

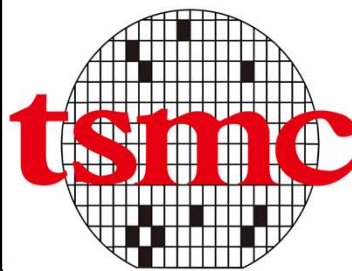
# Krause Fund Research

Fall 2024

November 16, 2024

## Analyst

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## Company Information

**Company:** Taiwan Semiconductor Manufacturing Company  
**Sector:** Technology  
**Industry:** Semiconductors  
**Exchange:** NYSE: TSM

## Company Overview

Taiwan Semiconductor Manufacturing Co., Ltd. engages in the manufacture and sale of integrated circuits and wafer semiconductor devices. Its chips are used in personal computers and peripheral products, information applications, wired and wireless communications systems products, and automotive and industrial equipment including consumer electronics such as digital video compact disc player, digital television, game consoles, and digital cameras. The company was founded by Chung Mou Chang on February 21, 1987 and is headquartered in Hsinchu, Taiwan.

Source: 18 FactSet

## Financial Snapshot

### Valuation Summary

DCF/EP	\$231.30
DDM	\$137.34
Relative PE	\$215.69

### Price Data

Current Price	\$186.01
52 week Low – High	\$95.25 – 212.60
Beta Value	1.65
WACC	12.64%
Current P/E	\$20.05

### Share Highlights

Market Capitalization	\$977.576B
Shares Outstanding	5,186.1M
EPS (FY23)	5.360

### Financial Metrics

2023 Revenue	\$70,608B
2024E Revenue	\$89,123B
2023 Net Income	\$27,364B
2024E Net income	\$28,218B
2023 Profit Margin	38.8%
2024E Profit Margin	31.7%

## Investment Thesis

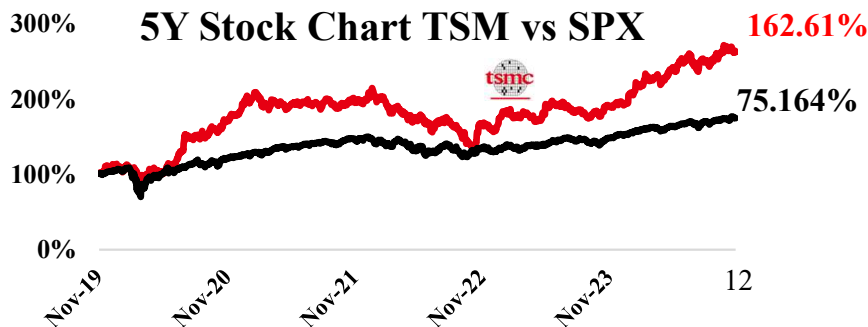
The Technology Investment Team recommends a **BUY** for TSMC because of its dominant position in the semiconductor space, its strong moat from competitors, and strong growth potential in the near future.

### Drivers of Thesis

- Dominant Position:** TSMC is the worlds largest dedicated independent semiconductor foundry, with over 50% of global foundry revenue. Its scale and market dominance allow it to maintain cost leadership and leverage its influence with key clients, including Apple, AMD, NVIDIA and QUALCOMM. Its position allows economies of scale, cost leadership, and high bargaining power with clients.
- Strong Moat:** TSMC's competitive moat is underpinned by substantial barriers to entry, including the mass amount of capital investments required to build advanced fabs, cutting-edge R&D capabilities, and a highly skilled workforce. These factors make it virtually impossible for new players to challenge TSMC's position. The company's proprietary manufacturing processes and industry-leading reliability further reinforce its advantage, while customer loyalty and high switching costs create long-term relationships with clients.
- Strong Growth Potential:** TSMC's growth potential is driven by increasing demand for chips in AI, 5G, electric vehicles, and high-performance computing. TSMC is investing heavily on R&D and expanding globally with new fabs in Arizona and Japan to align with supply chain shifts

### Risks to Thesis

- Geopolitical Tension:** Tensions between the U.S. and China, pose a significant risk to TSMC, as a majority of its operations are concentrated in Taiwan. Any escalation could disrupt its supply chain, production, or global customer relationships. Additionally, increasing pressure on countries to localize semiconductor production could lead to rising competition as governments begin to heavily subsidize domestic manufacturing
- Deceleration of Moore's Law:** The deceleration of Moore's Law presents a significant risk as it directly impacts the ability to sustain its leadership in semiconductor manufacturing. As chip sizes get smaller it requires increasingly complex manufacturing processes and involves significant R&D expenditures, and operational costs



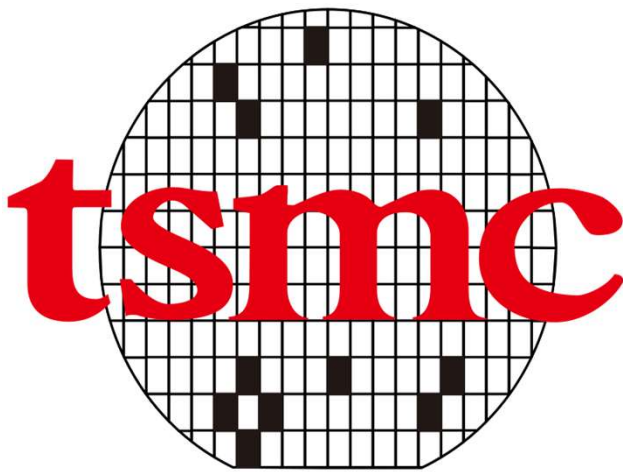
## Earnings Estimates

2024	2025	2026	2027
5.72	7.83	10.73	14.36

## Company Analysis

TSMC operates as a pure-play semiconductor foundry, manufacturing advanced chips for global clients in industries like consumer electronics, automotive, and artificial intelligence. A leader in the semiconductor manufacturing equipment and services, TSMC focuses on wafer fabrication, advanced process technologies, and customer-specific design enablement..

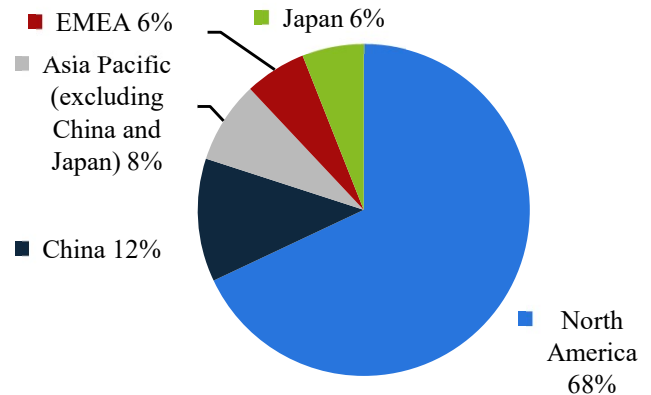
The company's success is driven by its cutting-edge R&D, dominance in advanced nodes like 3nm, and strong relationships with clients such as Apple, Nvidia, and AMD. Operating primarily from Taiwan, TSMC accounts for 70% of global pure-play foundry revenue, with recent expansions into the U.S. and Japan enhancing its global footprint. TSMC's profitability hinges on maintaining its technological edge and meeting surging chip demand.



## *Geographic & Customer Revenue Segmentation*

A significant portion of TSMC's revenue originates from the U.S., where the majority of its customer base is also located. Approximately 65% of revenue came from the US with customers such as Apple (25.18% of revenue), NVIDIA (10.11% of revenue), Broadcom inc. (6.45% of revenue), Qualcomm (6.45% of revenue) and Advanced Micro Devices (5.54% of revenue) being some of the biggest names that they supply.<sup>11</sup> Over the past four years, revenue by geography has remained consistent, with the U.S. accounting for over 60% of total revenue. Given this stability, we opted to base our forecasts on business platforms rather than geography, as this approach better aligns with anticipated market growth and strategic business decisions. The remainder of the revenue analysis will focus on platform-specific trends.

**Distribution of net profit in 2023, by region**



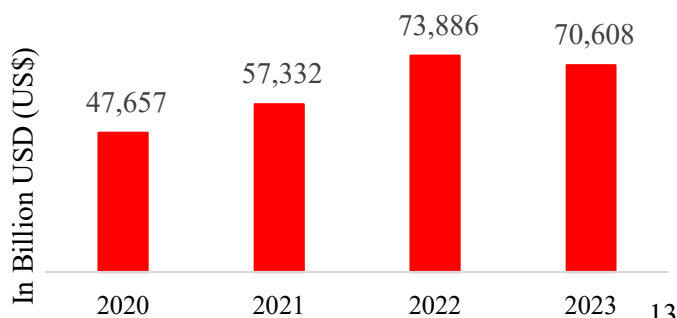
## *Business Segment overview*

Total revenue is comprised of sales from the company's six different business platforms: HPC (High Performance Computing), Smartphone, IoT (Internet of Things), Automotive, others, and Digital Consumer Electronics (DCE).

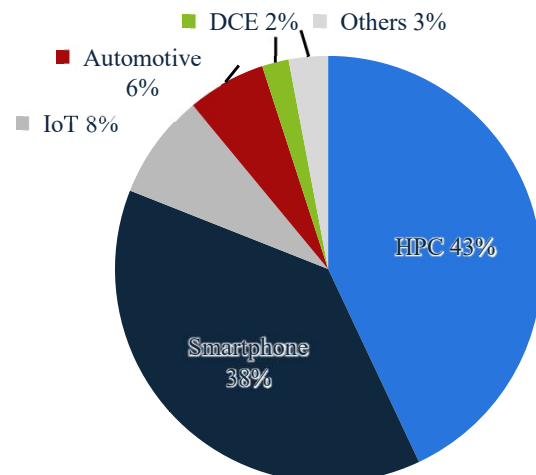
## Revenue Analysis & Decomposition

TSMC's revenue in 2023 was \$70,608 million, a 4.4% decrease from \$73,886 million in 2022 but a 23.15% increase from \$57,332 million in 2021. Revenue growth over the past five years has been driven significantly by the AI boom and can be analyzed by region business segment, and resolution

**Annual net revenue from 2020 to 2023**



**Distribution of net profit 2023, by business segment**



## High Performance Computing

High performance computing (HPC) **accounts for 43% of TSMC's revenue.**<sup>16</sup> HPC comprises the use of powerful supercomputers or clusters to process massive data and perform complex computations quickly, enabling advancements in fields like AI, research, and engineering.

In the HPC segment, we forecast 40% growth driven by companies racing to adopt AI technologies like large language models and generative AI, which will increase demand for high-performance processors. However, as this initial boom slows, companies will likely focus on optimizing their HPC resources rather than expanding rapidly, leading to a gradual slowdown in growth to around 12% by 2031.

## Internet of Things

Internet of Things (IoT) **accounts for 8% of revenue.**<sup>16</sup> IoT refers to a network of interconnected devices that collect, share, and analyze data in real-time, enabling automation and smarter decision-making across various applications.

we expect sectors like manufacturing, agriculture, and logistics to increase their use of automation and data analytics, creating demand for TSMC's low-power chips. This growth will be supported by consumer and industrial IoT adoption, boosted by 5G capabilities. We project a 38% growth rate initially, which will slow to 6% as the market matures, infrastructure stabilizes, and efficiency in device design becomes the focus.

## Smartphones

Smartphones **account for 38% of TSM's revenue.**<sup>16</sup> TSMC produces advanced semiconductor chips that power key functions in smartphones, including processors, modems, GPUs, and AI accelerators

We anticipate an initial high growth of 16% as 5G adoption completes, followed by steady declines as the market stabilizes and focuses on efficiency. TSMC's early advantages in cutting-edge nodes and major brand partnerships provide a robust foundation, but growth will moderate as the industry matures and economic pressures affect upgrade cycles.

## Automotive

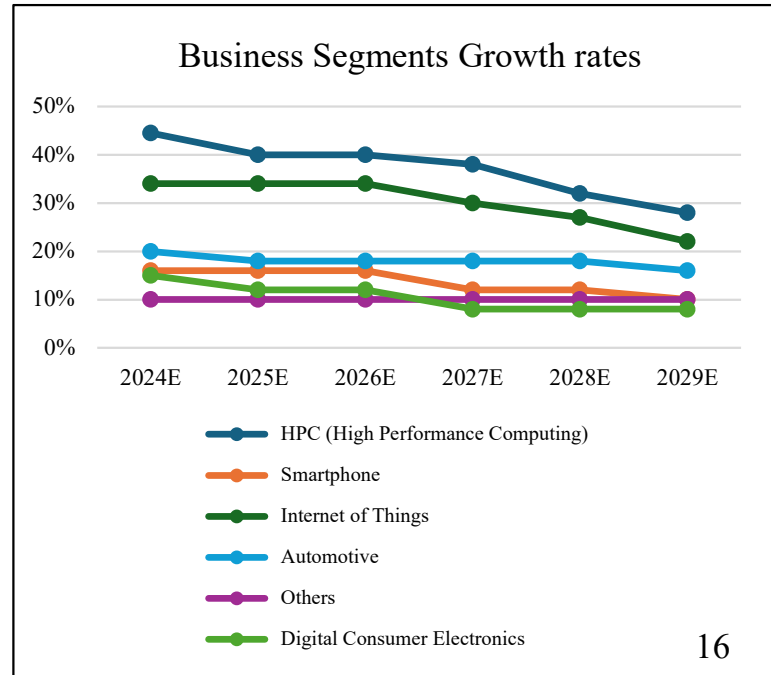
TSMC's automotive platform currently **accounts for 6% of revenue.**<sup>16</sup> The chips are currently made for modern vehicles that use sensors, power management ICs and advanced driver-assistance systems (ADAS).

The industry is currently positioned for robust growth of approximately 20%, driven by rapid EV and ADAS adoption. Growth will gradually moderate to 12% as the largest markets will have already adopted EV.

## Digital Consumer Electronics

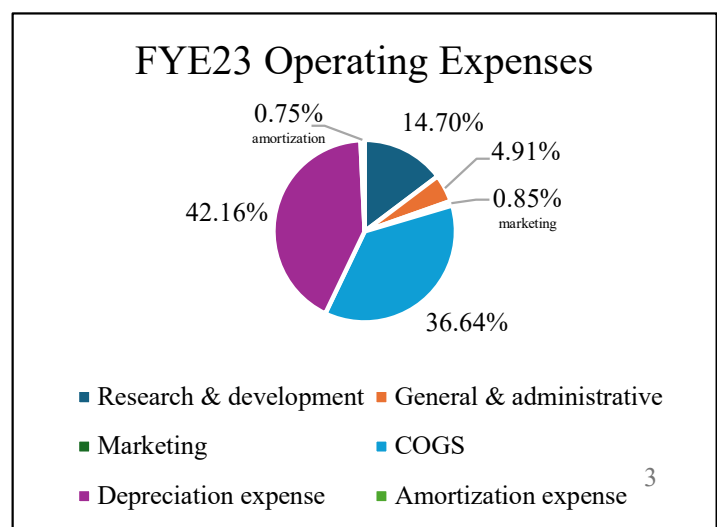
Digital consumer electronics currently **makes up 2% of TSMC's revenue.**<sup>16</sup> Digital consumer electronics are tablets, gaming consoles, and smart TVs.

We believe that GDP (specifically US GDP) will continue to grow in a positive manner and that discretionary spending from consumers will increase. Therefore, projecting 10% growth throughout the years.



## Expense Analysis

TSMC's largest expense category is its cost of goods sold (COGS), accounting for approximately 45.6% of the company's net revenue. Operating expenses increased by about 1.8% year-over-year (YOY) compared to 2023.<sup>14</sup> We anticipate that TSMC's costs will continue to rise as the company expands production and invests heavily in advanced process technologies, such as 3nm and beyond. To project operating costs, we utilized a 4-year historical average, reflecting the relative consistency of R&D, G&A, and marketing expenses. This approach aligns with TSMC's recent explosive growth and the development of cutting-edge technologies.



Source: Income Statement

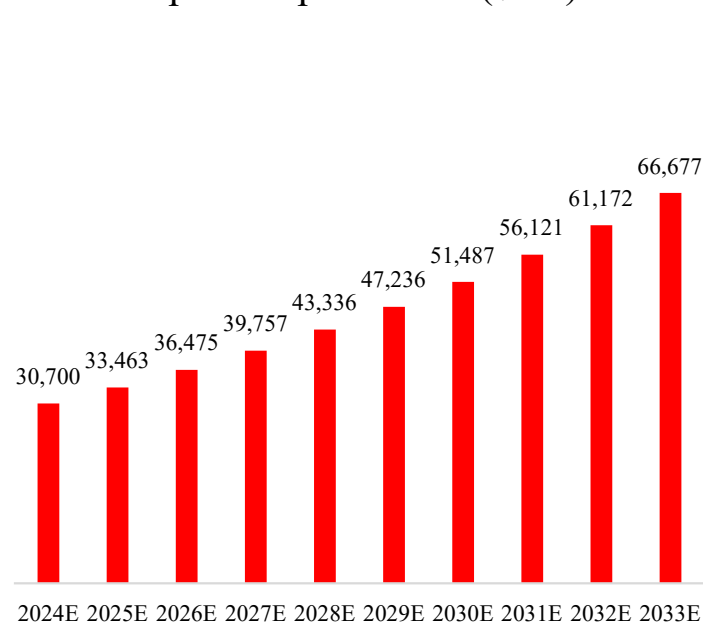
Semiconductor manufacturing is highly capital-intensive, with fixed costs such as equipment depreciation and building facilities accounting for a significant portion of total expenses. We expect TSMC's COGS to rise as labor costs, utility and energy expenses, and material prices increase, driven by ongoing inflationary pressures. TSMC's operations demand substantial power, clean water, and advanced cooling systems, all of which contribute significantly to its operational expenses. Additionally, TSMC is currently facing rising electricity costs in Taiwan, where electricity rates raised by 14%, after a 25% increase in the first half of the year.<sup>1</sup> We expect these prices to increase YoY.

## Capital Expenditures

TSMC's CapEx reflects its strategy of aligning investments with long-term market demand. Management projects 2024 CapEx to slightly exceed \$30 billion, and **our forecast places it at \$30.7 billion based on management's guidance.**<sup>2</sup> For future projections, we **assume an 9% CAGR**, just slightly below the expected growth rate of the semiconductor market from 2024 to 2029. This rate is justified by TSMC's proven track record of leveraging CapEx to meet robust industry demand and its leadership in advanced node production.<sup>3</sup> This will eventually bring CapEx to around \$65.2 billion dollars by 2033

These expenditures will be mostly used for advanced process technologies TSMC is currently in the process of building 3 new fabs in Arizona, with the first fab to begin production in the first half of 2025. The second should be completed by 2028 and the third fab to be completed by the end of the decade. TSMC plans to utilize capital expenditures to support customer growth in regard to AI-related demand. With that TSMC has stated that their CapEx is spent in anticipation of growth that will follow in future years. They expect 2024's CapEx to be slightly higher than \$30 billion USD.

### 17 Capital Expenditures (\$mn)



## WACC

TSMC's WACC was calculated using the market weights and current capital structure. This is an important assumption used in valuation as it is the discount rate, and any change to it has a significant impact on overall valuation. TSMC's cost of equity is calculated using a risk-free rate of 4.243% from the 10-year US treasury, a raw beta of 1.65 (5Y monthly), and a 5.26% equity risk premium. This calculates to a **cost of equity of 12.92%**. Next, we calculated the cost of debt by once again using the risk-free rate of 4.243% plus our implied default premium to get a pre-tax cost of debt is 4.72% and then multiplied it by our marginal tax rat of 20% to get our **after-tax cost of debt to 3.76%**. The **weight of equity** was **96.98%** and the **weight of debt** (operating leases) was **3.02%**. This equates to a **WACC of 12.64%**.

## Capital Structure

TSMC's debt-to-equity ratio has steadily declined over the past three years, dropping from 0.72 in 2021 to 0.59 in 2023. In our model, we project the ratio to stabilize around 0.65 in the near term before gradually decreasing to 0.31 by 2033. This trend is driven by anticipated significant growth in the HPC and IoT industries, which we expect to spur increases in both debt and equity investments. However, the growth in equity is projected to outpace the growth in debt, resulting in a gradual reduction in TSMC's leverage and a declining debt-to-equity ratio over time.

S&P and Moody's assigned a credit rating of AA- and Aa3 respectfully with a stable debt outlook

TSMC's long-term debt has significantly increased in recent years, with the majority of this growth occurring in early 2020. Starting at \$2.19 billion in March 2020, long-term debt surged to \$29.9 billion by September 2024. Despite this increase, TSMC has historically maintained higher levels of cash and cash equivalents compared to its debt. This strong liquidity position indicates that TSMC is well-equipped to meet its debt obligations, even if faced with higher current liabilities in the future.

### Bonds/Notes Maturity Schedule

Fixed rate notes maturing in	Term Loans	Notes/Bonds	Total Classified (\$ in billions)
2024	0.0	0.0	0.0
2025	0.0	1,967.9	1,967.9
2026	0.0	3,795.7	3,795.7
2027	0.0	5,432.8	5,432.8
2028	0.0	3,720.5	3,720.5
2029	0.0	1,307.6	1,307.6
2030	361.4	2,544.6	2,906.1
2031	0.0	3,403.5	3,403.5
2032	0.0	1,828.1	1,828.1
2033	0.0	909.3	909.3
> 2034	0.0	5,522.9	5,522.9
Total	361.4	30,432.9	30,794.3

## ***Payout Policy:***

TSMC regularly pays dividends and steadily increases the amount paid out per share as a part of their commitment to shareholders. In FYE 2023, TSMC paid a dividend of \$2.03 per share which was a 14.8% increase from the dividend paid out in 2022.

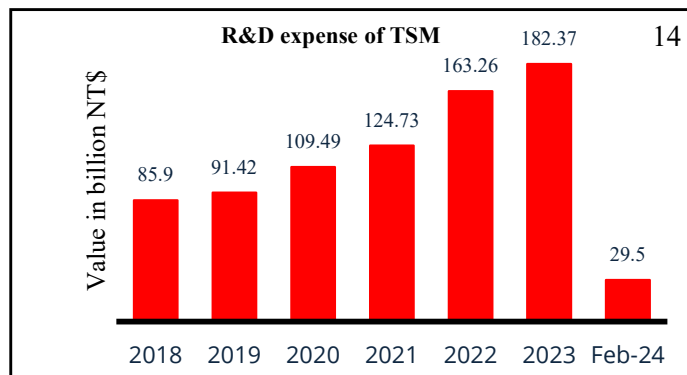
As a result of continued increases in dividends our model adjusts 2024E to 2027E dividends to reflect the high continuous growth. The growth of dividends was calculated using an average of the previous five years (including dividends paid in 2024) to see how TSMC will grow their dividends in high growth environments. We then changed our model prediction past 2027E for a more stable growth which we predicted dividends would then begin growing at approximately 5%, in line with previous years where TSMC did not have as high of growth.. Our model predicts a dividend of \$3.34 by 2027E and a dividend per share of \$4.47 by 2033E-the end of the forecast period. TSMC's continued efforts to increase dividends solidify it as a leader in the semiconductor industry.

TSMC does not maintain a consistent share repurchase program, and historical buyback activity has been sporadic. To incorporate potential repurchases into my model, I assumed a buyback rate of 0.5%. This assumption reflects the irregular nature of TSMC's repurchase activity and acknowledges the company's strategic emphasis on dividend payouts and substantial reinvestment in its operations over share buybacks. By applying a steady rate, the forecast aims to provide a more realistic representation of potential buyback activity over time, rather than predicting the occurrence of buybacks in specific years.

## **Swot Analysis:**

### ***Strengths***

TSMC stands as the world's first dedicated semiconductor foundry, a pioneering achievement that has solidified its **first-mover advantage** in the industry. This leadership has enabled TSMC to establish long-standing relationships with major semiconductor players such as AMD, Apple, NVIDIA, and Broadcom. These partnerships ensure recurring revenue streams and maintain TSMC's leadership. The company's commitment to innovation is evident in its strong R&D investments, which have historically driven the development of smaller, more efficient, and high-performing chips.



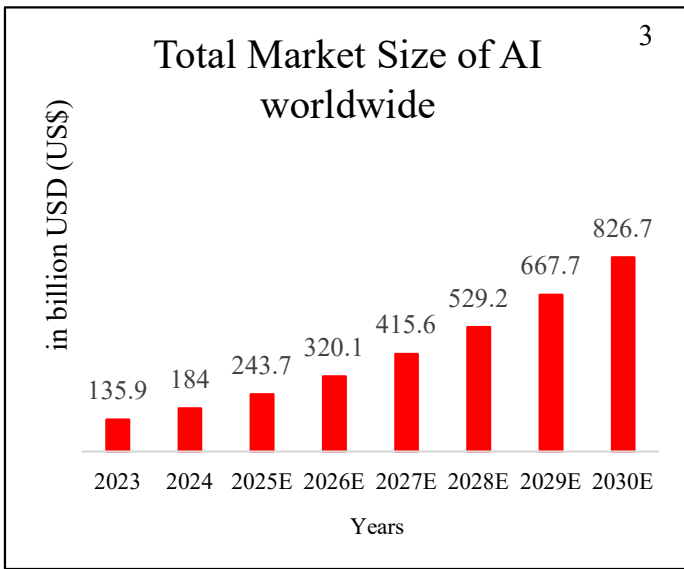
Additionally, TSMC's expansive portfolio of intellectual property, including critical patents and trademarks, ensures exclusivity over its cutting-edge technologies. These intellectual property rights not only strengthen its competitive edge but also serve as a significant barrier to entry for competitors. TSMC's strategic focus on advanced process nodes further positions it as a key enabler of technological progress across sectors such as consumer electronics, automotive, and artificial intelligence.

### ***Weakness***

Despite its many strengths, TSMC faces challenges that could hinder its performance. One notable weakness is its **high customer concentration**. A significant portion of TSMC's revenue is derived from a small number of major clients, with Apple alone accounting for approximately 25% of its revenue.<sup>11</sup> This dependence exposes the company to risks if any key client reduces orders, delays projects, or switches to a competitor. Additionally, TSMC's operations are concentrated in Taiwan, a region subject to **geopolitical instability**. Escalating tensions between China and Taiwan could disrupt operations, impact supply chains, or damage investor confidence. TSMC faces weakness in terms of attracting talent. TSMC is forced to send Taiwanese workers to the US to ensure that its factories in the US are operational.

## Opportunities

TSMC is well-positioned to capitalize on the expanding markets for artificial intelligence (AI) and high-performance computing (HPC). These sectors demand cutting-edge semiconductors, such as GPUs and CPUs, where TSMC holds a technological lead. The increasing adoption of generative AI, machine learning, and cloud computing presents a significant growth opportunity for the company. Similarly, the rise of electric vehicles (EVs) and autonomous driving technologies is driving demand for automotive semiconductors.



and incentives for local semiconductor manufacturing through government programs such as the CHIPS Act and the European Chips Act

## Threats

TSMC operates in a **geopolitically sensitive region**, with the bulk of its production facilities located in Taiwan.<sup>11</sup> Rising tensions between China and Taiwan pose a significant risk to its operations and the global semiconductor supply chain. Any military action or economic sanctions could severely disrupt production, damage infrastructure, and harm TSMC's ability to meet demand. Additionally, TSMC faces intensifying competition from rivals like Samsung Foundry and Intel. Both companies are aggressively investing in advanced nodes, with Samsung ramping up its 3nm production capacity to challenge TSMC's dominance. TSMC also faces increasing energy prices. Taiwan, which was previously known for its low energy prices has begun ramping up pricing.<sup>5</sup>

## Industry Analysis

It is important to note that there are different business segments within the semiconductor industry.

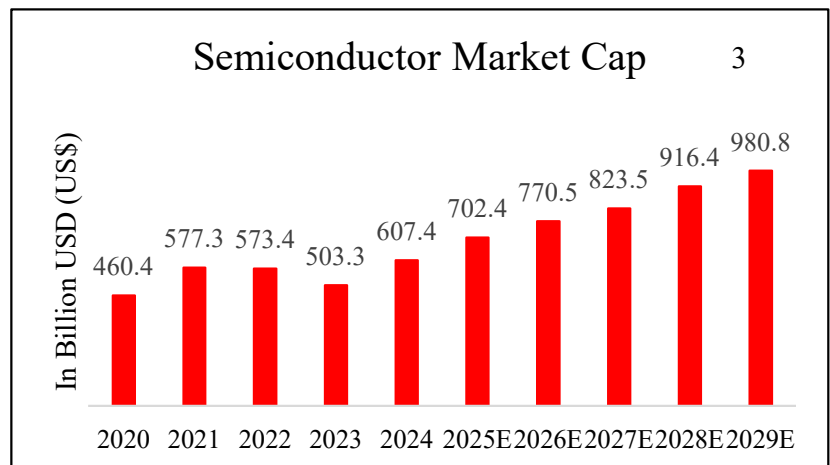
- **Design (Fabless):** Companies that focus on designing and selling semiconductor chips without manufacturing them.
- **Manufacturing (Foundries):** Firms specializing in chip production
- **Packaging and Testing:** Companies that handle the final stages of chip production, ensuring functionality and quality
- **Integrated Device Manufacturing (IDM):** Vertically integrated companies that design, manufacture, and sell their own chips
- **Equipment and Materials:** Suppliers of manufacturing equipment and raw materials for chip production
- **Electronic Design Automation (EDA):** Software tools for designing and testing semiconductor chips

### Industry Trends and Growth projections:

The semiconductor industry is undergoing an explosive transformation, with chipmakers such as NVIDIA, AMD, and Intel focusing on high-performance computing (HPC) to support AI applications across various sectors. Key trends driving the sector include AI, 5G, IoT, automotive, and HPC, all of which are reshaping the landscape.

In response to global demands, governments are prioritizing domestic semiconductor production. The US, through the CHIPS and Science Act, has awarded TSMC \$6.6 billion to build foundries within the country. Similarly, Europe has committed significant resources, investing €43 billion via the European Chips Act.<sup>17</sup> China has also heavily invested in its national semiconductor industry, aiming to boost manufacturing capacity and reduce dependence on imports.

On the technological front, the foundry industry is in a race to produce the first 2-nanometer chips, with TSMC already showcasing prototypes to its largest customers. The competition to release these advanced chips is critical, as the first companies to succeed will be positioned to dominate the foundry market.



**Industry comparison and Competition**

TSMC's main competitors in the foundry space include Samsung Foundry, Global Unichip, United Microelectronics, Advantest Corporation, and ASE Technology Holding. While there are smaller players and emerging competitors like Intel Foundry Services, which have much smaller market caps, all of these companies are vying for market share. Although these firms produce similar products, they differentiate themselves through their respective strengths. Some focus on mature and specialty nodes, which are used for larger nanometer chips, while others, such as Intel, Samsung, and TSMC, are heavily invested in developing the most advanced chip technologies available.

**Bargaining Power of Buyers: Moderate**

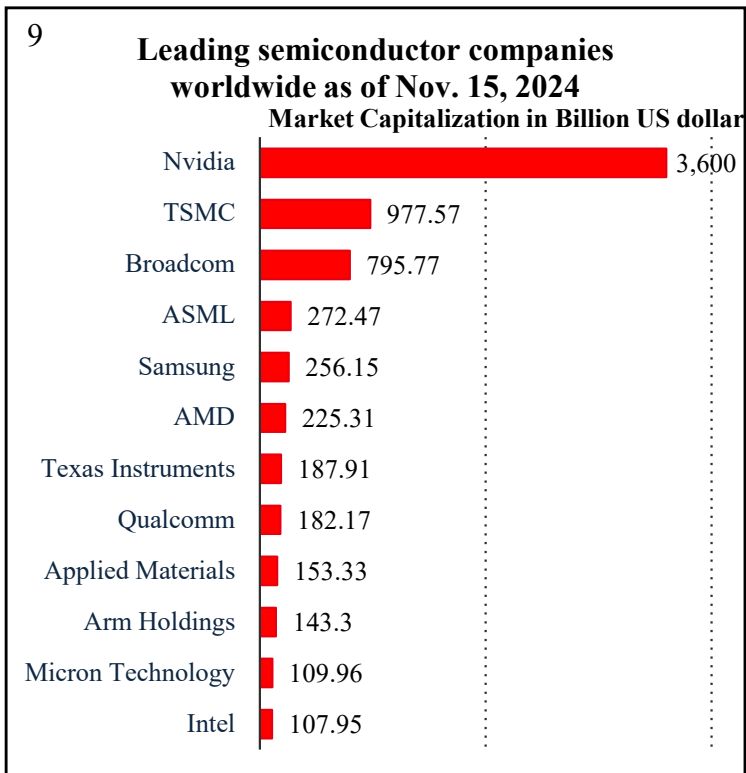
The semiconductor market has a large number of buyers across various sectors such as consumer electronics, automotive, industrial, and telecommunications. However, large customers, like Apple, Intel, or automotive companies, have more bargaining power due to their large-scale purchases. However, there are some drawbacks as in some cases, switching suppliers can be costly, particularly for specialized components, giving suppliers equal footing.

**Threat of Substitutes: Moderate**

There are emerging technologies, such as quantum computing or optical computing, that could potentially substitute traditional semiconductor chips, though these are still in the research phase and not widely adopted. The rapid pace of technological change means that semiconductors need constant innovation. While there may not be direct substitutes now, innovations can quickly alter market dynamics.

**Industry Rivalry: High**

The semiconductor market is highly competitive. Many companies constantly compete on technology innovation. The need for constant innovation, particularly in performance and power efficiency, fuels competition. Players are under pressure to release new products faster and invest heavily in R&D. Whoever has the best chip will control the semiconductor market.<sup>18</sup>



**Economic Analysis**

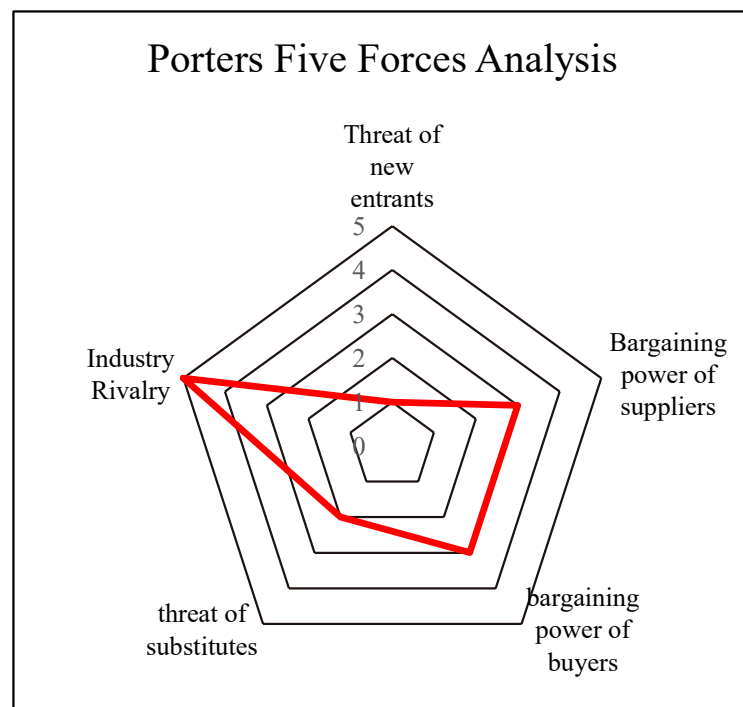
***Porter's Five Forces Analysis***

**Threat of New Entrants: Low**

Due to high capital investment required for R&D, manufacturing facilities, and intellectual property protection. Building semiconductor fabs requires billions of dollars in investment and specialized knowledge. Such high investments to grapple at low market share does not seem like an appealing return on investment.

**Bargaining Power of Suppliers: Moderate**

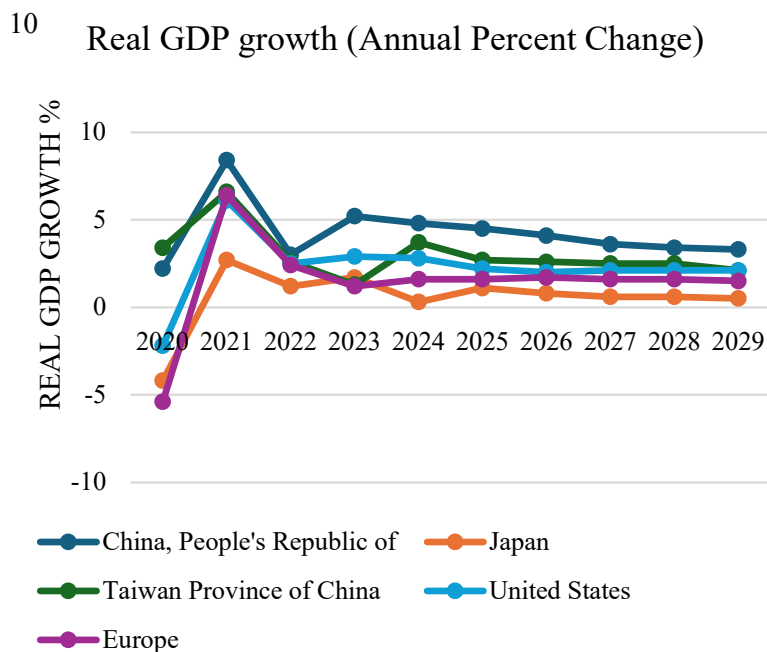
While the number of raw material suppliers (e.g., for silicon wafers, rare earth metals) is limited, the market for these materials is growing, and new suppliers are emerging. However, specialized equipment suppliers, such as ASML who specialize in photolithography tools, are highly specialized, and only a few companies provide them. This gives those suppliers significant leverage.



## Real GDP Growth

Semiconductor revenue growth exhibits a strong correlation with global GDP trends, as semiconductor demand is closely tied to economic expansion. During periods of economic growth, industries such as consumer electronics, automotive, and industrials typically increase their investments in technology, driving demand for semiconductors. TSMC, as a leading supplier of advanced chips, benefits from this heightened demand. Conversely, during periods of economic slowdown, declining consumer and industrial spending on electronics can weigh on semiconductor revenue.

The International Monetary Fund (IMF) projects global real GDP to grow at a stable rate of approximately 3.5% over the coming years. In the United States, we believe that **GDP growth is expected to improve at a much faster rate from the prior year**, supported by fiscal measures such as tax cuts introduced and most likely will be continued under the Trump administration. These economic tailwinds could spur increased business investment in advanced technologies, further driving demand for TSMC's innovative chip solutions as companies seek to enhance productivity and maintain competitiveness.

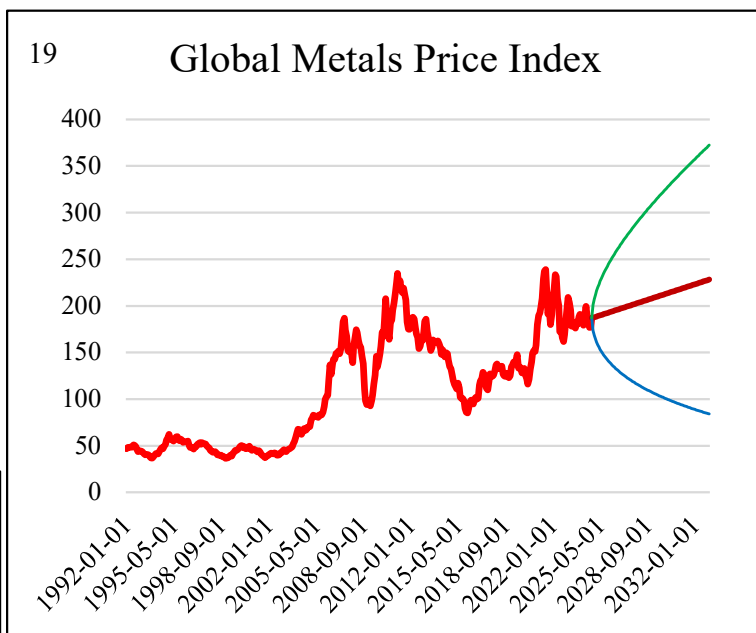


## Labor Market Dynamics

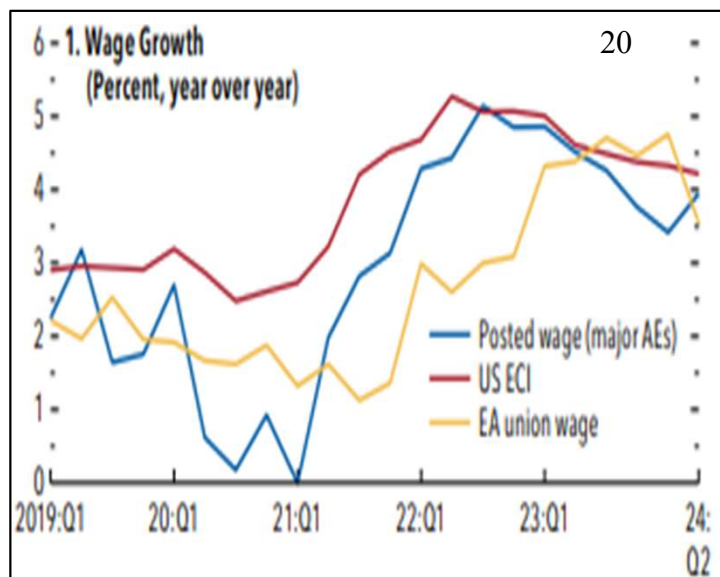
As TSMC continues to expand its manufacturing footprint beyond Taiwan, it becomes increasingly exposed to labor market variations in international locations. Labor costs in many regions outside Taiwan are higher, which would lead to increased operational expenses. Since Q1 2021, wage growth has largely tracked real GDP growth, further pressuring TSMC's labor-related spending. Managing these higher costs will be crucial for TSMC to maintain its competitive margins, particularly as it navigates global expansion and scales its operations in advanced semiconductor manufacturing hubs, particularly in the US and EU. We expect wages to continue to follow its current trajectory and hover around a **4% growth YOY**.

## Global Metals Price Index

Metals are critical inputs in semiconductor manufacturing, serving as essential components for conducting electricity. Key materials such as silicon, gold, tungsten, and tin form the backbone of semiconductor production. Consequently, trends in the global metals price index and forward-looking forecasts are vital indicators for assessing cost implications in TSMC's supply chain.



The global metals price index, which tracks the prices of key metals traded on international markets, has exhibited significant growth since 2020. As shown in the chart above, metal prices surged in 2020 and have since remained elevated. Looking ahead, we anticipate metal prices to grow at a steady **annual rate of 4%, assuming current market conditions persist**. However, in a downside scenario driven by recent geopolitical tensions in key metal-exporting regions, we estimate that prices could increase by as much as **30% in the event of severe supply chain disruptions**. Such volatility underscores the importance of cost management and supply chain resilience as TSMC navigates a global environment of increasing uncertainty in raw material pricing.

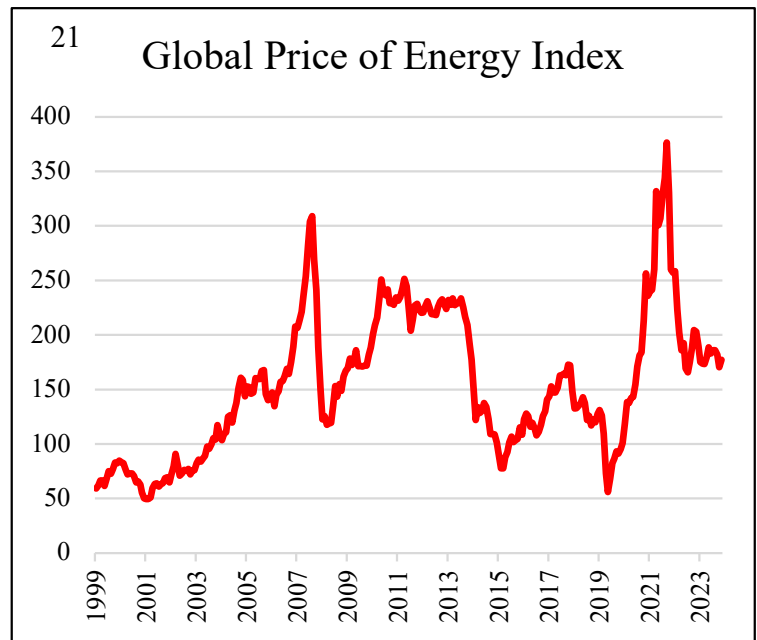




## Global Price of Energy Index

TSMC's operations are highly energy-intensive, making fluctuations in energy prices a critical factor affecting its operating margins. In 2024, Taiwan experienced a significant 45% increase in electricity prices, which has already put upward pressure on the company's costs. As TSMC accelerates its globalization efforts, with new fabs under construction in the U.S. and the EU, the company will increasingly face global energy price dynamics rather than relying solely on Taiwan's historically lower electricity costs.

To reflect this shift, we incorporated an assumption of a 7.5% annual increase in overall utility costs, driven by rising global energy prices and the anticipated higher operating expenses associated with fabs in regions with less favorable cost structures. This adjustment highlights a key cost headwind as TSMC diversifies its geographic footprint, which could weigh on margins over the long term.



## Discounted Cash Flows and Economic Profit Models

Estimated Share Price: **\$231.30**

The Discounted Cash Flow (DCF) and Economic Profit (EP) models were the most reliable tools in projecting TSMC's revenue growth. Both models accurately reflect the company's key growth drivers: expansion in the IoT, High-Performance Computing (HPC), and Electric Vehicle (EV) markets. TSMC holds a commanding 61.7% share of the semiconductor foundry market and approximately 14% of the overall semiconductor market. This dominant position in semiconductor production uniquely positions TSMC to capitalize on the accelerating demand for HPC, EV, IoT, and 5G technologies. Its strength is further demonstrated by its reliance on two of the world's largest technology companies—NVIDIA and Apple—which collectively contribute 35% of its revenue.

Overall, TSMC's transparency during earnings calls provides clear insights into its strategic decisions and market outlook. With strong management guidance and favorable analyst projections, we view TSMC as a compelling investment opportunity in the semiconductor space.

## Dividend Discount Model

Estimated Share Price: **\$137.42**

We believe the Dividend Discount Model (DDM) is the least accurate for valuing TSMC. While DDM can provide a baseline for evaluating dividend-paying stocks, its reliance on stable dividends and growth rates renders it less suitable for a company like TSMC.

The DDM assumes that dividends are the primary driver of shareholder value. However, TSMC's value is more closely tied to its growth potential, technological leadership, and market share expansion. These factors significantly influence its stock price but may not be fully captured by the DDM unless they directly translate into dividends. Instead, alternative valuation methods, such as the Price-to-Earnings (P/E) ratio or the Discounted Cash Flow (DCF) model, are better suited to reflect TSMC's intrinsic value by incorporating its growth trajectory and future earnings potential.

## Relative Peer Valuation

Estimated Share Price: \$215.69

Model is based on forward looking P/E multiples

Comparable companies: Advantest corporation, ASE Technology Holding, Disco Corp, Global Unichip Corp, GlobalWafers Co., Tokyo Electron Ltd. Lasertec Corp, United Microelectronics Corp.

We believe the relative valuation model is the second most accurate approach for analyzing TSMC's intrinsic value. As the world's largest semiconductor foundry, TSMC holds an approximate 60% market share, which translates to a dominant position and a substantial proportion of the industry's overall market capitalization. While relative valuation offers valuable insights by benchmarking TSMC against its peers, this approach has inherent limitations when applied to a market leader of TSMC's scale. Unlike its competitors, TSMC benefits from unparalleled economies of scale, technological leadership, and a diverse global customer base, which are difficult to quantify fully in peer comparisons. Additionally, the foundry market itself is highly concentrated, and no direct peers match TSMC's advanced-node capabilities and operational efficiency. As a result, relative valuation may undervalue TSMC by not fully capturing the company's outsized influence on the semiconductor supply chain and its ability to maintain pricing power even during industry downturns. However, the model does provide a useful benchmark for understanding how TSMC is valued relative to broader industry trends and smaller competitors, which can offer a perspective on market sentiment and sector-wide valuation dynamics.

# Sensitivity Analysis

## Beta vs Risk Free Rate

		Risk Free Rate							
		231.30	1.24%	2.24%	3.24%	4.24%	5.24%	6.24%	7.24%
Beta	1.50	415.52	348.32	297.23	257.22	225.14	198.93	177.17	
	1.55	395.86	333.55	285.76	248.09	217.72	192.80	172.03	
	1.60	377.69	319.76	274.99	239.46	210.68	186.95	167.12	
	1.65	360.86	306.88	264.85	231.30	203.98	181.38	162.42	
	1.70	345.21	294.81	255.29	223.56	197.61	176.06	157.91	
	1.75	330.65	283.49	246.26	216.22	191.54	170.97	153.59	
	1.80	317.05	272.85	237.73	209.25	185.76	166.10	149.45	

In our analysis, we assessed the sensitivity of TSM's stock price to variations in beta and the risk-free rate. The findings indicate that changes to the risk-free rate have a more substantial impact on the share price compared to adjustments in beta. While both factors affect the weighted average cost of capital (WACC), the sensitivity analysis underscores the outsized influence of the risk-free rate on valuation.

## Wacc vs. CV Growth of NOPLAT

		WACC							
		231.30	12.04%	12.24%	12.44%	12.64%	12.84%	13.04%	13.24%
CV growth of NOPLAT	1.00%	231.98	225.77	219.80	214.06	208.54	203.22	198.10	
	1.50%	238.17	231.62	225.33	219.29	213.49	207.91	202.54	
	2.00%	244.98	238.04	231.39	225.01	218.90	213.02	207.38	
	2.50%	252.50	245.12	238.06	231.30	224.83	218.62	212.67	
	3.00%	260.85	252.96	245.43	238.24	231.36	224.78	218.48	
	3.50%	270.18	261.70	253.63	245.93	238.59	231.58	224.88	
	4.00%	280.67	271.50	262.80	254.52	246.64	239.13	231.97	

In both the DCF and EP models, WACC and terminal value (CV) growth play pivotal roles in determining valuation. Given that all cash flows are discounted by the WACC, even minor fluctuations can lead to substantial changes in the outcome. For instance, a 0.2% decrease in WACC results in a share price increase from \$214.06 to \$219.80. Similarly, a 0.5% increase in CV growth drives the stock price up from \$252.50 to \$260.85. These findings highlight the sensitivity of the models to changes in these key assumptions.

## Equity Risk Premium Vs. Marginal Tax Rate:

		Equity risk premium							
		231.30	4.00%	4.50%	4.75%	5.26%	5.50%	5.75%	6%
Marginal Tax Rate	17.30%	299.84	264.82	249.68	222.73	211.59	200.88	190.99	
	18.30%	303.52	268.12	252.82	225.59	214.33	203.50	193.50	
	19.30%	307.19	271.42	255.96	228.44	217.06	206.12	196.02	
	20.30%	310.87	274.73	259.11	231.30	219.80	208.75	198.53	
	21.30%	314.54	278.03	262.25	234.16	222.54	211.37	201.05	
	22.30%	318.22	281.34	265.40	237.01	225.28	214.00	203.57	
	23.30%	321.90	284.65	268.55	239.87	228.02	216.62	206.09	

Changes in the equity risk premium have a more significant impact on share prices than adjustments in tax rates. This difference in sensitivity arises from the effect of the equity risk premium on the discount rate used in valuation models. Variations in the equity risk premium can be influenced by shifts in stock market dynamics, overall market sentiment, or changes in tax policies driven by political developments.

## Depreciation Rate vs Amortization Rate

		Depreciation Rate							
		231.30	16.1%	17.1%	18.1%	19.1%	20.1%	21.1%	22.1%
Amortization Rate	7.84%	239.05	236.27	233.68	231.27	229.02	226.92	224.95	
	9.84%	239.06	236.28	233.69	231.28	229.03	226.93	224.96	
	11.84%	239.07	236.29	233.70	231.29	229.04	226.94	224.97	
	13.84%	239.08	236.30	233.71	231.30	229.05	226.95	224.98	
	15.84%	239.09	236.31	233.72	231.31	229.06	226.96	224.99	
	17.84%	239.09	236.31	233.72	231.31	229.06	226.96	225.00	
	19.84%	239.10	236.32	233.73	231.32	229.07	226.97	225.00	

In our analysis, we assessed the sensitivity of TSM's stock price to variations in depreciation and amortization, given the company's high capital expenditure (CAPEX). Since TSM invests heavily in long-term assets, changes in depreciation rates can significantly impact earnings, cash flows, and valuation. Analyzing different depreciation rates helps us understand how variations in asset lifespans or depreciation methods affect financial performance and stock price. This is particularly important for capital-intensive companies like TSM, where depreciation has a more pronounced effect than amortization.

## 2025 Cost of R&D as % of revenue vs 2025 COGS as % of revenue

		2025 Cost of R&D as % of Revenue							
		231.30	7.00%	7.50%	8.00%	8.50%	9.00%	9.50%	10.00%
2025 Cogs as % of revenue	24.6%	262.04	258.63	255.21	251.79	248.38	244.96	241.55	
	25.6%	255.21	251.79	248.38	244.96	241.55	238.13	234.71	
	26.6%	248.38	244.96	241.55	238.13	234.71	231.30	227.88	
	27.6%	241.55	238.13	234.71	231.30	227.88	224.47	221.05	
	28.6%	234.71	231.30	227.88	224.47	221.05	217.63	214.22	
	29.6%	227.88	224.47	221.05	217.63	214.22	210.80	207.39	
	30.6%	221.05	217.63	214.22	210.80	207.39	203.97	200.55	

In this analysis, we compared the effects of R&D growth versus COGS growth on the implied share price. As shown, increases in both R&D and COGS lead to a decline in share price, with COGS having a more pronounced impact. This difference is attributed to TSM's recent underinvestment in R&D, which is a critical factor in the semiconductor industry for maintaining innovation and competitiveness.

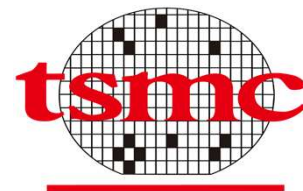
## CAPEX growth % vs COGS growth %

		CAPEX growth %							
		231.30	6.00%	7.00%	8.00%	9.00%	10.00%	11.00%	12.00%
CoGS growth %	24.60%	267.92	262.80	257.42	251.79	245.89	239.72	233.24	
	25.60%	261.09	255.96	250.59	244.96	239.06	232.88	226.41	
	26.60%	254.26	249.13	243.76	238.13	232.23	226.05	219.58	
	27.60%	247.43	242.30	236.93	231.30	225.40	219.22	212.75	
	28.60%	240.59	235.47	230.10	224.47	218.57	212.39	205.91	
	29.60%	233.76	228.64	223.26	217.63	211.74	205.56	199.08	
	30.60%	226.93	221.80	216.43	210.80	204.90	198.72	192.25	

In this analysis, we examine the impact of CAPEX growth percentage versus COGS growth percentage on the implied share price. While both factors lead to a decrease in share price, it is notable that even a modest increase in CAPEX growth has a disproportionately large effect on the implied share price, similar to the impact of COGS growth. This highlights the sensitivity of the valuation to changes in capital expenditures, despite them being relatively smaller in scale compared to COGS growth.

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**Taiwan Semiconductor Manufacturing Company**  
Revenue Decomposition

<i>Fiscal Years Ending Dec. 31</i>	2020	2021	2022	2023	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
<b>Revenue by Platform</b>	<b>45,487</b>	<b>56,835</b>	<b>75,986</b>	<b>69,358</b>	<b>89,961</b>	<b>115,895</b>	<b>150,561</b>	<b>193,247</b>	<b>242,666</b>	<b>297,808</b>	<b>347,310</b>	<b>383,295</b>	<b>422,363</b>	<b>465,444</b>
HPC (High Performance Computing)	14,938	21,045	31,295	29,992	43,338	60,673	84,942	117,220	154,731	198,055	237,666	266,186	298,129	333,904
Growth Rate	46.12%	40.88%	48.71%	-4.16%	44.50%	40.00%	40.00%	38.00%	32.00%	28.00%	20.00%	12.00%	12.00%	12.00%
Smartphone	21,917	24,887	29,835	26,146	30,329	35,182	40,811	45,709	51,194	56,313	60,255	62,665	65,172	67,779
Growth Rate	29.31%	13.55%	19.88%	-12.36%	16.00%	16.00%	16.00%	12.00%	12.00%	10.00%	7.00%	4.00%	4.00%	4.00%
Internet of Things	3,748	4,762	6,583	5,195	6,961	9,328	12,500	16,250	20,637	25,177	29,206	32,126	34,375	36,437
Growth Rate	34.11%	27.05%	38.23%	-21.08%	34.00%	34.00%	34.00%	30.00%	27.00%	22.00%	16.00%	10.00%	7.00%	6.00%
Automotive	1,507	2,402	3,906	4,288	5,146	6,072	7,165	8,455	9,977	11,573	12,962	14,517	16,259	18,210
Growth Rate	-2.84%	59.37%	62.65%	9.78%	20.00%	18.00%	18.00%	18.00%	18.00%	16.00%	12.00%	12.00%	12.00%	12.00%
Others	1,524	1,750	2,483	2,229	2,452	2,697	2,967	3,264	3,590	3,949	4,344	4,779	5,257	5,782
Growth Rate	10.61%	14.87%	41.86%	-10.21%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Digital Consumer Electronics	1,853	1,990	1,885	1,508	1,734	1,942	2,175	2,349	2,537	2,740	2,877	3,021	3,172	3,331
Growth Rate	6.54%	7.39%	-5.28%	-20.00%	15.00%	12.00%	12.00%	8.00%	8.00%	8.00%	5.00%	5.00%	5.00%	5.00%
<b>Revenue by Geography</b>														
Taiwan	4,594.1	7,575.5	6,863.5	4,881.2	6,233.0	8,029.9	10,431.7	13,389.2	16,813.3	20,633.9	24,063.6	26,556.8	29,263.8	32,248.6
United States	29,109.5	36,657.2	48,697.5	45,914.2	58,629.1	75,531.0	98,123.2	125,942.3	158,149.7	194,086.9	226,348.3	249,800.0	275,261.8	303,337.9
China	8,320.3	5,576.2	7,995.0	8,706.6	11,117.7	14,322.7	18,606.8	23,882.0	29,989.4	36,804.1	42,921.7	47,368.8	52,197.0	57,521.0
Japan	2,252.8	2,594.9	3,883.8	4,304.2	5,496.2	7,080.7	9,198.6	11,806.5	14,825.8	18,194.7	21,219.0	23,417.5	25,804.4	28,436.4
Europe, the Middle East and Africa	2,498.9	3,211.5	4,036.0	3,824.4	4,883.5	6,291.3	8,173.1	10,490.3	13,172.9	16,166.3	18,853.5	20,806.9	22,927.7	25,266.3
Others	888.5	1,514.3	2,349.8	2,820.4	3,601.5	4,639.7	6,027.5	7,736.4	9,714.8	11,922.4	13,904.1	15,344.7	16,908.8	18,633.4
<b>Total Geography Revenue</b>	<b>47,664.1</b>	<b>57,129.6</b>	<b>73,825.5</b>	<b>70,451.0</b>	<b>89,960.9</b>	<b>115,895.2</b>	<b>150,560.9</b>	<b>193,246.7</b>	<b>242,665.8</b>	<b>297,808.2</b>	<b>347,310.3</b>	<b>383,294.7</b>	<b>422,363.4</b>	<b>465,443.6</b>
Growth (YoY)	33.25%	19.86%	29.22%	-4.57%	27.69%	28.83%	29.91%	28.35%	25.57%	22.72%	16.62%	10.36%	10.19%	10.20%

Income Statement

Fiscal Years Ending Dec. 31	2019	2020	2021	2022	2023	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
<b>Net revenue</b>	35739	47,657	57,332	73,886	70,608	89,961	115,895	150,561	193,247	242,666	297,808	347,310	383,295	422,363	465,444
COGS	9699	10,547	12,478	15,609	14,844	24,829	31,987	41,555	53,336	66,976	82,195	95,858	105,789	116,572	128,462
Depreciation expense	9400	11,549	14,959	13,985	17,080	19,141	21,351	23,667	26,116	28,725	31,519	34,524	37,768	41,278	45,082
Amortization expense	183	256	296	286	302	292	302	315	331	350	372	397	425	457	493
<b>Gross profit</b>	16457	25,305	29,599	44,006	38,382	45,991	62,557	85,339	113,794	146,965	184,094	216,928	239,737	264,613	291,899
Research & development	3054	3,896	4,505	5,328	5,957	7,647	9,851	12,798	16,426	20,627	25,314	29,521	32,580	35,901	39,563
General & administrative	726	1,013	1,334	1,747	1,988	2,533	3,263	4,239	5,441	6,832	8,385	9,779	10,792	11,892	13,105
Marketing	212	253	273	324	346	441	568	738	947	1,189	1,459	1,702	1,878	2,070	2,281
Total operating expenses	3992	5,162	6,112	7,399	8,291	10,620	13,682	17,775	22,814	28,648	35,158	41,002	45,250	49,862	54,948
Other operating income & (expenses), net	17	25	12	12	6	6	6	6	6	6	6	6	6	6	6
<b>Income from operations</b>	20466	20,169	23,475	36,595	30,098	35,377	48,881	67,570	90,986	118,323	148,942	175,932	194,493	214,657	236,957
<b>NON-OPERATING INCOME AND EXPENSES</b>															
Income from non-controlling interest (Share of profits of	96	128	202	255	157	293	337	388	446	513	590	678	780	897	1,032
Interest income	541	321	206	732	1,969	754	754	754	754	754	754	754	754	754	754
Other income	555	24	35	31	16	20	26	34	44	55	67	79	87	96	105
Foreign exchange gain (loss), net	70	118	493	147	(88)	-	-	-	-	-	-	-	-	-	-
Interest Expense	109	74	196	(383)	(392)	450	601	671	749	835	931	1,038	1,154	1,278	1,413
Other gains & (losses), net	38	375	(249)	(31)	257	78	78	78	78	78	78	78	78	78	78
Total non-operating income & (expenses)	573	640	475	748	1,885	1,816	2,017	2,146	2,291	2,456	2,641	2,847	3,073	3,323	3,602
Income before income tax	13022	20,809	23,950	37,343	31,982	37,192	50,897	69,716	93,277	120,779	151,583	178,779	197,566	217,980	240,559
Income tax expense (benefit)	-1197	2,371	2,386	4,154	4,619	7,550	10,332	14,152	18,935	24,518	30,771	36,292	40,106	44,250	48,834
<b>Net income (loss)</b>	11825	18,438	21,564	33,188	27,364	29,642	40,565	55,563	74,342	96,260	120,812	142,487	157,460	173,730	191,726
Weighted average shares outstanding - basic	25930.38	5,186.08	5,186.08	5,185.84	5,185.84	5,185	5,182	5,179	5,177	5,174	5,172	5,170	5,169	5,167	5,166
Year end shares outstanding	25930.38	5,186.08	5,186.08	5,186.08	5,186.41	5,183	5,180	5,178	5,175	5,173	5,171	5,170	5,168	5,167	5,165
Net EPS - basic	0.456	3.510	4.120	6.230	5.360	5.717	7.828	10.729	14.361	18.604	23.358	27.558	30.464	33.621	37.113
Dividends per share	1.58	1.77	1.93	1.77	2.03	2.50	2.81	3.17	3.56	3.81	4.08	4.36	4.67	5.00	5.35

Taiwan Semiconductor Manufacturing Company  
Balance Sheet

Fiscal Years Ending Dec. 31	2020	2021	2022	2023	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
<b>Assets</b>														
<b>Current Assets:</b>														
Cash & cash equivalents	23,492	38,464	43,825	47,865	63,792	86,120	122,014	171,540	240,805	336,687	449,575	570,639	706,110	862,458
Short-term investments	4,672	4,459	7,136	7,258	7,548	7,850	8,164	8,491	8,830	9,184	9,551	9,933	10,330	10,744
Notes & accounts receivable, net	5,177	7,136	7,498	6,575	8,405	10,862	14,156	18,226	22,958	28,261	33,059	36,595	40,447	44,706
Receivables from related parties	20	26	52	20	25	33	43	55	69	84	98	109	120	132
Other receivables from related parties	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Inventories	4,888	6,974	7,218	8,198	10,445	13,456	17,481	22,437	28,175	34,577	40,325	44,503	49,039	54,041
Other financial assets	380	601	847	887	1,130	1,456	1,891	2,428	3,048	3,741	4,363	4,815	5,306	5,847
Other current assets	235	380	421	856	1,091	1,405	1,825	2,343	2,942	3,610	4,211	4,647	5,120	5,643
<b>Total current assets</b>	<b>38,865</b>	<b>58,042</b>	<b>67,000</b>	<b>71,661</b>	<b>92,438</b>	<b>121,184</b>	<b>165,577</b>	<b>225,521</b>	<b>306,829</b>	<b>416,147</b>	<b>541,184</b>	<b>671,243</b>	<b>816,474</b>	<b>983,572</b>
<b>NonCurrent Assets</b>														
Financial assets at fair value through other comprehensive income	161	213	201	674	703	732	763	796	830	865	902	940	980	1,021
Financial assets at amortized cost	156	55	1,146	2,587	2,697	2,811	2,930	3,055	3,184	3,320	3,460	3,607	3,760	3,920
Investments accounted for using equity method	670	793	902	967	1,232	1,587	2,062	2,647	3,323	4,079	4,757	5,249	5,784	6,374
Property, plant & equipment	55,355	71,334	87,918	100,094	111,653	123,765	136,572	150,213	164,824	180,541	197,503	215,856	235,750	257,345
Right-of-use assets	987	1,182	1,368	1,320	1,472	1,632	1,801	1,981	2,174	2,381	2,605	2,847	3,109	3,394
Intangible assets	917	969	849	744	641	552	476	410	353	304	262	226	195	168
Deferred income tax assets	924	1,775	2,258	2,096	3,181	4,666	6,700	9,422	12,946	17,369	22,586	28,350	34,710	41,729
Refundable deposits	48	95	146	230	293	378	490	629	790	970	1,131	1,249	1,376	1,516
Other noncurrent assets	157	94	246	327	417	537	697	895	1,124	1,379	1,608	1,775	1,956	2,156
<b>Total noncurrent assets</b>	<b>59,374</b>	<b>76,510</b>	<b>95,034</b>	<b>109,039</b>	<b>122,289</b>	<b>136,661</b>	<b>152,493</b>	<b>170,048</b>	<b>189,549</b>	<b>211,207</b>	<b>234,814</b>	<b>260,099</b>	<b>287,620</b>	<b>317,623</b>
<b>Total assets</b>	<b>98,238</b>	<b>134,552</b>	<b>162,034</b>	<b>180,700</b>	<b>214,727</b>	<b>257,845</b>	<b>318,070</b>	<b>395,569</b>	<b>496,378</b>	<b>627,354</b>	<b>775,998</b>	<b>931,341</b>	<b>1,104,094</b>	<b>1,301,195</b>
<b>Current Liabilities</b>														
Short-term loans	3,151	4,151	-	-	-	-	-	-	-	-	-	-	-	-
Financial liabilities at fair value through profit or loss	3	25	4	4	14	10	11	9	10	11	10	10	10	10
Hedging financial liabilities	-	-	-	893	-	-	-	-	-	-	-	-	-	-
Accounts payable	1,387	1,708	1,791	1,820	2,319	2,987	3,881	4,981	6,255	7,676	8,952	9,880	10,887	11,997
Payables to related parties	75	52	54	51	65	84	109	140	175	215	251	277	305	336
Salary & bonus payable	714	860	1,189	1,084	1,381	1,779	2,311	2,967	3,725	4,572	5,332	5,884	6,484	7,146
Accrued profit sharing bonus to employees & compensation to direc	1,270	1,319	2,015	1,657	2,111	2,720	3,533	4,535	5,695	6,989	8,151	8,995	9,912	10,923
Payables to contractors & equipment suppliers	5,615	5,264	6,968	5,600	5,862	6,389	6,964	7,591	8,274	9,019	9,831	10,716	11,680	12,731
Cash dividends payable	4,614	5,151	4,655	5,506	2,637	3,240	3,643	4,098	4,609	4,930	5,273	5,640	6,033	6,454
Income tax payable	1,918	2,154	3,943	3,231	6,763	9,256	12,678	16,962	21,963	27,565	32,511	35,927	39,639	43,746
Long-term liabilities - current portion	93	165	630	304	1,968	3,796	5,433	3,721	1,308	2,906	3,404	1,828	909	5,523
Accrued expenses & other current liabilities	3,120	5,861	9,568	9,690	12,346	15,905	20,662	26,521	33,303	40,870	47,664	52,602	57,964	63,876
<b>Total current liabilities</b>	<b>21,961</b>	<b>26,708</b>	<b>30,816</b>	<b>29,840</b>	<b>35,466</b>	<b>46,165</b>	<b>59,226</b>	<b>71,524</b>	<b>85,317</b>	<b>104,753</b>	<b>121,377</b>	<b>131,759</b>	<b>143,823</b>	<b>162,741</b>
<b>Noncurrent Liabilities</b>														
Long term debt	29,920	29,970	30,005	29,993	40,050	44,757	49,942	55,691	62,078	69,171	76,902	85,183	94,196	104,023
Deferred income tax liabilities	62	68	34	2	18.0	40.0	70.0	110.2	162.2	227.5	304.6	389.7	483.6	587.3
Lease liabilities	732	750	971	937	1,080	1,197	1,321	1,453	1,594	1,746	1,910	2,088	2,280	2,489
Net defined benefit liability	424	399	304	302	272	245	220	198	178	160	144	130	117	105
Guarantee deposits	9	25	29	30	-	-	-	-	-	-	-	-	-	-
Other noncurrent liabilities	85	6,050	5,873	5,825	7,422	9,561	12,421	15,942	20,019	24,569	28,652	31,621	34,844	38,398
<b>Total noncurrent liabilities</b>	<b>10,424</b>	<b>29,445</b>	<b>34,597</b>	<b>37,089</b>	<b>48,841</b>	<b>55,800</b>	<b>63,974</b>	<b>73,395</b>	<b>84,032</b>	<b>95,874</b>	<b>107,914</b>	<b>119,412</b>	<b>131,921</b>	<b>145,602</b>
<b>Total liabilities</b>	<b>32,385</b>	<b>56,153</b>	<b>65,413</b>	<b>66,929</b>	<b>84,308</b>	<b>101,965</b>	<b>123,201</b>	<b>144,919</b>	<b>169,349</b>	<b>200,627</b>	<b>229,291</b>	<b>251,171</b>	<b>275,745</b>	<b>308,343</b>
<b>Stockholder Equity</b>														
Capital stock	9,235	9,348	8,438	8,470	8,752	8,553	8,592	8,632	8,592	8,606	8,610	8,603	8,606	8,606
Capital surplus	2,007	2,335	2,256	2,282	2,358	2,305	2,315	2,326	2,315	2,319	2,320	2,318	2,319	2,319
Common Stock	11,241	11,682	10,694	10,752	11,110	10,858	10,907	10,958	10,908	10,924	10,930	10,921	10,925	10,925
Total retained earnings	56,048	68,053	84,442	103,150	119,221	144,597	183,150	238,433	314,349	413,441	532,736	665,429	812,707	976,178
Other equity (deficiency) attributable to shareholders of the parent	1,947	(2,257)	(667)	(925)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)
Equity attributable to shareholders of the parent	65,342	77,479	94,469	112,978	129,331	154,455	193,057	248,391	324,257	423,365	542,666	675,350	822,632	986,103
Non-controlling interests	34	87	482	795	1,088	1,425	1,813	2,259	2,772	3,362	4,040	4,820	5,717	6,749
<b>Total equity</b>	<b>65,376</b>	<b>77,566</b>	<b>94,951</b>	<b>113,773</b>	<b>130,420</b>	<b>155,880</b>	<b>194,870</b>	<b>250,651</b>	<b>327,029</b>	<b>426,727</b>	<b>546,707</b>	<b>680,170</b>	<b>828,350</b>	<b>992,852</b>

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Total liabilities & shareholders' equity	98,238	134,294	161,551	180,702	214,727	257,845	318,071	395,569	496,378	627,354	775,998	931,341	1,104,095	1,301,196
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<b>Fiscal Years Ending Dec. 31</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Income before income tax	13022	20809	23950	37343	31982
Depreciation expense	9400	11549	14959	13985	17080
Amortization expense	183	256	296	286	302
Expected credit losses recognized (reversal) on investments in debt instruments	0	0	0	2	-
Finance costs	109	74	196	383	392
Loss (gain) on held-to-maturity financial assets redeemed by the issuer	-	-	-	-	0
Share of losses (profits) of associates	-96	-128	-202	-255	-152
Interest income	-541	-321	-206	-732	-1969
Share-based compensation	0	0	0	10	16
Loss (gain) on disposal or retirement of property, plant & equipment, net	32	-7	10	-3	12
Loss (gain) on disposal of intangible assets, net	0	0	-	-	-
Loss on disposal or retirement of intangible assets, net	-	-	0	0	-
Impairment loss on (reversal of) property, plant & equipment	-10	0	10	26	-
Loss (gain) on financial instruments at fair value through profit or loss, net	32	0	-	-	-1
Loss (gain) on disposal of investments in debt instruments at fair value through other com	-18	-51	-3	13	-11
Loss (gain) on disposal of available-for-sale financial assets, net	-	-	-	-	15
Loss (gain) from disposal of subsidiaries	0	-	-	-	-
Unrealized (realized) gross loss (profit) on sales to associates	0	1	-	-	-
Loss (gain) on foreign exchange, net	-175	-49	-582	338	-
Dividend income	-14	-23	-13	-9	-15
Other adjustments	-	-	-15	5	-
Loss (gain) arising from fair value hedges, net	0	-	-	-	-
Loss (gain) on lease modification	0	0	-	-	-
Financial instruments at fair value through profit or loss	28	-106	96	-44	-
Notes & accounts receivable, net	-605	-288	-1882	-1050	31
Receivables from related parties	-9	11	-6	-28	-
Other receivables from related parties	0	0	0	0	-
Inventories	676	-1935	-2013	-915	-975
Other financial assets	113	49	-297	-55	9
Other current assets	-3	-48	-141	-145	61
Other noncurrent assets	-	-	-	-	-409
Accounts payable	196	14	300	248	28
Payables to related parties	2	24	-24	7	-
Salary & bonus payable	60	135	135	412	-2
Increase (decrease) in salary & bonus payable	-	-	-	-	-1452
Accrued profit sharing bonus to employees & compensation to directors	-11	428	30	823	-106
Accrued expenses & other current liabilities	-79	734	3045	1520	-
Other noncurrent liabilities	-	-	5565	3309	435
Net defined benefit liability	-7	-28	-23	-83	-
Cash generated from operations	22285	31102	43183	55390	-
Income taxes paid	-1738	-1828	-3016	-2825	-5222
Adjustments for unrealised foreign exchange losses (gains)	-	-	-	-	-8
Decrease (increase) in accounts receivable	-	-	-	-	929
Decrease (increase) in other receivable due from related parties	-	-	-	-	0
Adjustments for interest income	-	-	-	-	-1969
Cash flows from (used in) operations	-	-	-	-	45788
Net loss (gain) on financial assets or liabilities at fair value through profit or loss	-	-	-	-	0
Expected credit loss (gain) / Provision (reversal of provision) for bad debt expense	-	-	-	-	1
Decrease (increase) in other operating assets	-	-	-	-	-24
Increase (decrease) in net defined benefit liability	-	-	-	-	-22
Increase (decrease) in other operating liabilities	-	-	-	-	-360
Net cash generated by operating activities	20547	29274	40167	52564	-
Acquisitions of financial instruments at fair value through profit or loss	-4	-	-	-4	-4879
Acquisitions of financial assets at fair value through other comprehensive income	-8603	-9346	-9242	-1781	-2050
Acquisitions of financial assets at amortized cost	-10	-153	-137	-5977	-462
Acquisitions of property, plant & equipment	-15379	-18050	-30309	-35335	-31024
Acquisitions of intangible assets	-312	-340	-327	-227	-180
Acquisitions of land use right	-	-	-	-	-2
Proceeds from disposal or redemption of financial instruments at fair value through profit o	81	1	-	-	-
Proceeds from disposal or redemption of financial assets at fair value through other compr	7697	9499	9195	1467	1166
Proceeds from disposal or redemption of financial assets at amortized cost	479	10	338	2034	4397
Proceeds from disposal or redemption of property, plant & equipment	10	22	14	32	23
Proceeds from disposal or redemption of intangible assets	-	-	-	0	0
Proceeds from return of capital of investments in equity instruments at fair value through o	0	2	4	0	-
Derecognition of hedging financial instruments	-15	-11	10	55	0
Interest received	564	348	216	590	1825
Proceeds from government grants - property, plant & equipment	86	37	30	230	-
Proceeds from government grants - land use right & others	28	1	-	-	-
Proceeds from government grants - others	-	-	0	0	-
Other dividends received	11	26	13	9	15
Dividends received from investments accounted for using equity method	57	98	77	90	100
Increase in prepayments for leases	-	-167	-43	-	1553
Refundable deposits paid	-49	-26	-72	-69	47
Refundable deposits refunded	34	51	25	16	-132
Decrease (increase) in other assets	-	-	-	-	4
Derecognition of financial liabilities for hedging	-	-	-	-	2
Net cash generated by (used in) investing activities	-15325	-17998	-30207	-38868	-29596
Increase (decrease) in short-term loans	1062	-1123	1288	-3654	-
Proceeds from short-term bills payable	-	266	-	-	-
Repayments of short-term bills payable	-	-267	-	-	-
Proceeds from issuance of bonds	-	8424	13168	6472	2799
Repayment of bonds	-1166	-1132	-94	-144	-591
Proceeds from long-term bank loans	-	71	55	87	80
Payments for transaction costs attributable to the issuance of bonds	-	-14	-27	-14	-
Repayments of long-term bank loans	-	-	-	-5	-57
Repayment of the principal portion of lease liabilities	-98	-93	-72	-79	-93
Interest paid	-120	-63	-138	-399	-567
Decrease in obligations under finance leases	-	-	-	-	-3
Guarantee deposits received	2	5	17	9	8
Guarantee deposits refunded	-23	-1	-1	-2	-
Cash dividends	-8661	-9227	-9599	-9309	-9528
Disposal of ownership interests in subsidiaries (without losing control)	-	-	341	-	1
Increase (decrease) in guarantee deposits	-	-	-	-	912
Donation from shareholders	0	0	0	0	-12
Treasury stock acquired	-	-	-	-28	-
Decrease in non-controlling interests	-	-	-4	-	361
Increase (decrease) in non-controlling interests	-3	-	-	531	-
Net cash generated by (used in) financing activities	-9006	-3153	4934	-6535	-6692
Effect of exchange rate changes on cash & cash equivalents	-304	-836	-274	1906	-272
Net increase (decrease) in cash & cash equivalents	-4089	7287	14621	9067	-
Cash & cash equivalents, beginning of year	19300	16205	23843	34758	43860
Cash & cash equivalents, end of year	15211	23492	38464	43825	47865
Cash flows from (used in) operating activities	-	-	-	-	40566

Taiwan Semiconductor Manufacturing Company  
Forecasted Cash Flow Statement

<b>Fiscal Years Ending Dec. 31</b>	<b>2024E</b>	<b>2025E</b>	<b>2026E</b>	<b>2027E</b>	<b>2028E</b>	<b>2029E</b>	<b>2030E</b>	<b>2031E</b>	<b>2032E</b>	<b>2033E</b>
<b>Operating Activities</b>										
Net Income	29642	40565	55563	74342	96260	120812	142487	157460	173730	191726
	<i>Adjustments:</i>									
Depreciation	19141	21351	23667	26116	28725	31519	34524	37768	41278	45082
Amortization	292	302	315	331	350	372	397	425	457	493
Change in Deferred income Taxes	-1069	-1463	-2004	-2681	-3472	-4358	-5139	-5679	-6266	-6915
<i>Changes in Non-Cash Working capital :</i>										
Change in Accounts Receivables	-1830	-2458	-3294	-4070	-4732	-5303	-4798	-3536	-3852	-4259
Change in Inventory	-2247	-3011	-4025	-4956	-5738	-6402	-5747	-4178	-4536	-5002
Change in other current assets	-235	-314	-420	-517	-599	-669	-600	-436	-474	-522
Change in accounts payable	499	668	894	1100	1274	1421	1276	928	1007	1110
Change in receivables from other parties	-5	-7	-10	-12	-14	-16	-14	-10	-11	-12
Change in accrued expenses & other liabilities	2656	3559	4757	5858	6782	7568	6793	4938	5362	5912
Change in Salary & Bonus Payable	297	398	532	655	759	847	760	552	600	661
Change in income taxes payable	3532	2492	3422	4285	5001	5602	4946	3416	3712	4106
Change in other non-current liabilities	1597	2140	2860	3521	4077	4549	4084	2969	3223	3554
Change in Payables to contractors & equipment suppliers	262	528	575	627	683	745	812	885	964	1051
Change in Payables to related parties	14	19	25	31	36	40	36	26	28	31
Change in Accrued profit sharing bonus to employees & compensation to directors	454	609	814	1002	1160	1294	1162	844	917	1011
<b>Total Operating Cash Flow</b>	<b>53000</b>	<b>65377</b>	<b>83672</b>	<b>105631</b>	<b>130552</b>	<b>158020</b>	<b>180977</b>	<b>196372</b>	<b>216139</b>	<b>238027</b>
<b>Investing activities</b>										
Change in Financial assets at fair value through other comprehensive income	-29	-30	-31	-32	-34	-35	-37	-38	-40	-42
Change in Financial assets at amortized cost	-110	-114	-119	-124	-130	-135	-141	-147	-153	-160
Change in Investments accounted for using equity method	-265	-355	-475	-585	-677	-755	-678	-493	-535	-590
CAPEX	-30700	-33463	-36475	-39757	-43336	-47236	-51487	-56121	-61172	-66677
Change in Right-of-use assets	-152	-160	-169	-180	-193	-207	-224	-242	-262	-285
Change in Intangible assets	-190	-214	-239	-265	-293	-323	-355	-389	-426	-466
Change in Refundable deposits	-63	-84	-113	-139	-161	-180	-161	-117	-127	-140
Change in Other noncurrent assets	-90	-120	-161	-198	-229	-255	-229	-167	-181	-200
Change in Net defined benefit liability	-30	-27	-24	-22	-20	-18	-16	-14	-13	-12
Change in Guarantee deposits	-30	0	0	0	0	0	0	0	0	0
Change in Short term investments	-290	-302	-314	-327	-340	-353	-367	-382	-397	-413
Change in other financial assets	-243	-326	-435	-536	-621	-693	-622	-452	-491	-541
<b>Change in Total Investing Cash Flows</b>	<b>-24583</b>	<b>-35195</b>	<b>-38555</b>	<b>-42165</b>	<b>-46031</b>	<b>-50190</b>	<b>-54317</b>	<b>-58562</b>	<b>-63797</b>	<b>-69525</b>
<b>Financing activities</b>										
Change in Long term debt	10057	4707	5185	5749	6387	7093	7731	8281	9013	9826
Change in Other equity (deficiency) attributable to shareholders of the parent	-75	0	0	0	0	0	0	0	0	0
Change in Non-controlling interests	293	337	388	446	513	590	678	780	897	1032
Change in Cash dividends payable	-2869	602	404	454	511	321	343	367	393	421
Change in Hedging financial liabilities	-893	0	0	0	0	0	0	0	0	0
Change in Financial liabilities at fair value through profit or loss	9.8	-3.8	1.4	-2.7	0.9	1.1	-0.6	0.0	-0.3	0.2
Change in Short term loans	0	0	0	0	0	0	0	0	0	0
Change in operating lease liabilities	143	117	124	132	141	152	164	178	192	209
Change in common stock	358	-252	49	52	-51	17	6	-9	4	0
total dividends paid	-12962	-14578	-16395	-18441	-19723	-21096	-22564	-24136	-25818	-27618
Share Repurchases	-609	-612	-615	-618	-621	-624	-627	-631	-634	-637
Change in Long-term liabilities - current portion	1664	1828	1637	-1712	-2413	1599	497	-1575	-919	4614
<b>Total Financing Cash Flows</b>	<b>-4883</b>	<b>-7854</b>	<b>-9222</b>	<b>-13941</b>	<b>-15255</b>	<b>-11948</b>	<b>-13772</b>	<b>-16746</b>	<b>-16871</b>	<b>-12154</b>
Change in Cash	23535	22328	35895	49525	69265	95882	112888	121064	135471	156348
Beginning Cash	47865	63792	86120	122014	171540	240805	336687	449575	570639	706110
Ending Cash	63792	86120	122014	171540	240805	336687	449575	570639	706110	862458

Taiwan Semiconductor Manufacturing Company  
Common Size Income Statement

Fiscal Years Ending Dec. 31	2020	2021	2022	2023	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
<b>Net revenue</b>	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
COGS	22.13%	21.76%	21.13%	21.02%	27.60%	27.60%	27.60%	27.60%	27.60%	27.60%	27.60%	27.60%	27.60%	27.60%
Depreciation	24.23%	26.09%	18.93%	24.19%	19.12%	19.12%	19.12%	19.12%	19.12%	19.12%	19.12%	19.12%	19.12%	19.12%
Amortization	0.54%	0.52%	0.39%	0.43%	0.33%	0.26%	0.21%	0.17%	0.14%	0.12%	0.11%	0.11%	0.11%	0.11%
<b>Gross profit</b>	<b>53.10%</b>	<b>51.63%</b>	<b>59.56%</b>	<b>54.36%</b>	<b>51.12%</b>	<b>53.98%</b>	<b>56.68%</b>	<b>58.89%</b>	<b>60.56%</b>	<b>61.82%</b>	<b>62.46%</b>	<b>62.55%</b>	<b>62.63%</b>	<b>62.71%</b>
Research & development	8.18%	7.86%	7.21%	8.44%	8.50%	8.50%	8.50%	8.50%	8.50%	8.50%	8.50%	8.50%	8.50%	8.50%
General & administrative	2.13%	2.33%	2.36%	2.82%	2.82%	2.82%	2.82%	2.82%	2.82%	2.82%	2.82%	2.82%	2.82%	2.82%
Marketing	0.53%	0.48%	0.44%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%	0.49%
Total operating expenses	10.83%	10.66%	10.01%	11.74%	11.81%	11.81%	11.81%	11.81%	11.81%	11.81%	11.81%	11.81%	11.81%	11.81%
Other operating income & (expenses), net	0.05%	0.02%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Income from operations</b>	<b>42.32%</b>	<b>40.95%</b>	<b>49.53%</b>	<b>42.63%</b>	<b>39.32%</b>	<b>42.18%</b>	<b>44.88%</b>	<b>47.08%</b>	<b>48.76%</b>	<b>50.01%</b>	<b>50.66%</b>	<b>50.74%</b>	<b>50.82%</b>	<b>50.91%</b>
<b>NON-OPERATING INCOME AND EXPENSES</b>														
Share of profits of associates	0.27%	0.35%	0.35%	0.22%	0.33%	0.29%	0.26%	0.23%	0.21%	0.20%	0.20%	0.20%	0.21%	0.22%
Interest income	0.67%	0.36%	0.99%	2.79%	0.84%	0.65%	0.50%	0.39%	0.31%	0.25%	0.22%	0.20%	0.18%	0.16%
Other income	0.05%	0.06%	0.04%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
Foreign exchange gain (loss), net	0.25%	0.86%	0.20%	-0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Interest Expense	0.16%	0.34%	-0.52%	-0.56%	0.50%	0.52%	0.45%	0.39%	0.34%	0.31%	0.30%	0.30%	0.30%	0.30%
Other gains & (losses), net	0.79%	-0.43%	-0.04%	0.36%	0.09%	0.07%	0.05%	0.04%	0.03%	0.03%	0.02%	0.02%	0.02%	0.02%
Total non-operating income & (expenses)	1.34%	0.83%	1.01%	2.67%	2.02%	1.74%	1.43%	1.19%	1.01%	0.89%	0.82%	0.80%	0.79%	0.77%
Income before income tax	43.66%	41.77%	50.54%	45.30%	41.34%	43.92%	46.30%	48.27%	49.77%	50.90%	51.48%	51.54%	51.61%	51.68%
Income tax expense (benefit)	4.98%	4.16%	5.62%	6.54%	8.39%	8.92%	9.40%	9.80%	10.10%	10.33%	10.45%	10.46%	10.48%	10.49%
<b>Net income (loss)</b>	<b>38.69%</b>	<b>37.61%</b>	<b>44.92%</b>	<b>38.75%</b>	<b>32.95%</b>	<b>35.00%</b>	<b>36.90%</b>	<b>38.47%</b>	<b>39.67%</b>	<b>40.57%</b>	<b>41.03%</b>	<b>41.08%</b>	<b>41.13%</b>	<b>41.19%</b>



Fiscal Years Ending Dec. 31	2020	2021	2022	2023	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
<b>NOPLAT:</b>														
Operating Income (EBIT)	20169	23475	36595	30098	35377	48881	67570	90986	118323	148942	175932	194493	214657	236957
Depreciation expense	11549	14959	19985	17080	19141	21351	23667	26116	28725	31519	34524	37768	41278	45082
<b>EBIT</b>	<b>8620</b>	<b>8516</b>	<b>22610</b>	<b>13018</b>	<b>16236</b>	<b>27530</b>	<b>43903</b>	<b>64870</b>	<b>89598</b>	<b>117423</b>	<b>141408</b>	<b>156725</b>	<b>173379</b>	<b>191875</b>
Income tax expense	2371	2388	4154	4819	7550	10332	14152	18935	24518	30771	36292	40106	44250	48834
Tax shield on interest expense +/-	65	42	149	400	0	0	0	0	0	0	0	0	0	0
Tax on interest or investment income -	-141	9	-142	-452	-169	-169	-169	-169	-169	-169	-169	-169	-169	-169
Tax shield on amortized goodwill	32	11	233	525	547	571	595	620	646	674	702	732	763	796
<b>Total Adjusted Taxes</b>	<b>2327</b>	<b>2448</b>	<b>4393</b>	<b>5092</b>	<b>7929</b>	<b>10734</b>	<b>14578</b>	<b>19387</b>	<b>24996</b>	<b>31276</b>	<b>36826</b>	<b>40669</b>	<b>44844</b>	<b>49460</b>
Change in Deferred Taxes	275	-845	-517	130	-1069	-1463	-2004	-2681	-3472	-4358	-5139	-5679	-6166	-6915
<b>NOPLAT</b>	<b>\$ 10,671.54</b>	<b>\$ 10,118.71</b>	<b>\$ 26,485.93</b>	<b>\$ 18,239.99</b>	<b>\$ 23,095.18</b>	<b>\$ 36,800.38</b>	<b>\$ 56,477.03</b>	<b>\$ 81,574.92</b>	<b>\$ 111,121.54</b>	<b>\$ 144,342.06</b>	<b>\$ 173,094.13</b>	<b>\$ 191,714.69</b>	<b>\$ 211,957.38</b>	<b>\$ 234,419.90</b>
<b>Invested Capital (IC):</b>														
<b>Operating Current Assets</b>														
Normal Cash	20283	24401	31447	30052	38289	49327	64081	82248	103282	126751	147820	163135	179764	198099
Accounts receivable - net	5177	7136	7498	6575	8405	10862	14156	18226	22958	28261	33059	36595	40447	44706
Inventory	4888	6974	7218	8198	10445	13456	17481	22437	28175	34577	40325	44503	49039	54041
Other current assets	235	380	421	856	1091	1405	1825	2343	2942	3610	4211	4647	5120	5643
<b>Total OCA</b>	<b>30348</b>	<b>38511</b>	<b>46163</b>	<b>44825</b>	<b>57138</b>	<b>73645</b>	<b>95718</b>	<b>122912</b>	<b>154415</b>	<b>189590</b>	<b>221204</b>	<b>244233</b>	<b>269249</b>	<b>296846</b>
<b>Operating Current Liabilities</b>														
Accounts payable	1387	1708	1791	1820	2319	2987	3881	4981	6255	7676	8952	9880	10887	11997
payables to related parties	75	52	54	51	65	84	109	140	175	215	251	277	305	336
income taxes payable	1918	2154	3943	3231	6763	9256	12678	16962	21963	27565	32511	35927	39639	43746
payables to contractors and equipment suppliers	5615	5264	6968	5600	5862	6389	6964	7591	8274	9019	9831	10716	11680	12731
salary and bonus payable	714	860	1189	1084	1381	1779	2311	2967	3725	4572	5332	5884	6484	7146
accrued expenses and other current liabilities	3120	5861	9568	9690	12346	15905	20662	26521	33903	40870	47664	52602	57964	63876
<b>Total OCL</b>	<b>12829</b>	<b>15899</b>	<b>23513</b>	<b>21476</b>	<b>28736.01</b>	<b>36400.31</b>	<b>46605.66</b>	<b>59161.61</b>	<b>73696.20</b>	<b>89917.97</b>	<b>104540.45</b>	<b>115285.92</b>	<b>126959.32</b>	<b>139831.68</b>
<b>Net PPE</b>	<b>55355</b>	<b>71334</b>	<b>87918</b>	<b>100094</b>	<b>111653</b>	<b>123765</b>	<b>136572</b>	<b>150213</b>	<b>164824</b>	<b>180541</b>	<b>197503</b>	<b>215856</b>	<b>235750</b>	<b>257345</b>
Net Other Operating Assets														
net intangible assets	917	969	849	744	641	552	476	410	353	304	262	226	195	168
PI of operating leases	987	1182	1368	1320	1472	1632	1801	1981	2174	2391	2606	2847	3108	3394
<b>Total LT Operating Assets</b>	<b>1904</b>	<b>2151</b>	<b>2217</b>	<b>2064</b>	<b>2113</b>	<b>2184</b>	<b>2277</b>	<b>2391</b>	<b>2527</b>	<b>2685</b>	<b>2867</b>	<b>3073</b>	<b>3304</b>	<b>3562</b>
Less: LT Operating Liabilities														
net defined benefit	424	399	304	302	272	245	220	198	178	160	144	130	117	105
<b>Total LT Operating Liabilities</b>	<b>424</b>	<b>399</b>	<b>304</b>	<b>302</b>	<b>272</b>	<b>245</b>	<b>220</b>	<b>198</b>	<b>178</b>	<b>160</b>	<b>144</b>	<b>130</b>	<b>117</b>	<b>105</b>
<b>Invested Capital (IC):</b>	<b>74354</b>	<b>95698</b>	<b>112481</b>	<b>125205</b>	<b>141897</b>	<b>162950</b>	<b>187741</b>	<b>216156</b>	<b>247891</b>	<b>282737</b>	<b>316889</b>	<b>347746</b>	<b>381226</b>	<b>417815</b>
<b>Free Cash Flow (FCF):</b>														
NOPLAT	\$ 10,672	\$ 10,119	\$ 26,486	\$ 18,240	\$ 23,095	\$ 36,800	\$ 56,477	\$ 81,575	\$ 111,122	\$ 144,342	\$ 173,094	\$ 191,715	\$ 211,957	\$ 234,420
Change in IC	29,585	21,344	16,783	13,724	16,693	21,053	24,792	28,415	31,735	34,846	36,157	37,857	39,481	36,589
<b>FCF</b>	<b>\$ (19,013.37)</b>	<b>\$ (11,225.10)</b>	<b>\$ 9,703.33</b>	<b>\$ 5,516.15</b>	<b>\$ 6,402.83</b>	<b>\$ 15,747.87</b>	<b>\$ 31,685.31</b>	<b>\$ 53,160.03</b>	<b>\$ 79,386.78</b>	<b>\$ 109,495.88</b>	<b>\$ 138,942.26</b>	<b>\$ 160,858.09</b>	<b>\$ 178,476.68</b>	<b>\$ 197,830.89</b>
<b>Return on Invested Capital (ROIC):</b>														
NOPLAT	\$ 10,671.54	\$ 10,118.71	\$ 26,485.93	\$ 18,239.99	\$ 23,095.18	\$ 36,800.38	\$ 56,477.03	\$ 81,574.92	\$ 111,121.54	\$ 144,342.06	\$ 173,094.13	\$ 191,714.69	\$ 211,957.38	\$ 234,419.90
Beginning IC	44,676	74,354	95,698	112,481	125,205	141,897	162,950	187,741	216,156	247,891	282,737	316,889	347,746	381,226
<b>ROIC</b>	<b>23.89%</b>	<b>13.61%</b>	<b>27.68%</b>	<b>16.22%</b>	<b>18.45%</b>	<b>25.93%</b>	<b>34.66%</b>	<b>43.45%</b>	<b>51.41%</b>	<b>58.23%</b>	<b>61.22%</b>	<b>60.50%</b>	<b>60.95%</b>	<b>61.49%</b>
<b>Economic Profit (EP):</b>														
Beginning IC	44670	74354	95698	112481	125205	141897	162950	187741	216156	247891	282737	316889	347746	381226
x (ROIC - WACC)	11.2%	1.0%	15.0%	3.6%	5.8%	13.3%	22.0%	30.8%	38.8%	45.6%	48.6%	47.9%	48.3%	48.9%
<b>EP</b>	<b>5025.1</b>	<b>720.0</b>	<b>14389.3</b>	<b>4022.0</b>	<b>7268.8</b>	<b>18864.1</b>	<b>35879.6</b>	<b>57843.7</b>	<b>83798.6</b>	<b>113007.7</b>	<b>137355.1</b>	<b>151658.8</b>	<b>168001.1</b>	<b>186231.5</b>

**Taiwan Semiconductor Manufacturing Company**  
*Weighted Average Cost of Capital (WACC) Estimation*

**Cost of Equity:**

Risk-Free Rate	4.243%
Beta	1.65
Equity Risk Premium	5.26%
<b>Cost of Equity</b>	<b>12.92%</b>

**ASSUMPTIONS:**

10-year Treasury Bond rate  
*Beta (5Y Monthly)*  
[https://finbox.com/NYSE:TSM/explorer/country\\_equity\\_ris](https://finbox.com/NYSE:TSM/explorer/country_equity_ris)

**Cost of Debt:**

Risk-Free Rate	4.243%
Implied Default Premium	0.48%
Pre-Tax Cost of Debt	4.72%
Marginal Tax Rate	20%
<b>After-Tax Cost of Debt</b>	<b>3.76%</b>

10-year Treasury Bond rate  
 Corporate Bond YTM

**Market Value of Common Equity:**

Total Shares Outstanding	5,190,000,000
Current Stock Price	\$189.72
<b>MV of Equity</b>	<b>984,646,800,000.00</b>

**MV Weights**

96.93%

**Market Value of Debt:**

Short-Term Debt	
Current Portion of LTD	30,297,000,000
PV of Operating Leases	937,000,000
<b>MV of Total Debt</b>	<b>31,234,000,000.00</b>

3.07%

**Market Value of the Firm**

**1,015,880,800,000.00**

100.00%

**Estimated WACC**

**12.64%**

Discounted Cash Flow (DCF) and Economic Profit (EP) Valuation Models

Key Inputs:	
CV Growth of NOPLAT	2.50%
CV Year ROIC	61.49%
WACC	12.64%
Cost of Equity	12.92%

Fiscal Years Ending Dec. 31	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
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<b>DCF Model:</b>	
Free Cash Flow (FCF)	6402.8 15747.9 31685.3 53160.0 79386.8 109495.9 138942.3 160858.1 178476.7 197830.9
Continuing Value (CV)	2217763.0
PV of FCF	5684.3 12411.8 22170.5 33022.4 43780.2 53608.5 60391.5 62071.3 61141.4 759746.5
Value of Operating Assets:	1,114,028.41
Non-Operating Adjustments	
excess cash	9576.4
Operating lease liabilities	-937.0
notes payable	-1820.0
long-term liabilities	-304.0
Refundable Deposits	230.0
Marketable securities	7258.0
Other financial assets	887.0
Financial assets at fair value through OCI	674.0
Financial assets at amortized cost	2587.0
Investments accounted for using equity method	967.0
Other noncurrent assets	327.0
Cash dividends payable	-5506.0
Long Term Debt	-40050.0
Value of Equity	1,087,918
Shares Outstanding	5,186
Intrinsic Value of Last FYE	\$ 209.76
<b>Implied Price as of Today</b>	<b>\$ 231.30</b>

<b>EP Model:</b>	
Economic Profit (EP)	7268.8 18864.1 35879.6 57843.7 83798.6 113007.7 137355.1 151658.8 168001.1 186231.5
Continuing Value (CV)	1836536.7
PV of EP	6453.1 14867.8 25105.3 35931.9 46213.3 55327.9 59701.7 58521.5 57552.7 629148.6
Total PV of EP	988823.7
Invested Capital (last FYE)	125204.7
Value of Operating Assets:	1,114,028.41
Non-Operating Adjustments	
excess cash	9576.4
Operating lease liabilities	-937.0
notes payable	-1820.0
long-term liabilities	-304.0
Refundable Deposits	230.0
Marketable securities	7258.0
Other financial assets	887.0
Financial assets at fair value through OCI	674.0
Financial assets at amortized cost	2587.0
Investments accounted for using equity method	967.0
Other noncurrent asset	327.0
Cash dividends payable	-5506.0
Long Term Debt	-40050.0
Value of Equity	1,087,918
Shares Outstanding	5,186
Intrinsic Value of Last FYE	\$ 209.76
<b>Implied Price as of Today</b>	<b>\$ 231.30</b>





## Taiwan Semiconductor Manufacturing Company

### Relative Valuation Models

Ticker	Company	Price	EPS		P/E 24	P/E 25
			2024E	2025E		
6857.T	Advantest corporation	\$57.68	\$0.58	\$1.12	99.45	51.50
3711 TT	ASE Technology Holding Co Ltd	\$4.82	\$0.23	\$0.34	20.96	14.18
6146 JP	Disco Corp	\$281.48	\$5.35	\$7.31	52.61	38.51
3443-	Global Unichip Corp	\$38.72	\$0.82	\$1.09	47.22	35.52
6488-	GlobalWafers Co.	\$13.17	\$0.96	\$1.14	13.72	11.55
8035-JP	Tokyo Electron Ltd.	\$147.90	\$5.40	\$6.88	27.39	21.50
6920-JP	Lasertec Corp	\$129.05	\$4.39	\$5.68	29.40	22.72
2303-	United Microelectronics Corp.	\$1.44	\$0.13	\$0.13	11.08	11.08
Average					<b>37.73</b>	<b>25.82</b>
TSM	Taiwan Semiconductor Manufacturing Company	\$189.72	\$5.72	\$7.83	33.2	24.2

### Implied Relative Value:

P/E (EPS24) \$ 215.69

P/E (EPS25) \$ 202.12

Taiwan Semiconductor Manufacturing Company  
Key Management Ratios

Fiscal Years Ending Dec. 31	2020	2021	2022	2023	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
<b>Liquidity Ratios:</b>														
Current Ratio (Current Assets/Current Liabilities)	1.77	2.17	2.17	2.40	2.61	2.63	2.80	3.15	3.60	3.97	4.46	5.09	5.68	6.04
Quick Ratio ((Cash + Accounts Receivable)/Current Lia)	1.31	1.71	1.67	1.82	2.04	2.10	2.30	2.65	3.09	3.48	3.98	4.61	5.19	5.57
Cash Ratio (Cash/Current Liabilities)	1.07	1.44	1.42	1.60	1.80	1.87	2.06	2.40	2.82	3.21	3.70	4.33	4.91	5.30
<b>Asset-Management Ratios:</b>														
Days Sales Turnover (Accounts Receivable/Revenue)*:	39.65	45.43	37.04	33.99	34.10	34.21	34.32	34.43	34.53	34.64	34.74	34.85	34.95	35.06
Total Asset Turnover (Net Sales/Total Assets)	0.49	0.43	0.46	0.39	0.42	0.45	0.47	0.49	0.49	0.47	0.45	0.41	0.38	0.36
Accounts Receivable Turnover (Net Sales/Accounts Re	9.21	8.03	9.85	10.74	10.70	10.67	10.64	10.60	10.57	10.54	10.51	10.47	10.44	10.41
<b>Financial Leverage Ratios:</b>														
Debt-to-Equity (Total Liabilities/Total Equity)	0.50	0.72	0.69	0.59	0.65	0.65	0.63	0.58	0.52	0.47	0.42	0.37	0.33	0.31
Debt-to-Assets Ratio (Total Liabilities/Total Assets)	0.33	0.42	0.40	0.37	0.39	0.40	0.39	0.37	0.34	0.32	0.30	0.27	0.25	0.24
Debt-to-Capital (Total Debt/(Total Debt + Total Equity)	0.31	0.28	0.24	0.21	0.23	0.22	0.20	0.18	0.16	0.14	0.12	0.11	0.10	0.09
<b>Profitability Ratios:</b>														
Return on Equity (NI/Beg TSE)	34.16%	32.98%	42.79%	28.82%	26.05%	31.10%	35.64%	38.15%	38.40%	36.94%	33.39%	28.80%	25.54%	23.15%
Net Income Margin	38.69%	37.61%	44.92%	38.75%	32.95%	35.00%	36.90%	38.47%	39.67%	40.57%	41.03%	41.08%	41.13%	41.19%
Return on Assets (NI/Total Assets)	18.77%	16.03%	20.48%	15.14%	13.80%	15.73%	17.47%	18.79%	19.39%	19.26%	18.36%	16.91%	15.74%	14.73%
<b>Payout Policy Ratios:</b>														
Dividend Payout Ratio (Dividend/EPS)	0.50	0.47	0.28	0.38	0.44	0.36	0.30	0.25	0.20	0.17	0.16	0.15	0.15	0.14
Total Payout Ratio ((Divs. + Repurchases)/NI)	174.32	134.52	78.86	86.34	71.83	47.38	31.22	21.07	14.69	10.57	0.04	0.04	0.03	0.03

Sensitivity Tables

		Risk Free Rate						
		1.24%	2.24%	3.24%	4.24%	5.24%	6.24%	7.24%
Beta	#REF!							
	1.50	415.52	348.32	297.23	257.22	225.14	198.93	177.17
	1.55	395.86	333.55	285.76	248.09	217.72	192.80	172.03
	1.60	377.69	319.76	274.99	239.46	210.68	186.95	167.12
	1.65	360.86	306.88	264.85	231.30	203.98	181.38	162.42
	1.70	345.21	294.81	255.29	223.56	197.61	176.06	157.91
	1.75	330.65	283.49	246.26	216.22	191.54	170.97	153.59
	1.80	317.05	272.85	237.73	209.25	185.76	166.10	149.45

		Equity risk premium						
		4.00%	4.50%	4.75%	5.26%	5.50%	5.75%	6%
Marginal Tax Rate	#REF!							
	17.30%	299.84	264.82	249.68	222.73	211.59	200.88	190.99
	18.30%	303.52	268.12	252.82	225.59	214.33	203.50	193.50
	19.30%	307.19	271.42	255.96	228.44	217.06	206.12	196.02
	20.30%	310.87	274.73	259.11	231.30	219.80	208.75	198.53
	21.30%	314.54	278.03	262.25	234.16	222.54	211.37	201.05
	22.30%	318.22	281.34	265.40	237.01	225.28	214.00	203.57
	23.30%	321.90	284.65	268.55	239.87	228.02	216.62	206.09

		WACC						
		12.04%	12.24%	12.44%	12.64%	12.84%	13.04%	13.24%
CV growth of NOPLAT	#REF!							
	1.00%	231.98	225.77	219.80	214.06	208.54	203.22	198.10
	1.50%	238.17	231.62	225.33	219.29	213.49	207.91	202.54
	2.00%	244.98	238.04	231.39	225.01	218.90	213.02	207.38
	2.50%	252.50	245.12	238.06	231.30	224.83	218.62	212.67
	3.00%	260.85	252.96	245.43	238.24	231.36	224.78	218.48
	3.50%	270.18	261.70	253.63	245.93	238.59	231.58	224.88
	4.00%	280.67	271.50	262.80	254.52	246.64	239.13	231.97

		Depreciation Rate						
		16.1%	17.1%	18.1%	19.1%	20.1%	21.1%	22.1%
Amortization Rate	#REF!							
	7.84%	239.05	236.27	233.68	231.27	229.02	226.92	224.95
	9.84%	239.06	236.28	233.69	231.28	229.03	226.93	224.96
	11.84%	239.07	236.29	233.70	231.29	229.04	226.94	224.97
	13.84%	239.08	236.30	233.71	231.30	229.05	226.95	224.98
	15.84%	239.09	236.31	233.72	231.31	229.06	226.96	224.99
	17.84%	239.09	236.31	233.72	231.31	229.06	226.96	225.00
	19.84%	239.10	236.32	233.73	231.32	229.07	226.97	225.00

		2025 Cost of R&D as % of Revenue						
		7.00%	7.50%	8.00%	8.50%	9.00%	9.50%	10.00%
2025 Cogs as % of revenue	#REF!							
	24.6%	262.04	258.63	255.21	251.79	248.38	244.96	241.55
	25.6%	255.21	251.79	248.38	244.96	241.55	238.13	234.71
	26.6%	248.38	244.96	241.55	238.13	234.71	231.30	227.88
	27.6%	241.55	238.13	234.71	231.30	227.88	224.47	221.05
	28.6%	234.71	231.30	227.88	224.47	221.05	217.63	214.22
	29.6%	227.88	224.47	221.05	217.63	214.22	210.80	207.39
	30.6%	221.05	217.63	214.22	210.80	207.39	203.97	200.55

		CAPEX growth %						
		6.00%	7.00%	8.00%	9.00%	10.00%	11.00%	12.00%
CoGS growth %	#REF!							
	24.60%	267.92	262.80	257.42	251.79	245.89	239.72	233.24
	25.60%	261.09	255.96	250.59	244.96	239.06	232.88	226.41
	26.60%	254.26	249.13	243.76	238.13	232.23	226.05	219.58
	27.60%	247.43	242.30	236.93	231.30	225.40	219.22	212.75
	28.60%	240.59	235.47	230.10	224.47	218.57	212.39	205.91
	29.60%	233.76	228.64	223.26	217.63	211.74	205.56	199.08
	30.60%	226.93	221.80	216.43	210.80	204.90	198.72	192.25