

The Impact of COVID-19 on ASML's Financial Performance

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Abstract. During 2020-2022, the arrival of COVID-19 has influenced the world economy and led to a surge in demand for working from home, and the demand for semiconductors such as chips has changed significantly too. Some researchers have found that ASML, a leading company in the semiconductor industry, has also been affected by the sudden epidemic. However, there is a lack of uniform explanation for the specific financial impact on ASML. This paper aims to analyze how COVID-19 has affected the financial performance of ASML. Incorporating evidence from calculating the data from ASML's financial statement as well as relative valuation, the data in the report insulates that the profitability and operational efficiency of ASML company have improved over the past four years, while the volatility of the stock is also relatively stable. With the outbreak of the epidemic and its direct impact on the world economy, the financial performance of ASML has become worse. Although there have been some losses in some aspects, overall, there is still a good prospect of upward development for ASML. In the complex international situation, this has important reference significance for the development and breakthroughs of other small and medium-sized enterprises.

Keywords: ASML, Financial Performance, Financial Statement, Risk and Return, Relative Valuation.

1. Introduction

Since 2019, the emergence of COVID-19 has increased the demand for people to work online [1], and the demand for electronic equipment and chips for corresponding electronic equipment has also increased, so the development of the semiconductor industry has become more and more prosperous [2].

ASML, one of the leading companies in the semiconductor industry, was affected by the epidemic. This company was founded in the Netherlands in 1984. At first, ASML was just a small workshop with only a few hundred people under Philips. Later, with continuous research and innovation, ASML gradually surpassed Japanese and American companies and became the only manufacturer in the world to master the production technology of EUV lithography machines. Its customers include Hynix, SMIC, and others who use its machines to manufacture microchips for electronic devices such as smartphones and laptops.

ASML also has many competitors in the industry, such as SAMSUNG, TSMC, Intel, etc. Samsung is a multinational conglomerate headquartered in Seoul, South Korea. In recent years, its subsidiary Samsung Electronics has also entered the microprocessor and wafer foundry to expand the semiconductor business market. Intel is the first company to introduce x86 architecture central processing units, making it the second-largest semiconductor company in the world. TSMC is a foundry company in Taiwan. It is the world's No. 1 semiconductor fabrication plant by market share and the No. 1 company in Asia by market capitalization. Then, how will ASML's financial position, risk and returns, etc. perform during the COVID-19 compared to those of its competitors?

This research aims to examine the financial performance of ASML as well as to show how COVID-19 affects this company. After using financial models to investigate the financial statements and risk and return of ASML, this paper describes the relative valuations between ASML and its comparable firms [3].

2. Method

2.1. The formula used in ASML's Financial Statement

The revenue or sales figure is calculated as gross revenue or sales minus the cost of goods sold (COGS). And gross profit is the difference between revenue and COGS. The more gross margin, the more money it can use to pay debts or expenses.

$$\text{gross margin} = \frac{\text{gross profit}}{\text{sales}} = \frac{\text{revenue} - \text{Costs of Good Sold}}{\text{Sales}} \quad (1)$$

Operating margin measures a company's profit on a dollar of sales after paying for variable costs of production but before tax and interest.

$$\text{operating margin} = \frac{\text{operating income}}{\text{sales}} = \frac{\text{revenue} - \text{COGS} - \text{SG\&A} - \text{D\&A}}{\text{sales}} \quad (2)$$

The current ratio compares a company's current assets to its current liabilities. It helps assess the ability to meet short-term needs.

$$\text{current ratio} = \frac{\text{current asset}}{\text{current liabilities}} \quad (3)$$

The debt-to-equity ratio measures a company's financial leverage and then evaluates a company's reliance on debt financing.

$$\text{DE ratio} = \frac{\text{total debt}}{\text{total equity}} \quad (4)$$

2.2. Assessment of Risk and Return

Annualized Return is the annual rate of return on an investment that analyzes how much is lost or gained in a period with consideration of compounding.

$$\text{Annualized Return} = \sqrt{(1 + r_1) \times (1 + r_2) \times (1 + r_3) \times \dots \times (1 + r_n)} - 1 \quad (5)$$

Volatility (usually denoted by σ) is the degree of variation in an investment during a period, usually measured by the standard deviation.

$$\sigma = \sqrt{\frac{\sum (X - \mu)^2}{n}} \quad (6)$$

Standard Deviation is a statistical measure that depicts the amount of variation within a set of data.

Annualized volatility is a measure used to assess the level of risk associated with an investment or portfolio. It calculates the expected fluctuations in the value of an investment over a year. A higher annualized volatility indicates a higher level of risk for the investment.

Sharpe ratio measures return per unit of risk. Investors prefer assets with higher ratios.

$$\text{Sharpe ratio} = \frac{\text{Risk premium}}{\text{SD of excess return}} \quad (7)$$

Beta (β) assesses a firm's sensitivity to systematic risk.

$$\text{Beta } (\beta) = \frac{\text{Covariance } (R_e - R_f, R_m - R_f)}{\text{Variance } (R_m - R_f)} \quad (8)$$

R_e =the return on an individual stock

R_m =the return on the overall market

Covariance=how changes in a stock's returns are related to changes in the market's returns

Variance=What is the spread of market data points from their average value

2.3. Valuation

Relative Valuation is a very useful and effective tool in pricing a firm's stock when it has comparable firms. Several popular multiples can be used, such as EV/Sales, EV/EBITDA, EB/EBIT and P/E ratios.

The data needed in relative valuation: Enterprise Value (EV), EBITDA, EBIT, Sales, share prices, and EPS (earnings per share).

The formula used in relative valuation:

$$EPS = \frac{\text{net income}}{\text{number of shares outstanding}} \quad (9)$$

$$P/E \text{ ratio} = \frac{\text{share price}}{EPS} = \frac{\text{market capitalization}}{\text{net income}} \quad (10)$$

Experts in company valuation tend to favor the forward P/E ratio, as it provides a comparison between a company's current stock price and its projected earnings per share for the upcoming year. On the other hand, the trailing P/E ratio compares the current stock price to the earnings per share from the previous year. Since future earnings are a key consideration, the forward P/E ratio is typically deemed more important.

This method is quick and easy to complete. It is suitable for generic companies with many competitors. Also, many people can easily understand.

However, relative valuation requires similar companies to compare to (apples to oranges possible). It would be influenced by temporary factors and not reflect intrinsic value [4].

3. Financial Statement Analysis

3.1. Profitability

3.1.1. Gross margin

As shown in Fig. 1, ASML's gross margin increased from 2019 to 2021 and then decreased slightly. The approach that improves gross profit margin is to lower the variable costs linked to the production of your goods. This can be achieved by either cutting down on the cost of raw materials or optimizing your production process. A viable approach to reducing raw material expenses is by leveraging bulk discounts. Procuring larger quantities of materials from a specific supplier could enable ASML to negotiate for more favorable prices and ultimately reduce their expenditure.

However, if the company chooses to raise prices, it could lead to lower sales. If there is a significant drop in sales, it is likely that the revenue earned will not be enough to cover the operating expenses.

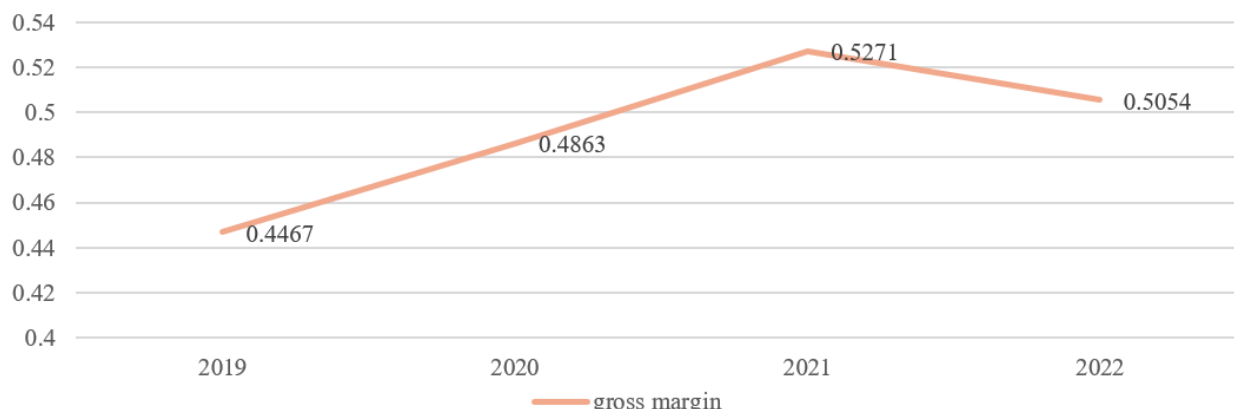


Figure 1. ASML's Gross margin

Fig. 2 compares the gross margins of ASML to those of the other three comparable firms. From this chart, we know that in 2019, Intel had the largest gross margin value. And that of TSMC's is the second largest. ASML's gross margin is slightly lower than TSMC's, at around 36%. And Samsung's is the lowest. In 2020, the gross margin rankings of Intel and TSMC remain unchanged, but Intel's gross margin has declined compared to the previous year. Meanwhile, ASML, TSMC, and Samsung all saw their gross margins rise. From 2021 to 2022, a more obvious change took place. TSMC's gross profit margin surpassed Intel's to become the first. ASML's gross margin also stabilized at around 50% over the two years, ranking second.

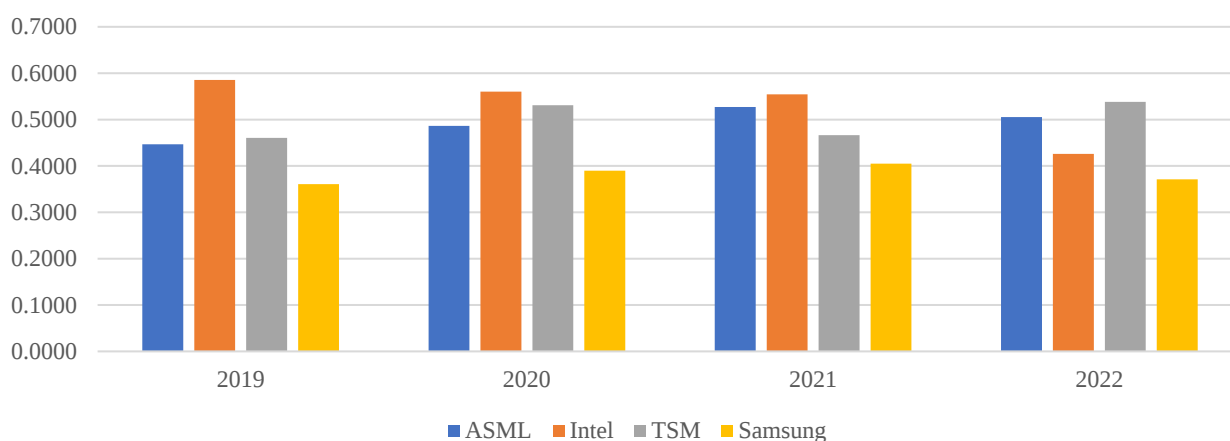


Figure 2. Gross Margin of the comparable firms

3.1.2. Operating margin

The operating margin of ASML continuously increased during 2019 and 2020 from 23.61% to 28.98%. This means the relative efficiency of the firm's operation has increased during the three years. And the rate of increase from 2019 to 2020 is lower than that of 2020 to 2021. But the operating margin decreased to 30.70% between 2021 and 2022. This reflects a decline in operational efficiency, as shown in Fig. 3.

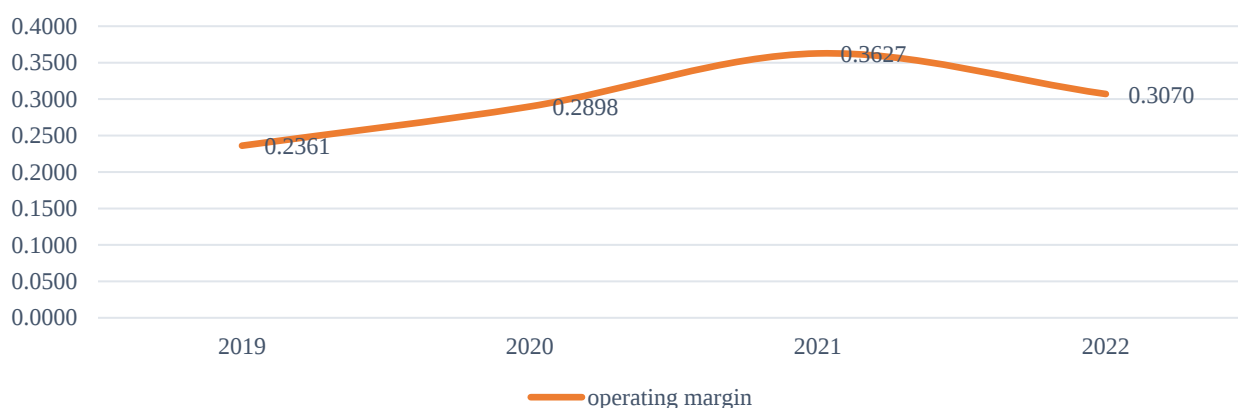


Figure 3. ASML's Operating margin

Fig. 4 shows the operating margin of ASML compared with its peer group. Throughout the past four years, TSMC's operating margin has been ranked first, which shows that their work efficiency has been very high. Between 2019 and 2021, ASML's and Intel's operating margin ratios are similar, both fluctuating between 20% and 35%. This means that the two companies are operating efficiently.

But in 2022, Intel's operating margin plummeted by about 20 percent. Intel's decline in operational efficiency can be attributed to the organizational modifications implemented in 2022, which were intended to enhance their execution and innovation efforts. As a result of these changes, the company's business units underwent restructuring, allowing them to extend their reach into established and emerging markets with significant potential for growth.

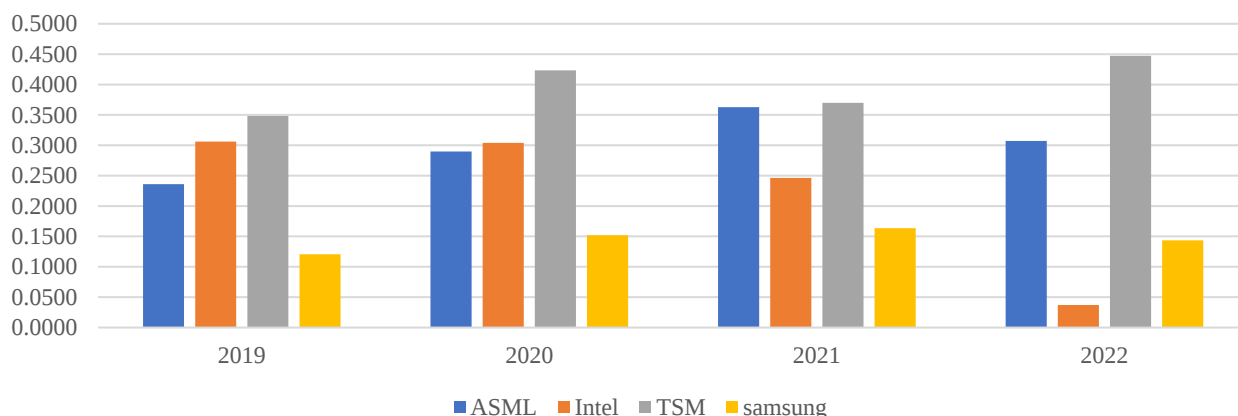


Figure 4. Operating Margin of the comparable firms

3.2. Leverage

According to the diagram, ASML's debt-to-equity ratio has increased at a faster rate in recent years. When the debt-equity ratio is high, it suggests that the company heavily depends on borrowed funds to operate its business, and this heightens its financial risk. This is particularly noteworthy amid interest rate fluctuations or economic down turns. At present, however, ASML's lithography machine technology level represents the most advanced technology level in the world. When a business is in a tailwind, a higher debt-to-equity ratio can help it grow further, as shown in Fig. 5.

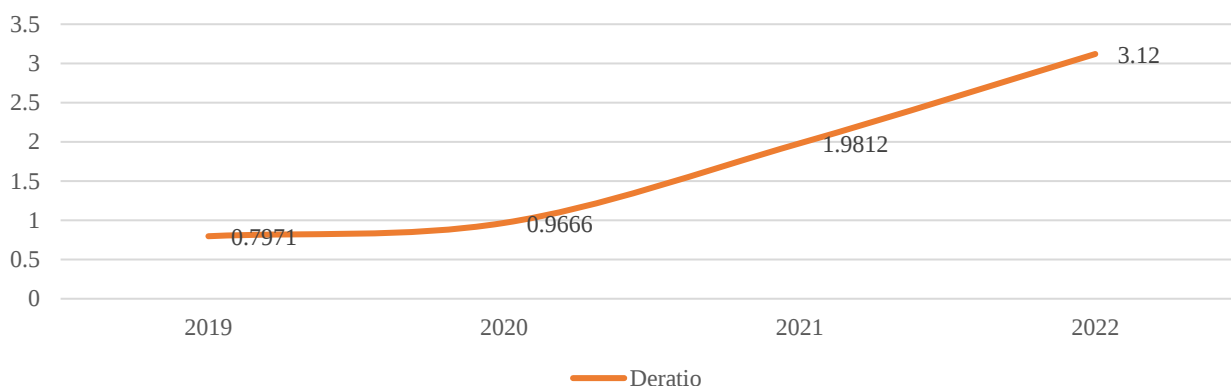


Figure 5. ASML's D-E ratio

According to Fig. 6, ASML's debt-equity ratio was relatively higher than other firms from 2019 to 2022 most of the time. And its value grew at a faster rate. However, data from comparable firms is almost constant [5].

In recent years, due to the impact of the pandemic, people's demand for online offices has increased. As the only EUV lithography machine manufacturer in the world, the number of orders received by ASML will increase significantly. When the marginal tax shield benefit equals the marginal financial distress cost, the optimal capital structure of a company is achieved, and its value is maximized. However, other companies may suffer greatly because of management or financial problems and so on.

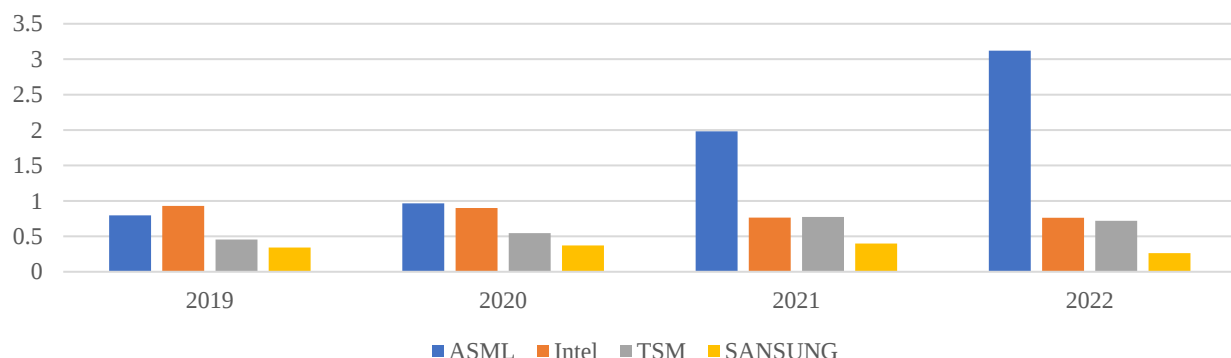


Figure 6. D-E Ratio of the comparable firms

3.3. Liquidity--Current ratio

Having a higher current ratio indicates a lower risk of facing a shortage of cash in the near future. From Fig. 7, the current ratio of ASML was highest in 2019 at above 2.5, and then it decreased slightly about 0.1 from 2019 to 2020. The next two years experienced a plunge from 2.4 to 0.5. A decline in the current ratio from 2020 to 2022 could be due to an increase in short-term debt, a decrease in current assets, or a combination of both factors. But that is not necessarily a bad thing. After all, many conditions have not been taken into account, such as the bias of accounts receivable.

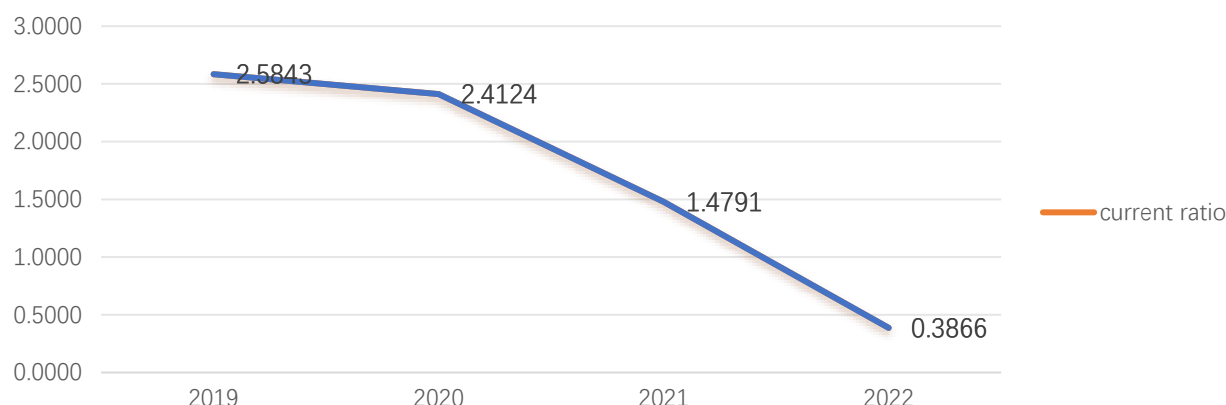


Figure 7. ASML's Current ratio

A company's sales and credit policies can have an impact on the owed amount. The cyclical nature of accounts receivable can make it an unreliable indicator of future cash flow, unless the company is making an active effort to collect outstanding debts. In the analysis of the flow ratio, if the amount of accounts receivable is regarded as a reliable indicator of the future cash inflow, the deviation of the goods, credit policies and other factors of the enterprise is inevitable [6].

From Fig. 8, ASML's current ratio declined rapidly. This may be because accounts receivable increased. Accounts receivable refers to money that is not received immediately after a business sells goods or services to customers. If the sales scale of the enterprise expands or the credit policy is too loose, it may lead to an increase in accounts receivable, which will reduce the current ratio. In addition, if the customer's credit status deteriorates or the market environment changes, it may also lead to the timely collection of accounts receivable and the reduction of the current ratio.

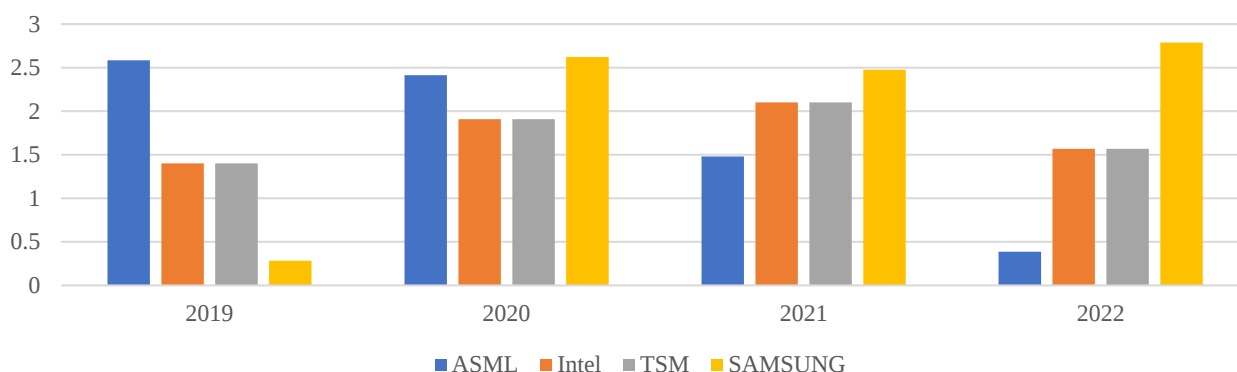


Figure 8. Current Ratio of the comparable firms

However, Samsung's current ratio is generally on the rise. This may be due to companies raising more illiquid assets. For example, enterprises raise more funds by issuing stocks or bonds, which can be used to purchase non-current assets such as fixed assets and intangible assets. However, this practice may cause a temporary increase in a company's current ratio, as non-current assets are difficult to quickly convert into cash, which may affect a company's short-term solvency.

In addition, the increase in the current ratio may also be due to the reduction of current liabilities. For example, companies have reduced short-term borrowing by repaying debt early and lowering interest rates, thereby reducing current liabilities. This can improve a company's credit rating and reduce interest expenses, but it can also cause companies to lose liquidity and have difficulty borrowing again.

It is important to note that while an increase in the current ratio is generally viewed as good news, and it also needs to be analyzed in conjunction with other financial indicators. For example, if the company's profit margin does not improve correspondingly, then the increase in the current ratio may be only a temporary appearance, and the company may face the risk of declining profitability.

4. Risk and Return

4.1. Annualized return

It can be seen from Fig. 9, that Intel has always been at the lowest level and may have decreased significantly in the last two years because of the epidemic. ASML had the highest annualized return at the beginning with 89.34% and also decreased a little bit in 2020 due to the epidemic, which is the same as Samsung in 2022 with about 70%. Samsung's big earnings growth in 2021 was driven by mobile businesses such as foldable phones and increased chip sales. Compared with the other two companies, the changing trend of ASML is more stable, basically in the 60%, range of 20%.

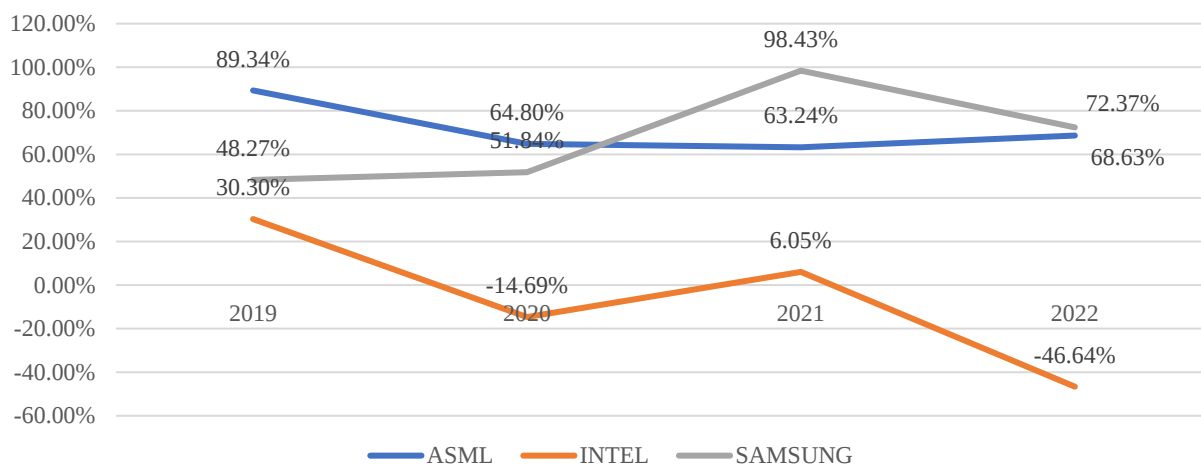


Figure 9. ASML's Annualized return

4.2. Annualized volatility

The graph shows that annualized volatility, which indicates risk, fluctuated constantly. Higher risk results in greater profits in a bull market but also more significant losses in a bear market. Market constraints and seasonal fluctuations, as well as difficulties in the production and delivery of lithography machines, have had a certain impact on the company [7].

One of the most serious problems was the production and delivery of EUVL, the company's latest generation of lithography machines. Due to technical difficulties and manufacturing problems, ASML's EUVL lithography machines are currently being produced at a slower pace and delivered later than expected [8]. This has led some of ASML's customers to abandon the purchase of EUVL lithography machines, which has affected the company's performance, as shown in Fig. 10.

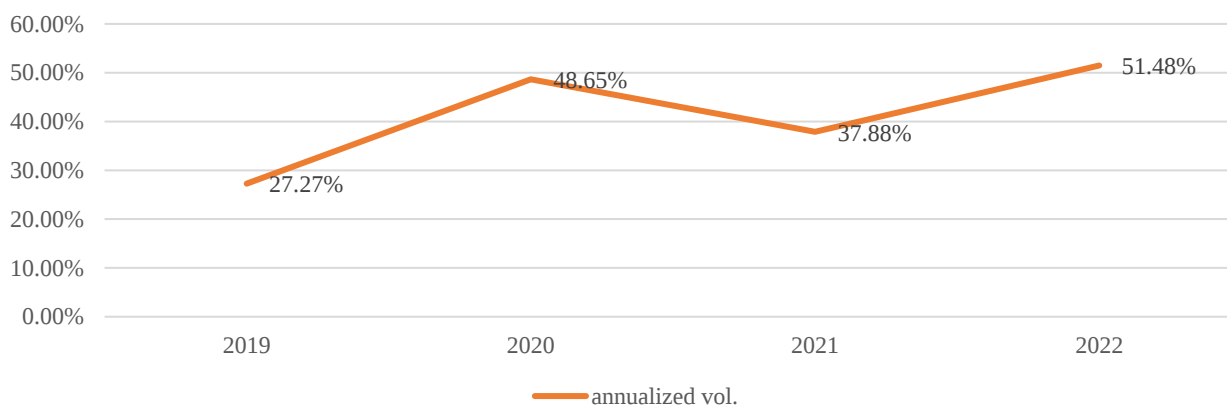


Figure 10. Annualized volatility

In annualized volatility, Samsung has always been at the bottom with about 23% mainly because the rapid development of the chip industry around 2017 led to an oversupply situation and a sharp

decline in chip prices. Intel has been volatile, reaching a table high in 2020, but 2021 is down 23% from the previous year, in part because its competitors are doing well in the data center market, and Intel is no longer able to raise prices to reflect manufacturing costs as it once did. What is more, the market is worried that Intel's 7nm products have been delayed in launching, which has led to important customer transfers. So, in 2022, Intel's annualized volatility 'was surpassed by ASML's. ASML is in the EUV monopoly position, and EUV has a high profit margin, coupled with logic chips and memory chips gradually increasing the demand for advanced processes, in 2021 after a small decline in 2022 growth, as shown in Fig. 11.

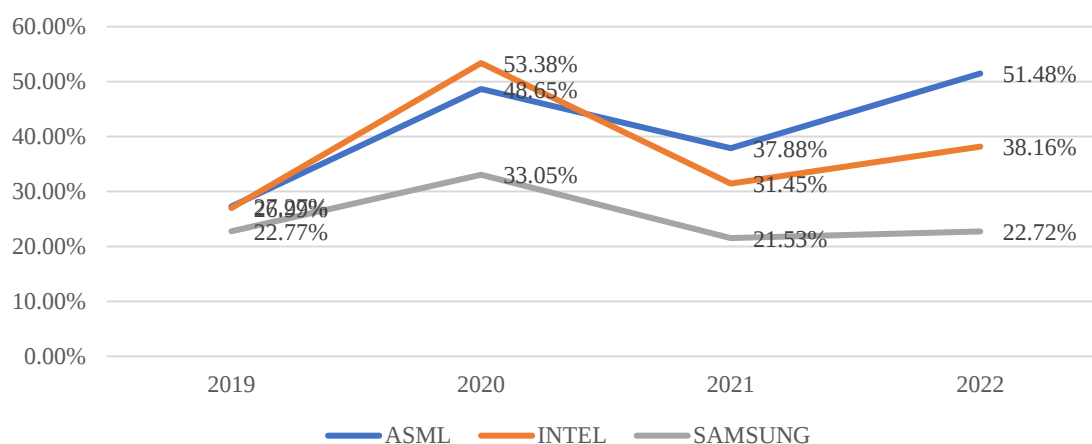


Figure 11. Annualized volatility of the comparable firms

4.3. Sharpe ratio

As shown in Fig. 12, there is a sharp fall between 2019 and 2020 from 319.77% to 131.37%. This situation is not a good sign for the company. This shows that the company's return per unit of risk had a significant decline. For the Sharpe ratio between 2020 and 2021, it has increased from 131.37% to 163.13%. This implies the return ASML can get per risk has increased. But from 2021 to 2022, the Sharpe ratio decreases again from 163.13% to 130.09%, and the return it can get per risk goes down [9].

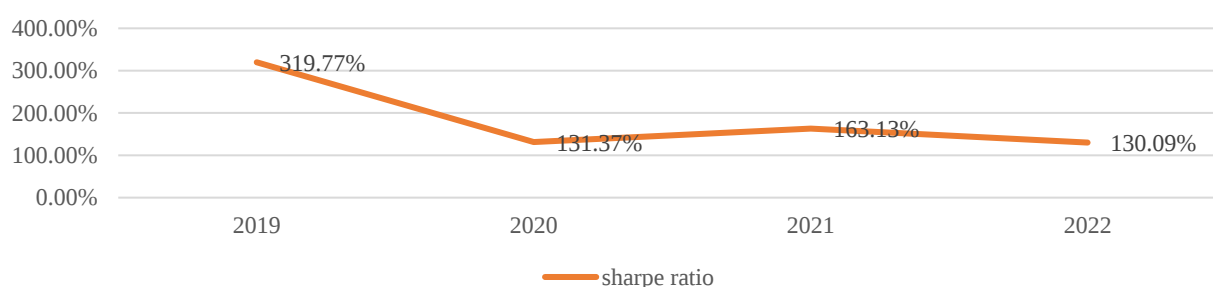


Figure 12. ASML's Sharpe ratio

4.4. Beta

ASML's beta value, which measures its sensitivity to systematic risk, is greater than 1.0, indicating a higher level of volatility compared to the overall market. At 1.37, ASML is regarded as a riskier investment than stocks with a beta value below 1.0, but it also presents the possibility of higher returns.

5. Relative Valuation

The relative valuation method compares ASML's implied share price with its actual share price. According to Table 1, Table 2, and Table 3, ASML is currently overvalued based on the relative

valuation using the multiples EV/Sales, EV/EBITDA, and P/E ratios. As the world's only manufacturer of EUV lithography machines, there is no doubt that ASML has a broad prospect for development. However, its status in the minds of shareholders may be higher than it should be. The irrational enthusiasm of stockholders can make stock prices overvalued. And it is notable here that the limitation of the above method of pricing ASML's stock price is that ASML is mostly a monopolist and hence its irreplaceable position in the chip manufacturing industry, it is much harder to find out its comparable firms [10].

Table 1. Relative valuation of the peer group in 2022.12.31

Peer group	EV/sales	EV/EBITDA	P/E
TSM	0.57	-5.54	13.44
SAMSUNG	3.63	17.05	8.97
INTEL	8.98	-188.12	8.18
CANON	0.02	0.18	10.8
NIKON	0.01	0.04	12.31
APPLIED MATERIALS	11.38	36.08	11.82
KLA	19.07	43.08	17.01
Mean	6.24	15.15	11.79

Table 2. Some financial values of ASML in 2022.12.31

Company	ASMA
Share price	554.65
Shares outstanding	390
Revenue	23,775.16
EBITDA	10,952.77
Net income	6,315.19
Net debt	22,706.50

Table 3. The comparison Stock valuation

Method	EV/sales	EV/EBITDA	P/E
Implied ASML Enterprise Value	148289.07	165916.2	97162.6
Net Debt	22,706.5	22,706.5	22,706.5
Implied ASML Equity Value	125582.6	143209.7	74456.1
Share price	554.65		
Implied ASML Share Price	322.007	367.204	190.913
Is ASML overvalued based on comps?	Yes	Yes	Yes

6. Conclusion

This project was undertaken to evaluate the financial performance of ASML during the COVID-19, with a sample period from 2019 to 2022. This research report finds out that ASML's operation during the epidemic was indeed affected, mainly in the following aspects.

First, in terms of analyzing financial statements, ASML's gross profit margin and operating margin both increased from 2019 to 2021, indicating that the company's profitability and operational efficiency had increased in these years. During the past four years, ASML's D-E ratio has continued to increase significantly, and its leverage has become higher and higher, which indicates that the company has been increasingly relying on debt financing. Moreover, the company's current ratio has continued to decline since 2019, which proves that the company's capital liquidity continues to deteriorate.

About quantifying the firm's risk and return, the annualized return of ASML has declined over the four years, but not by much. The annualized volatility of ASML is relatively high in 2020, but is between 30% and 40% in other years, indicating that the volatility of ASML's stock is relatively stable.

Besides, the surge in 2020 is also related to the sudden outbreak of the pandemic and the hit to the entire society and economy. Moreover, ASML's Sharpe ratio has also fallen significantly over the four years, which means the return ASML visitors can get is becoming lower and lower for each unit of risk they bear.

Finally, with relative valuation, the actual share price of ASML is much higher than the implied price, which may be due to the irrational enthusiasm of shareholders and their excessively positive prospects for ASML.

However, there were some limitations. For example, the sample years selected in the study are not large. Also, in the relative valuation of Samsung, the specific data of Samsung Group was not found, and finally, the data of its subsidiary - Samsung Electronics was selected and used.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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