

# ***Interest Rate Sensitivity and Business Mode Heterogeneity: Evidence from NVIDIA and Intel During the Federal Reserve's 2022–2025 Rate Cycle***

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**Abstract.** Equity price sensitivity to monetary policy varies significantly across firms with different operating structures; however, firm-level transmission mechanisms remain underexplored in capital-intensive technology sectors. Using NVIDIA and Intel as representative examples of the Fabless and Integrated Device Manufacturer (IDM) models, this paper examines the Federal Reserve's rate-hiking and rate-cutting cycle from 2022 to 2025 to assess how interest rate policy differentially affects semiconductor firms through the discount rate and financing cost channels. The findings show that early in the hiking phase, rising discount rates sharply pressured both firms: NVIDIA's stock fell by 50.4%, and Intel's by 47.2%, initially supporting the view that asset-light, high-valuation Fabless firms are more rate-sensitive. However, the subsequent AI-driven demand surge significantly revised NVIDIA's long-term earnings outlook, resulting in a 91.6% net gain over the full hiking cycle and demonstrating that strong exogenous demand shocks can dominate and even reverse the rate effect for growth firms. During the cutting cycle, limited easing and firm-specific headwinds constrained the expected valuation rebound. Overall, interest rate policy systematically shapes semiconductor valuations, but its realized impact is moderated by business model and prevailing demand conditions, with Fabless firms exhibiting greater valuation elasticity in both directions.

**Keywords:** Interest rate transmission, Equity valuation, Financial risk management, Investment strategy, Semiconductor industry

## **1. Introduction**

Since 2022, the Federal Reserve has raised the federal funds rate repeatedly and substantially to curb the sharpest rise in inflation in four decades; by the end of 2024, after an earlier rise, it had begun to lower the rate as inflation fell. Therefore, a considerable amount of price fluctuation occurred in the capital market. As a fundamental support of the digital economy, the semiconductor industry has relatively high R&D intensity, significant capital investment and extended product cycles, etc., making it a good case study for investigating the transmission mechanism of interest rate policy to firm-level outcomes.

Most prior studies on the transmission of the rate have used only macroeconomic indicators or traditional cyclical industries. Recently, some studies have explored how sensitive the stock prices of large enterprises are to monetary policy surprises, but hard-tech sectors, such as semiconductors, are strategically important yet technologically complex, so they have not been studied at the firm level [1]. This industry also has a basic difference in business models. NVIDIA (NVDA) is a typical representative of the Fabless model, which has a relatively light-asset structure and high growth expectations, and is thus valued at a premium. On the other hand, the Integrated Device Manufacturer (IDM) model of Intel (INTC) integrates manufacturing and design to bear a larger leverage and greater asset commitments. The two will have different financing costs and capital allocation plans in a low-interest-rate and a high-interest-rate environment, respectively [2].

Based on the rate-hike and rate-cut cycle of the Federal Reserve from 2022 to 2025, NVIDIA and Intel are used as case studies in this paper. Several qualitative case studies will be carried out at various times to explore the impact of interest-rate policy on enterprises of different business models. The three contents of this paper are: First, connect the macro-level interest rate policy with changes in firm stock prices in the semiconductor industry to address a lack of research on the transmission mechanism of interest rates for hard-tech sectors. Second, according to the Fabless and IDM models, this study can determine whether changes in the asset structure and valuation logic affect the transmission of interest rate changes. Third, based on the channels of discounted cash flow and financing cost, given that discount rates remain high over multi-year periods under changing monetary conditions, this paper offers empirically supported suggestions for semiconductor risk management and investor strategy [3].

## 2. Theoretical framework and research hypotheses

### 2.1. Theoretical rationale for larger stock price declines

Rising interest rates primarily affect equity valuation through the discount rate channel. According to the discounted cash flow (DCF) model, stock prices represent the present value of expected future cash flows [4]. An increase in the risk-free rate raises the discount rate, thereby reducing intrinsic value. This impact is most pronounced for growth firms, whose value is heavily weighted toward distant cash flows [5]. The longer a firm's effective cash flow duration, the more sensitive it is to increases in the discount rate; thus, even a modest rise in rates can disproportionately compress valuation multiples.

Fabless firms such as NVIDIA exemplify this pattern. Their asset-light structure, unlike capital-intensive integrated device manufacturers (IDMs) that operate fabrication facilities, limits their direct exposure to financing costs. However, their growth-driven valuations make them highly sensitive to fluctuations in discount rates [6]. Conversely, IDMs such as Intel face the opposite balance. Their heavier fixed assets and leverage expose them more directly to financing costs, while their comparatively stable earnings anchor expectations and mitigate valuation volatility.

Accordingly, this paper proposes the following:

H1a: During rate-hiking cycles, fabless firms such as NVIDIA, which have longer cash flow durations and greater sensitivity to discount rates, will experience significantly larger stock price declines than IDM firms such as Intel.

## 2.2. Theoretical framework for enhanced stock price recoveries

This discount rate sensitivity is theoretically symmetric. The same mechanism that amplifies downside pressure during tightening equally magnifies recovery during easing [5]. As policy becomes accommodative and the risk-free rate declines, discount rate compression reverses, increasing the present value of future cash flows and positioning growth firms to benefit the most.

For fabless firms, whose valuation is anchored in the market's assessment of long-term growth potential [6], this recovery potential is correspondingly greater and more elastic. Lower capital expenditure requirements and greater flexibility to adapt to technological changes enable them to capitalize on improved financing conditions more quickly than their IDM counterparts. While IDMs also benefit from reduced financing costs, their substantial asset bases cause earnings improvements to materialize more gradually, and valuation multiples to expand more modestly.

Accordingly, this paper proposes the following:

H1b: During rate-cutting cycles, fabless firms such as NVIDIA, benefiting from greater valuation rebound elasticity, will experience significantly larger stock price recoveries than IDM firms such as Intel.

## 3. Research design

### 3.1. Sample selection and data sources

NVIDIA (NVDA) and Intel (INTC) are selected as the research subjects to represent the Fabless and IDM models, respectively. Both companies are top-tier global semiconductor enterprises and are generally comparable in terms of market value and industry influence; thus, they are suitable for an all-around cross-model comparison [2]. From January 2022 to March 2025, the three monetary policy cycles in the research period included a rate-hiking cycle (March 2022 - July 2023), a high-plateau period (August 2023 - August 2024), and the start of a rate-cutting cycle in September 2024. The above coverage will ensure that both H1a and H1b hypotheses have corresponding phases for empirical investigation. Yahoo Finance will be used to acquire stock prices and other trading data, and the Federal Reserve's FRED platform will be utilized to obtain the federal funds rate.

### 3.2. Research framework

Drawing on the qualitative case study method, this paper adopts the stages of the interest rate cycle as its research framework to explore how macroeconomic changes and the internal dynamics of the two companies have affected their stock prices [7]. The sample period will be divided into a rate-hike cycle and a rate-cut cycle, and how the stock prices of the two companies respond around the important policy decisions will be observed. Patterns in the data are analyzed through the lens of a discount rate and financing cost, and descriptive evidence for hypotheses H1a and H1b is provided.

Quantitative regression is not used in this paper for the following two reasons. First, the about 38 monthly observations available would reduce the statistical power. Second, the stock price of NVIDIA during this time was heavily affected by the demand shock of AI, so a single interest rate factor could not be identified [8]. Therefore, qualitative case studies are more suitable for observing changes in both the speed of reform and corporate health at the same time.

## 4. Case analysis and empirical findings

### 4.1. Descriptive analysis

Although they were subject to the same macroeconomic environment, such as a strong rate-hike cycle by the Federal Reserve and a subsequent pause, NVIDIA and Intel took very different paths from January 2022 to March 2025. NVIDIA's stock price rose from \$24.49 to \$108.38 due to increased demand for AI infrastructure and the top-tier data-center GPUs at the forefront of this development, bringing a total return of 342.5%. At the same time, Intel's stock dropped from \$48.82 to \$22.71 due to manufacturing delays, market share loss to AMD, and a relatively small amount in the high-growth area of AI accelerators. Given that both are semiconductor companies in the same macroeconomic environment, but are performing differently, it can be concluded that their individual execution and exposure to secular growth trends have had a more significant impact than interest rate fluctuations. Table 1 presents the performance of all rate-cycle stages and provides the foundation for the phase-by-phase analysis below.

Table 1. Stock price performance by interest rate phase

| Phase                                      | Federal Funds Rate Movement | NVDA Return | INTC Return |
|--------------------------------------------|-----------------------------|-------------|-------------|
| Early hiking (Jan 2022 – Sep 2022)         | 0.08% → 3.08%               | -50.4%      | -47.2%      |
| Full hiking cycle (Feb 2022 – Jul 2023)    | 0.08% → 5.33%               | +91.6%      | -25.0%      |
| High-plateau phase (Aug 2023 – Aug 2024)   | Held at 5.33%               | +141.9%     | -37.3%      |
| Rate-cutting cycle (Sep 2024 – Mar 2025)   | 5.33% → 4.33%               | -9.2%       | +3.0%       |
| Full research window (Jan 2022 – Mar 2025) | 0.08% → 4.33%               | +342.5%     | -53.5%      |

### 4.2. Rate-hiking cycle analysis (March 2022 – July 2023)

The Federal Reserve started to raise interest rates in March 2022, and by July 2023, a total increase of 525 basis points had been made, bringing the federal funds rate to 5.33%. At the start of the tightening cycle, the discount-rate channel quickly increased market prices. As interest rates rise, the present value of future cash flows is reduced, and high-valuation growth stocks are thus affected more severely [9]. In January 2022, NVIDIA was trading at \$24.49, and it had fallen considerably since then; by September 2022, it had dropped to as low as \$12.14 and was about 50.4% lower than its peak. Intel's Stock dropped to \$25.77 from \$48.82, down 47.2%. The similar size of these initial drops indicates that, in the beginning, markets had broadly repriced the technology sector due to the sharp rise in interest rates, providing some initial support for hypothesis H1a.

From 2023, the boom in generative AI and rising GPU demand have been driven by NVIDIA. The relatively large increase in the company's long-term earnings outlook has offset the negative impact of a higher discount rate, and therefore, by July 2023, the stock had risen by 91.6% since the start of the hike cycle to \$46.73. Intel has no comparable catalyst and continues to lag in process technology; therefore, it has fallen by 25.0% over the same period. Thus, the result meets the requirement of H1b: a strong demand shock can offset the dampening effect of higher interest rates, and the direction of the price change depends on which factor is relatively larger.

### 4.3. Rate-cutting cycle analysis (September 2024 – March 2025)

The Federal Reserve started lowering interest rates in September 2024, and by March 2025, a total reduction of 100 basis points had been implemented to bring the federal funds rate from 5.33% down to 4.33%. The stock performance in H1 did not meet the expectations for H1b; thus, NVIDIA's stock dropped from \$119.37 to \$108.38 (a decline of 9.2%), and Intel's stock rose slightly to \$22.71 from \$22.04 (an increase of 3.0%).

The deviation is not an error in the system; it is due to two reasons. First, the 100-basis-point cut was too small; it did not reduce discount rates significantly enough to re-rate growth stocks in the same way as the deep-cutting cycles in 2008 and 2020. Second, by the end of 2024, NVIDIA would have been highly valued, and the tightening of US export controls for advanced chips added policy risk to its near-term prospects [10]. Monetary policy signals at this time were also not entirely accommodative; rather, the simultaneous macroeconomic communications added informational noise that complicated their interpretation [11]. At this time, it can be seen that a rate policy is not standalone. It will affect stock prices via changes in demand, geopolitical risk and market sentiment, etc., so a single explanatory variable cannot be employed. Thus, H1b is not supported by this cutting cycle. The boundary conditions for this result are introduced in Section 4.4.

### 4.4. Integrated findings and discussion

Together, the two cycles produced the following three results. Firstly, early in the hiking cycle, the discount rate channel pressed on both stocks to some extent, with NVIDIA dropping by 50.4% and Intel by 47.2%, and thus provided initial support for H1a. Second, a relatively strong exogenous demand shock, such as the current AI computing boom, can fully offset the restraining effect of higher interest rates on Fabless valuations and validate the competitive logic proposed in H1b during the hiking cycle. Third, the rate-cutting cycle did not align with H1b's forecast; thus, under conditions of a shallow cut and firm-specific headwinds, valuation recovery failed to occur.

All of the above indicate that the policy rate affects the value of semiconductors. However, in practice, the actual results will be affected by changes in demand and alterations to the firm's fundamentals and the entire policy environment, and different business models will have different degrees of moderation. Hypothesis H1a shows an initial support in the early hiking period; the competitive logic of H1b is confirmed by the following demand shock, and only when combined with a limited rate cut and firm-specific risks during the cutting cycle do these hypothesized effects hold..

## 5. Conclusion

### 5.1. Main findings

From 2022 to 2025, this paper will investigate the cycle of interest rate increases and decreases by the Federal Reserve, and using NVIDIA and Intel as case studies, examine how the different business models of semiconductor companies react differently to changes in interest rate policy. Based on the above analysis, the policy generally had a positive effect on chip stock prices through changes in the discount rate and financing costs; however, the actual results varied among different business models under different demand conditions.

An increase in the discount rate at the beginning of the rise in prices lowered the valuation of high-growth stocks. NVIDIA's maximum drawdown of 50.4% was slightly higher than Intel's

47.2%, and thus it met the condition for hypothesis H1a. However, with the rise of the AI computing boom, NVIDIA has made significant upward revisions to its long-term earnings outlook, fully offsetting the effect of higher interest rates and posting a 91.6% net gain over the entire hiking cycle; thus, hypothesis H1b has been confirmed. Limited easing and firm-specific headwinds were left unsupported during the cutting cycle for H1b; however, this result can be used to set the boundary conditions for the hypothesized effects. Taken together, the above results indicate that the difference in business models significantly moderates the effect of interest rate changes, and fabless companies are more sensitive and elastic to both high-interest-rate and low-interest-rate environments..

## 5.2. Implications for corporate risk management and market investment strategy

NVIDIA is a fabless company with a relatively high valuation multiple and thus is more sensitive to changes in interest rates. Market adjustment to a general increase in the discount rate will occur before any actual deterioration of the company's fundamentals; at this time, management should communicate proactively with investors and provide reasonable earnings forecasts to reduce unwarranted fluctuations, keep adequate cash on hand for financing risks, and prepare for tighter financing conditions. Intel is an IDM; therefore, a high debt-to-asset ratio will expose the company to rising financing costs in a tight credit environment. Adjust the debt structure, extend the maturity of liabilities, and enhance the competitiveness of core technology for these companies.

Therefore, the following are the strategic implications for investors. Early in a hiking cycle, high-growth fabless stocks are at a valuation peak; therefore, investors should be more cautious, reduce their investment in such stocks, or use options to hedge downside risk. Towards the end of the cycle, as strong demand drivers appear, fabless companies will have a higher rebound elasticity and thus enjoy a better excess return. During a period of rate cuts, the boost to growth stocks will depend on both how large the reduction is and the health of the companies; thus, simple linear extrapolation cannot be used. Consider the speed of the reduction in restrictions and demand in that industry before deciding. Given the increase in interest rates, IDM enterprises have shown relatively strong defensive capabilities and are more appealing to risk-averse investors.

## 5.3. Limitations and future study

This study has several limitations. The qualitative case analysis is based on only two firms, which limits the generalizability of the findings across the broader populations of Fabless and IDM companies. Examining a single interest rate cycle makes it challenging to fully disentangle the effects of interest rate changes from concurrent shocks, particularly the surge in AI demand and firm-specific events such as export controls, which may confound the discount rate channel. Furthermore, the lack of formal econometric controls reduces the precision in isolating rate sensitivity from other influencing factors. Future research should expand the sample to include additional Fabless and IDM firms, employ event-study or regression methods to control for confounding shocks, and extend the observation period across multiple interest rate cycles to test the robustness of the proposed hypotheses.

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