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Data Bootcamp 2025

Midterm project

Purpose

Our goal for this project is to identify the best publicly traded company to invest in out of 5 companies based on analysis of their three statements – Balance sheet, cashflow, and income statement. We chose five companies leading in the technology industry to conduct the project: Apple(AAPL), Microsoft(MSFT), Nvidia(NVDA), Meta (META), and Google(GOOG). Using the yahoo finance Api, we obtained data needed and created dataframes and graphs to showcase and interpret our data.

Methods

We initially retrieved data of the last 4 fiscal years from 11 different categories: Trailing Price to Earnings Ratio, Forward Price to earnings ratio, Free Cashflow, Cash Conversion Ratio, Return on Invested Capital, Dividends Amount, Revenue, Earnings per Share, Net Income, Operating Cash Flow, and Stock Prices.

Furthermore, we add on another 4 categories of growth rate data which derived from their corresponding data retrieved earlier, which are: Revenue change rate, Earnings per Share change rate, Net Income change rate, Operating Cash Flow change rate.

The reason we calculate percentage of change for Revenue, Earnings per share, Net income, and Operating cash flow is because as investors, we value growth and consistency for these data significantly. Having the percentages of changes, therefore, provide clearer measures

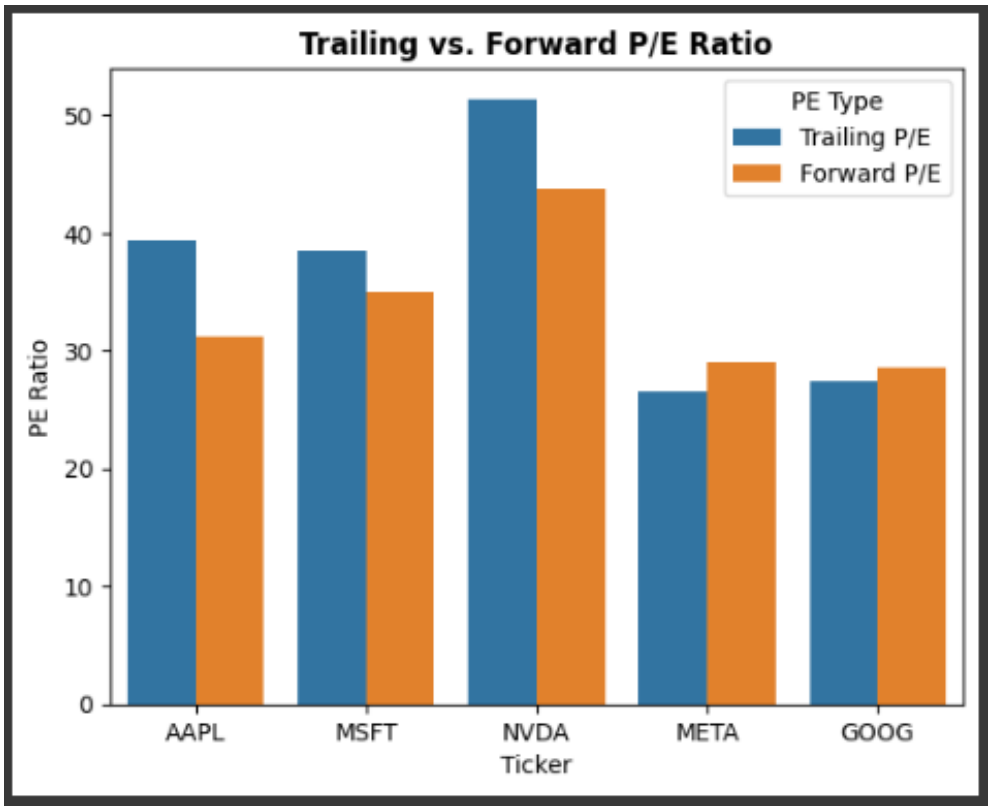
to growth and consistency, compared to raw data. Furthermore, such raw data differ greatly due to the size of companies, hence making these raw data and their visualization less meaningful when attempting to make comparisons among companies. As a result, based on the raw data we obtained for these 4 categories of data, we calculate the percentage of change of the latest 3 fiscal years for each company and create dataframes & visualizations, as demonstrated in the Final Dataframe. This provides insights to the quality and potential of companies and thus assists the identification of the best company to invest in.

Data which do not require growth rate are: Trailing Price to Earnings Ratio, Forward Price to Earnings ratio, Free Cashflow, Cash Conversion Ratio, Return on Invested Capital, Dividends Amount, and Stock Price high and lows. From an investor's perspective, we either do not necessarily expect growth or changes in such data, such as free cash flow where we pay most attention to their consistency and positiveness instead of growth, or these data are not affected by the size/scale of the company such as ROIC ratio, meaning that such extracted raw data or computed ratio data by themselves is sufficient to provide insights and comparisons. Therefore, for such data, we simply create dataframes and visualizations for comparison to help decide the best company to invest in.

Data & Analysis

- **Raw Data & Ratios**

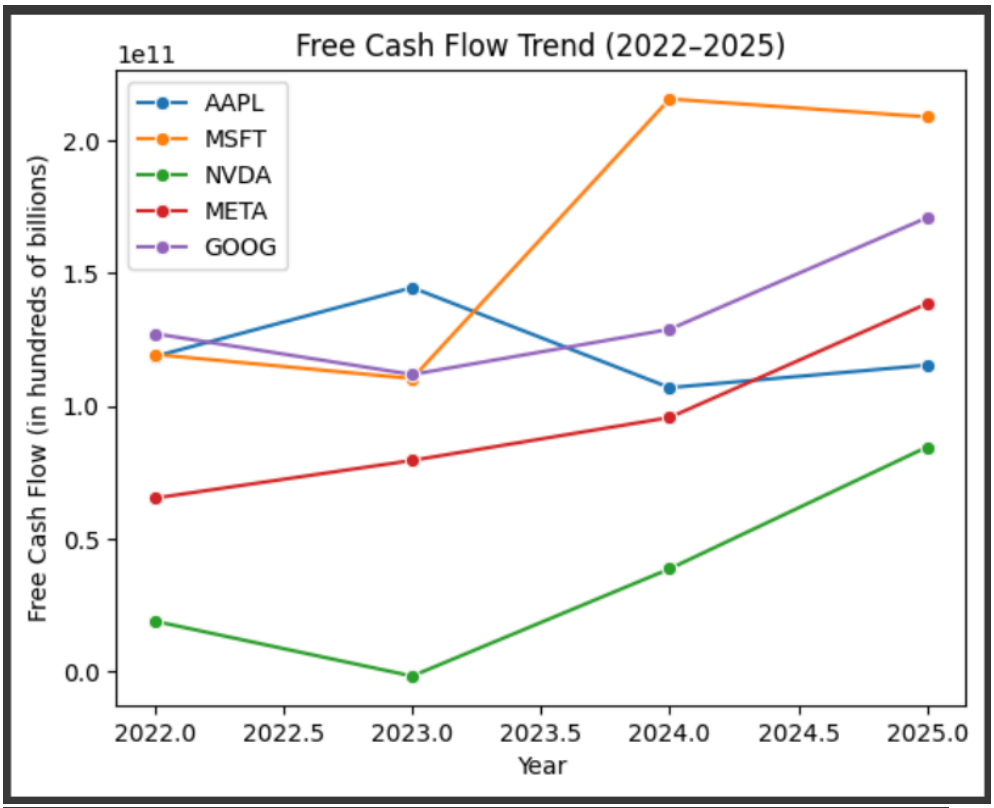
Price to Earnings Ratio (P/E Ratio)



Ticker	Trailing P/E	Forward P/E
AAPL	39.062122	31.024065
MSFT	38.386850	34.946156
NVDA	50.884613	43.350727
META	26.416939	28.787155
GOOG	26.895410	28.157541

Trailing P/E is the earnings from the past 12 months and forward P/E is the estimated future earnings for the next 12 months. From the graph, we can see that Nvidia is expected to have the greatest future earnings, with Microsoft and Apple following after.

Free Cashflow

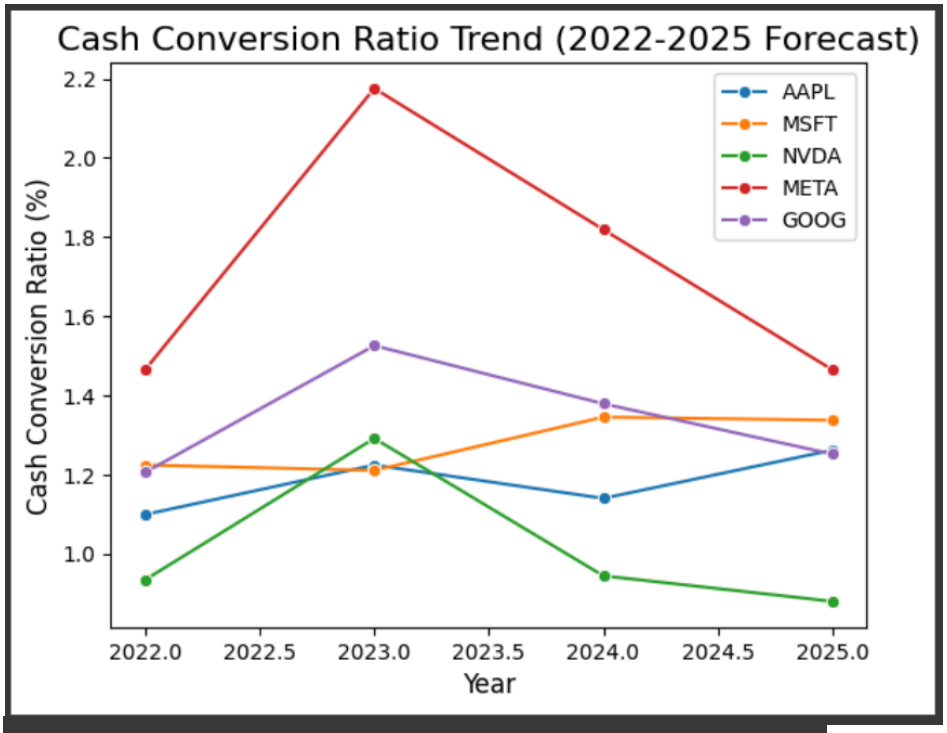


	AAPL	MSFT	NVDA	META	GOOG
2025	1.153190e+11	2.087610e+11	8.451000e+10	1.384780e+11	1.708350e+11
2024	1.068380e+11	2.155180e+11	3.865600e+10	9.560800e+10	1.288090e+11
2023	1.445050e+11	1.102620e+11	-1.735000e+09	7.944500e+10	1.117930e+11
2022	1.185830e+11	1.193460e+11	1.893800e+10	6.525300e+10	1.271750e+11

Free cash flow (FCF) is operating cashflow - investing cashflow. This data indicates how much cash is remaining after every action of the company involving cash, demonstrating how much cash the company has remaining in a year for financing activities such as paying dividends, but back shares and debts, etc. As investors, we would like to see positive, consistent free cash flow as it shows that the company is comfortable instead of struggling cashwise through their core business operations, indicating the quality of the business. Analyzing this data, we can see that

there was some significant growth from 2022 to 2025. Microsoft has consistently the highest Free Cash Flow, growing significantly to over 208 billion. While Google and Apple and Meta maintained high, consistent growth. The company that is showing the most varied change is Nvidia with a dip in free cash flow in 2023 then steadily rising to over $84 billion by 2025.

Cash Conversion Ratio

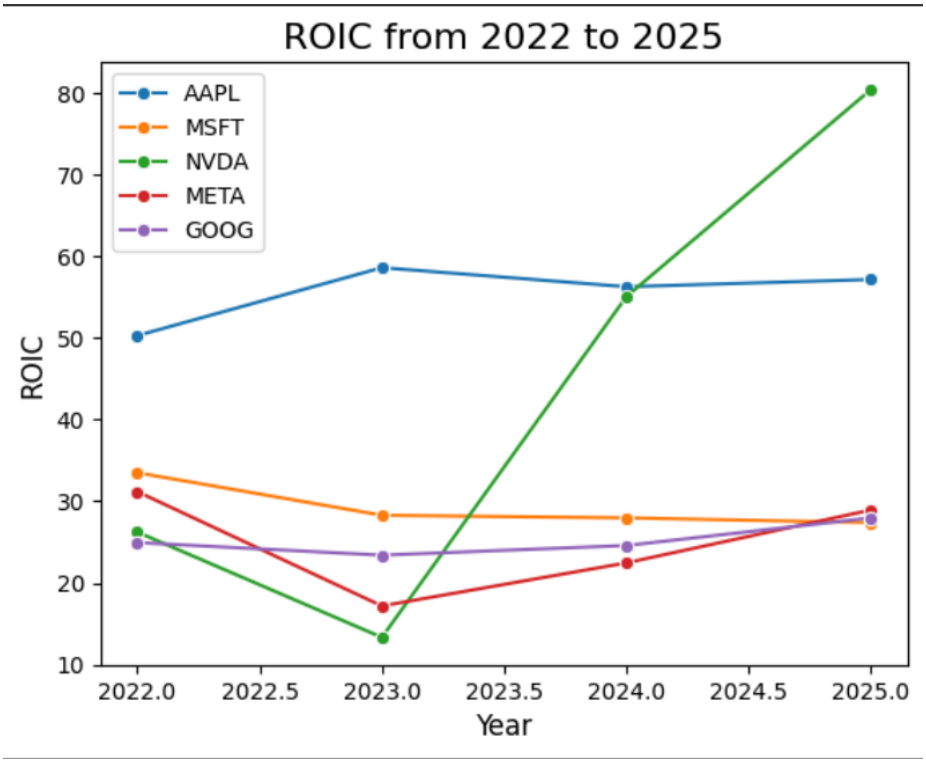


	AAPL	MSFT	NVDA	META	GOOG
2025	1.261564	1.337124	0.879377	1.464529	1.251513
2024	1.139677	1.345058	0.943884	1.818840	1.378765
2023	1.223921	1.210348	1.291209	2.175647	1.525629
2022	1.098838	1.224051	0.933962	1.465151	1.205424

Cash Conversion Ratio (CCR) is Operating cashflow / Net income. The ratio reflects how true the company's reported net income in income statement is. As investors, we want to see high

CCR ratio as it indicates the company does not occupy much account receivables and delay payments, healthy for the company operation. Looking at the Cash Conversion Ratio data, we can see that Meta was most effective at converting revenue into free cash flow from 2022 to 2025. Although according to the data, the conversion ratio declines after 2023 for Meta, therefore we can assume that it will continue to decline after 2025 also. Whereas both Microsoft and Apple have maintained stable, high conversion ratios. Google for most of the years, has shown a steady conversion ratio only declining slightly. While Nvidia is last with its ratio dropping considerably since 2023, which could suggest a decrease in efficiency for turning sales into cash.

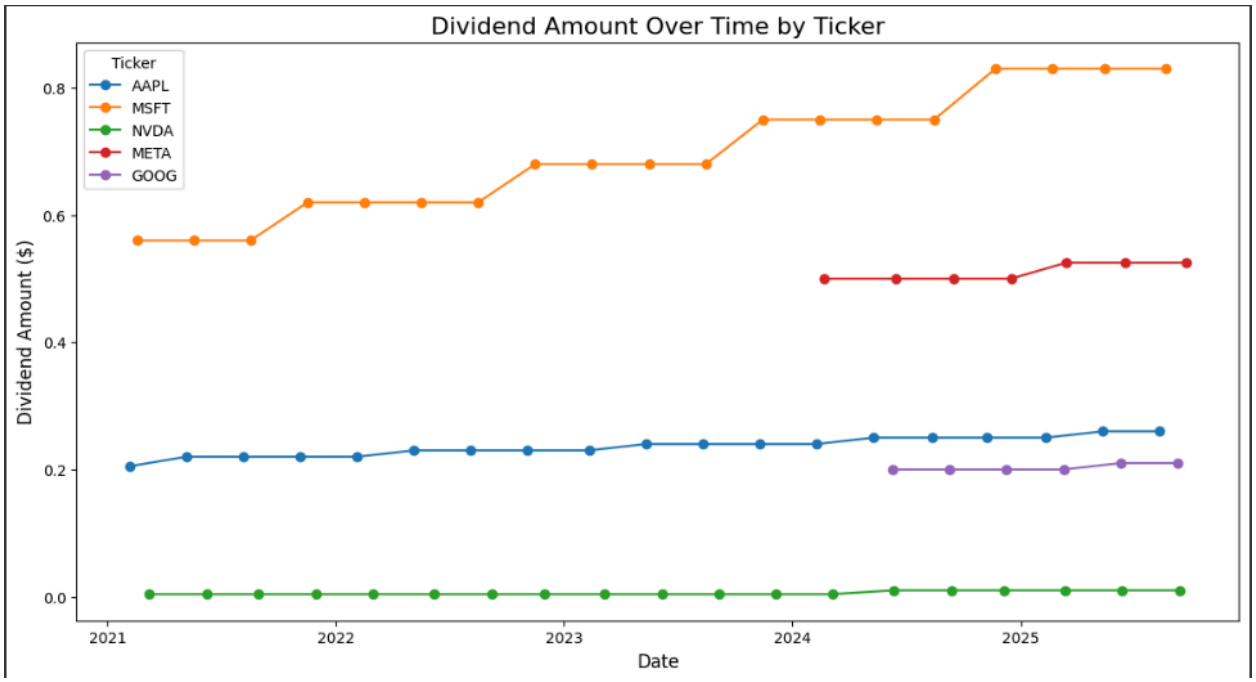
Return on Invested Capital



	AAPL	MSFT	NVDA	META	GOOG
2025	57.171730	27.392358	80.441680	28.937999	27.966449
2024	56.281534	27.964460	55.071194	22.455348	24.581378
2023	58.619901	28.289920	13.329189	17.178271	23.398471
2022	50.295131	33.496127	26.226692	31.186388	24.940480

Return on Invested Capital (ROIC ratio) is demonstrated as percentages% here. ROIC = (Net operating income after tax / invested capital)*100%. The greater the ROIC, the more efficient the company is at generating operating income considering their size. As investors, we usually would like to see companies with high ROIC ratio as it potentially indicates a company's competitive advantage in the industry. Through analyzing the data on Return on Invested Capital we can see that the company that shows the greatest increase in performance is Nvidia which recovered from a low of 13.3% in 2023 and finished at 80.4% in 2025. Apple shows a strong and stable ROIC consistently maintaining the second highest place near 50-60%. While Microsoft, Meta, and Google show a lower ROIC, clustered together around 28%.

Dividends



	Ticker	Date	Dividend Amount
69	AAPL	2021-02-05	0.205
70	AAPL	2021-05-07	0.220
71	AAPL	2021-08-06	0.220
72	AAPL	2021-11-05	0.220
73	AAPL	2022-02-04	0.220
...	...	...	...
235	GOOG	2024-09-09	0.200
236	GOOG	2024-12-09	0.200
237	GOOG	2025-03-10	0.200
238	GOOG	2025-06-09	0.210
239	GOOG	2025-09-08	0.210

70 rows × 3 columns

Looking at the dividends data, Microsoft shows the highest dividend growth rising from around 0.56 to 0.83 by 2025. While Apple remained steady at around 0.25 showing minimal growth. Both Meta and Google were historically non-dividend payers, but both initiated payouts in 2024, with Meta starting higher at 0.5 while Google at 0.2. Finally, Nvidia maintained a low dividend at around 0.04, this indicates that they focus more on reinvesting capital rather than returning it through dividends. This matches with our data above on ROIC, with Nvidia getting the most out of invested capital.

Revenue

	AAPL	MSFT	NVDA	META	GOOG
2025	3.910350e+11	2.817240e+11	1.304970e+11	1.645010e+11	3.500180e+11
2024	3.832850e+11	2.451220e+11	6.092200e+10	1.349020e+11	3.073940e+11
2023	3.943280e+11	2.119150e+11	2.697400e+10	1.166090e+11	2.828360e+11
2022	3.658170e+11	1.982700e+11	2.691400e+10	1.179290e+11	2.576370e+11

Earnings Per Share

	AAPL	MSFT	NVDA	META	GOOG
2025	6.08	13.64	2.940	23.86	8.04
2024	6.13	11.80	1.190	14.87	5.80
2023	6.11	9.68	0.174	8.59	4.56
2022	5.61	9.65	0.385	13.77	5.61

Net Income

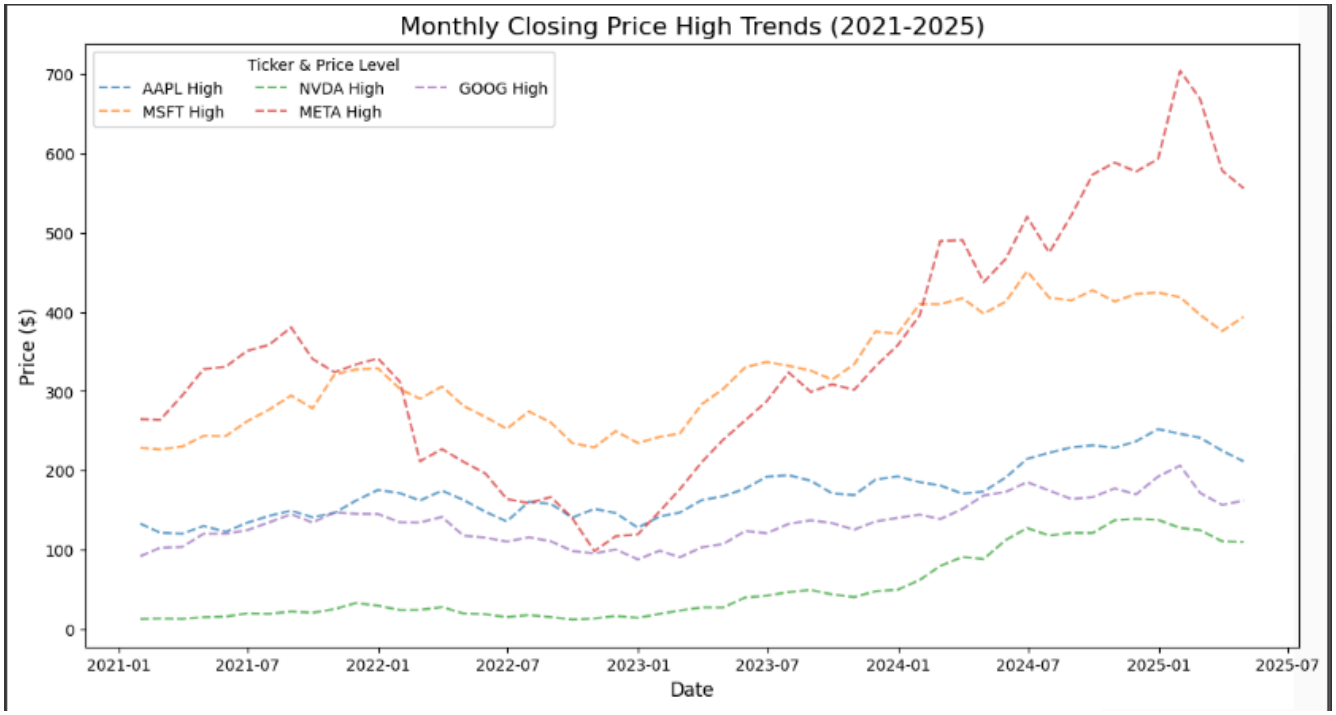
	AAPL	MSFT	NVDA	META	GOOG
2025	9.373600e+10	1.018320e+11	7.288000e+10	6.236000e+10	1.001180e+11
2024	9.699500e+10	8.813600e+10	2.976000e+10	3.909800e+10	7.379500e+10
2023	9.980300e+10	7.236100e+10	4.368000e+09	2.320000e+10	5.997200e+10
2022	9.468000e+10	7.273800e+10	9.752000e+09	3.937000e+10	7.603300e+10

	2025 Net Income in descending order
AAPL	9.373600e+10
MSFT	1.018320e+11
NVDA	7.288000e+10
META	6.236000e+10
GOOG	1.001180e+11

Operating Cash Flow

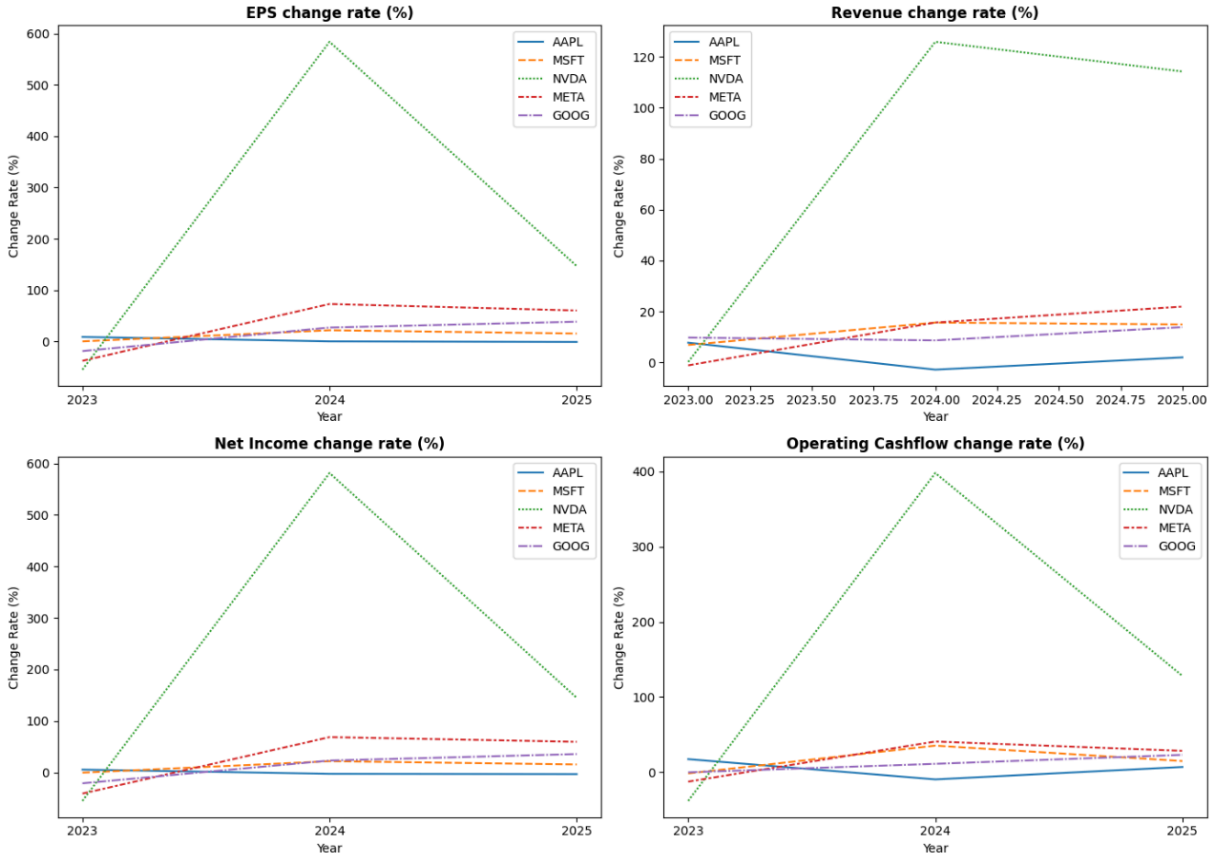
	AAPL	MSFT	NVDA	META	GOOG
2025	1.182540e+11	1.361620e+11	6.408900e+10	9.132800e+10	1.252990e+11
2024	1.105430e+11	1.185480e+11	2.809000e+10	7.111300e+10	1.017460e+11
2023	1.221510e+11	8.758200e+10	5.640000e+09	5.047500e+10	9.149500e+10
2022	1.040380e+11	8.903500e+10	9.108000e+09	5.768300e+10	9.165200e+10

Stock Price: High Trends



❖ Growth Rate Dataframe & visualizations

		AAPL	MSFT	NVDA	META	GOOG
EPS change rate (%)	2023	8.912656	0.310881	-54.805195	-37.618010	-18.716578
	2024	0.327332	21.900826	583.908046	73.108265	27.192982
	2025	-0.815661	15.593220	147.058824	60.457297	38.620690
Revenue change rate (%)	2023	7.790000	6.880000	0.220000	-1.120000	9.780000
	2024	-2.800000	15.670000	125.850000	15.690000	8.680000
	2025	2.020000	14.930000	114.200000	21.940000	13.870000
Net Income change rate (%)	2023	5.410858	-0.518299	-55.209188	-41.071882	-21.123723
	2024	-2.813543	21.800417	581.318681	68.525862	23.049090
	2025	-3.359967	15.539621	144.892473	59.496649	35.670438
Operating Cashflow change rate (%)	2023	17.409985	-1.631942	-38.076416	-12.495883	-0.171300
	2024	-9.502992	35.356580	398.049645	40.887568	11.203891
	2025	6.975566	14.858117	128.155927	28.426589	23.148822



We calculated the change rate for the Earnings per Share, Revenue, Net Income, and Operating Cashflow. Since we would like to see growth in these raw data, we would like to observe large, positive, preferably consistent growth rate in the dataframe and visualizations. These data are key indicators of the sustainability and trend of a company's financial health, performance efficiency, and future growth prospects.

- Earnings per share change rate (%):

From Earnings per share change rate, we see that NVIDIA experiences significant growth as its 2023 data is around the same as other companies, but drastically excels other companies in 2024 and has a more moderate advantage in 2025. Apple demonstrates a relatively consistent little growth rate and even a slight trend of decreasing. Microsoft demonstrates a modest upward trend, remaining relatively stable compared to its peers. Meta and Google fluctuate mildly, maintaining low to medium growth, indicating steady EPS growth.

- Revenue change rate (%):

For revenue growth rate, NVIDIA shows a clear excelling pattern again. It remains close to others in 2023 but sharply rises in 2024, far surpassing every other company's growth rate, before moderating in 2025. This sharp 2024 spike indicates a year of strong revenue expansion. Apple, Microsoft, and Google all show gradual, stable, but significantly lower growth, reflecting mature revenue bases with consistent but limited growth potential. Meta shows slightly negative or minimal growth in 2023 but recovers in 2024 and 2025.

- Net Income change rate (%):

For net income change rate, the same pattern appears with NVIDIA dominating. Its net income growth accelerates sharply in 2024, continuing the great upward momentum in 2025. Apple and Microsoft show more controlled, small positive net income growth rate, indicating stable profitability and less volatility. Meta experiences moderate fluctuations, increasing substantially in 2024 before settling again, while Google remains in the middle range with relatively balanced and steady upward change rates.

- Operating Cashflow change rate (%):

From the operating cashflow change rate, NVIDIA, again, exhibits the most dramatic growth trend, particularly in 2024, where its change rate reaches a much higher level than all other firms. This indicates that NVIDIA's earnings growth is strongly supported by real cash generation. Apple and Microsoft show steady and healthy cashflow growth, reflecting reliable operating efficiency. Meta and Google both show moderate but consistent improvement, suggesting that their ability to generate cash from operations remains stable and gradually increasing.

- Overall Observation

Across all growth growth rate indicators, EPS, revenue, net income, and operating cashflow, NVIDIA stands out as the strongest growth performer, especially in 2024, showing significant spikes which dramatically exceeds the other companies. Microsoft maintain steady, predictable but moderate growth, while Meta and Google fluctuate and show weak numbers but improving trends toward 2025. Apple, however, shows weak and even slightly decreasing trend across all metrics. The consistent excellence of NVIDIA across growth metrics indicates recent accelerated business expansion, whereas the others remain stable, mature growth trajectories. Consequently, through the analysis of Earnings per Share growth rate, Revenue growth rate, Net Income growth

rate, and Operating Cashflow growth rate, we think that Nvidia, out of the 5 companies selected, is most worthy of investment.

Investment Model

	Forward P/E	Latest CCR	Investment Score	Investment Rank
META	28.988537	1.464529	0.050521	1
GOOG	28.215643	1.251513	0.044355	2
AAPL	31.101084	1.261564	0.040563	3
MSFT	34.818730	1.337124	0.038402	4
NVDA	43.757282	0.879377	0.020097	5

To figure out which company would be best to invest in we calculated an ‘investment score’ for each company. This was found by dividing the latest cash conversion ratio (CCR) over the forward Price to Earnings Ratio (P/E). This is because a higher cash conversion ratio means a company is good at converting profits into actual cash, therefore it would have stronger financial health, more flexibility to invest in future growth, and increased liquidity so it’s more stable and less risky. Whereas a lower Price to Earnings Ratio is better since it suggests a low stock price compared to the company’s earnings. Although when only looking at the Price to Earnings ratio and not comparing it to anything else, a low P/E could also be a bad thing, such as its earnings are expected to decline in the near future or other investors are pessimistic about the company’s future growth. Which is why it is important to compare it to other data such as the CCR. Through comparing the data and solely based on our CCR/ (P/E) model, we found that Meta is best to invest in as it has both a high CCR and a low P/E suggesting that there is both a high degree of

operational efficiency and a potentially undervalued stock price relative to its cash-generating ability. After Meta, the best to invest in would be Google, then Apple.

Limitations/Risks

While our 'investment score' model clearly identifies Meta as the top investment, it is important to acknowledge that this analysis relies heavily on historical data and forecast data which is subject to change. Specifically, Nvidia's extremely high ROIC and Free Cash Flow growth makes it a highly desirable growth stock which is entirely missed by the CCR/(P/E) model. Especially since when evaluating which company to invest in, its future potential is important. But our model focuses more on current efficiency ratios. Therefore, while our score obtained from our model is a strong quantitative guide, it is also important to take into account a qualitative assessment of a company's long term growth.

Conclusion

Looking at both the quantitative and qualitative information we have gathered, both Nvidia and Meta would be good companies to invest in. This was decided based on both the CCR/ (P/E) model and the growth rate model. Since Nvidia shows a strong future growth long term and Meta shows a stable historical growth.