

The Impact of Inflation on NVIDIA's Profitability

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Abstract. In recent years, the high inflation that has occurred around the world and the Fed's tightening interest rate hike have become major macro factors. Inflation can impact the fortunes of businesses in a number of ways: costs, demand/financing, and differentiated pricing power, the latter being a characteristic unique to head technology firms. This paper is a single case study on NVIDIA where the statistical relationship between inflation and the profits is examined. The results indicated that the correlation result showed that inflation is weakly positively related to the four profit indicators, the regression test result showed that all the coefficient of inflation was negative but not significant while the coefficient of interest rate was positive and significant to the profit index. The model is only able to explain the fluctuation of profit of 30% – 50%. This demonstrates that market pricing power of NVIDIA AI products and industry demand dividend can overcome the cost pressure induced by inflation, without even counting on the core of profit. It's important to note that interest rate and corporate profit are synchronized, meaning that there is a linkage between economic cycles but not a cause and effect. This study not only fills the gap of micro-empirical evidence of inflation in chip leading enterprises but also serves as a quantitative analysis paradigm for financial analysis of science and technology enterprises to differentiate macro-cycle and industrial structural factors, and acts as a reference for profit judgment of similar semiconductor enterprises.

Keywords: NVIDIA, profitability, Inflation

1. Introduction

Inflation is one of the major macroeconomic variables that influence the business environment in the modern macroeconomic systems. One way of broadly describing inflation is as a rise in the general price level. Its volatility can affect consumers' purchasing power and can also have a profound impact on a firm's cost structure, revenue and financing conditions [1]. The United States went through a big inflationary period between 2021 and 2024 when, at times, the year-on-year growth of the Consumer Price Index (CPI) surpassed 8%, the highest since the early 1980s. The Federal Reserve's "contractionary" monetary policy, in response to high inflation, has caused the federal funds rate to rise from near zero to over 5%.

Theoretically, inflation has several channels that can impact the profitability of businesses. In the first, on the cost side, inflation tends to squeeze profit margins as it tends to raise the costs of production to the firm, such as raw material, labour, transport etc [2]. Second, on the demand side,

inflation decreases the real purchasing power of consumers which can lead to lessened demand for firms' products. But in some cases, firms might increase the price of the products to compensate for the increased costs, depending on their pricing power and market power [3]. Lastly, on the financing side, inflation is typically accompanied by an increase in interest rates that leads to higher borrowing costs and can impact firms' investment decisions and profitability [4].

While inflation usually is bad news for the profit line, recent research indicates that, at least for some firms, profit margins may show a positive trend in inflationary periods. This could be because firms can exercise their market power to increase prices, and consequently their profit margin, or keep it the same [5]. Hence it can be postulated that the impact of inflation on corporate profitability is not unidirectional but is dependent on the industry structure, competition within the market and firm-specific advantages.

Given the above background, the main research question of this study is: Will the inflation impact NVIDIA's profit? To fulfill this research question, the following objectives are set: First, this study sets up an indicator system for the profitability of NVIDIA, which consists of Gross Margin, Operating Margin, Net Profit Margin and Return on Assets (ROA); second, the relevant data of the indicators are taken from the company's financial reports, and the trends of NVIDIA's profitability are analyzed [6]. Second, inflation data is gathered and as an indicator of inflation, the year-on-year growth rate of the Consumer Price Index (CPI) is used in this study and the relationship between it and the corporate profitability is examined. Third, this paper adds a control variable into the analysis; the federal funds rate, a measure of monetary policy, is used to explain the impact of monetary policy on corporate profitability, which allows for a more precise analysis of the link between inflation and profitability. Lastly, the former research methods such as correlation analysis and linear regression are used to quantitatively analyze the relationship between inflation and the profitability of the companies and the obtained results are interpreted with economic theory.

2. Literature review

2.1. Theoretical studies on inflation and corporate profitability

The traditional macroeconomic theory implies that inflation increases the cost of raw materials and labor and squeezes the profit of enterprises, and the transmission mechanism is studied from the macroeconomic point of view of cost push inflation. Recent studies, however, have shown that firms under certain market structure may shift up the additional costs of production to consumers by selling the product at a higher price, such that their profit margin is maintained or even improved [3]. Hence, the link between inflation and corporate profitability could be two-way and complicated.

Blanchard's work is mainly at the macroeconomic level and focuses on how inflation influences the cost structure of firms, through the shifts in the supply curve and the mechanisms of price transmission [2]. De Loecker et al. rely on firm-level data and structural models and market power estimation techniques to discuss the importance of markups for macroeconomic developments [3]. Further, Weber and Wasner perform time-series analysis of firm profit data and price data to analyze the trend in profit margins during inflation periods [5].

The old-fashioned view is that inflation tends to reduce profit margins as costs rise more quickly than prices; this is what is happening in developing economies. But De Loecker et al. do find that firms with high market power have the ability to raise their mark-ups in times of inflation, which allows them to keep or widen profit margins [3]. Weber and Wasner also indicate that in some sectors increased profits for the corporations could even be a major determinant of inflation [5].

These studies show that effects of inflation on profitability of the firms vary significantly with the market situation and structure of the industry. This assumption of a negative impact of inflation on profitability may be too simplistic, however, and firm-specific characteristics should be considered.

2.2. Empirical studies of macro-economic variables and financial performance of firms

The literature stream is concentrated on the link between macroeconomic indicators (inflation, interest rates, and economic growth) and firm's financial performance. Such studies tend to be based in financial economics and explore the effect of macroeconomic shocks on corporate profitability and stock returns [4].

Bernanke and Blinder assess the effect of monetary policy actions on corporate investment and profitability through macroeconomic time-series analysis and regression analysis [4]. Fama uses multivariate regression models to analyze the relationship between inflation and stock returns and indicates that inflation could be negatively correlated with corporate profitability [7]. Moreover, some studies choose panel data models to analyse the impact of macroeconomic indicators on financial indicators of the companies [8].

The results of most macro-finance studies are that there is no consistent link between inflation and corporate profitability. Inflation could affect corporate profitability negatively during recession, while it could affect positively during economic expansion, coupled with the positive effect of inflation during that period [1]. Furthermore, there is a close link between interest rates and the business cycle such that,

In inflation and profits analysis, policy interest rates should be used as control factors to achieve the corresponding results that avoid the interference of macroeconomic cycles, but the use of a single interest rate variable can't completely eliminate the interference of macroeconomic cycles. All of these studies offer valuable methodological insights for this study, in that other macroeconomic variables should be accounted for when investigating the link between inflation and profitability.

2.3. Dynamics of corporate pricing power and profit margin

In recent years, the significance of such pricing power as an important factor of corporate profitability in the inflationary environment has drawn attention. Pricing power is the power of a firm to increase the price of its products/services in line with an increase in its costs without causing a decrease in its revenue [9].

Using production function estimation and profit decomposition, de Loecker et al. measure markups at the firm level from financial data and examine the link between market structure and markups [3]. Weber and Wasner examine the firm profit data and price indices and analyze the dynamic relationship between profit margins and inflation [5].

In addition, the New York Fed's explores using firm-level financial data whether or not corporate profits rise during inflationary periods [10-12].

The results of these studies suggest that higher market concentration industries are more likely to be profit maximized by increasing prices. This indicates the important role of market power on the inflation–profitability nexus. Moreover, in the inflationary environment, it has been reported that increase in profit margin can make the income inequality worse [5, 13].

The results can be applied to the theory of the NVIDIA company, which is one of the leading companies in the semiconductor sector, and analyze its profitability in an inflationary environment.

2.4. Gaps and contributions of the study

The literature has already covered the relationship between profitability of the firms and inflation, but there are some gaps. First, the majority of the studies are conducted at the macro level and/or industry level, and very few studies analyze the impact at the firm level. Hence, individual firms' performance in the context of inflation needs further study.

Second, many studies do not make in-depth analysis on the financial data of a particular firm, but they make an analysis of average effect for a group of firms by using panel data models or structural models.

Third, previous studies have widely examined the link between inflation and profitability for general manufacturing companies and consumer technology companies, yet there are limited studies that examine the link between inflation and profitability over time across leading AI chip monopolists. Profitability in semiconductor industry may differ markedly from that in conventional industries because of the high technological barriers and the concentration of the industry.

This article, using NVIDIA's single-enterprise time series data, provides a supplement to micro-cases in the semiconductor industry and includes macroeconomic inflation data as well as firm-level financial data. It uses a simple linear correlation model, however, and provides no in-depth analysis of the interaction mechanism between inflation, pricing power and demand. It is just superficial empirical evidence.

3. Methodology

3.1. Data collection

The approach used in this study is secondary data, which uses macroeconomic data and financial reports of companies to make a time series database for the variables inflation, corporate profitability indicators and control variables. In terms of macroeconomic variables, in the first place, the annual change (in percentage) of the Consumer Price Index (CPI) is used as a proxy for the inflation rate. CPI is an important parameter to gauge changes in the overall price level and is commonly employed in macroeconomic studies to capture inflation. The CPI data comes from the Federal Reserve Economic Data (FRED) database, and the year-on-year annual percentage growth rate is used as the inflation indicator. The use of year-on-year growth in CPI is because it smooths out some of the short-term volatility and "noise" in the price.

Second, at the firm level, this study chooses NVIDIA as the case firm and retrieves its annual financial reports (Form 10-K) from the U. S. Securities and Exchange Commission (SEC) EDGAR database. NVIDIA is selected on the basis of the transparency and availability of its financial data, the length of time series and because it is a representative firm in the semiconductor industry. In addition, it has undergone significant changes in its profitability in recent years and proves to be a worthwhile investigation case.

The indicators are some of the standard financial measures used in both corporate finance and empirical research and reflect the profitability from various aspects in different macro-economic conditions.

Further, this study adds the Effective Federal Funds Rate (EFFR) as a control variable to control for the macroeconomic policy factors. One of the important monetary policy instruments is the interest rate, which tends to increase in times of high inflation, and thus has an impact on financing costs and investment by companies [4]. Unless interest rates are controlled for, the impact of their

effects could be mistaken for the impact of inflation. Hence, the data on federal funds rate is retrieved from the FRED database and annual averages are taken for better analysis.

In terms of the time period, this study is based on data from 2015 to 2025, which is on an annual basis. This period consists of both the low inflation periods, but also includes the high inflation period of 2021-2023, which will enable the comparison of firm profitability in different inflation periods. Furthermore, the annual data has the advantage of minimizing the short-term volatility of the data and improves the stability of the results.

Data collection will be followed by cleaning and standardisation of all data to make them consistent in time frequency. Data for each financial indicator is produced on an annual basis to create a complete data set for further statistical analysis.

3.2. Data analysis

Description analysis, correlation analysis, and linear regression analysis are the three main methods used in this study to systematically explore the statistical relationship between inflation and the profitability indicators of NVIDIA.

Descriptive statistics are first performed to get basic information of each variable such as mean, standard deviation, maximum and minimum. This is used to determine the range and variability of variables and can be used as a starting point for more in-depth analysis. In addition, trend graphs are used for visualisation of the inflation rates and profitability indicators and possible co-movements and trends can be observed. This makes it easier to work with the data in subsequent correlation/regression analysis.

Secondly, Pearson correlation analysis has been used to analyse the linear relationship between inflation and the individual profitability indicators. Pearson correlation coefficient is a measure of the direction and amount of linear relationship between two variables, ranging from -1 to $+1$. Positive values mean that there is a positive linear relationship, negative values mean there is a negative linear relationship, and values close to zero mean there is no clear linear relationship.

A correlation analysis will give a first impression of a statistical association but cannot control for other variables or isolate independent effects. Thus, this study also uses linear regression analysis to further investigate the relationship between inflation and corporate profitability.

The Ordinary Least Squares (OLS) method of estimating the regression model is as follows:

$$Profitability = \beta_0 + \beta_1 Inflation + \beta_2 Interest Rate \quad (1)$$

4. Results and discussion

4.1. Descriptive statistics analysis

Prior to correlation and regression analysis, this study describes the main variables in this study by descriptive statistical analysis to know the characteristics of the variables and the range of the variables. Table 1 shows the descriptive statistics of inflation, FED and NVIDIA's profitability indicators.

Table 1. Descriptive statistics (2019Q1-2025Q4)

Variable	Mean	Std. Dev.	Min	Max
Inflation rate (%)	3.80	2.31	0.80	8.60
Interest rate (%)	2.75	2.15	0.08	5.33
Gross margin (%)	67.73	5.59	58.70	77.30
Operating margin (%)	39.06	10.10	26.40	57.50
Net profit margin (%)	36.41	10.20	24.10	55.60
ROA (%)	23.93	7.41	15.20	38.20

From the descriptive statistics, the mean inflation rate for the United States from 2019 to 2025 was 3.80%, minimum inflation rate was 0.80%, maximum inflation rate was 8.60% and the standard deviation of the inflation rate was 2.31%. This suggests significant variability in the inflation rate, especially in 2021-2022, which may be due to various factors such as economic recovery from the pandemic, supply chain challenges, and loose monetary policies. The standard deviation is rather large, indicating a high level of macroeconomic volatility, and therefore a solid ground for discussing the inflation-corporate profitability nexus.

The federal funds rate has a standard deviation of 2.15%, a minimum of 0.08%, and a maximum of 5.33% and a mean of 2.75%. This is a reflection of the significant changes that have occurred in U. S. monetary policy over the sample period. During 2020, the COVID-19 pandemic, interest rates fell significantly in order to encourage economic activity and increased quickly between 2022 and 2023 to fight inflation. Because interest rates have a direct impact on the financing cost of the firm, these factors are included as a control variable, so as not to describe their impact to inflation.

As far as corporate profitability is concerned, the average gross profit margin for NVIDIA for the sample period was 67.73%. With its exclusive GPU technology, it boasts powerful market pricing power. The major reason for the growth in profit margins rise, from 2022 to 2024, was the global boom in generative AI computing power, and inflation costs were a secondary buffer. The upward movement indicates that the value-added improvement and cost control has been successful. The operating margin is more volatile (std. dev. = 10.10%) reflecting that operating costs, R&D investments and demand swings have a significant impact on profitability. Notably, there was a significant improvement in operating margin from 2023 to 2025, reflecting the rapid growth in demand for AI chips.

The same applies to the net profit margin (mean 36.41%) and ROA (mean 23.93%), which has significantly increased and indicates better operational efficiency and market demand. In summary, while NVIDIA's financial metrics are subject to fluctuations in the macroeconomic environment, there is an overall upward trend in profitability indicators.

It indicates that NVIDIA is able to retain or enhance profitability in inflationary periods due to its pricing power. Furthermore, the semiconductor industry has high tech barriers to entry, which allows companies to earn higher profits when demand for semiconductors is high. Yet, relatively high standard deviations of the profitability indicators show variations in the various macroeconomic environments which further emphasize the need for correlation/regression analysis.

4.2. Correlation analysis

This study then uses the Pearson correlation analysis to gain a deeper understanding of the correlation between the inflation and the profitability of NVIDIA. The Pearson correlation coefficient is within -1 to $+1$ with positive value showing positive relationship and negative value showing negative relationship (Table 2).

Table 2. Pearson correlation matrix

Variable	INF	IR	GM	OM	NPM	ROA
INF	1.000	-0.0137	0.342	0.281	0.254	0.223
IR	-0.0137	1.000	0.602	0.754	0.781	0.724
GM	0.342	0.602	1.000	0.951	0.963	0.932
OM	0.281	0.754	0.951	1.000	0.987	0.971
NPM	0.254	0.781	0.963	0.987	1.000	0.982
ROA	0.223	0.724	0.932	0.971	0.982	1.000

The correlation of the price level (inflation) with the four profitability indicators is weak and positive. The overall correlation coefficient is relatively low, suggesting that the positive trend in prices has a much smaller effect on Nvidia's profits than the price movement due to the global AI computing power demand cycle. This indicates that there is a positive impact of inflation increases on profitability, but it is minimal.

Economically this corresponds with the notion of pricing power: companies with a high market power are able to increase prices to compensate for rising costs. NVIDIA's market position and technological advantages make it a leading semiconductor company. The low values of the correlation, however, suggest that inflation is not the main determinant of the profitability; other factors like technological innovation, growth in demand and industry cycles probably play a more significant role.

The interest rates (IR), on the other hand, are more positively correlated with profitability. IR is correlated with OM with 0.754, and NPM with 0.781. This implies that higher interest rates go hand in hand with greater profitability. Economically, it can be indicators of periods of economic growth and expansion when demand will rise and drive-up firm revenues.

Furthermore, interest rate and inflation rate are well correlated (0.821) as per the macro-economic theory, central banks increase the interest rates to curb the inflation rate. Thus, to prevent spurious relationships, it is important to control for the interest rates.

Since they are based on revenue and profit information, profitability indicators are, themselves, highly correlated. This validates the indicators used.

Based on the overall results of the correlation analysis, there is a weak positive correlation between inflation and profitability while there is a stronger correlation between interest rates and profitability. But correlation does not mean causation as it requires further analysis of regressions.

4.3. Regression results

This study is further explored by OLS regression analysis with the inclusion of interest rates as control variable (Table 3) to analyse the effect of inflation.

Table 3. OLS regression

Dependent Variable	Constant	Inflation (INF)	Interest Rate (IR)	R ²	Adjusted R ²
Gross Margin (GM)	64.125***	-0.1856	1.5692***	0.3717	0.3214
Operating Margin (OM)	33.6627***	-0.8130	3.0893***	0.4711	0.4287
Net Profit Margin (NPM)	31.0651***	-0.8487	3.1208***	0.4740	0.4319
ROA	19.8253***	-0.5641	2.2746***	0.4705	0.4282

(* indicates significance levels)

Inflation coefficients in the four types of profit regression were all negative, but not significant in the test. Monopoly pricing by enterprises on the other hand, can compensate for the increased costs of raw materials as a result of inflation. However, the multiple collinearity of inflation and interest rates and small number of annual samples had the effect of reducing the statistical effectiveness of the coefficients. Economically, this is in line with the cost push theory of inflation, which states that increases in costs can squeeze profits. But NVIDIA's pricing power and that it's driven by demand (e.g., AI boom), probably offset all these effects.

The interest rates have a significant positive relationship with profitability in all models. This is a counterintuitive finding which may be interpreted as a macroeconomic state variable as opposed to a direct cost variable. An increase in the rate of interest often comes when there is high economic activity, high demand and investment growth. The positive coefficient is thus presumably associated with co-movement along the economic cycle and not directly caused by the interest rate on the profitability.

The R² value varies between 0.37 and 0.47 which shows moderate explanatory power. Only part of the variation in profitability is explained by macro-economic variables. So internal factors like pricing strategy, product mix and innovation are likely to have a bigger influence, at least in the case of gross margin.

The findings indicate that there is no significant effect of inflation on the profitability of NVIDIA and interest rates have high co-movement with the profitability indicators. Theoretically, the negative but insignificant inflation coefficient shows cost pressures; however, these are not significant compared to firm- and industry-specific factors. NVIDIA's product has a high degree of monopoly power and is highly differentiated which helps it to sustain its margins in the face of inflation. Interpretation of the important positive relationship with interest rates should be done with some caution. It is probably indicative of macroeconomic cycles and not causes.

5. Conclusion

Using descriptive statistics, correlation analysis and OLS regression, this study concludes that: after controlling with an interest rate, inflation has a negative marginal effect, but not statistically significant, on NVIDIA's profitability. The interest rates, on the other hand, exhibit a positive relationship with all the studied profitability indicators, which is statistically significant.

The direct answer to the research question is: inflation is not a stable statistical explanation of the changes in the profitability of NVIDIA. Rather, the profitability can be more attributed to the demand of the industry and competitive advantages of the firm, and macro-economic variables only provide a background in which the other variables co-move in a cyclical way.

First, the inflation coefficient is negative in all four models, but not significant. It indicates that this intuitive effect of rising inflation on profit margins, which occurs because of increased input prices (such as supply chains, materials and wages), is not significant during the sample period. That is, inflation can affect the business environment, but it is not the primary factor in the changes in NVIDIA's profitability.

Second, all the interest rate coefficients have the expected positive sign and are statistically significant at the 1% level. This suggests high co-movement between NVIDIA's profitability and the macroeconomic state (as measured by interest rates, which proxies overall economic activity, monetary tightening period and industry demand trend). This relationship is probably just a "co-movement" at the macro-level, though, and not necessarily a causal one. High interest rates tend to come in conjunction with high economic activity and demand and can overlap with periods of higher profitability.

Third, the model explains moderate amounts of variation in NVIDIA's profitability ($R^2 \approx 0.37-0.47$), meaning that inflation and interest rates do not account for all of the variation in NVIDIA's profitability. This adds to the finding that firm and industry effects - for example product upgrades, AI demand cycles and market power - are more significant.

This study's findings need to be understood with three boundary conditions. First, this study is on one company (NVIDIA), and the findings might not be applicable to other manufacturing companies or very competitive markets. NVIDIA's business model is based on semiconductors and AI chips, which have specific demand and pricing dynamics as markets with high technological barriers and product differentiation. Second, OLS framework looks for statistical association, not causal relations. Because of the strong co-movement of macroeconomic variables (e.g., inflation and interest rates), the coefficients should be interpreted as marginal associations, and not as causal effects. Third, the sample period (2019-2025) has seen unusual events, like the COVID-19 pandemic, supply chain disruptions and changes in AI demand. The results may have been distorted by these factors, which may have exaggerated the industry and led to changes in profitability, which will in turn have reduced the statistical significance of inflation in the model.

Both this study and the literature have a number of drawbacks. First, the macro-control variables are limited to inflation and the federal funds rate; other macroeconomic indicators like the US gross domestic product (GDP), the international semiconductor industry index, the exchange rate of the US dollar, and the amount of research and development enterprises spend per year are excluded. There is a significant endogenous bias due to the omission of these variables. Other variables like growth in GDP, the unemployment rate, industry demand indicators like semiconductor sales index and firm-specific factors like capital expenditure can also have a significant impact on profitability. Second, there is a high correlation between inflation and interest rates, which could lead to multicollinearity, causing the coefficient of inflation to be statistically insignificant and obscuring its separate impact. Thirdly, the linear model specification might not adequately capture the actual economic relationship. Lag effects, thresholds, or non-linearities (such as more severe cost pressures when inflation is high) may affect the impact of inflation, which may not be fully captured by OLS. Fourth, the small sample size (quarterly observations) may have an impact on the stability and significance of the regression coefficients.

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