Transactions on Economics, Business and Management Research
ISSN: 2960-1789, eISSN: 2960-2254 | Volume 14
AFTEM 2024

Comparative Analysis of Three High-Tech Chip Companies

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Abstract. This essay provides a thorough financial examination of three of the top semiconductor companies: AMD, TSM Instruments, and Nvidia. Additionally, these three businesses are involved in various sectors of the chip industry, some focusing on semiconductor processing and chip foundry. Ten different investor profiles—Value, Income, PEG, Index, Ratio analysis, DCF, Momentum, Growth, Smart Money, Insider buying, and Stock buyback investors—are among those whose asset selection challenges are examined in this investigation. Additionally, recent financial indicators for these companies are analyzed, and the meaning of various data is explored. The study, which makes use of well-established financial models, finds that investors who favor index, momentum, and stock buybacks are more likely to invest in all three equities. Furthermore, Nvidia and AMD have insider buying. Almost all the famous investors have invested in these stocks. The knowledge gathered from this study helps to create customized investment plans that eventually try to maximize profits in the semiconductor industry.

Keywords: Semiconductor; High-tech chip; Risk; Profitability; Ratio.

1. Introduction

Investing has several benefits that can assist people in reaching their financial objectives and give a means of gradually increasing wealth. Real wealth may be preserved or increased by investors via outpacing inflation in returns.Choosing investment portfolios is a difficult task that takes into account a number of competing factors [1]. Given the increased stability of the stock market, it is natural that a majority of individuals opt to invest in it [2]. In addition, the stock market has a comparatively low investment threshold and makes its information widely accessible and transparent. Numerous factors, including the state of the economy as a whole, current political developments, Sino-US ties, and business activities, all had an impact on the stock market. Thus, the most crucial thing for analysts and investors to do if they want to profit from the stock market is to anticipate the financial markets' time series ahead of time. Predicting the path of the stock market, however, requires access to data from current markets and previous records. It is usually the most challenging and crucial issue to accomplish accurate forecasting and lower forecasting expenses under such complex work and cost structures [3]. Investors strive to use scientific procedures when investing in these companies because of the stocks' high potential return and significant risk. As a result, the main focus of this essay is fundamental analysis, which is predicated on evaluating and comparing a stock's underlying worth to its current market price [4].

Chip firms are at the forefront of technological innovation because they consistently invest in R&D to generate new products and maintain competitiveness. They are spearheading developments in artificial intelligence, 5G connectivity, renewable energy systems, driverless vehicles, and more. They are also advancing computers, communication, automation, and other fields. Certainly, in recent years, the rapid development and application of artificial intelligence have promoted chip companies' business and market value. To take a recent example, openai's ChatGPT model promotes the application of artificial intelligence. Therefore, the application of artificial intelligence models requires the support of chip computing power, which has led to the rise of Nvidia's stock in a year, which tells us there are signs that the current chip industry, like the previous mobile phone industry, is standing in the wind of the times. Because crucial components are now integrated into many commonly used electronic products, the semiconductor sector plays a major role in driving

technological advancement. Because of its vital relevance, this industry is always changing to meet the demands of the market, which are driven by ever changing consumer preferences [5].

For these reasons, this paper has selected three companies that are most represented in the chip industry. By comparing their company background, risk ratio, profitability ratio, and market value ratio, this paper will evaluate their market performance and give investment advice.

2. Profiles

These three companies are the three most famous companies in the chip industry. However, their market targets are different from the products they are responsible for developing in the chip industry.

Nvidia was Established in 1993; it is a multinational technology company based in the United States. It has an important effect in the field of artificial and is the leader in the field of performance computing. As a company that produces high-tech chips, It is dedicated to developing CPU, DPU, GPU, and A.I. software to support computing solutions in fields such as construction engineering, financial services, scientific research, manufacturing, and automotive. It is worth mentioning that they have created specialized hardware, such Tensor Cores and CUDA Cores, which are well-liked for applications in artificial intelligence, machine learning, and gaming since they are tuned for parallel processing workloads. As an illustration, consider NVIDIA's most recent flagship GPU, the A100 Tensor Core GPU. It has been built with a ton of cutting-edge features to support workloads in data analytics, artificial intelligence, and HPC [6]. These prove that Nvidia is in the leading position in the chip field and has an impact on artificial intelligence.

American-based AMD began operations as a global semiconductor firm in 1969. The company, which is the oldest semiconductor company in the world, is dedicated to creating and designing integrated circuit products, such as motherboard chipsets, graphics processors, and central processing units, in order to supply computing solutions for industries like cloud computing, artificial intelligence, and gaming. AMD has been listed multiple times in the Global 2000 and US 500 companies and has won multiple awards in the European Hardware Awards. AMD. It creates APUs, FPGAs, GPUs, and CPUs. With its Ryzen CPUs, AMD competes with Intel, and with its Radeon GPUs, Nvidia. With an emphasis on semiconductor design, TSMC has taken over production since 2008. AMD's success is based on its constant research and development, which allows it to release a variety of new products. Among all worldwide semiconductor businesses, AMD's stock has increased the most as operational earnings and sales both skyrocketed as a result of the new products' strong sales [7]. Its product FX-8150 set the Guinness World Record for "Fastest Computer Processor" in 2011. As of March 2024, the market value has exceeded 300 billion U.S. dollars.

TSM, Taiwan's electronics company, is a pivotal player along the entire global consumer electronics supply chain and is notable for leading both the capital-intensive segment, such as the production of semiconductor chips and other electronics components, as well as the labor-intensive segment, including the final assembly of personal computers and smartphones [8]. As a typical example, 1987 saw the establishment of TSMC. It is the first expert integrated circuit manufacturing services company in the world. It is a stand-alone semiconductor design business that solely produces goods for other semiconductor design businesses. TSMC is deeply influenced by the United States, and its founders and executives are almost all from the American Academy of Sciences and several major chip companies in the United States. It focuses more on the manufacture of integrated circuits than on development, making money mainly by processing chips and manufacturing chips. TSMC is renowned in the industry for its advanced process technology, particularly in chip foundry orders for advanced processes of 5 nanometers and below. The company, with its leading 2.5D/3D chipset advanced packaging technology, has occupied the majority of high-end chip packaging orders for 5-nanometer and below processes in the market.

3. Financial Indicators

The financial indicators are obtained from the financial statements of each company. These financial data are mainly based on the year 2023.

3.1. Risk

Risk is the possibility of suffering a financial loss or other undesirable result while investing money in different assets like stocks, bonds, real estate, or other financial instruments. This paper selected the market cap, beta ratio, debt ratio, and current ratio as indicators to reflect risk. Market capitalization is a term that is utilized to illustrate the total worth of a company's outstanding shares on the stock market. A measure known as beta shows how a certain stock's price typically responds to changes in a larger market index. An indication of a company's financial health that shows how much of its total assets are financed by debt is the total debt ratio. The link between a company's current assets and current liabilities is displayed by the current ratio. This metric offers crucial details on the amount of leverage a company employs to fund its operational and investment endeavors. This paper specifically selects the current ratio as a measure of a company's cash flow. The author assume that the company's ability to repay debts is also a very important manifestation of risk. The relevant indicators for the three firms are shown in the Table 1 below.

Table 1. Risk

market cap	3.108T	286.98B	964.8B
beta	1.68	1.68	1.29
debt ratio	36.24%	17.23%	36.67%
current ratio	352.95%	263.89%	239.02%

As shown in Table 1, there is no doubt that all three stocks have a high market cap; people always have high expectations for chip companies. The market value of these companies is particularly high, which proves that they have strong stability. Looking at the beta, all three companies have betas higher than 1; the higher the beta is, the higher the risk is. Investing in these companies means higher yields and higher risks. AMD and Nvidia's beta are 1.68 and 1.29, respectively, so it is the highest risk to invest. TSM has the lowest risk of investment because its beta ratio is 1.29. But its overall risk is still above average. The debt ratio measures the portion of debt used in the company's capital structure; the debt ratios of these companies are relatively low. Nvidia's instruments are similar to TSM, whose debt ratios are around 36%, but they all have very high current ratios. Their current ratios are all over 200%, the higher the current ratio, the greater the liquidity of the asset. However, given their industry, the author thinks they have more extra cash. They have a strong ability to repay their debts in the short term. In a word, the risk of investing in these companies is not high. Through the above analysis of financial statements, the author would say that all three companies have a relatively low level of risk from a risk perspective.

3.2. Profitability

The ability to turn a profit or provide positive financial returns from business operations is referred to as profitability. It offers perceptions into the business's capacity to create value for its investors and maintain operations over the long haul. This paper selected the total asset turnover, profit margin, ROA, and ROE as indicators to reflect profitability. Total asset turnover is a measure of how efficiently a company uses its assets to generate sales revenue. The financial ratio known as profit margin is calculated as the difference between revenue and cost. The financial ratio known as return on assets (ROA) gauges a company's capacity to generate profits. A financial statistic called return on equity (ROE) gauges a business's performance in accordance to its shareholders' ownership stakes—following this. The relevant indicators of the three companies are shown in the Table 2 below.

Table 2. Profitability

	Nvidia	AMD	TSM
Total asset turnover	0.34	0.08	0.22
Profit margin	57.14%	2.25%	38%
ROA	32.31%	0.18%	3.98%
ROE	20.84%	0.22%	4.33%

As shown in Table 2, the highest total asset turnover is 0.34, achieved by NVIDIA. AMD has the lowest total asset turnover, at 0.08. With the highest profit margin of 57.14%, NVIDIA is the market leader. TSM's profit margin is 38%. AMD has the lowest profit margin of all the companies, at 2.25%. With a ROA of 32.31%, NVIDIA has the highest of all. AMD has the lowest ROA of 0.18%, while TSM has the highest ROA of 3.98%. With a ROE of 20.84%, NVIDIA has the highest of all. TSM's ROE is 18.85%. The lowest ROE, 4.33%, is exhibited by TSM. The above indicator data indicates that Nvidia has the best profitability, TSM has the second highest profitability, and AMD has the worst profitability.

3.3. Market Ratio

Market ratio refers to different ratios used in the context of evaluating a company's performance and market value. This paper selected the Price-to-Earnings (P/E) ratio, Price-to-Book (P/B) ratio, PEG, Divided yield, DCF, and momentum as indicators to reflect the market ratio. Price-to-Earnings (P/E) ratio is an indicator used to evaluate stock prices relative to a company's profitability level, reflecting the price investors are willing to pay for each unit of profit. Price-to-Book (P/B) ratio is a kind of book value. Dividend yield is a good financial figure. It can measure the annual dividend income generated by investors by investing in stocks. The average investor believes that the higher the dividend yield, the more worthwhile the investment. PEG is the price-to-earnings ratio relative to the profit growth ratio, which is an indicator used to evaluate the investment value of stocks. A valuation technique used in finance to determine the intrinsic value of an investment, such as a stock, bond, or business, is called discounted cash flow, or DCF. The author believes that the higher the DCF, the greater the expectation of enterprises to make new investments. Momentum (Mom) is a trading strategy when stocks rise or fall sharply. The relevant indicators of the three companies are shown in the Table 3 below.

Table 3. Market ratio

	Nvidia	AMD	TSM
P/B	5.9	4.59	7.96
PE	69.04	225.75	33.24
Dividend yield	0.1%	0%	1.1%
PEG	1.34	1.46	1.53
Momentum (50 Day MA>200 Day MA)	Yes	Yes	Yes
DCF	48.88	84.85	171.44

The P.B. ratio reflects the market's valuation of a company's net assets, and the P.E. ratio reflects investors' expectations of a company's future profitability. For these high-tech chip companies (their P.B. is more than four and P.E. is more than 30), Their PE and P.B. values are very high. High PE and P.B. values usually indicate that the market is optimistic about the company's future development prospects and current asset value, but at the same time, it also implies higher investment risks, and it also shows that companies in the chip industry have higher profits and development prospects as for the dividend yield, which reflects the cash return an investor receives from a stock investment, These

firms have dividend yields that are less than 3%. The PEGs of these three businesses are higher than 1. The greatest DCF among the three companies is TSM. The 50-day momentum averages for these companies are all above their 200-day momentum averages. These companies all have the phenomenon of insider buying and stock buyback, which the possible reasons could be that the company has ample cash flow, or it could be that it has been operating well in the past period and has not invested shareholders' money into poor projects (See Table 4).

Table 4. Insider Buying and Stock Buyback

	Nvidia	AMD	TSM
Insider Buying	Yes	Yes	Yes
Stock Buybacks	Yes(5.13%)	Yes(3.14%)	Yes(5.1%)

All of the companies have their insider buying and stock buyback.

4. Asset Selection

A company's profits and dividends are examined as part of fundamental analysis, which also takes interest rate forecasts into account and evaluates the degree of risk associated with the business [9]. Making investment selections gets much more difficult in the financial industry, where a multitude of factors impact the market [10]. Therefore, this study examines ten different investor types' selections in these three equities, and the findings are shown in the Table 5 below.

Table 5. Investing Selection

	Nvidia	AMD	TSM
Ratio	Yes	No	Yes
Index	Yes	Yes	Yes
Value	No	No	No
Momentum (50 Day MA>200 Day MA)	Yes	Yes	Yes
Insider Buying	Yes	Yes	Yes
Stock Buybacks of 5% or more	Yes	No	Yes
Smart Money	Yes	Yes	Yes
DCF	48.88	84.85	171.44
income	No	No	No
growth	yes	yes	yes

Through this analysis, value investors will not invest in these companies because their P/B ratio and P/E ratio are too high, which proves that they are overvalued. In contrast, growth investors invest in these stocks, which indicates that these companies have high growth. Because the dividend yield on these three firms is less than 3%, income investors will not be interested in them. PEG is less than 1, hence PEG investors won't purchase these. Since all three of these businesses are listed in the US500, index investors will purchase them. Ratio analysis investors will buy NVIDIA and TSM because they have a relatively high ROE. For momentum investors, their near 50-day momentum averages are higher than their near 200-day averages, indicating that these companies have high upside potential. For DCF investors, they will invest in TSM because its DCF value is the highest. Moreover, Ratio analysis Investors will invest in Nvidia and TSM.

5. Conclusion

This paper provides a detailed financial analysis of three chip companies, including Nvidia, AMD, and TSM, which have leading positions in the semiconductor and chip industries. This paper is committed to conducting fundamental financial analysis of these three chip companies to provide investors with effective investment strategies. The present study delves into the difficulties associated with choosing investments for ten different investor profiles: Value, Income, PEG, Index, Ratio analysis, DCF, Momentum, growth, Insider buying, and Stock buyback. The findings indicate that investors who fall into the Index, Momentum, and Stock Buyback categories are more likely to invest in all three stocks. Additionally, Nvidia and AMD have insider buying (more than 5%). Almost all the famous investors (smart money) have invested in these stocks. This paper presents the risks of these three companies, revealing that their investment risk is relatively low.

In addition to these indicators, this paper will reflect these stocks through different indicators in the future. There are other indicators and related models that are relevant to this study. Take an example, the comparison of the Sharpe ratios of various investment strategies—such as equities, portfolios, mutual funds, hedge funds, or technical trading rules—is a common application of financial performance analysis, ultimately to optimize the future development strategy of these chip companies and provide investors with more detailed and advanced investment strategies.

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