UC San Diego Student Foundation Investment Committee

ASML Holding NV

ASML | $684.47 | 11/25/2024

Outperform | Target price: $850

Initiation of Coverage

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Is the Litho Era Over?

Recent: ASML reported (by accident) Q3 earnings on 10/15, slightly missing consensus on revenue (€7.47bn vs. €7.9bn). The stock traded down ~20% due to misses on Q3 bookings (€2.6bn vs. consensus of €5.39bn) and 2025 net sales guidance (€30-€35bn vs. consensus €35bn).

Our Take: While future outlook is concerning with China curbs, fab pushouts, and technological implications, we believe ASML is still well-positioned to outperform in the long run given:

1) Their continued monopolistic status within lithography (80%+ in DUV and 100% in EUV).
2) Strong customer relationships with the leading-edge fabs (TSMC, Intel, Samsung)
3) Exposure to structural tailwinds within the semiconductor industry (AI/5G/Cloud, etc.)
4) Continued innovation through the roll-out of high-NA EUV (released in 2023) and hyper-NA EUV (expected by 2030)

Investment Thesis: Given the most recent drawdown, we believe the market is most notably pricing in a slowdown of China stockpiling (reverting to ~20% of sales) and continued struggles at Intel/Samsung, both of which contributing to lagging order flow vs. consensus expectations.

To an extent, these are both valid concerns; however, we strongly believe they are not sufficient enough to warrant a re-pricing of ASML to be more in-line with its semi-cap peers.

Led by an incredibly seasoned management team that tends to understate guidance, the recent market movement should be looked at nothing more than an overreaction.

ASML's EUV technology remains mission-critical to the manufacturing of leading-edge chips and the company continues to prove time and time again the returns on their R&D. We are long term buyers with a minimum time horizon of 3-5 years.

Company Statistics

52-Week Range	$645.45 - $1,110.09
Market Capitalization	$263,080
Enterprise Value	$255,390
Dividend Yield	1.03%
Net Cash/Share	$14.11
Shares Outstanding (in mm)	393.6

Earnings Summary

	2023	2024E	2025E
Revenue	$29,792	$30,940	$36,493
EBITDA	$10,647	$11,084	$13,110
NOPAT	$8,257	$8,669	$10,255
EV/Revenue	8.6x	8.3x	7.0x
EV/EBITDA	24.0x	23.0x	19.5x
EV/NOPAT	30.9x	29.5x	24.9x

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Business Overview

Business Model: ASML operates as a semiconductor capital (semi-cap) equipment provider, specializing in the design, manufacture, and sale of lithography systems. Put simply, lithography systems print complex semiconductor designs using light at a level of precision that can get as small as the nanometer scale (one-billionth of a meter). This has required 20+ years of R&D, which provides ASML high barriers to entry within its space and a historical premium vs. its semi-cap peers.

Semiconductor devices range in complexity with the most advanced products requiring highly specialized manufacturing processes that can only be performed by a select number of companies, namely: TSMC, Intel, and Samsung. As such, these companies are ASML's primary customers, who then use these systems in their manufacturing process of semiconductors (either for themselves or on behalf of their customers). Therefore, ASML is highly exposed to both the headwinds and tailwinds of the semiconductor industry as a derivative within the supply chain.

Key Products: ASML's products can be broken down into two primary categories: Extreme Ultraviolet (EUV) and Deep Ultraviolet (DUV).

Extreme ultraviolet systems use light with a much shorter wavelength (13.5 nm) to precisely print designs onto wafers for more advanced manufacturing processes. These systems have smaller throughput, but incredible capabilities when scaled down to the highest performing semiconductor chips, such as those sold by Nvidia or AMD.

Deep ultraviolet systems use light with a longer wavelength (193nm) to precisely (still precise, but not as precise as EUV) print designs onto wafers for less advanced manufacturing processes. These systems have higher throughput and are typically used in high-volume manufacturing of commodity-like chips, such as those sold by Texas Instruments or NXPI.

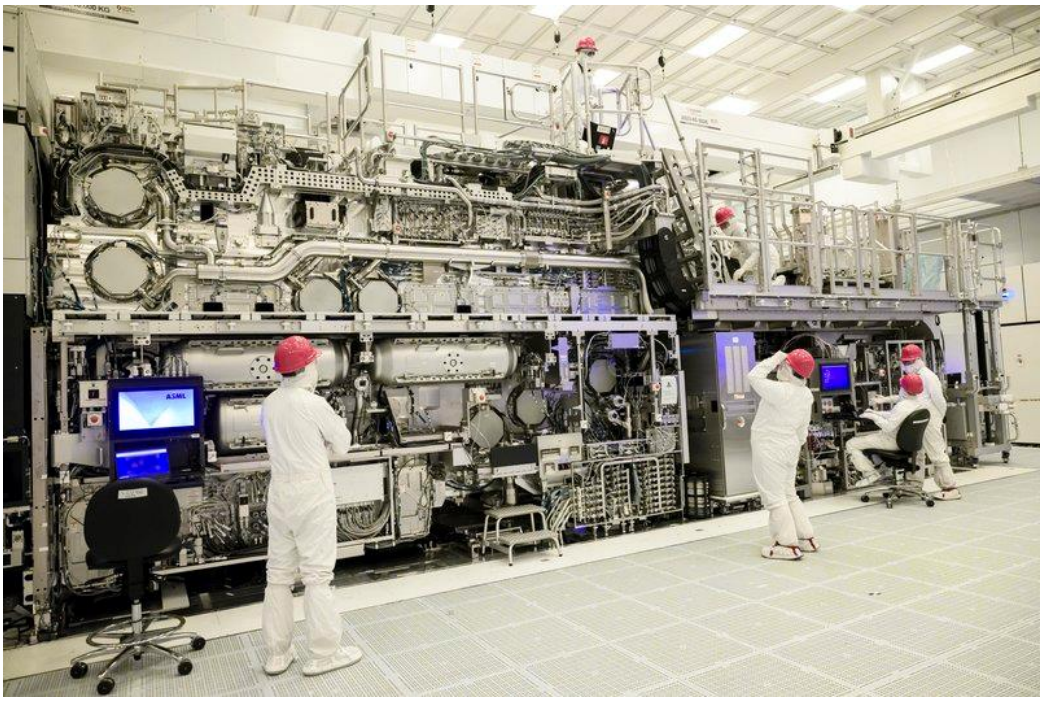


Figure 1: ASML's EXE: 5000 High-NA EUV, Source: Data Center Dynamics

Business Overview

Other Sources of Revenue: Outside of system sales, the company also provides software and servicing solutions to their customer base. Both revenue streams could be considered recurring (in some cases) and pretty sticky given customers are usually combining these services with their purchasing of ASML's hardware. Therefore, the company has done well in growing this business line over the years at around 25% of revenue currently. Below is historical data on sales as well as our base case projections within these segments.

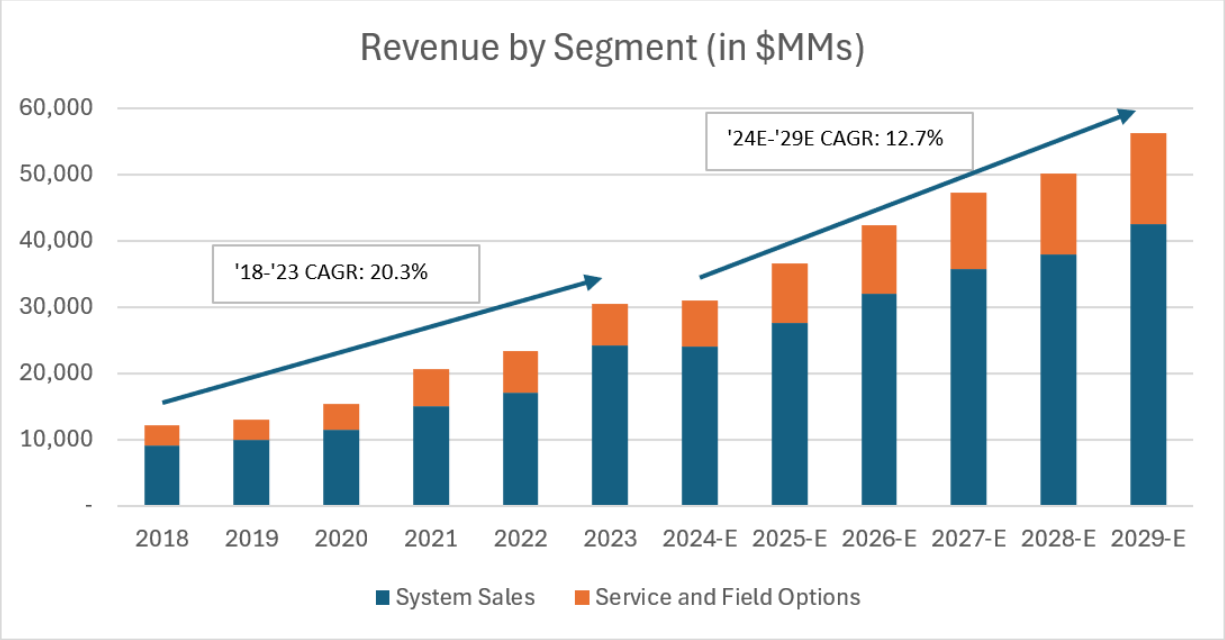


Figure 2: ASML's Revenue Segments, Source: Company Reports and UCSD SFIC

Business Overview

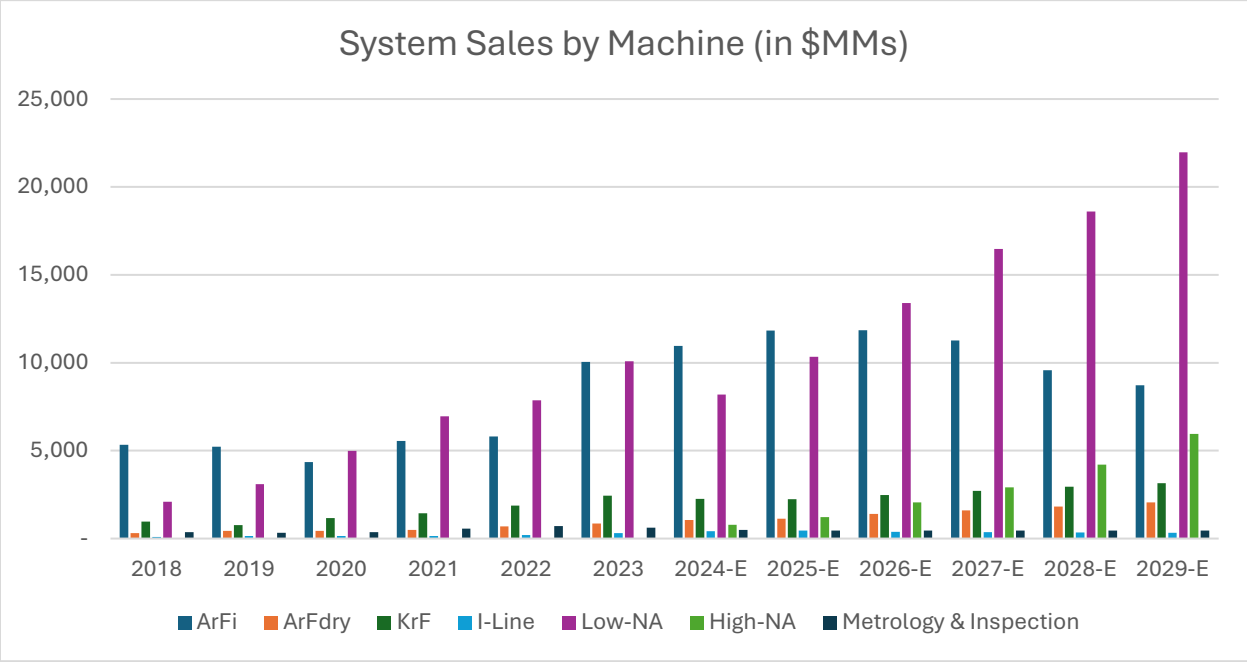


Figure 3: ASML's System Sales by Machine, Source: Company Reports and UCSD SFIC

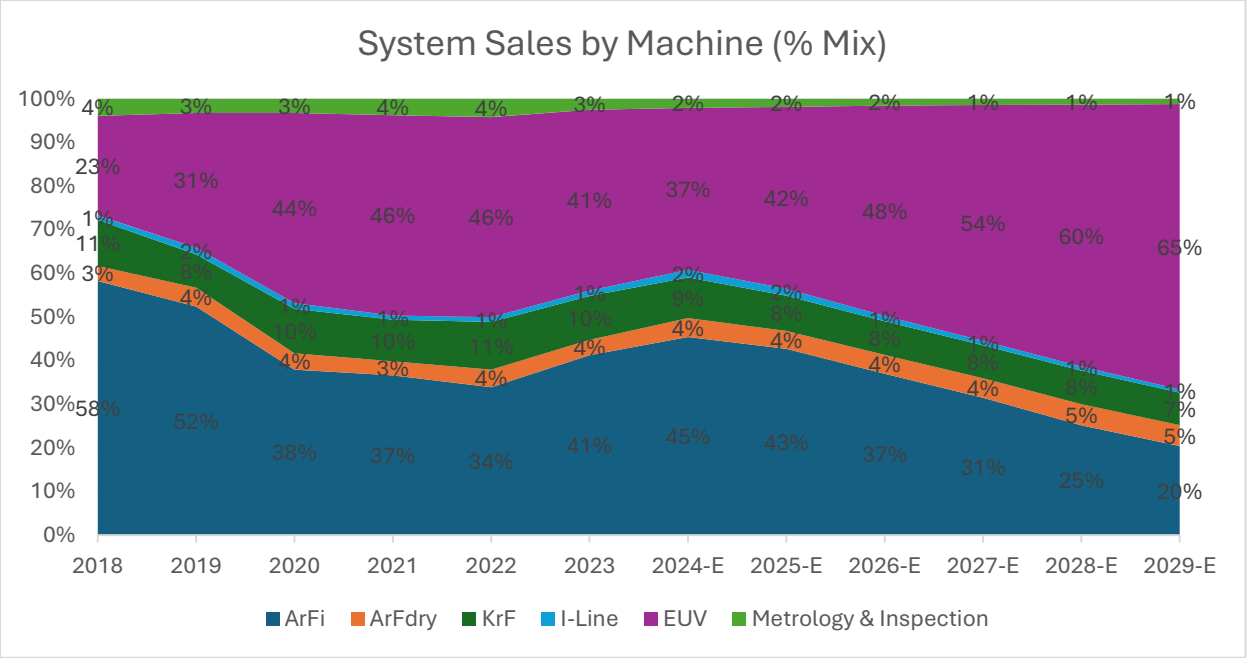


Figure 4: ASML's System Sales by Machine Mix, Source: Company Reports and UCSD SFIC

Business Overview

Pricing: Given ASML's near 90% market share of the lithography market, the company benefits from significant pricing power, providing it an attractive margin profile vs. its semi-cap peers (figure 5). In terms of ASPs, these machines can range widely in the millions of dollars (figures 6 and 7) and based on the level of complexity, ASML can leverage even higher prices. For example, their newest EUV machine (High-NA) that is currently in the rolling out process comes at a price tag over $350 million.

However, this advantage serves as a double-edged sword as customers are aware of ASML's incredibly narrow opportunity set. Recently, TSMC has been able to negotiate lower prices on their orders of high-NA EUV. While this may be concerning if other customers follow suit, it is important to note that fairly negotiating prices is mutually beneficial for both ASML and their customers. If ASML's business model fails, then their customers are left out to dry with no substitutes.

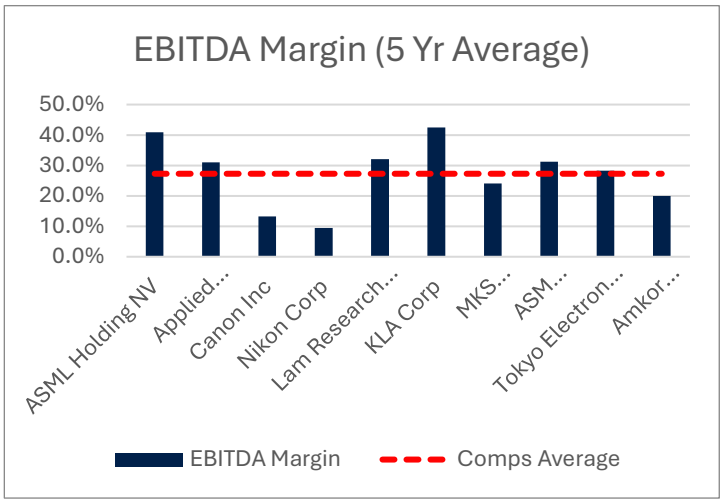


Figure 5: ASML EBITDA Margin vs. Comps, Source: Refinitiv

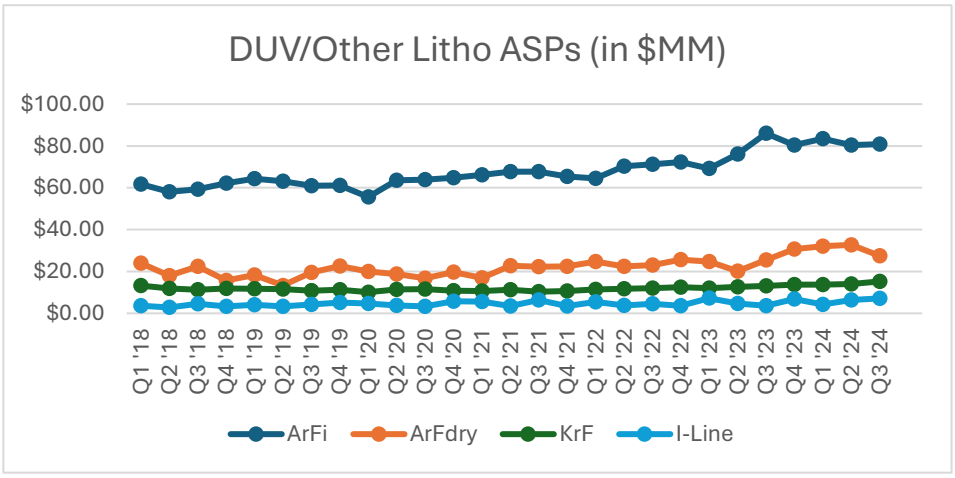


Figure 6: DUV/Other Litho ASPs, Source: Company Reports and UCSD SFIC

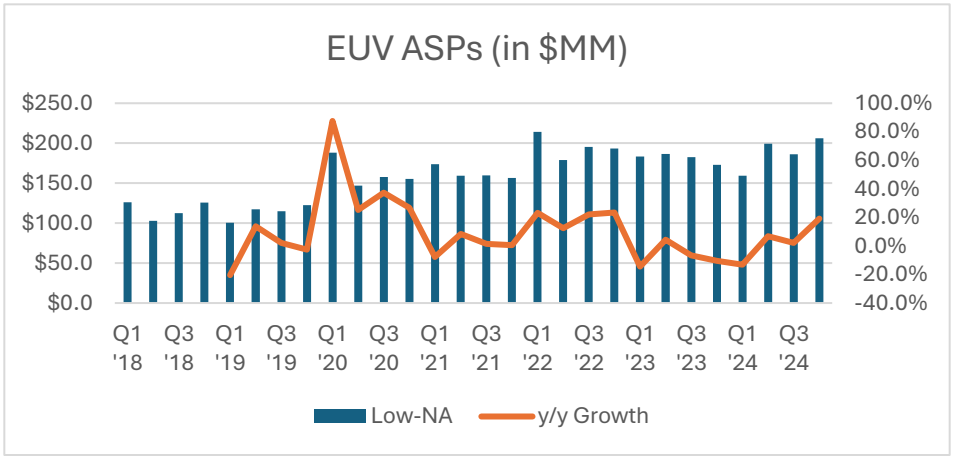
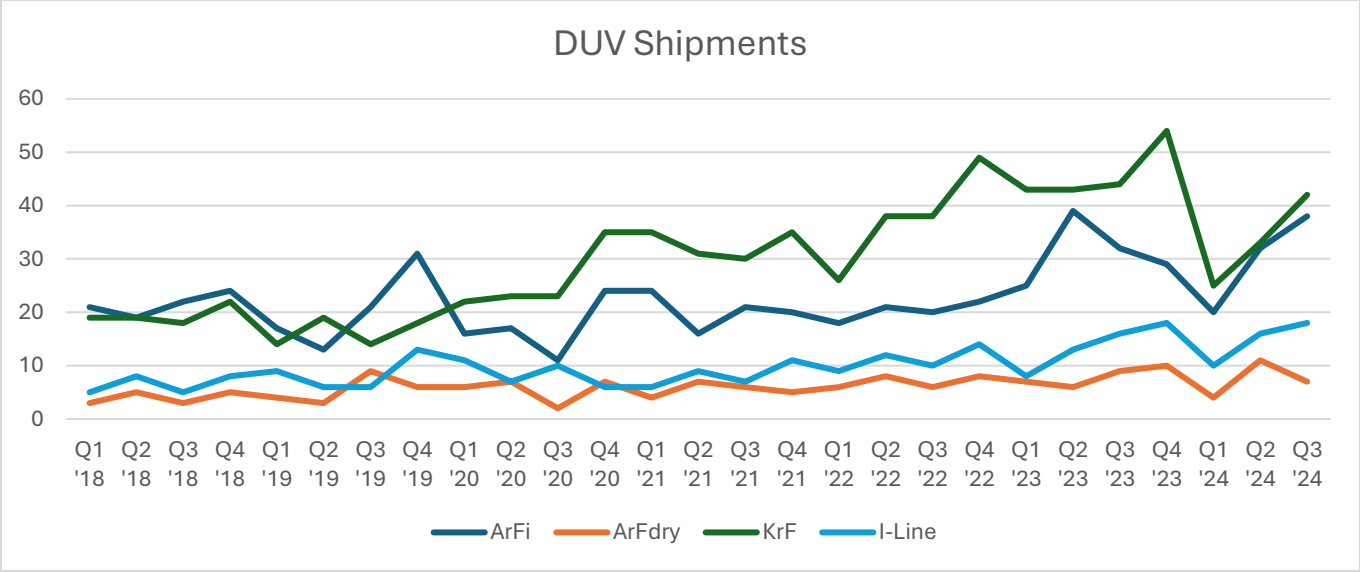


Figure 7: EUV ASPs, Source: Company Reports and UCSD SFIC

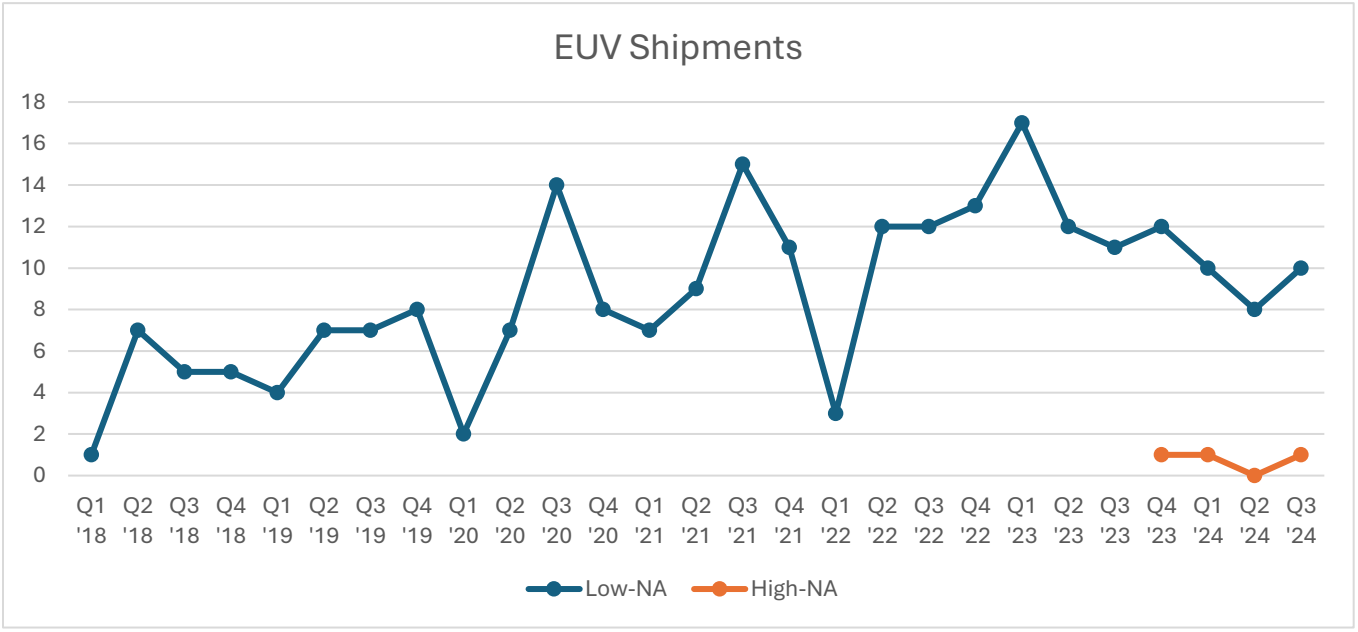
Business Overview

Volume: In any given year, ASML sells more DUV systems than EUV, which is a direct consequence of the economics of their customers. High volume manufacturers don't need the most advanced equipment to produce the chips they need; however, they do need a lot of capacity.

Recognition of Revenue: While the company gives information on quarterly shipments, this is not the same as final revenue recognition so there are discrepancies between revenue and unit shipments at times. Instead, the company formally recognizes revenue once the item has been shipped and "accepted" by the customer. More specifically, the customer may at times, make specific moderations and customizations to the product in collaboration with ASML. Then, they will formally "accept" the machine and it is implemented into their production process. The timing of this is case-by-case.



Figures 8 and 9: DUV and EUV Shipments, Source: Company Reports



Business Overview

Product Descriptions - DUV Machines

ArFi (Argon Fluoride Immersion): Water is placed (or immersed) between the lens on the machine and the wafer (material used to manufacture semiconductors), to increase resolution and enable printing finer features used for more complex designs (CPUs, GPUs, etc.).

ArFdry (Argon Fluoride Dry): Similar to ArFi; however, there is no water (hence, dry) placed between the lens and wafer. Therefore, it is not capable of producing fine features and is more commonly used for less advanced chips.

KrF (Krypton Fluoride): A krypton fluoride laser is used to print features onto a wafer, although, even less precise as ArFdry.

I-Line (Mercury Vapor Lamp): Mercury vapor lamp emits light to print features onto a wafer but is the least precise out of the bunch.

Product Descriptions - EUV Machines

Low-NA: Using a 13.5nm wavelength beam of EUV light, incredibly complex designs are etched onto wafers, which are eventually turned into highly advanced chips such as Nvidia's H100.

High-NA: Similar to the low-NA, high-NA also uses a 13.5nm wavelength beam of EUV light, except the numerical aperture (NA) is adjusted higher to increase resolution even more. ASML has only sold three of these machines since it's debut in 2023; however, this is expected to change in the future as chip designs require more and more precise light sources.

There is a direct negative relationship between average selling prices and wavelength/precision (figure 10).

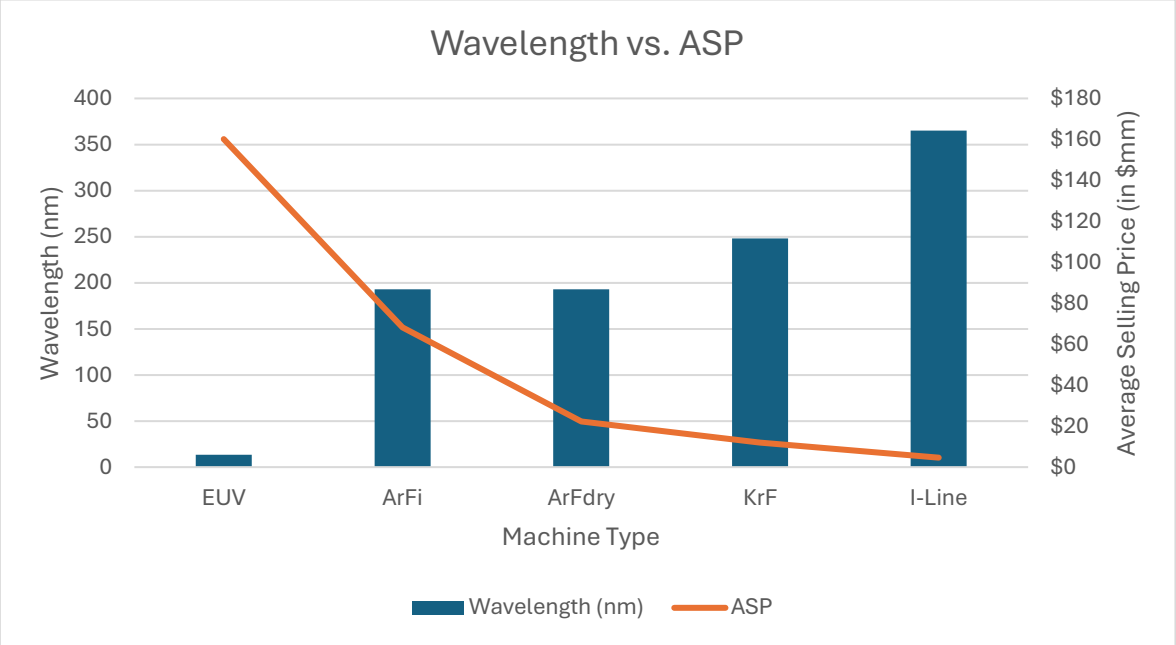


Figure 10: Wavelength and average selling price, Source: Company Reports

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Business Overview

Leadership Team:

Christophe Fouquet (CEO) – Christophe joined ASML in 2008 and has held various management positions in marketing and product management both at ASML as well as semi-cap peers KLA and Applied Materials. He holds a master's degree in physics from the Institut Polytechnique de Grenoble. He became CEO in 2024, following the retirement of ASML's old CEO, Peter Wennick. His membership on the Board of Management expires in 2028.

Roger Dassen (CFO) – Roger joined ASML in 2018, coming from a background in accounting at Deloitte. He holds a master's degree in economics and business administration, a post-master's degree in auditing, and a PhD in business and economics from the University of Maastricht. His membership on the Board of Management expires in 2026.

Frederic Schneirder-Maunoury (EVP and COO) – Frederic joined ASML in 2009 as Executive Vice President and COO in 2009. He previously worked at a French industrial and transport group called Alstrom and holds degrees from Ecole Polytechnique and Ecole Nationale Superieure des Mines in Paris. His membership on the Board of Management expires in 2026.

Wayne Allan (EVP and Chief Strategy Sourcing & Procurement Officer) – Wayne Joined ASML in 2018 as EVP of Customer Support, bringing experience from his time at Micron, where he spent over 8 years in various management roles. He holds a degree in chemical engineering from the College of Idaho. His membership on the Board of Management expires in 2027.

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Business Overview

Management Compensation: Management compensation is largely performance/variable based (~75% of total) that considers various short-term and long-term incentives (STIs and LTIs). Some factors that influence these include: ESG initiatives, product roadmap success, financial metrics/growth, etc. Below is a compensation table that highlights renumeration for the various Board of Management from the fiscal year end 2023.

Management Compensation

ASML Holdings NV

$ in 000s

Board of Management	Financial Year	Base Salary	Pension	Other Benefits	Total Fixed	*% Fixed*	STI	LTI	Total Variable	*% Variable*	Total Renumeration
P.T.F.M Wennick	**2023**	1,123	268	66	1,457	*22.7%*	1,512	3,447	4,959	*77.3%*	6,416
	2022	1,102	222	63	1,387	*30.0%*	1,038	2,198	3,236	*70.0%*	4,622
	2021	1,102	222	62	1,386	*26.6%*	1,186	2,634	3,820	*73.4%*	5,206
M.A. van den Brink	**2023**	1,123	268	64	1,455	*22.7%*	1,512	3,447	4,959	*77.3%*	6,414
	2022	1,102	222	62	1,386	*30.0%*	1,038	2,198	3,236	*70.0%*	4,621
	2021	1,102	222	60	1,385	*26.6%*	1,186	2,634	3,820	*73.4%*	5,205
F.J.M. Schneider-Maunoury	**2023**	783	160	49	991	*25.7%*	954	1,915	2,868	*74.3%*	3,860
	2022	750	152	39	941	*30.6%*	669	1,462	2,131	*69.4%*	3,072
	2021	750	124	39	913	*26.8%*	807	1,691	2,498	*73.2%*	3,411
R.J.M Dassen	**2023**	783	131	60	974	*25.4%*	954	1,915	2,868	*74.6%*	3,843
	2022	750	125	55	930	*30.4%*	669	1,462	2,131	*69.6%*	3,061
	2021	750	124	55	929	*22.6%*	807	2,368	3,175	*77.4%*	4,104
C.D. Fouquet	**2023**	783	89	60	932	*24.5%*	954	1,915	2,868	*75.5%*	3,801
	2022	750	84	57	891	*29.5%*	669	1,462	2,131	*70.5%*	3,022
	2021	750	84	56	890	*26.3%*	807	1,691	2,498	*73.7%*	3,388
W.R. Allan	**2023**	531	89	41	661	*29.6%*	647	929	1,576	*70.4%*	2,237
Total Board of Management	2023	5,127	1,003	340	6,470	*24.4%*	6,532	13,568	20,100	*75.6%*	26,570
	2022	4,452	807	275	5,534	*30.1%*	4,081	8,783	12,864	*69.9%*	18,398
	2021	4,452	778	272	5,502	*25.8%*	4,792	11,019	15,811	*74.2%*	21,313

Business Overview

Supply Chain: ASML's supply chain is highly complex with about 90% of its manufacturing costs being outsourced to other firms. However, given the relationship between revenue growth and COGS growth, we firmly believe that ASML holds strong supplier power given the scale of its business (figure 11).

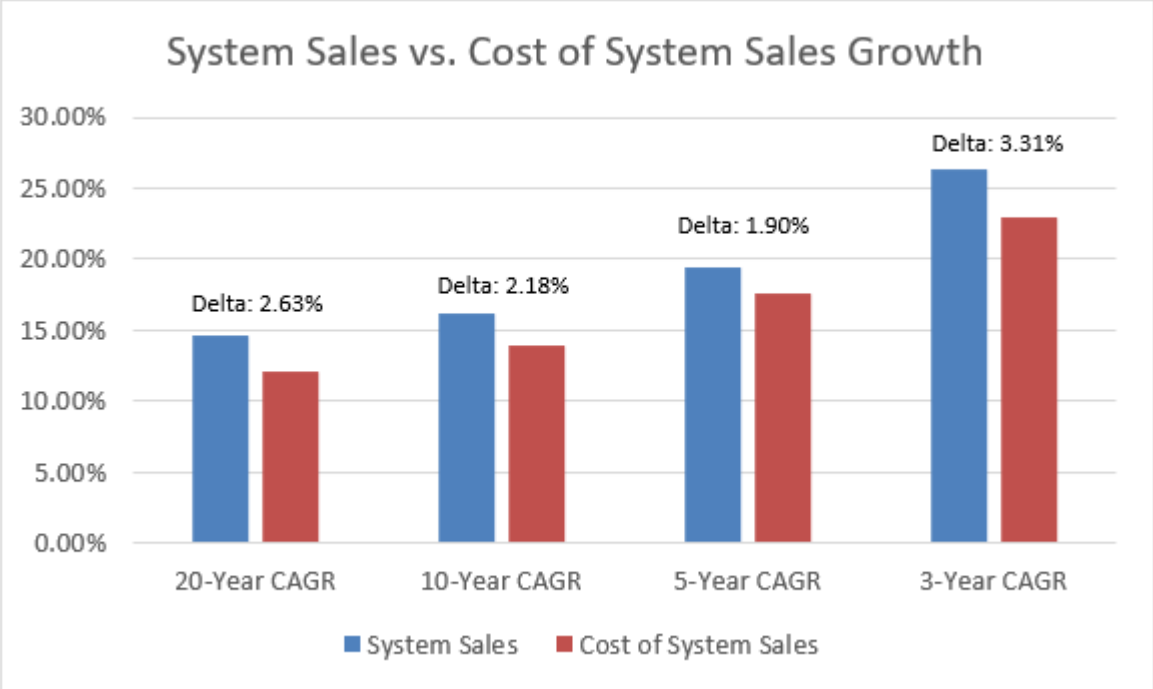


Figure 11: System Sales and COGS, Source: Company Reports

Business Overview

Raw Materials: Tin, tungsten, tantalum, and gold are essential elements used within lithography systems, especially ASML's EUV product line. Tiny droplets of tin are vaporized using powerful lenses to generate EUV light. Tungsten and tantalum are useful because of their incredibly strength and high melting point, making them resilient to extreme conditions inside the machine. Lastly, gold plays an important role because of its conductivity and resistance to corrosion. These four elements are considered "conflict minerals", given the involvement of armed groups with the mining of the minerals in specific places such as the Republic of Congo. However, ASML is committed to their conflict-free minerals policy, so through their due diligence program and the OECD guidelines, they ensure the mining and trading of these minerals does not contribute to conditions of armed conflict and serious human rights abuses. Additionally, ASML uses high purity silicon and fused silica for their precise lenses and mirrors, as well as rare Earth elements like lanthanum and cerium for optical coating and glass formulations. Lastly, the company's machines feature high grade metals such as stainless steel, aluminum, and titanium for structural parts of the machine.

Some of their key suppliers include:

Carl Zeiss AG: Carl Zeiss is one of the most important partners for ASML given their advanced optical components like mirrors and precision lenses that are essential in the performance of ASML's DUV and EUV lithography systems. As such, Carl Zeiss has even made products specifically for ASML such as the Starlith Projection optics and the Synchrotron Illumination systems. The lithography process is all about precision and therefore, Carl Zeiss' products play a key role in the advancements ASML makes in the space, which is why they are the sole supplier of optics for the firm.

TRUMPF Group: The TRUMPF Group supplies ASML with high-power laser systems that are used in their EUV products. These include industrial CO2 lasers and laser amplifier systems that boost the power of initial laser pulses specifically for EUVs. The company is not the sole supplier of these products; however, they are the primarily supplier for ASML given their systems are custom-built for ASML products.

Cymer LLC (Internal Supplier): Cymer provides light sources for both DUV and EUV systems. Its XLR series of lasers provides high performance and energy efficient laser systems for DUVs (ArF and KrF). Its EUV NL Series provides laser-produced plasma light sources for both low and high NA EUVs. The firm was acquired by ASML in 2013 and continues to act as the primary supplier for light sources.

Rockwell Automation: Given the size and complexity of ASML's machines, Rockwell provides automation tools that work within a variety of ASML's systems. These products include their Allen-Bradley ControlLogix and the Kinetix Servo Drives and Motors, which are both highly efficient programmable automation controllers (PACs) for complex machine control and machine control.

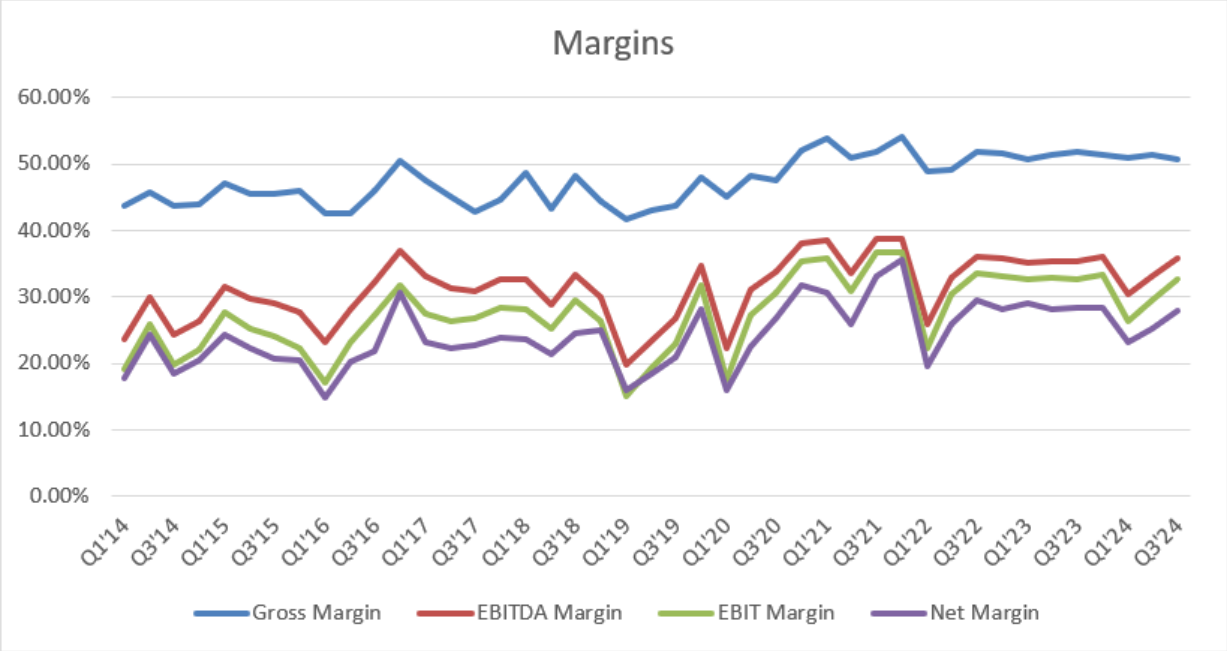
MKS Instruments: MKS provides components for vacuum and has management systems, which prevents contamination and helps stability and precision of tin droplets. Its product portfolio such as Baratron Capacitance Manometers, helps in precise pressure management devices and the GM50A which helps in precise gas flow regulation. MKS is not the sole supplier; however, primary one for ASML.

Gigaphoton Inc.: Gigaphoton supplies one of the most important parts for a DUV machine – the Excimer Laser Light sources. This includes their GT64A, a high output KrF laser for advanced lithography, the GT66A, am ArF specific designed laser for critical laser processing, and finally the GT40A which is a cost-effective KrF laser for volume production. Gigaphoton is not the sole supplier of these lasers as ASML also relies internally on Cymer for Excimer lasers.

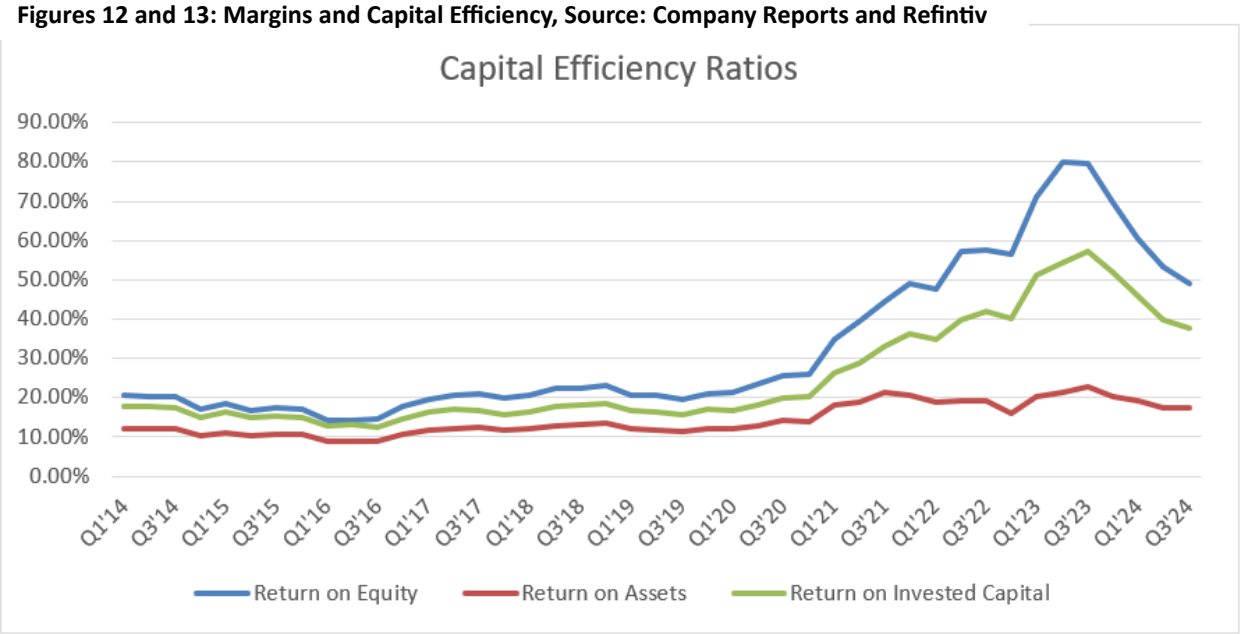
Edwards Vacuum: Edwards Vacuum provides vacuum pump systems, which are very important for creating the necessary environment inside the machines. Its NEXT Turbomolecular pumps and the GXS Dry Screw Pumps offer high reliability and are low maintenance too. Edwards specially designed its STOP-iXA4506 turbo pumps to be magnetically levitated for semiconductor applications. Therefore, they have turned into a primary supplied for ASML.

Business Overview

Margins: As a result of both pricing and supplier power, ASML's gross margins have expanded a significant amount over time (figure 12). Interestingly, other margins follow the same trend, although at a much choppier pace for a variety of reasons given the capital intensity and cyclicality of the business. Additionally, the company's exhibited incredible capital efficiency growth over the last two years, which we believe is due to the successful and highly profitable scaling of their low NA business line. As such, the more recent declines aren't as concerning to us, given the capital deployment the company is currently doing to scale high NA, just as they did with low NA. Management has cited this as well to contributing to lower margins in the near term, which we plan to look out for and adjust our models to moving forward.



Figures 12 and 13: Margins and Capital Efficiency, Source: Company Reports and Refintiv



Business Overview

Capital Allocation Strategy: Given the capital intensity of their business model, ASML must be incredibly strategic with its allocation. This means balancing shareholders' expectations, providing sufficient funds for R&D to keep pace with the rest of the industry, investing in their supply chain/capacity, and acquiring other companies in the space for strategic and technological reasons. Below is a graphic from ASML's recent Investor Day 2024 that summarizes their plans for capital allocation; however, it is worth noting that the company's dividends are nothing spectacular and fall pretty in-line with the rest of their peers. Our thesis is not exactly built on the hopes for further allocation of capital back to shareholders (ie. Dividends and share buybacks), but rather the fundamental drivers of the business. However, given management's positive commentary on this topic, these factors would only serve as more upside to the stock.

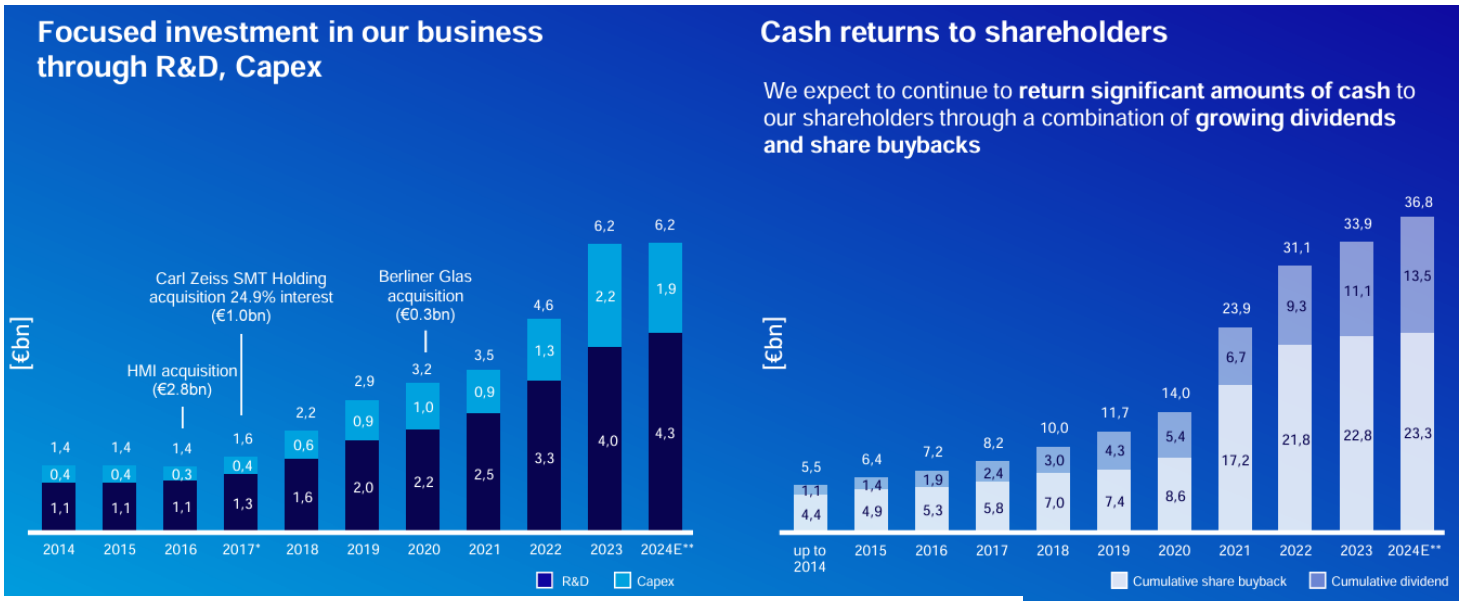


Figure 14: Capital Allocation, Source: Company Reports

Industry Overview

Breakdown: The broader semiconductor industry can be broken up into the following segments:

- **Fabless:** Design and market semiconductors; however, outsource the manufacturing process
- **Foundry:** Solely focus on manufacturing semiconductors on behalf of their customers (usually fabless companies), essentially acting as contract manufacturers. Production facilities are referred to as “fabs”.
- **Integrated Device Manufacturer (IDM):** Design, market, and manufacture semiconductors.
- **Semiconductor-Capital Equipment (Semi-cap):** Provide equipment to foundries and IDMs that support the manufacturing process of semiconductors
- **Electronic Design Automation (EDA):** Provide software and simulation tools to IDMs and fabless companies that support the design process of semiconductors

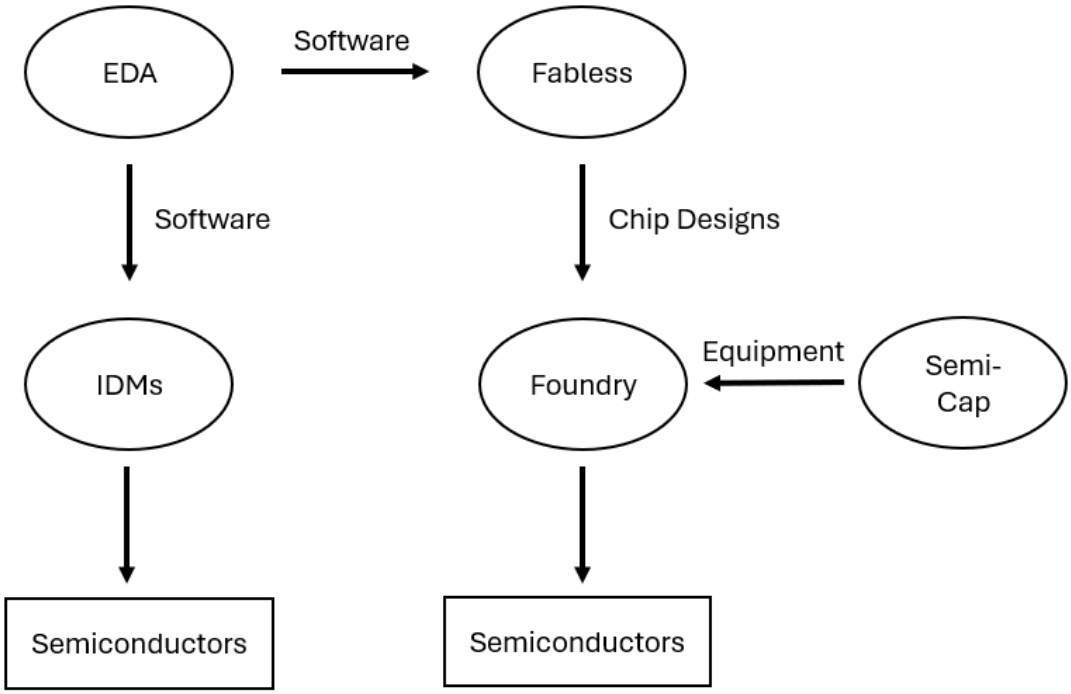


Figure 15: Semiconductor Industry Diagram, Source: UCSD SFIC

Industry Overview

Major Players: As shown below (figure 16), the industry is highly fragmented with few key players dominating specific segments of the market…

- **NVIDIA:** #1 in graphics and leading innovator in the AI hardware buildout story that is currently unfolding.
- **AMD:** Second in line behind Nvidia in graphics and quickly building up its AI portfolio. Also, holds a notable position in the CPU market.
- **TSMC:** The world's largest foundry for key customers such as Apple, Nvidia, and AMD.
- **Intel:** Mainly focused on CPUs; however, has a diverse product portfolio and sophisticated foundry capabilities.
- **Broadcom:** Creates chips for various communication devices, such as Wi-Fi, but also provides custom chip designing for big tech firms like Microsoft and Google within their respective AI portfolios.

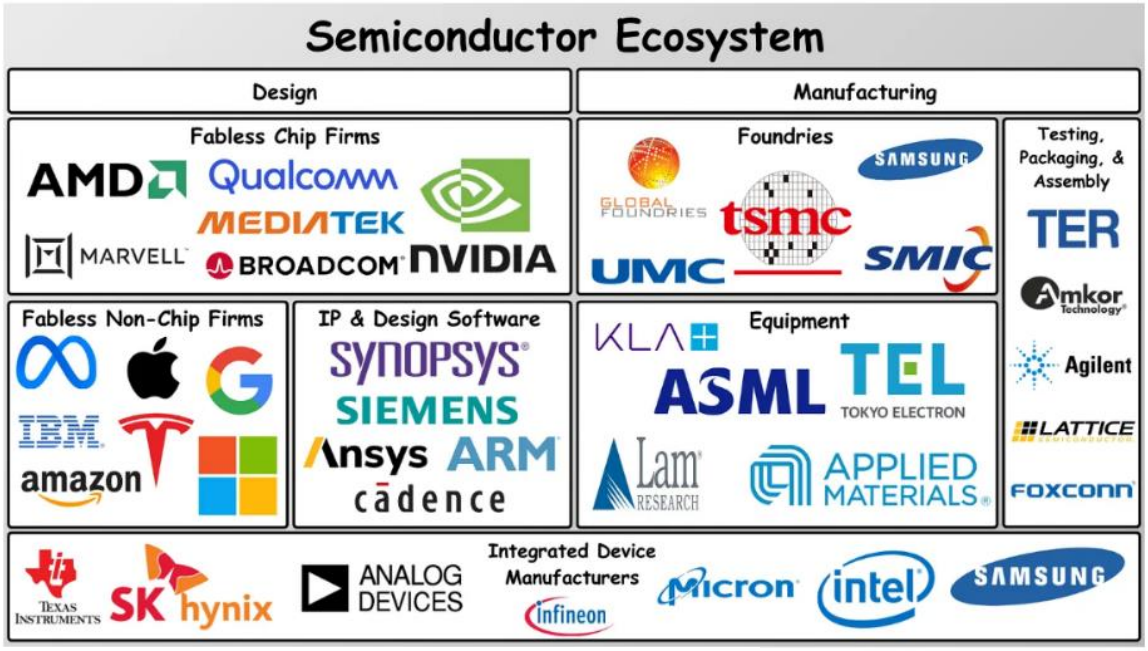


Figure 16: Semiconductor Ecosystem, Source: Generative Value

Industry Overview

Key Trends: The semiconductor industry's cyclicality is marked by low troughs and high peaks, with each of these cycles being driven by technological, geopolitical, and economic trends. Below are some that are currently top-of-mind for many investors…

1) **Artificial Intelligence**
2) **Sovereignty of Technology**
3) **Shift to Smaller Process Nodes**
4) **Rise of Semiconductor Content in Various End Markets**
5) **Consolidation**

Artificial Intelligence

Widely covered across many information channels, artificial intelligence (AI) has taken the world (and market) by storm since the release of OpenAI's ChatGPT in November 2022. This has been a lucrative opportunity for many semiconductor firms to deliver hardware solutions for large technology companies building out their AI infrastructure. Nvidia, AMD, and Broadcom (including many others), have taken significant shares of CapEx from the likes of Google, Microsoft, and Amazon, given their products' superior performance to their peers. ASML's lithography systems (namely low-NA EUV) are essential to the manufacturing process of chips used in AI applications, given their highly complex designs that require extreme precision.

Sovereignty of Technology

Starting in late-2022, the U.S. government began implementing various restrictions on semiconductors/semiconductor capital equipment available to the Chinese market from firms within the U.S., such as Nvidia and AMD (including ASML since their machines include U.S. components). In late-2023, the Biden administration expanded these even further. Consequently, China has stockpiled both semiconductors and semiconductor capital equipment in an effort to strengthen their technological outlook going forward. On the other side of things, the U.S. has exerted lots of effort on its own through the passing of the CHIPS and Science Act in August 2022, which expands semiconductor research and manufacturing footprint within the U.S. through ~$53bn in direct subsidies and tax credits.

Shift to Smaller Process Nodes

Moore's Law (originated by Intel's founder, Gordan Moore) is the observation that the number of transistors (computing power) in an integrated circuit (chip) doubles every two years. Process nodes refer to the complexity of the manufacturing process in which a chip is being constructed with, the lower the more advanced. We are currently at "3nm" with TSMC's N3 and Samsung's 3GAA. While the industry has strayed away from Moore's law in recent years, the demand for more shrink continues to dominate over the supply of solutions. However, key semi-cap companies, such as ASML have provided an ample pathway to smaller nodes with their cutting-edge lithography systems.

Rise of Semiconductor Content in Various End Markets

As evident from the various chip shortages that occurred during the COVID-19 pandemic, the world is becoming more and more reliant on technology in our everyday lives. Nowadays, semiconductors can be found in a variety of products ranging from household appliances to automobiles. This trend has only continued with the amount of semiconductor content increasing from both a unit and dollar perspective. Semiconductor companies that

take advantage of these tailwinds through innovative solutions tailored to specific applications will reap the rewards; however, the ecosystem as a whole (EDA, foundry, and semi-caps) should look to benefit as well.

Consolidation

As tailwinds of the industry drive competition higher, semiconductor companies have turned towards consolidation to better focus resources and share technological advantages. Some notable deals within the last 10 years include:

- Avago's acquisition of Broadcom for $37bn in 2015, creating the powerhouse that is Broadcom today.
- Infineon's purchases of International Rectifier (2015 - $3bn) and Cypress Semiconductor (2020 - $10bn), which have significantly strengthened their automotive and IoT positioning over time.
- Analog Devices' acquisitions of Linear Technology (2016 - $14.8bn) and Maxim Integrated (2021 - $20bn), which have built up their power management and mixed-signal capabilities.
- AMD's ~$50bn acquisition of Xilinx, giving AMD more exposure to adaptive computing and high-performance FPGA chips.
- Intel's $5.4bn acquisition of Tower Semiconductor in 2022, a strategic transition to focus more on building out their foundry services.
- NVIDIA's ~$7bn acquisition of Mellanox Technologies in 2019, allowing them to offer high performance networking solutions (to be used in their upcoming cycle of Blackwell products in the GB200 NVL72)

Looking into the Future: Heading into 2024, most of the Street anticipated a recovery in a variety of end markets, namely industrial and auto who both have struggled as a result of inventory glut. However, this story has yet to materialize as many companies exposed to these markets (mostly analog/mixed-signal semiconductor companies) are still enduring these challenges.

On the other hand, AI-exposed names have enjoyed continued accelerated growth as infrastructure buildouts continue to demand more and more semiconductor and semiconductor-related hardware. NVIDIA and AMD supply accelerators (processors), which serve as the backbone of computing for training and inferencing on AI models. Many big technology firms are aiming to insource their own processors and are relying on Broadcom and Marvel to get this done. Both of these companies also play a huge role in supplying key networking equipment.

How this Affects ASML: In ASML's recent earnings call on 10/16, management noted that cyclical weakness in markets such as auto/industrial have served as a continued drag on the business, which we believe should be a genuine concern. DUV machines are used to manufacture chips for these applications and they continue to make up around 35-40% of system sales. Therefore, a drag on production due to inventory glut and weak market dynamics has led to lower rates of utilization, which further pushes back repair/recycle/upgrade cycles (where ASML derives its revenue). Good news is… ASML's moat within EUV has allowed for a partial offset of this cyclical weakness as AI-related end markets have taken off.

Competitive Landscape

Introduction: The semi-cap industry follows an oligopoly market structure, with high technological and economic barriers to entry. These companies all compete to sell their software, manufacturing tools, and services to foundries across the complexity spectrum (the leading edge being the most complex/high-end and lagging edge being the least complex/low-end). As such, they all share similar risks, whether it be geopolitical or industry specific. Before we breakdown ASML's peers, it's important to have a solid understanding of the key steps within the semiconductor manufacturing process:

1) **Material Preparation:** Pure silicon is extracted and formed into ingots, which are then sliced in thin circles, also called wafers.
2) **Wafer Cleaning:** From there, wafers are cleaned to remove any impurities or particles. As these devices rely on incredibly precise circuitry and electromagnetic elements, any sort of disruption can ruin the product's abilities, so this step is repeated throughout the entire manufacturing process.
3) **Photolithography:** A light-sensitive material, called photoresist, is applied to the wafer. Then, a light is shown through a designed pattern, called a mask, onto the photoresist to transfer the pattern onto the wafer.
4) **Etching:** Based on the pattern, unwanted areas of the wafer are removed, leaving behind the desired structure.
5) **Deposition:** Thin layers of materials, such as metals or insulators, are added to the wafer to form various layers of the chip.
6) **Ion Implantation:** Specific impurities are introduced into the silicon to change its electrical properties, which creates regions of conductivity.
7) **Interconnection:** Layers of metal are added and patterned to create electrical connections between transistors.
8) **Testing and Inspection:** Chips are tested for defects and functionality throughout the process to ensure quality.
9) **Packaging:** Finished chips are cut from the wafer, encased in protective material, and fitted with electrical contacts for integration into devices.

Canon

Canon competes directly with ASML's lithography products via their offerings of I-line and KrF lithography tools (DUV). These are designed for older-generation semiconductor manufacturing processes, which emphasize cost-efficient and high-volume production. While Canon lacks ASML's technological advantage, it holds a strong position in traditional lithography, targeting cost-sensitive industries such as automotive and IoT. The company sold around 180 lithography units in 2023 and holds an approximate market share in the mid-single digits. Looking forward, the company hopes to directly compete with EUV offerings through their development of nanoimprint lithography (NIL) systems, which reportedly costs significantly less (offering most likely lower throughput however). The company has only shipped one of these systems to the Texas Institute for Electronics this past September and has yet to see commercial interest so far.

Nikon

Similar to Canon, Nikon also directly competes with ASML's lithography products but focuses more on DUV systems. It's systems appeal to mid-range and legacy semiconductor nodes, where high throughput and cost efficiency are key, maintaining relationships to manufacturers such as Intel. The company does not seem to have any plans to directly compete with ASML's EUV and, similar to Canon, holds a low single-digit market share.

Lam Research

Lam Research is a key player in etching and deposition equipment, which are essential in creating fine structures on semiconductor devices after the lithography portion of the process. While ASML's systems print and define chip patterns, Lam's tools refine and carve intricate features, making them indispensable in the post-lithography process. Lam indirectly competes with ASML by also serving clients who are investing in high-precision fabrication processes, potentially taking a share of the overall spend. However, the company primarily earns revenue from the sale of etching and deposition tools, process improvement software, spare parts, and service agreements, all of which, are not ASML's area of expertise.

KLA Corporation

KLA specializes in process control and yield management, providing inspection and metrology tools that ensure defect-free production. Its systems validate wafer quality, supporting manufacturers in achieving higher yields, which competes with ASML by delaying the need for next-generation lithography upgrades, as manufacturers can optimize nodes for improved performance. Additionally, ASML has its own inspection and metrology offerings, although an incredibly insignificant portion of their revenue is derived from this.

Applied Materials

Applied Materials provides deposition, etch, and inspection tools, specializing in material engineering and thin-film deposition. These solutions complement lithography by preparing substrates and enhancing chip functionality. By enabling advancements in chip layering and architecture, Applied Materials competes indirectly with ASML as manufacturers may prioritize using these technologies over new lithography tools.

Tokyo Electron

Tokyo Electron is a key provider of process tools, particularly in etching, deposition, and cleaning equipment. These tools refine and prepare chip layers, playing a vital role in miniaturization and feature enhancement. By offering alternatives for improving chip density without requiring additional EUV layers. Although, revenue is mostly generated from equipment sales, after-market services, and process optimization solutions. Tokyo Electron invests heavily in R&D to stay at the forefront of advanced fabrication processes, such as extreme scaling and chip stacking.

Conclusion: As you can tell, each company within the value chain has their own niches… ASML with lithography, Applied Materials with deposition/etch, KLA with process control/yield management, and the list goes on. The end goal of all of these companies is to provide tools that enable the production of high-performing semiconductors. So, while ASML does not directly compete with some of these companies from a products perspective, they indirectly compete in the sense that their goals overlap. In the end, it is up to the customers to choose how they'd like to approach the optimization of their production processes, which historically has opted to lithography winning a significant portion of the spend.

Comparable Companies Analysis

Takeaway: ASML's historical premium to peers has shrunken significantly (figure 17) and while some of this may be warranted, we feel that there is much room for a reversion to something in the middle of recent lows and historical averages. In past drawdowns (usually initiated by geopolitical headwinds), the stock has always found a way to revert back to historical ranges (figure 18) and though this time is slightly different given other headwinds, we think that the market tends to be forgiving in the long-run due to ASML's competitive advantages from their technological leadership.

Figure 17: ASML BF P/E , Source: Bloomberg

Figure 18: ASML BF EV/EBITDA, Source: Bloomberg

Comparable Companies Analysis

ASML Current Premium vs. Historicals

	Current Multiple	Current vs 5Y Average Historical Premium			
Name	FY 1 P/E	Premium (%)	Historical Avg. (%)	Difference (%)	# SD
ASML Holding NV	26.0x	*38.6%*	*71.0%*	*-32.5%*	-1.3296
Tokyo Electron Ltd	18.1x	*-3.8%*	*7.8%*	*-11.6%*	-0.8584
MKS Instruments Inc	13.8x	*-26.6%*	*-18.9%*	*-7.7%*	-0.5977
Canon Inc	13.9x	*-26.2%*	*-23.4%*	*-2.8%*	-0.1439
Lam Research Corp	18.1x	*-3.9%*	*-8.5%*	*4.6%*	0.585
Nikon Corp	21.2x	*12.7%*	*-13.9%*	*26.6%*	0.7383
ASM International NV	28.7x	*52.6%*	*33.4%*	*19.2%*	1.0153
KLA Corp	19.3x	*2.8%*	*-5.0%*	*7.8%*	1.0775
Amkor Technology Inc	13.8x	*-26.4%*	*-40.7%*	*14.3%*	1.111
Applied Materials Inc	17.4x	*-7.1%*	*-15.7%*	*8.6%*	1.3198

	Current Multiple	Current vs 5Y Average Historical Premium			
Name	FY 1 EV/EBITDA	Premium (%)	Historical Avg. (%)	Difference (%)	# SD
ASML Holding NV	21.2x	*54.7%*	*92.5%*	*-37.8%*	-1.3867
Tokyo Electron Ltd	12.3x	*-10.1%*	*-1.2%*	*-8.9%*	-0.6556
MKS Instruments Inc	11.2x	*-18.4%*	*-22.5%*	*4.1%*	0.3404
Canon Inc	9.8x	*-28.8%*	*-43.6%*	*14.8%*	1.6466
Lam Research Corp	14.6x	*6.4%*	*2.8%*	*3.7%*	0.4028
Nikon Corp	8.1x	*-40.7%*	*-63.8%*	*23.1%*	1.0527
ASM International NV	19.7x	*43.6%*	*38.8%*	*4.8%*	0.2864
KLA Corp	15.6x	*13.7%*	*5.9%*	*7.8%*	0.9345
Amkor Technology Inc	4.7x	*-65.6%*	*-69.2%*	*3.6%*	1.2779
Applied Materials Inc	14.3x	*4.5%*	*-3.3%*	*7.9%*	1.2851

ASML Current Valuation vs. Historical

		Current vs 5Y Average Historical Multiple			Implied Valuation & Upside	
Metric	Current	Historical Avg. (%)	Difference (%)	# SD	Price(USD)	Upside
BF P/E	26.0x	34.5x	*-24.5%*	-1.4	$861.46	*32.5%*
BF EV/EBITDA	21.2x	27.8x	*-23.6%*	-1.3	$850.68	*30.9%*
BF EV/EBIT	23.1x	30.4x	*-24.1%*	-1.4	$855.87	*31.7%*
BF EV/Rev	7.6x	10.0x	*-23.7%*	-1.3	$852.33	*31.1%*
LF P/BV	15.3x	20.1x	*-24.0%*	-0.7	$904.77	*39.2%*

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Comparable Companies Analysis

Name	Mkt Cap (USD)	EV	EV/EBITDA	EV/EBITDA FY1	EV/EBITDA FY2	P/E	P/E FY1	P/E FY2	P/FCF	Dividend Yield
ASML Holdings NV	260,014	259,688	26.8x	25.2x	20.8x	34.7x	32.0x	25.5x	50.5x	*1.0%*
Lam Research	89,013	87,929	17.5x	15.6x	13.4x	21.7x	19.4x	16.4x	18.7x	*1.2%*
KLA Corporation	81,894	84,090	18.4x	16.1x	15.0x	24.1x	19.9x	18.5x	26.2x	*1.0%*
MKS Instruments	7,208	11,484	13.6x	12.4x	11.3x	44.2x	16.8x	13.5x	16.7x	*0.8%*
ASM International	25,545	24,747	26.1x	24.1x	19.2x	43.8x	37.0x	27.9x	35.1x	*0.6%*
Applied Materials	138,508	135,296	16.4x	14.5x	12.9x	19.4x	17.6x	15.6x	18.6x	*0.9%*
Tokyo Electron	66,452	63,342	19.4x	13.5x	11.7x	21.5x	19.8x	17.2x	23.0x	*2.3%*
Amkor Technology	6,215	6,027	5.6x	5.7x	4.7x	17.0x	18.1x	13.4x	14.4x	*1.2%*
Canon	42,912	46,796	10.4x	10.6x	9.9x	16.3x	15.2x	13.7x	16.4x	*2.9%*
Nikon	4,283	4,060	8.5x	9.6x	7.5x	25.5x	30.0x	18.2x	25.1x	*2.9%*
Mean			**16.3x**	**14.7x**	**12.6x**	**26.8x**	**22.6x**	**18.0x**	**24.5x**	***1.5%***
Median			**16.9x**	**14.0x**	**12.3x**	**22.9x**	**19.6x**	**16.8x**	**20.8x**	***1.1%***
Median										
excl. ASML			16.4x	13.5x	11.7x	21.7x	19.4x	16.4x	18.7x	*1.2%*
excl. Nikon/Canon			18.0x	15.1x	13.2x	22.9x	19.6x	16.8x	20.8x	*1.0%*
Mean										
excl. ASML			15.1x	13.6x	11.7x	25.9x	21.5x	17.2x	21.6x	*1.5%*
excl. Nikon/Canon			18.0x	15.9x	13.6x	28.3x	22.6x	18.5x	25.4x	*1.1%*

Name	Sales Growth	EBITDA Growth	EBITDA Margin	Operating Margin	Net Income Growth	Net Margin	CapEx/Sales	ROIC	ROA	ROE
ASML Holdings NV	*-1.9%*	*-5.4%*	*34.3%*	*30.9%*	*-8.7%*	*26.5%*	*7.8%*	*40.4%*	*17.6%*	*49.4%*
Lam Research	*-1.5%*	*-0.2%*	*32.2%*	*29.8%*	*1.8%*	*26.8%*	*2.7%*	*29.6%*	*22.0%*	*50.6%*
KLA Corporation	*0.9%*	*1.0%*	*44.6%*	*40.2%*	*3.2%*	*33.6%*	*2.8%*	*36.3%*	*23.1%*	*105.2%*
MKS Instruments	*-7.1%*	*-2.3%*	*23.9%*	*13.8%*	*111.1%*	*4.6%*	*2.4%*	*5.9%*	*1.8%*	*6.8%*
ASM International	*1.1%*	*3.5%*	*32.7%*	*25.9%*	*-16.1%*	*20.1%*	*5.8%*	*16.1%*	*12.5%*	*16.7%*
Applied Materials	*2.5%*	*0.6%*	*30.8%*	*29.1%*	*5.8%*	*26.6%*	*4.4%*	*30.0%*	*22.2%*	*40.9%*
Tokyo Electron	*15.5%*	*31.6%*	*30.4%*	*27.7%*	*35.6%*	*21.7%*	*6.4%*	*27.9%*	*19.7%*	*27.9%*
Amkor Technology	*-3.3%*	*-8.5%*	*16.6%*	*7.2%*	*-10.0%*	*5.7%*	*11.5%*	*7.2%*	*5.3%*	*9.1%*
Canon	*5.4%*	*7.4%*	*15.7%*	*9.4%*	*11.3%*	*6.8%*	*5.5%*	*6.6%*	*5.3%*	*9.1%*
Nikon	*7.1%*	*-9.0%*	*10.4%*	*4.7%*	*-32.1%*	*3.8%*	*5.5%*	*3.6%*	*2.4%*	*4.1%*
Mean	***1.9%***	***1.9%***	***27.2%***	***21.9%***	***10.2%***	***17.6%***	***5.5%***	***20.4%***	***13.2%***	***32.0%***
Median	***1.0%***	***0.2%***	***30.6%***	***26.8%***	***2.5%***	***20.9%***	***5.5%***	***22.0%***	***15.0%***	***22.3%***

Key Risks

Internal: ASML relies upon a complex supply chain to source components for its machines. For example, they hold a key partnership with lenses and mirrors maker, Carl Zeiss who provides ASML with optics that are crucial to the company's technological advantage. As a result of this intricate sourcing of components and difficult assembly process (requiring three cargo planes in some cases), lead times can be largely unpredictable and may not sufficiently meet demand or be cost efficient. Additionally, this puts a limit on ASML's capacity that is particularly important in their EUV business line. Currently, the company has the capacity to produce only 5-6 high-NA EUV machines annually, which could become a problem if the company is not able to expand towards its goal of 20 per year by 2028, especially given the trajectory of growth that is expected in high performance computing.

Industry and Market Dynamics: The oligopoly that is semiconductor manufacturing industry has forced ASML into exhibiting higher customer concentration, which has proved to be incredibly costly at times. For example, financial struggles at Intel and project delays by Samsung have largely affected ASML's order book more recently with both DUV and EUV slowing down. Additionally, this customer concentration has the possibility to offset any pricing power ASML may have, given key customers such as TSMC are the only viable options ASML may have to sell their machines to. Lastly, ASML is exposed to the common cyclicality of the semiconductor industry, driven by capacity, inventory, and other external factors. Slower recovery in markets such as consumer, automotive, and industrial have been commonly mentioned factors ASML's management have highlighted before.

Geopolitical: Where it currently stands, ASML is banned from selling any of its EUV machines to China and is somewhat restricted in what DUV machines it can sell. More specifically, certain immersion DUV models have lost their export licenses with the Dutch government. Consequently, there has been a significant stock piling by Chinese customers to fulfill deliveries before bans fully go into place (figure 19). Additionally, the Dutch government is set to restrict ASML from servicing some of its already installed equipment in China, potentially preventing key fabs like SMIC from producing chips at a 7nm process node. This would most likely just focus on more advanced machines.

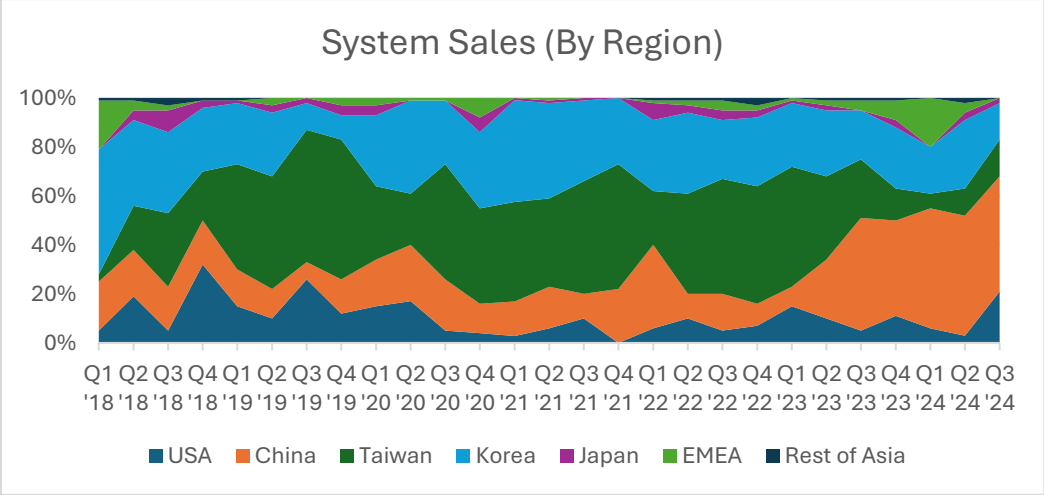


Figure 19: System Sales by Geography, Source: Company Reports

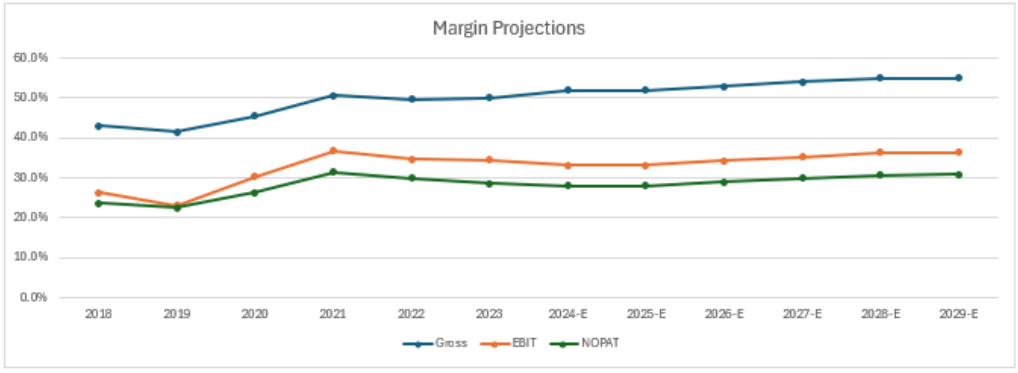
Technological: While ASML is prepared for sub 2nm process nodes via their high-NA product line that is already being shipped to various customers, there remains uncertainty whether this and future innovations will prove as successful as low-NA. Lithography has been a primary driver of design shrink (more complexity) over the years; however, a few of ASML's competitors have made the argument that other segments within the manufacturing process, such as materials engineering, will be a primary driver going forward and hence carry a larger share of the spend by fabs. This should be considered a sincere concern to be closely monitored as we hold ASML in the portfolio.

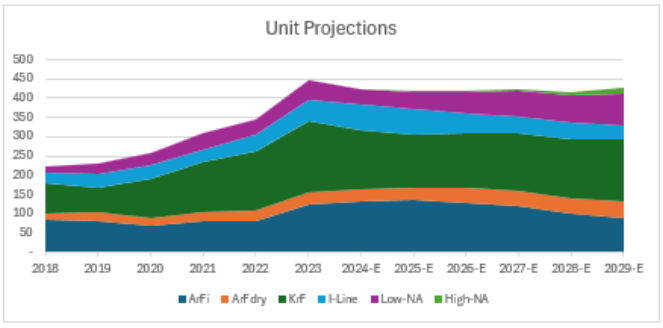
DCF Model Summary (Base)

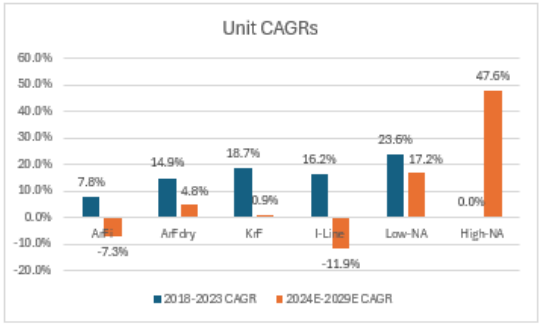
Base Case Price Target: $850 – Implied Upside of 25.3% (assuming exit multiple of 22x and WACC of 10.3%)

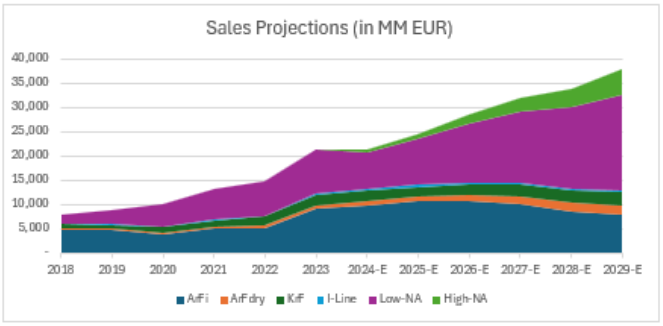
Our base case assumes the following:

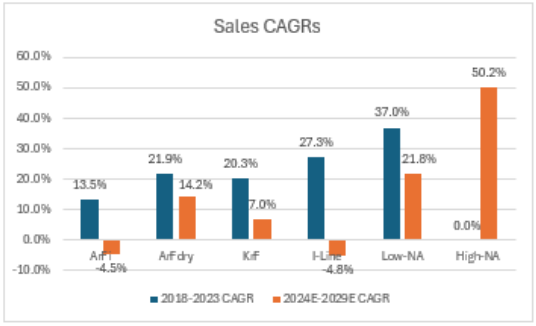
- Within DUV: ArFi units revert to growth levels more comparable to historical as China stockpiling cools down, while the rest of DUV grows modestly (or even flat) for the next 5 years reflecting a more conservative view on capacity and fabs' upgrades
- Within EUV: We reflect slower low-NA EUV unit growth as customers begin to shift expenditures in favor of high-NA EUV in the next 5 years. High-NA units are projected based on the street's models, expected market demand given high price ($380MM/machine), and ASML's capacity goal of 20 units produced per year by 2028.
- Margins are assumed to expand in the coming years given mix towards higher ASP products and end up near ASML's low end of their 2030 guidance (55% GM, 36% EBIT)
- Working capital assumptions follow historical trends in AR, inventory, prepaid expenses, etc









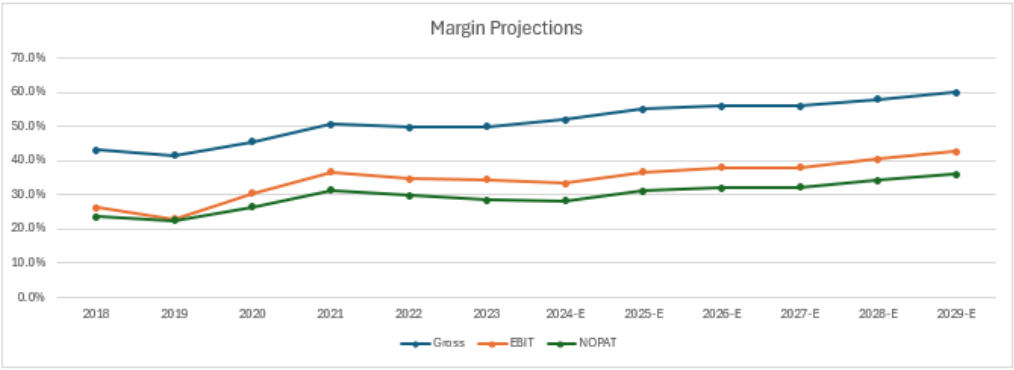


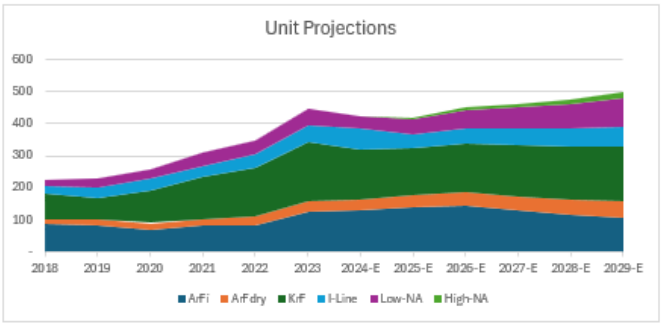
DCF Model Summary (Upside)

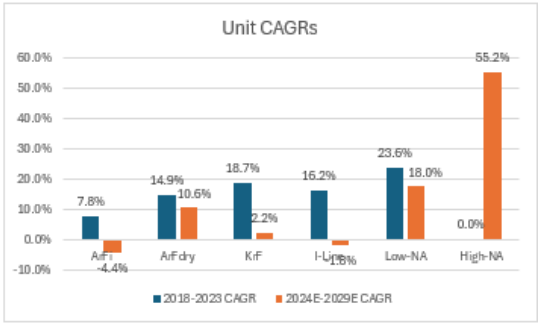
Upside Case Price Target: $1,103 – Implied Upside of 61.1% (assuming exit multiple of 22x and WACC of 10.3%)

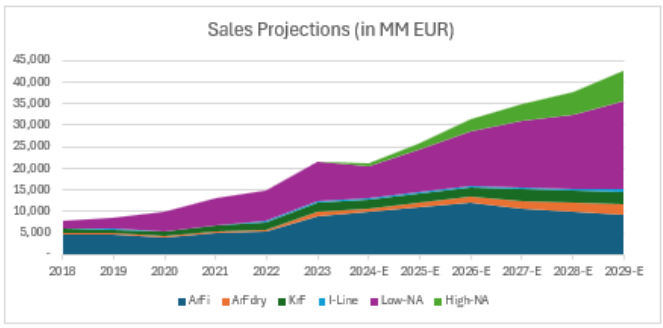
Our upside case assumes the following:

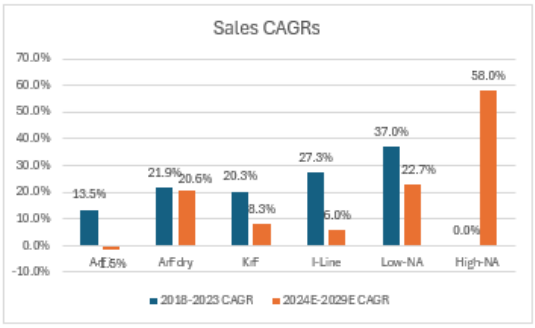
- Within DUV: Similar to our base, ArFi units revert to growth levels more comparable, but higher to historical as China stockpiling cools down. Instead of assuming modest (or even flat growth in other DUV units), we project growth rates that are pretty conservative based on past trends, but altogether unit growth is significantly slower.
- Within EUV: We reflect slightly higher (but historically lower) low-NA EUV unit growth as customers begin to shift expenditures in favor of high-NA EUV in the next 5 years. Again, high-NA units are projected based on the street's models, expected market demand given high price ($380MM/machine), and ASML's capacity goal of 20 units produced per year by 2028. However, we take a more aggressive approach and assume ASML sells close to capacity in a scenario where high-NA EUV adoption is higher, especially at largest customer TSMC.
- Margins are assumed to expand in the coming years given mix towards higher ASP products and end up to ASML's targets of 56-60% GM by 2030
- Working capital assumptions follow historical trends in AR, inventory, prepaid expenses, etc.









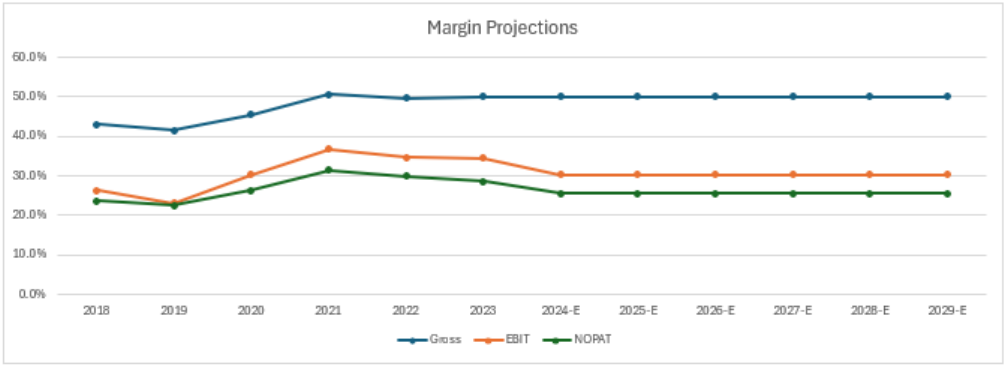


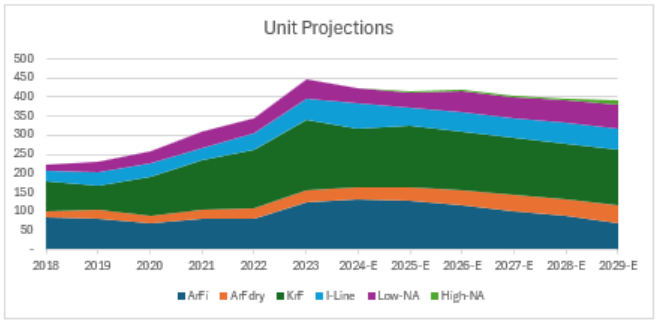
DCF Model Summary (Downside)

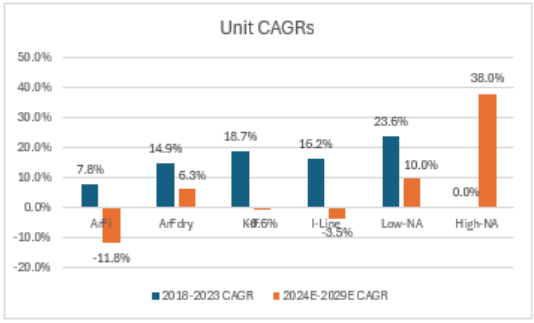
Downside Case Price Target: $572 – Implied Downside of -16.4% (assuming exit multiple of 22x and WACC of 10.3%)

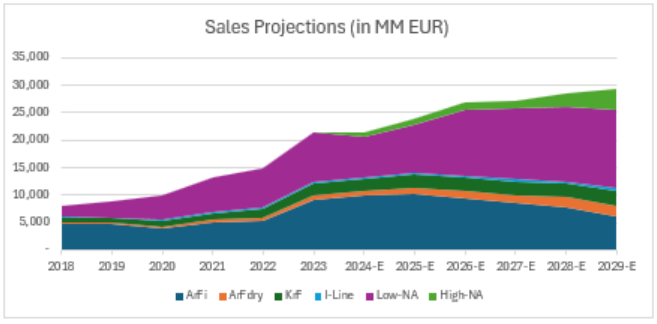
Our downside case assumes the following:

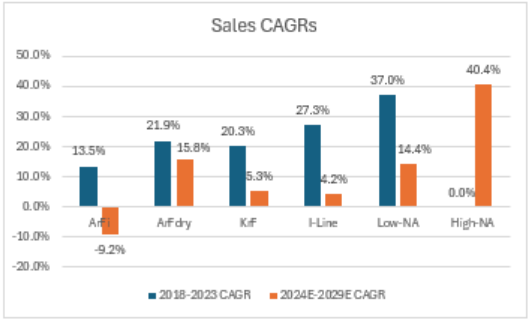
- Within DUV: Unlike our previous cases, we take an aggressive approach with our downside and assume generally little to even negative growth for DUV, excluding ArFdry as that exhibits consistent, but significantly lower growth
- Within EUV: We reflect a current investor's concern: a significant pushout in leading-edge fabs which is hurting demand for EUV machines. Low-NA EUV unit growth doesn't kick up until 2027. High-NA EUV adoption is much slower than expected and orders/deliveries take place later in the 2020s.
- Margins are assumed to stay completely flat, below historical averages. (2018-2023 GM average is ~59% and we assume 50%, which is also significantly below their 2030 GM guidance of 56-60%
- Working capital assumptions follow historical trends in AR, inventory, prepaid expenses, etc.











Investment Conclusion

Our General Thoughts: Timeline delays by various foundries should warrant genuine concern for ASML and its semi-cap peers in the near term. As these facilities fall behind in their plans for production, equipment providers must pushback shipments (and therefore recognize revenue later) and in some cases, cancel orders due to various reasons. Consequently, when management guided for 2025 low NA EUV unit shipments to be ~50 vs. consensus' estimates of ~70, the stock took a hit (-21% since 10/15 earnings).

However, given ASML's technological moat coupled with its dominant market share (80%+ DUV, 100% EUV) and clear industry tailwinds, we strongly believe this reaction to be largely short-sighted. Despite the hiccup of management's 2025 estimates, EUV units should still see massive growth in the next 5-10 years as customers require more capacity for their strong end markets, where a lot of this spend is still dominated by litho. Additionally, once high NA is scaled, we should also see significant margin expansion similarly to what the company experienced with the rollout of low NA.

Why Should SFIC Buy? As long-term investors, we are cautious about the timing of deliveries and subsequent revenue recognition, along with the recent slowing of EUV orders. However, given the current valuation, we believe there is more than enough margin of safety to enter into a conservative position (suggesting 1-2% of the total portfolio). Our model's assumptions are fairly tempered, only assuming an exit multiple (EV/EBITDA) of 22x vs. 5-year average of 27.8x as well as very little margin expansion from what management has already guided for the years leading up to 2030. On top of this, we incorporate order pushouts of EUV systems in our model, which is one of the primary fears of the market.

From a portfolio management perspective, specifically within SFIC's technology holdings, we believe SFIC lacks a company that truly has a unique competitive positioning within the AI ecosystem. For example, many of the hyperscalers we own, directly compete with each other on their AI infrastructure offerings. Additionally, numerous companies are directly competing to develop the necessary hardware to support these infrastructure offerings, such as Nvidia, AMD, Intel, Broadcom, and the list of goes on.

The point we are trying to make: **Regardless of who's hardware is used to train/run models, where this hardware is used, and the end applications for AI, ASML's lithography machines are essential in the manufacturing process for all hardware, especially those used in AI workloads.** Simply no other company comes even close to meeting ASML's balance between technological innovation and economies of scale that their products enable for various customers.

Therefore, we think that the market is highly underappreciating ASML's positioning in the industry. In the long term, we are confident in their ability to weather weaker-than-expected market dynamics and continue to deliver on innovation with the rollout of High-NA EUV. Furthermore, the company's more than $35bn in backlog orders reaffirms our belief that demand for their products remains incredibly strong despite weaker bookings recently and with plans to boost capacity over the coming years, we see them able to sufficiently meet this demand. ASML's past success in doing this has and we believe, will continue to drive the stock price over the next 3-5 years.

What to Look for Moving Forward: Some upside catalysts include: 1) Future quarterly earnings that clarifies near term demand on EUV systems 2) More insights on timeline of high NA EUV ramp at major foundries 3) Easing of export controls to customers in China 4) Margin expansion from the scaling of high NA (similar to what happened with low NA) 5) Increased CapEx for AI applications, leading to more capacity buildouts by fabs.

Some downside catalysts include: 1) Further Chinese export restrictions (especially given upcoming change of US administrations) 2) Continued/future investment in capacity by ASML puts drag on margins 3) High NA adoption is much slower than expected 4) Slowdown in CapEx for AI applications, lowering utilization rates at fabs and pushing back demand of updates/upgrades/repairs for semi-cap companies 5) Litho spend decreases significantly vs. in other areas such as materials engineering 6) Low NA orders continue to see pushbacks past 2025 as fab projects are delayed (possibly cancelled) further.

Appendix – DCF Base Case

UC San Diego Student Foundation Investment Committee

ASML Holdings N.V.

Most Recent Fiscal Year End	12/31/2023	WACC	10.3%	Revenue Build Case	Base
Most Recent Quarter End Date	9/29/2024	Exit Multiple	22.0x	GM Case	Base
Valuation Date	11/25/2024	Current Share Price	$684.47	SG&A Case	Base
End of First Fiscal Year	12/31/2024	Implied Share Price	$857.96	R&D Case	Base
Portion of Year 1 Cash Flows in Forecast	*25.6%*	Implied Upside (Downside)	*25.3%*	Other OpEx Case	Base

$ in Millions, Except Per Share Fiscal Year End December Discounted Cash Flow Valuation	2018A	2019A	2020A	2021A	2022A	2023A	2024-E	2025-E	2026-E	2027-E	2028-E	2029-E
Revenue (in USD)	12,909	13,230	15,931	22,005	22,265	29,792	**30,940**	**36,493**	**42,235**	**47,212**	**50,071**	**56,190**
% Growth		*2.5%*	*20.4%*	*38.1%*	*1.2%*	*33.8%*	*3.9%*	*17.9%*	*15.7%*	*11.8%*	*6.1%*	*12.2%*
Cost of Goods Sold	4,885	5,234	5,891	7,665	11,013	14,510	14,851	17,517	19,851	21,717	22,532	25,285
Gross Margin	**8,024**	**7,996**	**10,040**	**14,340**	**11,252**	**15,282**	**16,089**	**18,976**	**22,385**	**25,494**	**27,539**	**30,904**
Operating Expenses												
SG&A	702	722	771	995	1,186	1,480	1,671	1,934	2,196	2,455	2,579	2,866
R&D	1,732	2,064	2,358	2,875	3,230	4,027	4,239	5,000	5,786	6,468	6,860	7,698
Other	(2)	(1)	(1)	(86)	(107)	(95)	(62)	(73)	(84)	(94)	(100)	(112)
Total Operating Expenses	**2,433**	**2,785**	**3,129**	**3,784**	**4,308**	**5,412**	**5,848**	**6,861**	**7,898**	**8,829**	**9,338**	**10,451**
% Revenue	*18.8%*	*21.0%*	*19.6%*	*17.2%*	*19.4%*	*18.2%*	*18.9%*	*18.8%*	*18.7%*	*18.7%*	*18.7%*	*18.6%*
EBIT	**5,608**	**5,215**	**6,914**	**10,484**	**6,864**	**9,807**	**10,241**	**12,116**	**14,487**	**16,666**	**18,201**	**20,453**
NOPAT	4,937	4,854	5,964	8,887	5,833	8,257	8,669	10,255	12,262	14,107	15,406	17,313
Unlevered Free Cash Flow	**4,664**	**4,494**	**5,995**	**14,098**	**7,668**	**2,762**	**5,608**	**8,289**	**10,055**	**11,785**	**13,188**	**14,530**
PV of Unlevered Free Cash Flow							**1,419**	**7,445**	**8,192**	**8,708**	**8,837**	**8,830**

Enterprise Value	
Sum of PV of FCF	**43,431**
Terminal Year EBITDA	21,984
Exit Multiple (EV/EBITDA)	22.0x
Terminal Value	**483,655**
Discount Factor	0.61
PV of Terminal Value	**293,942**
% of Enterprise Value	*87.1%*
Enterprise Value	**337,373**

Implied Equity Value and Share Price	
Enterprise Value	**337,373**
(-) Total Debt	(5,240)
(-) Preferred Securities	-
(-) Non-Controlling Interests	-
(+) Cash and Cash Equivalents	5,560
Implied Equity Value	**337,693**
Fully Diluted Shares Outstanding	393.6
Implied Share Price	**$857.96**

Exit Multiple vs. WACC Sensitivity Analysis								
		WACC						
		9.7%	*9.9%*	*10.1%*	***10.3%***	*10.5%*	*10.7%*	*10.9%*
Exit Multiple	13.0x	$566.77	$561.95	$557.17	$552.45	$547.78	$543.15	$538.58
	16.0x	$671.48	$665.69	$659.96	$654.29	$648.68	$643.13	$637.64
	19.0x	$776.19	$769.43	$762.74	$756.12	$749.58	$743.10	$736.70
	22.0x	$880.90	$873.17	$865.52	**$857.96**	$850.48	$843.08	$835.75
	25.0x	$985.61	$976.91	$968.31	$959.80	$951.38	$943.05	$934.81
	28.0x	$1,090.32	$1,080.65	$1,071.09	$1,061.63	$1,052.28	$1,043.02	$1,033.87
	31.0x	$1,195.03	$1,184.40	$1,173.88	$1,163.47	$1,153.18	$1,143.00	$1,132.93

Appendix – DCF Base Case

	Historical						Projected							
Units	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024-E**	**2025-E**	**2026-E**	**2027-E**	**2028-E**	**2029-E**	**2018-2023 CAGR**	**2024E-2029E CAGR**
DUV/Other														
ArFi	86	82	68	81	81	125	131	135	130	120	100	90	*7.8%*	*-7.3%*
ArFdry	16	22	22	22	28	32	33	32	36	38	40	42	*14.9%*	*4.8%*
KrF	78	65	103	131	151	184	153	140	145	150	155	160	*18.7%*	*0.9%*
I-Line	26	34	34	33	45	55	66	65	50	45	40	35	*16.2%*	*-11.9%*
Total	**206**	**203**	**227**	**267**	**305**	**396**	**383**	**372**	**361**	**353**	**335**	**327**	***14.0%***	***-3.1%***
EUV														
Low-NA	18	26	31	42	40	52	38	45	55	65	72	85	*23.6%*	*17.2%*
High-NA	-	-	-	-	-	-	2	3	5	7	10	14	-	*47.6%*
Total	**18**	**26**	**31**	**42**	**40**	**52**	**40**	**48**	**60**	**72**	**82**	**99**	***23.6%***	***19.6%***
System Sales														
DUV/Other														
ArFi	4,812	4,711	3,913	5,001	5,232	9,057	9,878	10,666	10,682	10,156	8,633	7,847	*13.5%*	*-4.5%*
ArFdry	285	393	392	437	620	769	950	1,015	1,256	1,445	1,643	1,846	*21.9%*	*14.2%*
KrF	872	683	1,049	1,303	1,684	2,198	2,031	2,009	2,226	2,441	2,649	2,844	*20.3%*	*7.0%*
I-Line	83	138	135	137	177	276	378	410	344	335	318	295	*27.3%*	*-4.8%*
Total	6,051	5,925	5,489	6,878	7,714	12,300	13,236	14,101	14,509	14,377	13,243	12,832	*15.2%*	*-0.6%*
EUV														
Low-NA	1,886	2,783	4,494	6,267	7,079	9,090	7,372	9,315	12,068	14,833	16,759	19,785	*37.0%*	*21.8%*
High-NA	-	-	-	-	-	-	700	1,092	1,856	2,625	3,787	5,355	-	*50.2%*
Total	**1,886**	**2,783**	**4,494**	**6,267**	**7,079**	**9,090**	**8,072**	**10,407**	**13,925**	**17,458**	**20,546**	**25,140**	***37.0%***	***25.5%***
Margins														
Gross	*43.1%*	*41.5%*	*45.6%*	*50.6%*	*49.7%*	*50.0%*	*52.0%*	*52.0%*	*53.0%*	*54.0%*	*55.0%*	*55.0%*		
EBIT	*26.4%*	*23.0%*	*30.4%*	*36.7%*	*34.6%*	*34.6%*	*33.1%*	*33.2%*	*34.3%*	*35.3%*	*36.4%*	*36.4%*		
NOPAT	*23.7%*	*22.4%*	*26.4%*	*31.4%*	*29.8%*	*28.5%*	*28.0%*	*28.1%*	*29.0%*	*29.9%*	*30.8%*	*30.8%*		
% Revenue														
SG&A	*5.4%*	*5.5%*	*4.8%*	*4.5%*	*5.3%*	*5.0%*	*5.4%*	*5.3%*	*5.2%*	*5.2%*	*5.2%*	*5.1%*		
R&D	*13.4%*	*15.6%*	*14.8%*	*13.1%*	*14.5%*	*13.5%*	*13.7%*	*13.7%*	*13.7%*	*13.7%*	*13.7%*	*13.7%*		
Other	*0.0%*	*0.0%*	*0.0%*	*-0.4%*	*-0.5%*	*-0.3%*	*-0.2%*	*-0.2%*	*-0.2%*	*-0.2%*	*-0.2%*	*-0.2%*		
D&A	*4.7%*	*4.3%*	*4.0%*	*2.9%*	*3.1%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*		
CapEX	*5.6%*	*7.5%*	*7.2%*	*5.1%*	*6.2%*	*8.0%*	*6.6%*	*6.6%*	*6.6%*	*6.6%*	*6.6%*	*6.6%*		
Tax Rate	*12.0%*	*6.9%*	*13.7%*	*15.2%*	*15.0%*	*15.8%*	*15.4%*	*15.4%*	*15.4%*	*15.4%*	*15.4%*	*15.4%*		

Appendix – DCF Upside Case

UC San Diego Student Foundation Investment Committee

ASML Holdings N.V.

Most Recent Fiscal Year End	12/31/2023	WACC	10.3%	Revenue Build Case	Upside
Most Recent Quarter End Date	9/29/2024	Exit Multiple	22.0x	GM Case	Upside
Valuation Date	11/25/2024	Current Share Price	$684.47	SG&A Case	Upside
End of First Fiscal Year	12/31/2024	Implied Share Price	$1,103.02	R&D Case	Upside
Portion of Year 1 Cash Flows in Forecast	*25.6%*	Implied Upside (Downside)	*61.1%*	Other OpEx Case	Upside

$ in Millions, Except Per Share Fiscal Year End December Discounted Cash Flow Valuation	2018A	2019A	2020A	2021A	2022A	2023A	2024-E	2025-E	2026-E	2027-E	2028-E	2029-E
Revenue (in USD)	12,909	13,230	15,931	22,005	22,265	29,792	30,940	38,097	46,465	51,530	55,886	62,765
% Growth		*2.5%*	*20.4%*	*38.1%*	*1.2%*	*33.8%*	*3.9%*	*23.1%*	*22.0%*	*10.9%*	*8.5%*	*12.3%*
Cost of Goods Sold	4,885	5,234	5,891	7,665	11,013	14,510	14,851	17,144	20,445	22,673	23,472	25,106
Gross Margin	**8,024**	**7,996**	**10,040**	**14,340**	**11,252**	**15,282**	**16,089**	**20,953**	**26,020**	**28,857**	**32,414**	**37,659**
Operating Expenses												
SG&A	702	722	771	995	1,186	1,480	1,671	1,981	2,370	2,628	2,794	3,138
R&D	1,732	2,064	2,358	2,875	3,230	4,027	4,239	5,143	6,226	6,802	7,265	8,034
Other	(2)	(1)	(1)	(86)	(107)	(95)	(124)	(152)	(186)	(206)	(224)	(251)
Total Operating Expenses	**2,433**	**2,785**	**3,129**	**3,784**	**4,308**	**5,412**	**5,786**	**6,972**	**8,410**	**9,224**	**9,836**	**10,921**
% Revenue	*18.8%*	*21.0%*	*19.6%*	*17.2%*	*19.4%*	*18.2%*	*18.7%*	*18.3%*	*18.1%*	*17.9%*	*17.6%*	*17.4%*
EBIT	**5,608**	**5,215**	**6,914**	**10,484**	**6,864**	**9,807**	**10,303**	**13,982**	**17,610**	**19,633**	**22,578**	**26,738**
NOPAT	4,937	4,854	5,964	8,887	5,833	8,257	8,721	11,835	14,906	16,619	19,111	22,633
Unlevered Free Cash Flow	**4,664**	**4,494**	**5,995**	**14,098**	**7,668**	**2,762**	**5,660**	**9,644**	**12,271**	**14,121**	**16,518**	**19,519**
PV of Unlevered Free Cash Flow							**1,433**	**8,663**	**9,997**	**10,434**	**11,069**	**11,863**

Enterprise Value	
Sum of PV of FCF	**53,458**
Terminal Year EBITDA	28,448
Exit Multiple (EV/EBITDA)	22.0x
Terminal Value	**625,864**
Discount Factor	0.61
PV of Terminal Value	**380,370**
% of Enterprise Value	*87.7%*
Enterprise Value	**433,828**

Implied Equity Value and Share Price	
Enterprise Value	**433,828**
(-) Total Debt	(5,240)
(-) Preferred Securities	-
(-) Non-Controlling Interests	-
(+) Cash and Cash Equivalents	5,560
Implied Equity Value	**434,148**
Fully Diluted Shares Outstanding	393.6
Implied Share Price	**$1,103.02**

Exit Multiple vs. WACC Sensitivity Analysis

Exit Multiple \ WACC	*9.7%*	*9.9%*	*10.1%*	***10.3%***	*10.5%*	*10.7%*	*10.9%*
13.0x	$726.15	$719.93	$713.77	$707.68	$701.65	$695.69	$689.79
16.0x	$861.65	$854.17	$846.77	$839.46	$832.22	$825.06	$817.97
19.0x	$997.15	$988.42	$979.78	$971.24	$962.79	$954.43	$946.16
22.0x	$1,132.65	$1,122.66	$1,112.79	**$1,103.02**	$1,093.35	$1,083.80	$1,074.34
25.0x	$1,268.14	$1,256.91	$1,245.79	$1,234.80	$1,223.92	$1,213.17	$1,202.52
28.0x	$1,403.64	$1,391.15	$1,378.80	$1,366.58	$1,354.49	$1,342.53	$1,330.71
31.0x	$1,539.14	$1,525.40	$1,511.80	$1,498.36	$1,485.06	$1,471.90	$1,458.89

Appendix – DCF Upside Case

	Historical						Projected							
Units	2018	2019	2020	2021	2022	2023	2024-E	2025-E	2026-E	2027-E	2028-E	2029-E	2018-2023 CAGR	2024E-2029E CAGR
DUV/Other														
ArFi	86	82	68	81	81	125	131	140	145	128	115	105	*7.8%*	*-4.4%*
ArFdry	16	22	22	22	28	32	33	35	40	45	50	55	*14.9%*	*10.6%*
KrF	78	65	103	131	151	184	153	150	155	160	165	170	*18.7%*	*2.2%*
I-Line	26	34	34	33	45	55	66	40	45	50	55	60	*16.2%*	*-1.8%*
Total	**206**	**203**	**227**	**267**	**305**	**396**	**383**	**365**	**385**	**383**	**385**	**390**	***14.0%***	***0.4%***
EUV														
Low-NA	18	26	31	42	40	52	38	48	58	68	74	88	*23.6%*	*18.0%*
High-NA	-	-	-	-	-	-	2	3	7	10	14	18	-	*55.2%*
Total	**18**	**26**	**31**	**42**	**40**	**52**	**40**	**51**	**65**	**78**	**88**	**106**	***23.6%***	***21.2%***
System Sales														
DUV/Other														
ArFi	4,812	4,711	3,913	5,001	5,232	9,057	9,878	11,061	11,915	10,833	9,928	9,155	*13.5%*	*-1.5%*
ArFdry	285	393	392	437	620	769	950	1,110	1,396	1,712	2,054	2,417	*21.9%*	*20.6%*
KrF	872	683	1,049	1,303	1,684	2,198	2,031	2,152	2,380	2,604	2,820	3,021	*20.3%*	*8.3%*
I-Line	83	138	135	137	177	276	378	253	310	372	437	506	*27.3%*	*6.0%*
Total	6,051	5,925	5,489	6,878	7,714	12,300	13,236	14,577	16,000	15,521	15,239	15,100	*15.2%*	*2.7%*
EUV														
Low-NA	1,886	2,783	4,494	6,267	7,079	9,090	7,372	9,936	12,726	15,517	17,224	20,483	*37.0%*	*22.7%*
High-NA	-	-	-	-	-	-	700	1,092	2,599	3,750	5,302	6,886	-	*58.0%*
Total	**1,886**	**2,783**	**4,494**	**6,267**	**7,079**	**9,090**	**8,072**	**11,028**	**15,325**	**19,267**	**22,527**	**27,369**	***37.0%***	***27.7%***
Margins														
Gross	*43.1%*	*41.5%*	*45.6%*	*50.6%*	*49.7%*	*50.0%*	*52.0%*	*55.0%*	*56.0%*	*56.0%*	*58.0%*	*60.0%*		
EBIT	*26.4%*	*23.0%*	*30.4%*	*36.7%*	*34.6%*	*34.6%*	*33.3%*	*36.7%*	*37.9%*	*38.1%*	*40.4%*	*42.6%*		
NOPAT	*23.7%*	*22.4%*	*26.4%*	*31.4%*	*29.8%*	*28.5%*	*28.2%*	*31.1%*	*32.1%*	*32.3%*	*34.2%*	*36.1%*		
% Revenue														
SG&A	*5.4%*	*5.5%*	*4.8%*	*4.5%*	*5.3%*	*5.0%*	*5.4%*	*5.2%*	*5.1%*	*5.1%*	*5.0%*	*5.0%*		
R&D	*13.4%*	*15.6%*	*14.8%*	*13.1%*	*14.5%*	*13.5%*	*13.7%*	*13.5%*	*13.4%*	*13.2%*	*13.0%*	*12.8%*		
Other	*0.0%*	*0.0%*	*0.0%*	*-0.4%*	*-0.5%*	*-0.3%*	*-0.4%*	*-0.4%*	*-0.4%*	*-0.4%*	*-0.4%*	*-0.4%*		
D&A	*4.7%*	*4.3%*	*4.0%*	*2.9%*	*3.1%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*		
CapEX	*5.6%*	*7.5%*	*7.2%*	*5.1%*	*6.2%*	*8.0%*	*6.6%*	*6.6%*	*6.6%*	*6.6%*	*6.6%*	*6.6%*		
Tax Rate	*12.0%*	*6.9%*	*13.7%*	*15.2%*	*15.0%*	*15.8%*	*15.4%*	*15.4%*	*15.4%*	*15.4%*	*15.4%*	*15.4%*		

Appendix – DCF Downside Case

UC San Diego Student Foundation Investment Committee

ASML Holdings N.V.

Most Recent Fiscal Year End	12/31/2023	WACC	10.3%	Revenue Build Case	Downside
Most Recent Quarter End Date	9/29/2024	Exit Multiple	22.0x	GM Case	Downside
Valuation Date	11/25/2024	Current Share Price	$684.47	SG&A Case	Downside
End of First Fiscal Year	12/31/2024	Implied Share Price	$572.44	R&D Case	Downside
Portion of Year 1 Cash Flows in Forecast	*25.6%*	Implied Upside (Downside)	*-16.4%*	Other OpEx Case	Downside

$ in Millions, Except Per Share Fiscal Year End December Discounted Cash Flow Valuation	2018A	2019A	2020A	2021A	2022A	2023A	2024-E	2025-E	2026-E	2027-E	2028-E	2029-E
Revenue (in USD)	12,909	13,230	15,931	22,005	22,265	29,792	30,940	35,684	39,776	40,386	42,474	43,700
% Growth		*2.5%*	*20.4%*	*38.1%*	*1.2%*	*33.8%*	*3.9%*	*15.3%*	*11.5%*	*1.5%*	*5.2%*	*2.9%*
Cost of Goods Sold	4,885	5,234	5,891	7,665	11,013	14,510	15,470	17,842	19,888	20,193	21,237	21,850
Gross Margin	**8,024**	**7,996**	**10,040**	**14,340**	**11,252**	**15,282**	**15,470**	**17,842**	**19,888**	**20,193**	**21,237**	**21,850**
Operating Expenses												
SG&A	702	722	771	995	1,186	1,480	1,795	2,070	2,307	2,342	2,464	2,535
R&D	1,732	2,064	2,358	2,875	3,230	4,027	4,332	4,996	5,569	5,654	5,946	6,118
Other	(2)	(1)	(1)	(86)	(107)	(95)	-	-	-	-	-	-
Total Operating Expenses	**2,433**	**2,785**	**3,129**	**3,784**	**4,308**	**5,412**	**6,126**	**7,065**	**7,876**	**7,996**	**8,410**	**8,653**
% Revenue	*18.8%*	*21.0%*	*19.6%*	*17.2%*	*19.4%*	*18.2%*	*19.8%*	*19.8%*	*19.8%*	*19.8%*	*19.8%*	*19.8%*
EBIT	**5,608**	**5,215**	**6,914**	**10,484**	**6,864**	**9,807**	**9,344**	**10,777**	**12,012**	**12,197**	**12,827**	**13,197**
NOPAT	4,937	4,854	5,964	8,887	5,833	8,257	7,909	9,122	10,168	10,324	10,858	11,171
Unlevered Free Cash Flow	**4,664**	**4,494**	**5,995**	**14,098**	**7,668**	**2,762**	**4,848**	**7,268**	**8,222**	**8,706**	**9,010**	**9,363**
PV of Unlevered Free Cash Flow							**1,227**	**6,528**	**6,698**	**6,432**	**6,038**	**5,690**

Enterprise Value	
Sum of PV of FCF	**32,614**
Terminal Year EBITDA	14,388
Exit Multiple (EV/EBITDA)	22.0x
Terminal Value	**316,543**
Discount Factor	0.61
PV of Terminal Value	**192,380**
% of Enterprise Value	*85.5%*
Enterprise Value	**224,994**

Implied Equity Value and Share Price	
Enterprise Value	**224,994**
(-) Total Debt	(5,240)
(-) Preferred Securities	-
(-) Non-Controlling Interests	-
(+) Cash and Cash Equivalents	5,560
Implied Equity Value	**225,314**
Fully Diluted Shares Outstanding	393.6
Implied Share Price	**$572.44**

Exit Multiple vs. WACC Sensitivity Analysis

Exit Multiple \ WACC	*9.7%*	*9.9%*	*10.1%*	***10.3%***	*10.5%*	*10.7%*	*10.9%*
13.0x	$381.97	$378.78	$375.62	$372.49	$369.40	$366.34	$363.31
16.0x	$450.50	$446.67	$442.89	$439.14	$435.44	$431.77	$428.14
19.0x	$519.03	$514.57	$510.16	$505.79	$501.47	$497.20	$492.98
22.0x	$587.56	$582.47	$577.43	**$572.44**	$567.51	$562.63	$557.81
25.0x	$656.09	$650.37	$644.70	$639.09	$633.55	$628.06	$622.64
28.0x	$724.62	$718.26	$711.97	$705.74	$699.59	$693.50	$687.47
31.0x	$793.16	$786.16	$779.24	$772.39	$765.62	$758.93	$752.30

Appendix – DCF Downside Case

	Historical						Projected							
Units	2018	2019	2020	2021	2022	2023	2024-E	2025-E	2026-E	2027-E	2028-E	2029-E	2018-2023 CAGR	2024E-2029E CAGR
DUV/Other														
ArFi	86	82	68	81	81	125	131	130	115	100	90	70	*7.8%*	*-11.8%*
ArFdry	16	22	22	22	28	32	33	35	40	42	43	45	*14.9%*	*6.3%*
KrF	78	65	103	131	151	184	153	160	155	150	145	148	*18.7%*	*-0.6%*
I-Line	26	34	34	33	45	55	66	45	50	52	54	55	*16.2%*	*-3.5%*
Total	**206**	**203**	**227**	**267**	**305**	**396**	**383**	**370**	**360**	**344**	**332**	**318**	***14.0%***	***-3.7%***
EUV														
Low-NA	18	26	31	42	40	52	38	43	55	56	58	62	*23.6%*	*10.0%*
High-NA	-	-	-	-	-	-	2	3	3	4	7	10	-	*38.0%*
Total	**18**	**26**	**31**	**42**	**40**	**52**	**40**	**46**	**58**	**60**	**65**	**72**	***23.6%***	***12.2%***
System Sales														
DUV/Other														
ArFi	4,812	4,711	3,913	5,001	5,232	9,057	9,878	10,271	9,450	8,463	7,769	6,103	*13.5%*	*-9.2%*
ArFdry	285	393	392	437	620	769	950	1,110	1,396	1,597	1,766	1,978	*21.9%*	*15.8%*
KrF	872	683	1,049	1,303	1,684	2,198	2,031	2,296	2,380	2,441	2,478	2,630	*20.3%*	*5.3%*
I-Line	83	138	135	137	177	276	378	284	344	387	430	464	*27.3%*	*4.2%*
Total	6,051	5,925	5,489	6,878	7,714	12,300	13,236	13,962	13,569	12,889	12,443	11,175	*15.2%*	*-3.3%*
EUV														
Low-NA	1,886	2,783	4,494	6,267	7,079	9,090	7,372	8,901	12,068	12,779	13,500	14,431	*37.0%*	*14.4%*
High-NA	-	-	-	-	-	-	700	1,092	1,114	1,500	2,651	3,825	-	*40.4%*
Total	**1,886**	**2,783**	**4,494**	**6,267**	**7,079**	**9,090**	**8,072**	**9,993**	**13,182**	**14,279**	**16,151**	**18,257**	***37.0%***	***17.7%***
Margins														
Gross	*43.1%*	*41.5%*	*45.6%*	*50.6%*	*49.7%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*		
EBIT	*26.4%*	*23.0%*	*30.4%*	*36.7%*	*34.6%*	*34.6%*	*30.2%*	*30.2%*	*30.2%*	*30.2%*	*30.2%*	*30.2%*		
NOPAT	*23.7%*	*22.4%*	*26.4%*	*31.4%*	*29.8%*	*28.5%*	*25.6%*	*25.6%*	*25.6%*	*25.6%*	*25.6%*	*25.6%*		
% Revenue														
SG&A	*5.4%*	*5.5%*	*4.8%*	*4.5%*	*5.3%*	*5.0%*	*5.8%*	*5.8%*	*5.8%*	*5.8%*	*5.8%*	*5.8%*		
R&D	*13.4%*	*15.6%*	*14.8%*	*13.1%*	*14.5%*	*13.5%*	*14.0%*	*14.0%*	*14.0%*	*14.0%*	*14.0%*	*14.0%*		
Other	*0.0%*	*0.0%*	*0.0%*	*-0.4%*	*-0.5%*	*-0.3%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*		
D&A	*4.7%*	*4.3%*	*4.0%*	*2.9%*	*3.1%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*		
CapEX	*5.6%*	*7.5%*	*7.2%*	*5.1%*	*6.2%*	*8.0%*	*6.6%*	*6.6%*	*6.6%*	*6.6%*	*6.6%*	*6.6%*		
Tax Rate	*12.0%*	*6.9%*	*13.7%*	*15.2%*	*15.0%*	*15.8%*	*15.4%*	*15.4%*	*15.4%*	*15.4%*	*15.4%*	*15.4%*		

Appendix – DCF Street/Mgt. Case

UC San Diego Student Foundation Investment Committee

ASML Holdings N.V.

Most Recent Fiscal Year End	12/31/2023	WACC	10.3%	Revenue Build Case	Street/Mgt.
Most Recent Quarter End Date	9/29/2024	Exit Multiple	22.0x	GM Case	Street/Mgt.
Valuation Date	11/25/2024	Current Share Price	$684.47	SG&A Case	Street/Mgt.
End of First Fiscal Year	12/31/2024	Implied Share Price	$1,159.83	R&D Case	Street/Mgt.
Portion of Year 1 Cash Flows in Forecast	*25.6%*	Implied Upside (Downside)	*69.5%*	Other OpEx Case	Street/Mgt.

$ in Millions, Except Per Share Fiscal Year End December Discounted Cash Flow Valuation	2018A	2019A	2020A	2021A	2022A	2023A	2024-E	2025-E	2026-E	2027-E	2028-E	2029-E
Revenue (in USD)	12,909	13,230	15,931	22,005	22,265	29,792	30,940	38,037	45,708	54,422	60,523	66,317
% Growth		*2.5%*	*20.4%*	*38.1%*	*1.2%*	*33.8%*	*3.9%*	*22.9%*	*20.2%*	*19.1%*	*11.2%*	*9.6%*
Cost of Goods Sold	4,885	5,234	5,891	7,665	11,013	14,510	14,851	17,497	20,568	24,490	26,630	27,853
Gross Margin	**8,024**	**7,996**	**10,040**	**14,340**	**11,252**	**15,282**	**16,089**	**20,540**	**25,139**	**29,932**	**33,893**	**38,464**
Operating Expenses												
SG&A	702	722	771	995	1,186	1,480	1,547	1,712	1,920	2,177	2,300	2,321
R&D	1,732	2,064	2,358	2,875	3,230	4,027	4,177	5,021	5,942	6,912	7,565	8,091
Other	(2)	(1)	(1)	(86)	(107)	(95)	(62)	(76)	(91)	(109)	(121)	(133)
Total Operating Expenses	**2,433**	**2,785**	**3,129**	**3,784**	**4,308**	**5,412**	**5,662**	**6,656**	**7,770**	**8,980**	**9,744**	**10,279**
% Revenue	*18.8%*	*21.0%*	*19.6%*	*17.2%*	*19.4%*	*18.2%*	*18.3%*	*17.5%*	*17.0%*	*16.5%*	*16.1%*	*15.5%*
EBIT	**5,608**	**5,215**	**6,914**	**10,484**	**6,864**	**9,807**	**10,427**	**13,883**	**17,369**	**20,952**	**24,149**	**28,185**
NOPAT	4,937	4,854	5,964	8,887	5,833	8,257	8,826	11,752	14,702	17,735	20,441	23,857
Unlevered Free Cash Flow	**4,664**	**4,494**	**5,995**	**14,098**	**7,668**	**2,762**	**5,765**	**9,570**	**12,166**	**14,758**	**17,493**	**20,716**
PV of Unlevered Free Cash Flow							**1,459**	**8,596**	**9,911**	**10,904**	**11,722**	**12,590**

Enterprise Value	
Sum of PV of FCF	**55,183**
Terminal Year EBITDA	29,992
Exit Multiple (EV/EBITDA)	22.0x
Terminal Value	**659,821**
Discount Factor	0.61
PV of Terminal Value	**401,008**
% of Enterprise Value	*87.9%*
Enterprise Value	**456,191**

Implied Equity Value and Share Price	
Enterprise Value	**456,191**
(-) Total Debt	(5,240)
(-) Preferred Securities	-
(-) Non-Controlling Interests	-
(+) Cash and Cash Equivalents	5,560
Implied Equity Value	**456,511**
Fully Diluted Shares Outstanding	393.6
Implied Share Price	**$1,159.83**

Exit Multiple vs. WACC Sensitivity Analysis								
		WACC						
		9.7%	*9.9%*	*10.1%*	***10.3%***	*10.5%*	*10.7%*	*10.9%*
Exit Multiple	13.0x	$762.50	$755.94	$749.46	$743.04	$736.70	$730.42	$724.21
	16.0x	$905.35	$897.47	$889.68	$881.97	$874.35	$866.81	$859.35
	19.0x	$1,048.20	$1,039.00	$1,029.90	$1,020.90	$1,012.00	$1,003.20	$994.48
	22.0x	$1,191.05	$1,180.53	$1,170.13	**$1,159.83**	$1,149.65	$1,139.58	$1,129.62
	25.0x	$1,333.90	$1,322.06	$1,310.35	$1,298.76	$1,287.31	$1,275.97	$1,264.76
	28.0x	$1,476.75	$1,463.59	$1,450.57	$1,437.69	$1,424.96	$1,412.36	$1,399.90
	31.0x	$1,619.60	$1,605.12	$1,590.79	$1,576.62	$1,562.61	$1,548.75	$1,535.04

Appendix – DCF Street/Mgt. Case

	Historical						Projected							
Units	2018	2019	2020	2021	2022	2023	2024-E	2025-E	2026-E	2027-E	2028-E	2029-E	2018-2023 CAGR	2024E-2029E CAGR
DUV/Other														
ArFi	86	82	68	81	81	125	131	138	145	155	165	175	*7.8%*	*5.9%*
ArFdry	16	22	22	22	28	32	33	33	38	41	45	48	*14.9%*	*7.6%*
KrF	78	65	103	131	151	184	153	145	150	155	150	165	*18.7%*	*1.5%*
I-Line	26	34	34	33	45	55	66	55	45	40	35	38	*16.2%*	*-10.4%*
Total	**206**	**203**	**227**	**267**	**305**	**396**	**383**	**371**	**378**	**391**	**395**	**426**	***14.0%***	***2.1%***
EUV														
Low-NA	18	26	31	42	40	52	38	47	58	68	75	78	*23.6%*	*15.2%*
High-NA	-	-	-	-	-	-	2	4	6	10	12	16	-	*51.6%*
Total	**18**	**26**	**31**	**42**	**40**	**52**	**40**	**51**	**64**	**78**	**87**	**94**	***23.6%***	***18.4%***
System Sales														
DUV/Other														
ArFi	4,812	4,711	3,913	5,001	5,232	9,057	9,878	10,903	11,915	13,118	14,244	15,258	*13.5%*	*9.1%*
ArFdry	285	393	392	437	620	769	950	1,047	1,326	1,559	1,848	2,110	*21.9%*	*17.3%*
KrF	872	683	1,049	1,303	1,684	2,198	2,031	2,081	2,303	2,523	2,563	2,932	*20.3%*	*7.6%*
I-Line	83	138	135	137	177	276	378	347	310	297	278	320	*27.3%*	*-3.2%*
Total	6,051	5,925	5,489	6,878	7,714	12,300	13,236	14,378	15,853	17,498	18,934	20,621	*15.2%*	*9.3%*
EUV														
Low-NA	1,886	2,783	4,494	6,267	7,079	9,090	7,372	9,729	12,726	15,517	17,457	18,155	*37.0%*	*19.8%*
High-NA	-	-	-	-	-	-	700	1,456	2,228	3,750	4,545	6,120	-	*54.3%*
Total	**1,886**	**2,783**	**4,494**	**6,267**	**7,079**	**9,090**	**8,072**	**11,185**	**14,954**	**19,267**	**22,002**	**24,276**	***37.0%***	***24.6%***
Margins														
Gross	*43.1%*	*41.5%*	*45.6%*	*50.6%*	*49.7%*	*50.0%*	*52.0%*	*54.0%*	*55.0%*	*55.0%*	*56.0%*	*58.0%*		
EBIT	*26.4%*	*23.0%*	*30.4%*	*36.7%*	*34.6%*	*34.6%*	*33.7%*	*36.5%*	*38.0%*	*38.5%*	*39.9%*	*42.5%*		
NOPAT	*23.7%*	*22.4%*	*26.4%*	*31.4%*	*29.8%*	*28.5%*	*28.5%*	*30.9%*	*32.2%*	*32.6%*	*33.8%*	*36.0%*		
% Revenue														
SG&A	*5.4%*	*5.5%*	*4.8%*	*4.5%*	*5.3%*	*5.0%*	*5.0%*	*4.5%*	*4.2%*	*4.0%*	*3.8%*	*3.5%*		
R&D	*13.4%*	*15.6%*	*14.8%*	*13.1%*	*14.5%*	*13.5%*	*13.5%*	*13.2%*	*13.0%*	*12.7%*	*12.5%*	*12.2%*		
Other	*0.0%*	*0.0%*	*0.0%*	*-0.4%*	*-0.5%*	*-0.3%*	*-0.2%*	*-0.2%*	*-0.2%*	*-0.2%*	*-0.2%*	*-0.2%*		
D&A	*4.7%*	*4.3%*	*4.0%*	*2.9%*	*3.1%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*		
CapEX	*5.6%*	*7.5%*	*7.2%*	*5.1%*	*6.2%*	*8.0%*	*6.6%*	*6.6%*	*6.6%*	*6.6%*	*6.6%*	*6.6%*		
Tax Rate	*12.0%*	*6.9%*	*13.7%*	*15.2%*	*15.0%*	*15.8%*	*15.4%*	*15.4%*	*15.4%*	*15.4%*	*15.4%*	*15.4%*		