company also presents other non-operating expenses, which include Losses on disposal of PPE, donations, and others.

Regarding the Losses on disposal of PPE, it was considered that, as with the gains on disposal of PPE, it would amount for a fixed percentage of the PPE amount, which corresponds to 0.05%, approximately, as demonstrated in annex P, being this the average ratio of Losses on disposal of PPE/ PPE.

Table 5.11. PPE, and Gain on Disposal of PPE Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
PFE	209,445,662.39	234,264,451.44	262,024,205.13	293,073,420.46	327,801,890.42
Losses on disposal of PPE	105,075.83	117,527.06	131,453.72	147,030.66	164,453.43

In terms of donations, and others, it was assumed that these expenses would grow, during the explicit forecast period, at the average growth rate during the years of 2020 and 2023, which are, approximately. -6.8%, and -27.3%, respectively.

Table 5.12. Donations, and other expenses Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Donations	226,722.80	211,208.24	196,755.33	183,291.43	170,748.86
Other expenses	548,115.28	398,368.97	289,533.68	210,432.44	152,941.83

Thereby, we are now able to determine the total amount of the non-operating expenses, which consists of the sum of these components.

Table 5.13. Total other non-operating expenses Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Other non-operating expenses	879,913.91	727,104.26	617,742.73	540,754.53	488,144.12

5.1.8. Share of net profit of associates and joint ventures

In what concerns the share of net profit of associates and joint ventures, which refers to the portion of the profits generated by entities over which Samsung Electronics has a significant impact but not a full control, it was considered that, it would depend on the evolution of the investments in associates and joint ventures, that is, investments executed by Samsung Electronics in these entities, which include companies such as, Samsung Electro-Mechanics Co., Ltd., Samsung Biologics Co., Ltd., Samsung Corning Advanced Glass LLC, and others.

Considering the fact that the amount of these investments is unknown for the years after 2023, we assumed that they would grow at the average growth rate during the years of 2020 and 2023, which is, approximately, 14%.

Thereby, the share of net profit of associates and joint ventures will amount for 8% of the investments in associates and joint ventures, being this the average of the ratio of investments in associates and joint ventures/ share of net profit of associates and joint ventures, during the years of 2020 and 2023, as showed in annex R.

Table 5.14. Investments in associates and joint ventures and share of net profit of associates and joint ventures Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Investments in associates and joint ventures	13,358,864.43	15,165,507.38	17,216,479.38	19,544,823.33	22,188,050.79
Share of net profit of associates and joint ventures	1,068,498.62	1,213,001.59	1,377,047.02	1,563,277.85	1,774,694.39

5.1.9. Working capital changes

In order to determine the working capital changes for each year of the explicit forecast period, we first started to estimate the amount of inventories, trade receivables, cash and cash equivalents, trade payables, and the credit from State (VAT).

5.1.9.1. Inventories

Starting with the inventories, we first started by estimating the months of inventories for the years after 2023, which will correspond to average of the months of inventories between 2020 and 2023, mentioned in annex T. Hence, the months of inventories for the years between 2020 and 2023, were computed through the following formula.

$$Months\ of\ inventory = \frac{Inventory}{Cost\ of\ sales} * 12 \quad (22)$$

That said, by adjusting this formula, we are able to estimate the amount of inventories for the explicit forecast period which is computed by dividing the months of inventory by 12 and multiplying it by the amount of the cost of sales.

Finally, the amount of inventory for these years is listed below.

Table 5.15. Inventory Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Inventory	46,013,276.85	50,391,927.52	55,486,568.18	61,456,293.97	68,506,365.07

5.1.9.2. Trade receivables

Regarding the trade receivables, also known as, accounts receivables, it was also computed first the months of credit to clients, for the explicit forecast period, which in turn corresponds to the average of the months of credit to clients during the years if 2020 and 2023. Thereby, the months of credit between 2020 and 2023 were estimated through the following formula:

$$Months\ of\ credit\ to\ clients = \frac{Trade\ receivables}{Revenues*(1+VAT)} * 12 \quad (23)$$

Next, we computed the amount of trade receivables for the explicit forecast period by isolating the trade receivables variable, and we obtained the following values demonstrated in Table 5.16.

In what concerns the VAT rate, according to the OECD (2022), the VAT rate in South Korea has been 10% since its first appearance in this country, in 1977. Hence, it was assumed that it would remain constant for the following years.

Table 5.16. Trade receivables Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Trade receivables	37,806,226.69	41,403,889.61	45,589,836.64	50,494,786.29	56,287,388.01

5.1.9.3. Cash and Cash Equivalents

In order to estimate the amount of Cash and Cash Equivalents (CCE) for the period in consideration, it was considered to be more reasonable, that it would grow at a constant growth rate, which corresponds to an assumed value for the deposit rates offered by commercial banks, since according to the annual reports issued by the company, a large portion of CCE corresponds to bank deposits.

Thus, considering that the current base interest rate of South Korea is 3.5%, and it is expected to be lower, in the following years, since it is also expected for the inflation rate to decrease after 2023, reaching its 2% target value, it was assumed that the deposit rate offered by commercial banks would be 3%, for the years after 2023, and that the amount of CCE would grow at this rate.

Besides this, another reason that supports the use of this value, consists of the fact that commercial banks set deposit rates below the base interest rate, in order to make profits from the interest rate spread.

Table 5.17. Cash and Cash Equivalents Forecast, in millions of KRW. Samsung Electronics, co., LTD., Author Estimates

	2024F	2025F	2026F	2027F	2028F
CCE	71,153,319.79	73,287,919.38	75,486,556.97	77,751,153.67	80,083,688.28

5.1.9.4. Trade payables

In what concerns the trade payables, also known as, accounts payables, it was first estimated the months of credit from suppliers, which were also assumed to be the average of the months of credit from suppliers between 2020 and 2023. Regarding the months of credit from suppliers between 2020 and 2023, they were computed through the following formula:

$$Months\ of\ credit\ from\ suppliers = \frac{Trade\ payables}{purchases*(1+VAT)} * 12 \quad (24)$$

Thereby, the amount of trade payables was estimated by isolating the trade payables variable, whereas the amount of trade payables for each year of the explicit forecast period is listed in the Table 5.18..

Regarding the purchases amount, referred in annex U, it was computed through the sum of the Cost of sales with the variation of the inventories in each year, as illustrated in the formula below.

$$Purchases = Cost\ of\ sales + variation\ of\ inventories \quad (25)$$

Table 5.18. Trade payables Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Trade payables	11,129,012.59	12,865,691.29	14,184,012.81	15,731,101.89	17,561,187.91

5.1.9.5. Credit from State (VAT)

Lastly, in order to estimate the amount of credit from State (VAT), it was used the number of days a company has for the VAT payments in South Korea, stipulated in the Value added tax Act (2024), which is 25 days. Hence, the amount of credit from State, was estimated through the formula below demonstrated.

$$Credit\ from\ state\ (VAT) = (Sales - Purchases) \times VAT \times \frac{Credit\ VAT\ (Days)}{365} \quad (26)$$

Thus, the amount of the credit from State (VAT) is presented below in the Table below.

Next, the amount of income tax liabilities was computed by isolating the income tax liabilities variable, whereas its amounts are presented in the Table 5.19..

Table 5.19. Credit from State (VAT) Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Credit from State (VAT)	748,116.40	747,216.19	820,888.03	906,966.83	1,008,302.17

5.1.9.6. Working Capital computation

Thereby, after estimating all of the working capital components, we are now able to calculate the working capital for each year of the period under consideration, through the formula illustrated below, and consequently, the working capital variation, whereas the amounts are showed in table 5.20.

$$WC = Inventories + Trade\ receivables + CCE - Trade\ payables - Credit\ State\ (VAT) \quad (27)$$

Table 5.20. Working Capital and Working Capital variation Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
WC	143,095,694.34	151,470,829.03	161,558,060.93	173,064,165.21	186,307,951.28
WC Variation	420,073.34	8,375,134.69	10,087,231.90	11,506,104.28	13,243,786.07

5.1.10. CAPEX

Regarding the CAPEX of the company, it was assumed that it would constitute all the company's capital expenditures in fixed assets, which include, PPE, and Intangible assets, which include patents, goodwill, and others.

Thereby, in order to determine the CAPEX amount of the company, we started by estimating the total amount of the PPE and intangible assets, for the period under consideration, since the CAPEX amount will correspond to the sum of the PPE and the Intangible assets.

In what the PPE amount is concerned, it was previously estimated, and in the case of the intangible assets amount, they were estimated in a similar way, that is, through the average of the growth rate of between 2020 and 2023, which was 3%, approximately, as showed in annex V.

Table 5.21. Fixed assets Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
Fixed assets	232,822,569.04	258,294,135.74	286,724,895.28	318,463,853.64	353,901,327.06

Finally, the company's CAPEX for each year of the explicit forecast period, except for the last year, was determined through the sum of the depreciation amount of each year, with the fixed assets variation, as illustrated in the formula below.

$$CAPEX = D\&A + Fixed\ assets_n - Fixed\ assets_{n-1} \quad (28)$$

In what concerns the CAPEX for the last year of the explicit forecast period, it was assumed that it would be obtained through the formula illustrated below.

$$CAPEX = D\&A * (1 + g) \quad (29)$$

This assumption was used in our valuation because the CAPEX needs to be equal or slightly above the depreciation and amortization amount, in order for the company to maintain its asset base, ensuring this way, that the company has the ability to replace valueless assets and to continue its operation efficiently. Thus, by incorporating the perpetual growth rate in this formula, we are assuming that the company's investments in new assets are aligned with its projected growth trajectory.

That said, the CAPEX amount is illustrated in the table below.

Table 5.22. CAPEX Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F
CAPEX	25,127,679.97	27,993,978.83	31,208,188.37	34,815,207.06	3,501,158.26

5.1.11. Corporate tax rate

Regarding the corporate tax rate, according to Damodaran (2024), South Korea registered a corporate tax rate of 24%, in 2023. Thereby, it was assumed in our valuation that the corporate tax rate that Samsung Electronics pays on its income, remains constant for the following years.

5.1.12. Perpetual Growth rate

In what concerns the perpetual growth rate of the FCFF, that was used to compute the Terminal value, it corresponds, in this case, to the forecasted South Korean real GDP Growth rate for the year of 2028, for several reasons, including the fact that the country has demonstrated relative stability in its economic growth in the last years, excluding the years strongly affected by the

COVID-19 pandemic, and the company presents a strong dependence on the economic performance of the country.

Besides this, although Samsung Electronics conducts its business in international markets, the company is based in South Korea, and its substantial operations also remain in this country.

Thereby, it was used a 2.1% value for the perpetual growth rate of the FCFF, after the explicit forecast period.

5.2. Discount rate

Regarding the discount rate used to discount the FCFF that the company will generate during the period under consideration, and the following years, it will be used the WACC, since it reflects the risk associated with these cash flows and it corresponds to the required rate demanded by equity and debt holders.

Thus, in order to compute it, we need to use the cost of equity, the cost of debt, the company's capital structure, in which will be used the market values of Debt and Equity, and lastly, the corporate tax rate.

5.2.1. Cost of Equity

Starting with the cost of equity, it was estimated using the CAPM model, that incorporates the risk-free rate, the Market risk premium, which consists of the difference between the Equity risk premium and the risk-free rate, the beta parameter, and the country risk premium.

Regarding the risk-free rate, it was considered the 10-Year Government bond yield of South Korea, due to the low risk it carries. Thus, the risk-free rate used to estimate the cost of equity was 3.18%, approximately.

In what concerns, the Market risk premium, it was computed through the difference of the South Korean Equity risk premium, which was 5.32%, and the risk-free rate, previously mentioned. Hence, we obtained a 2.15% value for the Market risk premium.

As far as the beta parameter is concerned, it was retrieved from the Damodaran's Website (2024), that lists betas from different types of economies and sectors. Thereby, according to Damodaran, the beta parameter used to estimate the cost of equity presents a value of 1.4, approximately, since South Korea is an emerging economy, and the company operates in the Electronics sector.

Lastly, the country risk premium, which in this case corresponds to the South Korea risk premium, was also retrieved from Damodaran's Website (2024), whereas it presented a value of 0.72%.

Thus, after considering all of these components, it was obtained a value of 6.89% for the cost of equity, as illustrated in the table below.

Table 5.24. Cost of Equity Estimate. *Samsung Electronics, co., LTD., Author Estimates*

Cost of Equity	2023
Risk free Rate	3.18%
Levered/Equity Beta	1.40
South Korean equity risk premium	5.32%
Market Risk premium	2.15%
South Korean Risk premium	0.72%
Cost of Equity	**6.89%**

5.2.2. Cost of Debt

In what concerns the cost of debt, it was considered the risk-free rate, previously mentioned in the estimation of the cost of equity, a default spread, which reflects the default risk of Samsung Electronics, and the corporate tax rate, also previously mentioned.

Regarding the default spread, it was extracted from Damodaran's website (2024), which reports a company's default spread, based on its size and its interest coverage ratio. Thus, considering that Samsung Electronics is large company, and that it presents an interest coverage ratio of 7.2, the company's default spread is 0.70%.

Hence, considering a risk-free rate of 3.18%, a corporate tax rate of 24%, and a default spread of 0.7%, the company's cost of debt is 2.95%, approximately.

Table 5.25. Cost of Debt Estimate. *Samsung Electronics, co., LTD., Author Estimates*

Cost of Debt	2023
Risk-Free rate	3.18%
Default Spread	0.70%
Corporate Tax rate	24.00%
Cost of Debt	**2.95%**

5.2.3. Company's capital structure

In order to determine the company's capital structure that will, posteriorly, be used in the WACC calculation, we need to first determine the market value of Equity and Debt.

Regarding the market value of Equity, it was determined through the multiplication of the company's share price at the date of December 31st of 2023, which was 78,500 KRW, with the number of shares outstanding at the end of the year, which amounted to a total of 6,792.67 million shares, according to the latest annual report issued by the company. Thus, the market value of Equity accounts for 533,244,536 million KRW.

In what concerns the market value of Debt, considering the lack of disclosed information regarding the market value of all the debt securities issued by the company, it was assumed that the market value of debt would be the same as the book value of debt. Thus, in order to determine the book value of debt it was considered the short-term borrowings, the long-term borrowings, and debentures, which were extracted from the balance sheet, illustrated in annex B, and they account for a total of 11,377,069 million KRW.

Hence, after computing the market values of Debt and Equity we were able to determine the company's capital structure, in which we can observe that the Market value of Equity accounts for 98% of the total amount of market value of Debt and Equity, and the Market value of Debt only accounts for 2%.

5.2.4. WACC

Therefore, after determining all the components that are used in the WACC calculation, and considering a corporate tax rate of 24%, the company's presents a WACC of 6.80%, approximately.

Table 5.26. WACC Estimate. *Samsung Electronics, co., LTD., Author Estimates*

WACC	2023
Cost of Equity	6.89%
After-tax Cost of Debt	2.95%
Market Value of Equity	533,224,536
Market Value of Debt	11,377,069
E/(E+D)	97.91%
D/(E+D)	2.09%
WACC	**6.81%**

5.3. FCFF

That said, after considering all of these important assumptions, we are able to compute the FCFF for each one of years of the period under analysis, and the terminal value, as listed in the table below.

Table 5.23. FCFF Forecast, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

	2024F	2025F	2026F	2027F	2028F	Terminal value
EBIT	37,620,338.11	41,364,689.55	45,654,016.13	50,658,407.82	56,504,902.56	-
Income Tax Expense	9,028,881.15	9,927,525.49	10,956,963.87	12,158,017.88	13,561,176.61	-
NOPLAT	28,591,456.96	31,437,164.06	34,697,052.26	38,500,389.94	42,943,725.94	-
D&A	2,303,234.93	2,522,412.13	2,777,428.83	3,076,248.69	3,429,146.19	-
Operational Cash Flow	30,894,691.89	33,959,576.18	37,474,481.09	41,576,638.64	46,372,872.13	-
WC Variation	420,073.34	8,375,134.69	10,087,231.90	11,506,104.28	13,243,786.07	-
CAPEX	25,127,679.97	27,993,978.83	31,208,188.37	34,815,207.06	3,501,158.26	-
Free Cash Flow to Firm	5,346,938.59	(2,409,537.34)	(3,820,939.18)	(4,744,672.70)	29,627,927.80	642,035,990.12

5.4. Enterprise value, Equity value and Share value

In what concerns the EV, it was computed by discounting all the estimated FCFF the company will generate in the explicit forecast period, and the terminal value, at the WACC. Thus, the EV of the company amounts to 479,238,772.14 million KRW.

Regarding the EQV of the company it was determined through the sum of the EV with the NOA of the company, minus the company's book value of debt.

As far as the company's NOA is concerned, it was considered all the company's financial assets, financial instruments, and investments in associates and joint ventures, since these classes of assets are not essential to the company's main's operations in spite of generating income. Thus, the company's NOA amounts to 44,006,452 million KRW.

Consequently, the company's EQV is 511,868,105.14 million KRW.

Lastly, the intrinsic value of Samsung Electronics' shares is obtained through the ratio of the EQV and the number of shares outstanding, whereas we obtained a value of 75,355.96 KRW, as illustrated in the table below.

Table 5.27. Enterprise value, Equity value, and share value. *Samsung Electronics, co., LTD., Author Estimates*

Valuation results	
EV	479,238,722.14
NOA	44,006,452.00
Debt	11,377,069.00
EQV	511,868,105.14
Shares outstanding	6,792.67
Share value	75,355.96

5.5. Sensitivity analysis

Posteriorly, a sensitivity analysis was made, in order to analyse how our valuation's results change, whenever changes in important valuation inputs occur. Thereby, in our sensitivity analysis we analysed how the Samsung Electronics' shares change whenever changes in the WACC and the perpetual growth rate occur.

As presented in the Table 5.28., in this analysis it was considered a variation in the WACC and perpetual growth rate of 0.1%, from the original values used in our valuation, in each scenario, whereas the lowest value of the WACC was 6.61% and the highest value 7.01%, and in the case of the perpetual growth rate the lowest value was 1.90% and the highest value 2.3%.

Thereby, we can observe from this table that an increase in the WACC, results in lower share values, keeping everything else constant, and an increase in the perpetual growth rate causes an increase in the share value, keeping everything else constant. That said, the company's share value registers the greatest decrease in comparison with the original share value, when the WACC is 7.01% and the perpetual growth rate is 1.90%, since it decreases 8.0%, approximately, and the largest increase, in comparison with the original share value when the WACC is 6.61%, and the perpetual growth rate 2.30%, increasing 9.5%, approximately.

Table 5.28. Sensitivity analysis, in millions of KRW. *Samsung Electronics, co., LTD., Author Estimates*

		Perpetual Growth rate				
		1.90%	2.00%	2.10%	2.20%	2.30%
WACC	6.61%	75,884.75	77,438.65	79,061.44	80,757.80	82,532.85
	6.71%	74,135.99	75,619.73	77,167.82	78,784.54	80,474.55
	6.81%	72,459.77	73,877.77	**75,355.96**	76,898.26	78,508.93
	6.91%	70,851.72	72,208.05	73,620.75	75,093.42	76,629.95
	7.01%	69,307.85	70,606.24	71,957.50	73,364.93	74,832.10

5.6. Relative valuation

Regarding the relative valuation method, which was used to estimate the fair value of Samsung Electronics and its shares, we first started by selecting the group of comparable companies that were going to be used in this valuation.

That said, the first criterion to select the group of comparable companies consisted of the use of Samsung Electronics main competitors, since these companies are similar to Samsung Electronics in terms of business segments and commercialised products. Besides this, these companies present similar growth prospects to Samsung Electronics, and they are exposed to the same risks, since they all operate in the same sectors.

After considering this first criterion to determine the group of comparable companies, a second criterion was adopted which in turn consisted of the use of Samsung Electronics main competitors whose dimensions were not significantly different, since the inclusion of companies that differ significantly from each other, in terms of dimension, could lead to inaccurate results in our valuation. Thereby, Apple and Microsoft were not included in the list

of comparable companies, due to their significantly large dimensions, in comparison with the other companies of this group.

Afterwards, the multiples that were used in our valuation were selected, whereas we used the EV/Revenues, EV/EBITDA, and the Price-to-Book value.

That said, we computed the multiples for each one the companies from the group of comparable companies, whereas we identified outliers for the value of these multiples by defining an interval in which the value of these ratios should be within with.

In order to determine this interval, first we computed the average and the standard deviation for each one of these ratios. Next, we defined an upper bound that corresponds to the sum of the average and the standard deviation of these ratios, and a lower bound that corresponds to the difference between the average and the standard deviation. Thus, if a value was not in this interval, it would be considered an outlier, as showed in Table 5. 29.

Table 5.29. Comparable companies[2], *source: Refinitiv Eikon*

Companies	EV/Revenues	EV/EBITDA	Price book value
Sony	1.46	8.84	2.17
Hisence	0.55	7.44	3.10
LG	1.50	6.15	0.48
Siemens AG	2.18	12.26	3.02
Panasonic Corporation	0.47	5.15	0.78
Toshiba	0.30	4.53	2.47
Nokia	0.68	4.68	0.87
Philips	1.28	8.06	1.45
HTC	5.50	-7.07	1.68
Average	1.55	5.56	1.78
Standard Deviation (STD)	1.51	5.02	0.92
Upper bound (Average + STD)	**3.06**	**10.59**	**2.70**
Lower bound (Average - STD)	**0.03**	**0.54**	**0.86**

Hence, Siemens AG and HTC were excluded from the peer's group, since they presented outlier's values for more than one multiple. Consequently, we computed the average for these multiples excluding these companies, as demonstrated in the table below.

[2] The values highlighted in red correspond to the outliers.

Table 5.30. Comparable companies excluding outliers, *source: Refinitiv Eikon*

Companies	EV/Revenues	EV/EBITDA	Price book value
Sony	1.46	8.84	2.17
Hisence	0.55	7.44	3.10
LG	1.50	6.15	0.48
Panasonic Corporation	0.47	5.15	0.78
Toshiba	0.30	4.53	2.47
Nokia	0.68	4.68	0.87
Philips	1.28	8.06	1.45
Average	**0.89**	**6.41**	**1.62**

Posteriorly, the EQV and the share value were computed, for each multiple. In the case of the EV/Revenues and the EV/EBITDA, we started by computing the EV, which in turn consisted of the multiplication of average of these multiples, previously computed, with the Samsung Electronics' revenues, and EBITDA, respectively. Next, the EQV was computed through the sum of the EV with the company's NOA, minus the amount of debt.

Thus, in what concerns the EV/Revenues, we obtained an EQV of 263,114,842 million KRW and a share value of 10,542.59 KRW, and in the case of the EV/EBITDA we obtained a EQV of 89,683,079 million KRW and a share value of 3,587.32 KRW.

Table 5.31. Valuation results, in millions of KRW, according to EV/Revenues and EV/EBITDA, *Author Estimates*

	EV/Revenues	EV/EBITDA
EV	**230,485,459.30**	**57,053,696.92**
Debt	11,377,069.00	11,377,069.00
NOA	44,006,452.00	44,006,452.00
EQV	**263,114,842.30**	**89,683,079.92**
Shares outstanding	25,000.00	25,000.00
Share value	**10,524.59**	**3,587.32**

Lasty, the EQV according to the Price-to-book value was obtained through the multiplication of the company's book value of Equity with the average of the Price-to-book value multiple. That said, Samsung Electronics' EQV according to this multiple is 588,264,829 million KRW, and the share value 23,530.59 KRW.

Table 5.32. Valuation results, in millions of KRW, according to Price book value, *Author Estimates*

	Price book value
EV	**363,677,865.00**
EQV	**588,264,829.49**
Shares outstanding	25,000.00
Share value	**23,530.59**

5.7. Valuation results

After estimating the intrinsic value of Samsung Electronics and its shares through the Discounted Cash Flow method, we can observe that the company's shares were being traded at the end of 2023 at a 4.2% higher than its intrinsic value, approximately, since the estimate of the intrinsic value of its share, at this date is 75,356 KRW and, according to Yahoo Finance they were being traded at 78,500 KRW.

Similarly, after estimating the fair value of its shares through the Relative valuation method, we can also observe that the fair value of this company is below the value traded in the markets, according to the multiples previously mentioned.

Thereby, we can conclude that the Samsung Electronics' shares were being overvalued on December 28th of 2023, according to all methods used to estimate its intrinsic value, which means that our investment recommendation, at that date, is to sell.

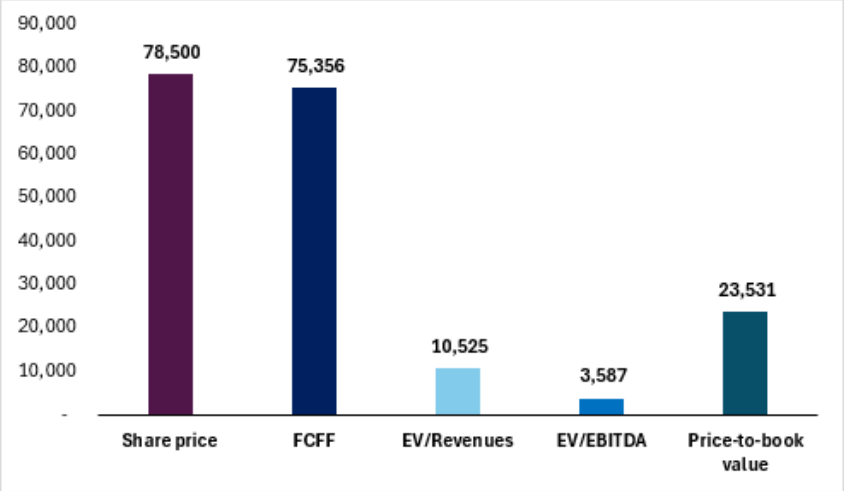

Figure 5.1. Share price comparison with other valuation methods, in KRW, *Author Estimates*

Conclusion

The main purpose of this master project was to estimate the intrinsic value of Samsung Electronics, and consequently, its shares in order to analyse whether its shares were being undervalued or overvalued, at the date of December 28th of 2023, and provide an investment recommendation, for this date.

The methodologies used to perform this valuation consisted of two important methods, namely, the Discounted Cash Flow method and the Relative valuation.

Regarding the first method, there was the necessity to define important assumptions that supported our valuation, during the period under analysis, and the following years.

As far as the Relative valuation is concerned, the main difficulty resulted from the choice of comparable companies, since the use of unsuitable companies could lead to inaccurate results in our valuation. Besides this, it was also important the use of the most appropriate multiples in our valuation, considering the characteristics of our company and its peer group.

That said, after estimating the fair value of Samsung Electronics and its shares, we can observe that according to these methodologies, which in turn, lead to consensual conclusions, that Samsung Electronics shares were being traded at a price above its fair value, which implies that they were overvalued.

Thereby, considering this analysis, our investment recommendation, at this date, for investors, is to sell Samsung Electronics' shares, since the values obtained in our valuation suggest that these shares were being traded at a price above its fair value, at the date of December 28th of 2023.

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Annexes

Annex A. Multiples to value Equity. *Aswath Damodaran, 2014a*

EV/EBITDA	$\frac{\boldsymbol{EV}}{\boldsymbol{EBITDA}} = \frac{Enterprise\ value}{EBITDA}$
P/E Ratio	$\frac{\boldsymbol{P}}{\boldsymbol{E}} = \frac{Share\ Price}{Earnings\ per\ share}$
P/B value Ratio	$\frac{\boldsymbol{P}}{\boldsymbol{B}} = \frac{Market\ Value\ of\ Equity}{Book\ Value\ of\ Equity}$
P/S Ratio	$\frac{\boldsymbol{P}}{\boldsymbol{S}} = \frac{Market\ Capitalization}{Sales}$
V/S Ratio	$\frac{\boldsymbol{V}}{\boldsymbol{S}} = \frac{Enterprise\ Value}{Sales}$

Annex B. Historical Balance Sheet, in millions of KRW. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

Balance sheet (In milions of Korean Won)	2020	2021	2022	2023
Assets				
Current assets				
Cash and Cash equivalents	29,382,578	39,031,415	49,680,710	69,080,893
Short-term financial instruments	92,441,703	81,708,986	65,102,886	22,690,924
Short-term financial assets at amortized cost	2,757,111	3,369,034	414,610	608,281
Short-term financial assets at fair value through profit or loss	71,451	40,757	29,080	27,112
Trade receivables	30,965,058	40,713,415	35,721,563	36,647,393
Non-trade receivables	3,604,539	4,497,257	6,149,209	6,633,248
Prepaid expenses	2,266,100	2,336,252	2,867,823	3,366,130
Inventories	32,043,145	41,384,404	52,187,866	51,625,874
Other current assets	3,754,462	5,081,665	6,316,834	5,038,838
Assets held-for-sale	929,432	0	0	217,864
	198,215,579	**218,163,185**	**218,470,581**	**195,936,557**
Non-current assets				
Financial assets at fair value through other comprehensive income	12,575,216	13,965,839	11,397,012	7,481,297
Financial assets at fair value through profit or loss	1,202,969	1,525,344	1,405,468	1,431,394
Investments in associates and joint ventures	8,076,779	8,932,251	10,893,869	11,767,444
Property, plant and equipment	128,952,892	149,928,539	168,045,388	187,256,262
Intangible assets	18,468,502	20,236,244	20,217,754	22,741,862
Net defined benefit assets	1,355,502	2,809,590	5,851,972	4,905,219
Deferred income tax assets	4,275,000	4,261,214	5,101,318	10,211,797
Other non-current assets	5,113,279	6,798,952	7,041,145	14,174,148
	180,020,139	**208,457,973**	**229,953,926**	**259,969,423**
Total assets	**378,235,718**	**426,621,158**	**448,424,507**	**455,905,980**
Liabilities and Equity				
Current Liabilities				
Trade payables	9,739,222	13,453,351	10,644,686	11,319,824
Short-term borrowings	16,553,429	13,687,793	5,147,315	7,114,601
Other payables	11,899,022	15,584,866	17,592,366	15,324,119
Advances received	1,145,423	1,224,812	1,314,934	1,492,602
Withholdings	974,521	1,294,052	1,298,244	892,441
Accrued expenses	24,330,339	27,928,031	29,211,487	26,013,273
Current income tax liabilities	4,430,272	6,749,149	4,250,397	3,358,715
Current portion of long-term liabilities	716,099	1,329,968	1,089,162	1,308,875
Provisions	4,349,563	5,372,872	5,844,907	6,524,876
Other current liabilities	1,127,719	1,492,239	1,951,354	2,308,472
Liabilities held-for-sale	338,742	0	0	61,654
	75,604,351	**88,117,133**	**78,344,852**	**75,719,452**
Non-current liabilities				
Debentures	948,137	508,232	536,093	537,618
Long-term borrowings	1,999,716	2,866,156	3,560,672	3,724,850
Long-term other payables	1,682,910	2,991,440	2,753,305	5,488,283
Net defined benefit liabilities	464,458	465,884	268,370	456,557
Deferred income tax liabilities	18,810,845	23,198,205	5,111,332	620,549
Long-term provisions	1,051,428	2,306,994	1,928,518	2,878,450
Other non-current liabilities	1,725,857	1,267,183	1,171,761	2,802,356
	26,683,351	**33,604,094**	**15,330,051**	**16,508,663**
Total liabilities	**102,287,702**	**121,721,227**	**93,674,903**	**92,228,115**
Equity attributable to owners of the parent company				
Preference shares	119,467	119,467	119,467	119,467
Ordinary shares	778,047	778,047	778,047	778,047
Share premium	4,403,893	4,403,893	4,403,893	4,403,893
Retained earnings	271,068,211	293,064,763	337,946,407	346,652,238
Other components of equity	-8,687,155	-2,128,473	1,938,328	1,280,130
Non-controlling interests	8,277,685	8,662,234	9,563,462	10,444,090
Accumulated other comprehensive income attributable to assets held	-12,132	0	0	0
Total equity	**275,948,016**	**304,899,931**	**354,749,604**	**363,677,865**
Total liabilities and equity	**378,235,718**	**426,621,158**	**448,424,507**	**455,905,980**

Annex C. Historical Income Statement, in millions of KRW. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

Income Statement	2020	2021	2022	2023
Revenue	236,806,988	279,604,799	302,231,360	258,935,494
Cost of Sales	144,488,296	166,411,342	190,041,770	180,388,580
Gross profit	92,318,692	113,193,457	112,189,590	78,546,914
Wages and salaries	6,763,143	7,245,981	7,763,588	8,324,562
Post-employment benefit	279,711	310,823	330,115	299,369
Commissions	5,678,703	6,192,568	7,457,896	8,753,442
Advertising	4,269,043	5,376,015	6,112,951	5,213,896
Sales promotion	5,861,954	6,286,159	7,110,649	6,894,395
Transportation	2,218,422	2,792,690	3,214,301	1,721,614
Service	3,368,401	4,039,642	3,671,913	3,968,816
Other	4,688,270	4,840,946	5,993,246	6,125,999
R&D	21,111,490	22,401,726	24,919,198	28,339,724
OPEX	54,239,137	59,486,550	66,573,857	69,641,817
EBITDA	38,079,555	53,706,907	45,615,733	8,905,097
Depreciation and Amortization	2085679	2073051	2239103	2,338,121
Operating Profit	35,993,876	51,633,856	43,376,630	6,566,976
Other non-operating income	1,384,068	2,205,695	1,962,071	1,180,448
Other non-operating expense	2,488,902	2,055,971	1,790,176	1,083,327
Share of net profit of associates and joint ventures	506,530	729,614	1,090,643	887,550
EBIT	35,395,572	52,513,194	44,639,168	7,551,647
Financial Income	12,267,600	8,543,187	20,828,995	16,100,148
Financial Expense	11,318,055	7,704,554	19,027,689	12,645,530
EBT	36,345,117	53,351,827	46,440,474	11,006,265
Income Tax Expense	9,937,285	13,444,377	-9,213,603	-4,480,835
Net Income	26,407,832	39,907,450	55,654,077	15,487,100

Annex D. Inflation rate and cumulative inflation index. *IMF World Economic Outlook, October 2023*

	2023 (Base Year)	2024	2025	2026	2027	2028
Inflation rate	0%	5%	5%	4%	4%	4%
Cummulative inflation Index	1.00	1.05	1.10	1.14	1.19	1.23

Annex E. Average historical Cost of sales/Revenues. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

Cost of Sales Computation	2020	2021	2022	2023
Cost of Sales	144,488,296	166,411,342	190,041,770	180,388,580
Revenues	236,806,988	279,604,799	302,231,360	258,935,494
Cost of Sales/Revenues	61%	60%	63%	70%
Average Cost of Sales/Revenues	63%			

Annex F. Average historical Wages and salaries/Revenues. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
Wages and salaries	6,763,143	7,245,981	7,763,588	8,324,562
Revenues	236,806,988	279,604,799	302,231,360	258,935,494
Wages and salaries/Revenues	3%	3%	3%	3%
Average Wages and salaries/Revenues	3%			

Annex G. Average historical post-employment benefit/Revenues. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
Post-Employment Benefit	279,711	310,823	330,115	299,369
Revenues	236,806,988	279,604,799	302,231,360	258,935,494
Post-Employment Benefit/Revenues	0.1%	0.1%	0.1%	0.1%
Average Post-Employment Benefit/Revenues	0.1%			

Annex H. Average historical OPEX/Revenues. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
OPEX	54,239,137	59,486,550	66,573,857	69,641,817
Revenues	236,806,988	279,604,799	302,231,360	258,935,494
OPEX/Revenues	23%	21%	22%	27%
Average OPEX/Revenues	23%			

Annex I. Average historical D&A/Revenues. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
D&A	2,085,679	2,073,051	2,239,103	2,338,121
Revenues	236,806,988	279,604,799	302,231,360	258,935,494
D&A/Revenues	1%	1%	1%	1%
Average D&A/Revenues	1%			

Annex J. Average historical Dividend income/Financial assets at fair value. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
Dividend income	152,440	135,840	414,601	164,203
Financial assets at fair value	13,778,185	15,491,183	12,802,480	8,912,691
Dividend income/Financial assets at fair value	1%	1%	3%	2%
Average	2%			

Annex K. Average historical financial assets at fair value growth rate. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
Financial assets at fair value	13,778,185	15,491,183	12,802,480	8,912,691
Growth rate	-	12%	-17%	-30%
Average	-11.8%			

Annex L. Average historical PPE growth rate. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

PPE Computation	2020	2021	2022	2023
PPE	128,952,892	149,928,539	168,045,388	187,256,262
Growth Rate	8%	16%	12%	11%
Average	12%			

Annex M. Average historical Rental income/PPE. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
Rental income	147,104	132,801	140,908	150,273
PPE	128,952,892	149,928,539	168,045,388	187,256,262
Rental income/ PPE	0.11%	0.09%	0.08%	0.08%
Average	0.09%			

Annex N. Average historical Gain of disposal of PPE/PPE. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
Gain on disposal of property, plant and equipment	154,249	340,400	159,123	104,663
PPE	128,952,892	149,928,539	168,045,388	187,256,262
Gain on disposal of property, plant and equipment /PPE	0.12%	0.23%	0.09%	0.06%
Average	0.12%			

Annex O. Average historical other income growth rate. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
Other	930,275	1,596,654	1,247,439	761,309
Growth rate	-	72%	-22%	-39%
Average	3.6%			

Annex P. Average historical Loss of disposal of PPE/PPE. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
Loss on disposal of property, plant and equipment	87,673	75,586	61,256	85,799
PPE	128,952,892	149,928,539	168,045,388	187,256,262
Loss on disposal of property, plant and equipment/PPE	0.07%	0.05%	0.04%	0.05%
Average	0.05%			

Annex Q. Average historical Donations, and other expenses growth rate. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
Donations	311,421	270,927	305,941	243,377
Growth rate	-	-13%	13%	-20%
Average	-6.8%			
Other	2,089,808	1,709,458	1,422,979	754,151
Growth rate	-	-18%	-17%	-47%
Average	-27.3%			

Annex R. Average historical investments in associates and joint ventures growth rate, and average historical ratio. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
Investments in associates and joint ventures	8,076,779	8,932,251	10,893,869	11,767,444
Growth rate	-	11%	22%	8%
Average	14%			
Share of net profit of associates and joint ventures	506,530	729,614	1,090,643	887,550
Ratio	6%	8%	10%	8%
Average	8%			

Annex S. Historical WC amounts and WC Variation. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
Inventories	32,043,145	41,384,404	52,187,866	51,625,874
Trade receivables	30,965,058	40,713,415	35,721,563	36,647,393
Cash and Cash Equivalents	29,382,578	39,031,415	49,680,710	69,080,893
Trade payables	9,739,222	13,453,351	10,644,686	11,319,824
Credit from State (VAT)	4,430,272	6,749,149	4,250,397	3,358,715
WC	78,221,287	100,926,734	122,695,056	142,675,621
WC Variation	-	22,705,447	21,768,322	19,980,565

Annex T. Average Historical months of WC items. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023	Average
Months Inventory	2.66	2.98	3.30	3.43	**3.09**
Months credit to clients	1.43	1.59	1.29	1.54	**1.46**
Months of credit from suppliers	0.71	0.84	0.58	0.69	**0.70**
Days of credit from state (VAT)	25.00	25.00	25.00	25.00	**25.00**

Annex U. Historical Purchases amounts. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

	2020	2021	2022	2023
Purchases	149,764,977	175,752,601	200,845,232	179,826,588

Annex V. Historical Intangible assets growth rate. *Samsung Electronics, co., LTD., Annual Reports 2020, 2021, 2022, and 2023*

Intangible assets Computation	2020	2021	2022	2023
Intangible assets	18,468,502	20,236,244	20,217,754	22,741,862
Growth Rate	-11%	10%	0%	12%
Average	3%			