The Impact of AI Events on U.S. Stock Returns and Market Risk Across Industries (2016–2024)

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Econ314: Empirical Finance

I. Introduction

A. Motivation

The rapid advancement of artificial intelligence (AI) since the early 2010s has profoundly influenced the global economy, reshaping corporate performance, industry competitiveness, and investor behavior. As AI becomes increasingly embedded in business operations—from automation and data analytics to product innovation—it is expected to affect not only firm-level fundamentals but also broader market dynamics, including stock returns and risk exposure. Despite growing academic and industry interest, empirical research on the financial impact of AI events across industries remains limited. This study addresses this gap by examining how AI-related events influence U.S. stock returns and market risk across industries from 2016 to 2024.

B. Data and Methods

We analyze daily stock data from Yahoo Finance for five U.S. companies (NVDA, TSLA, HSY, COST, MAR) and Fama–French 3-Factor data from the Kenneth R. French Data Library from 2016 to 2024. To evaluate the impact of AI-related events on stock returns, we implement the Capital Asset Pricing Model (CAPM) and Fama–French 3-Factor models, focusing on periods before and after COVID-19, using March 11, 2020, as the threshold. We measure short-term (±1 year) and long-term (±4 years) effects, selecting four AI events to capture a range of technological advancements. The dependent variable is the expected excess return, and key independent variables include the excess return on the market portfolio (R_{mt}- R_f), size premium (SMB), value

premium (HML), and a POST_AI dummy indicating the period after each AI event. We expect firms to exhibit sensitivity to market movements, small-cap characteristics, and growth-oriented behavior.

The five businesses were selected based on their unique traits, which offer a comprehensive picture of the potential effects of AI-related developments on various industries. As a pioneer in AI hardware and graphics processing units (GPUs), NVIDIA (NVDA) is directly involved in AI developments and symbolizes the expansion of the technology industry. Tesla (TSLA) is a crucial company for researching AI's impact on stock returns because it is a pioneer in autonomous driving technology, heavily influenced by AI, and frequently sensitive to technical advancements. Because of its stability in the consumer products industry, which is less directly affected by AI but is nevertheless impacted by market developments like manufacturing automation and AI marketing, Hershey (HSY) was chosen. As a major retailer, Costco (COST) has been exposed to AI through e-commerce, supply chain management, and customer behavior monitoring. This has allowed us to examine how AI is affecting traditional retail. Finally, Marriott (MAR) is a representative of the hospitality industry, where AI applications in booking algorithms, customer service, and tailored experiences are expanding. This shows how AI is affecting less technologically reliant businesses. These businesses cover a wide range of industries, including technology, consumer products, retail, and hospitality, making it possible to conduct a thorough analysis of AI's wider effects on stock returns.

C. Results and Conclusions

Our analysis reveals three key findings. First, market risk remains the primary driver of daily excess stock returns across all periods and industries. Companies like NVDA and TSLA

consistently exhibit high market sensitivities (betas > 1.5), while consumer staples firms like HSY show much lower sensitivities, reflecting industry differences.

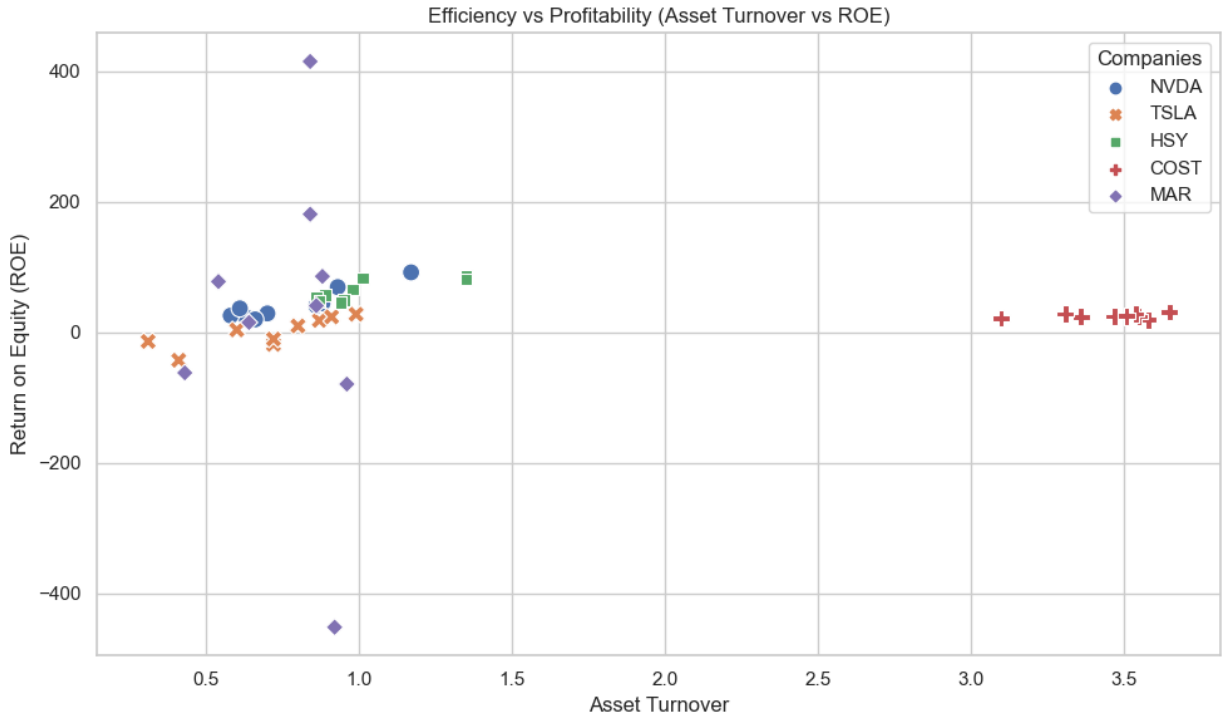
Second, AI-related events generally produce limited immediate impacts on stock returns. Most POST_AI event indicators are statistically insignificant, except for a small negative effect on NVDA following the Deepfake incident and a modest positive repricing after the release of ChatGPT.

Third, sector differences are pronounced: tech-intensive firms (NVDA, TSLA) experience stronger reactions to AI events and shifts in size and growth factors, while traditional firms (HSY, COST, MAR) largely remain anchored to fundamental market trends. Moreover, the Fama-French 3-factor model explains stock return variation better than the CAPM model, with higher R^2 values across the firms analyzed. Overall, while AI milestones influence long-term sentiment, broad market factors still dominate stock return dynamics across industries.

II. Financial statement analysis (in Millions)

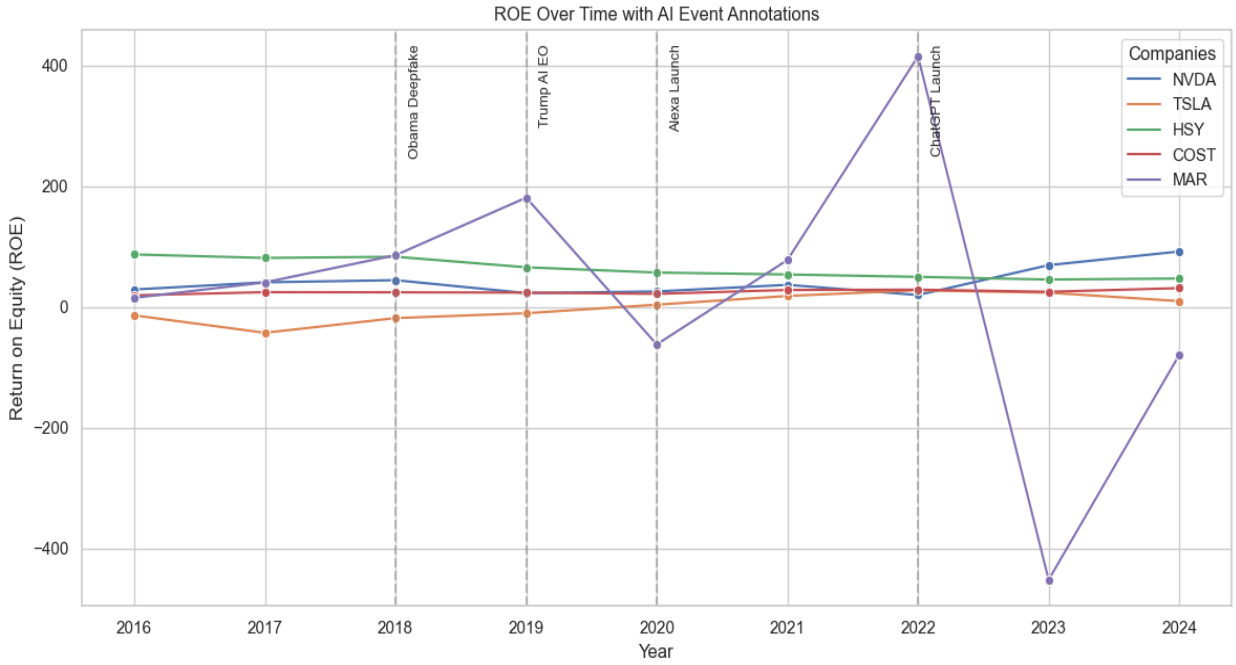
This section analyzes the financial profiles of NVDA, TSLA, HSY, COST, and MAR to assess how firm fundamentals shape AI adoption, stock returns, and market risk. Covering tech, manufacturing, consumer staples, retail, and hospitality, these companies provide a cross-industry view of AI exposure and illustrate its impact on returns and systemic risk in the post-COVID era.

A. Efficiency vs Profitability (Asset Turnover vs ROE)



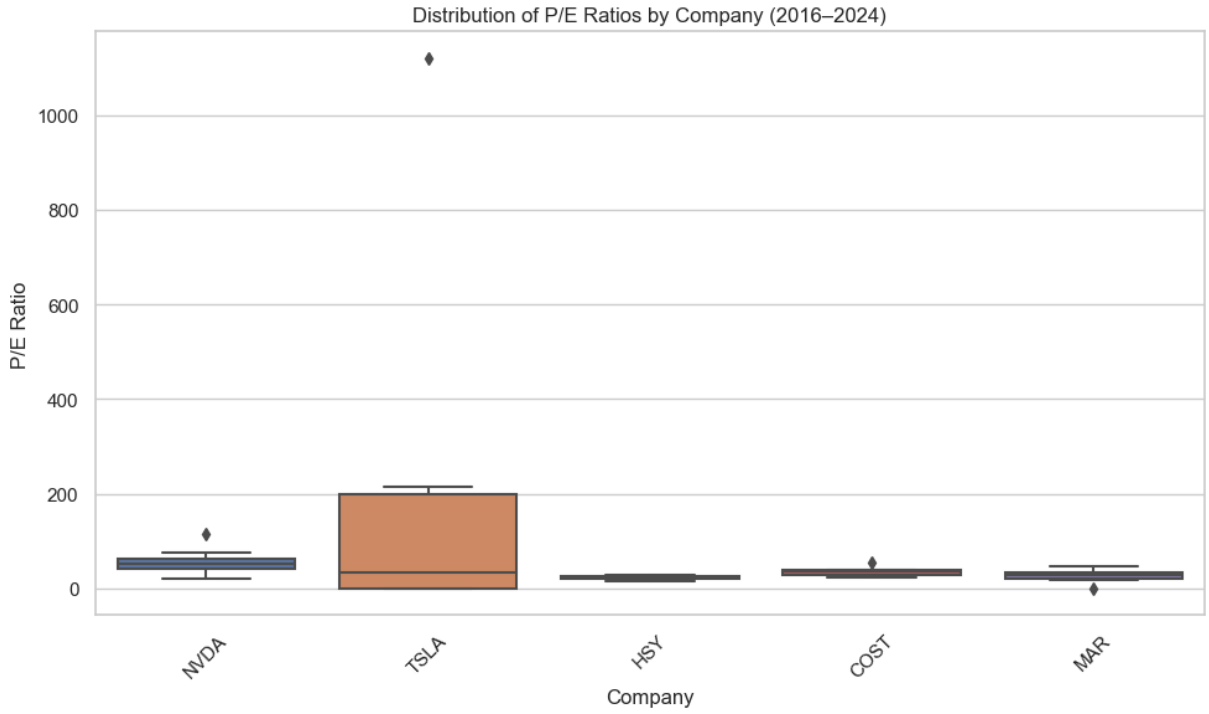
This scatter plot maps asset turnover against ROE, revealing how firms balance efficiency and profitability. NVDA and TSLA cluster with high ROE despite moderate or low efficiency, suggesting that AI-intensive firms generate strong returns through intangible assets like R&D and data, rather than traditional operations. HSY and COST display consistent, stable ROE with moderate efficiency, reflecting reliable, well-managed businesses less impacted by AI trends. MAR, on the other hand, shows greater volatility, likely tied to economic cycles and post-COVID recovery efforts. These patterns highlight how AI integration influences profitability differently across sectors, depending on business models and innovation intensity.

B. ROE Over Time with AI Event Annotations



This annotated ROE timeline highlights how AI events influence firms differently. NVDA shows a strong upward trend, especially after ChatGPT's release, reflecting its leadership in AI-driven innovation and investor confidence. TSLA's ROE rises gradually but remains volatile, suggesting uneven returns from its AI initiatives. In contrast, HSY and COST maintain stable ROE, indicating minimal impact from AI developments due to their traditional business models. MAR exhibits extreme ROE volatility, driven more by macroeconomic factors than AI. Overall, the plot supports the conclusion that AI's financial impact is firm- and sector-specific, with tech firms benefiting most from key AI milestones.

C. Distribution of P/E Ratios by Company (2016–2024)



This boxplot shows how AI exposure shapes investor valuation. TSLA's extremely wide P/E distribution reflects speculative volatility driven by its AI ambitions. NVDA also maintains high P/E ratios, signaling consistent market confidence due to its central AI role. In contrast, HSY, COST, and MAR exhibit low, stable P/E ratios, showing investors value these firms based on traditional fundamentals, not disruptive tech. These differences suggest that firms linked to AI innovation are priced more on potential than performance, highlighting how AI hype and future expectations significantly influence valuation in tech sectors, reinforcing the thesis that AI reshapes return-risk dynamics across industries.

III. Data and Methods

A. Data

We analyze two primary data sources. First, we use Yahoo Finance time series data for daily market information on five U.S. stocks: NVDA, TSLA, HSY, COST, and MAR. Prices are

in USD per share, and volume is the number of shares traded. The dataset covers 2016-2024 and includes date, opening price, highest and lowest prices, closing price, adjusted closing price, and trading volume for each stock. To support the analysis, we compute the daily logarithmic returns based on the previous day's adjusted closing price.

Secondly, we utilize the Fama-French 3-Factor daily time series data from the Kenneth R. French Data Library, which includes key financial factors such as Excess Return on the Market Portfolio (R_{mt}- R_f), Size Premium (SMB), Value Premium (HML), and the Risk-Free Rate (R_f) from 2016 to 2024. The unit of analysis is expressed as a daily return percentage.

Table 1: Summary Statistics for 2016-2024

Variable	Mean	SD	Minimum	Maximum
Excess Return on the Market Portfolio in decimal	0.001	0.012	-0.120	0.093
Size Premium in decimal	0.000	0.007	-0.036	0.055
Value Premium in decimal	0.000	0.009	-0.050	0.067
Risk-free rate in decimal	0.000	0.000	0.000	0.000
NVDA's Logarithmic return in decimal	0.002	0.031	-0.208	0.261
TSLA's Logarithmic return in decimal	0.001	0.037	-0.237	0.198
HSY's Logarithmic return in decimal	0.000	0.014	-0.181	0.156
COST's Logarithmic return in decimal	0.001	0.014	-0.133	0.095
MAR's Logarithmic return in decimal	0.001	0.021	-0.165	0.178

Table 1 presents summary statistics for the continuous response variables in the Fama-French 3-Factor Model and daily stock logarithmic returns. The (R_{mt}- R_f) variable has a mean of 0.001 (0.1%) and standard deviation of 0.012, with a wide range from -0.120 to 0.093. The SMB and HML factors have near-zero means, with SMB slightly less volatile (0.007) than HML (0.009). The risk-free rate (RF) remains stable at a mean and standard deviation of 0.000. Among stocks, NVDA and TSLA show the highest average returns (0.002 and 0.001) and volatilities (0.031 and

0.037), while HSY, COST, and MAR post lower returns (0.000–0.001) and volatilities (0.014–0.021). The ERP averages 0.002 with a standard deviation of 0.012, highlighting substantial variability in excess returns across firms.

The dataset has several limitations. It lacks a standardized measure of AI exposure, making it hard to isolate AI's impact on stock returns from other trends. Additionally, the data only extends through 2024, limiting long-term analysis.

B. Methods

We implement the CAPM and Fama–French 3-Factor models to evaluate the impact of AI-related events on U.S. stock returns, focusing on periods before and after COVID-19. We set March 11, 2020, when COVID-19 is declared a global pandemic, as the threshold, and measure short-term (±1 year) and long-term (±4 years) effects. To capture diverse AI advancements, we select four events: the Obama deepfake video (April 17, 2018) and Trump's Executive Order 13859 (February 11, 2019) for the pre-COVID period, and Amazon's Alexa Conversations launch (July 22, 2020) and ChatGPT's release (November 30, 2022) for the post-COVID period. The CAPM model can be specified as:

$$\mathbf{R_t - R_f = \alpha + \beta(R_{mt} - R_f) + \gamma * POST\_AI_t + \varepsilon_t}$$

where *t* denotes each day, R_t is the daily stock log return, R_{mt} is the S&P 500 excess return, and R_f is the daily risk-free rate. To capture additional size and value effects, the Fama–French 3-Factor model extends CAPM by including SMB and HML:

$$\mathbf{R_t - R_f = \alpha + \beta_{mkt}(R_{mt} - R_f) + \beta_{SMB}SMB_t + \beta_{HML}HML_t + \gamma * POST\_AI_t + \varepsilon_t}$$

The dependent variable is the expected excess return, and the independent variables include (R_{mt}-R_f), SMB, HML, and the POST_AI dummy (equal to 1 after the AI event, 0 before). We expect

positive coefficients for (R_{mt}- R_f) and SMB, indicating market sensitivity and small-cap characteristics, and a negative coefficient for HML, indicating growth orientation.

IV. Results

A. Pre-COVID

1. Long-Term Impact: Deepfake Obama Video (April 17, 2018)

Table 2: The Impact of Deepfake Technology on Industry Excess Return (CAPM)

VARIABLES	(1) Expected Excess Return (NVDA)	(2) Expected Excess Return (TSLA)	(3) Expected Excess Return (HSY)	(4) Expected Excess Return (COST)	(5) Expected Excess Return (MAR)
Excess Return on the Market Portfolio	1.611***	1.336***	0.474***	0.756***	1.114***
	(0.068)	(0.083)	(0.036)	(0.030)	(0.035)
AI Event	-0.002	0.001	0.001	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.002	-0.000	-0.000	0.000	0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	1,006	1,006	1,006	1,006	1,006
R-squared	0.305	0.164	0.119	0.321	0.434

Estimated standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 2 presents CAPM regressions for five firms around the Deepfake event. All market betas are positive and highly significant, confirming that excess returns co-move with the market; NVDA exhibits the highest sensitivity (1.611) and HSY the lowest (0.474). The POST_AI coefficient is small and statistically insignificant across all stocks, indicating the Deepfake event produced no consistent abnormal return in the surrounding year. Model fit, as measured by R^2, ranges from 11.9% for HSY to 43.4% for MAR, suggesting market risk explains a larger share of returns in hospitality and retail than in consumer staples. Overall, systematic risk remains the

primary driver of returns, and the AI shock had muted, heterogeneous short-term effects across industries.

Table 3: The Impact of the Deepfake Obama Video on Industry Excess Returns

VARIABLES	(1) Expected Excess Return (NVDA)	(2) Expected Excess Return (TSLA)	(3) Expected Excess Return (HSY)	(4) Expected Excess Return (COST)	(5) Expected Excess Return (MAR)
Excess Return on the Market Portfolio	1.731***	1.374***	0.395***	0.764***	1.072***
	(0.079)	(0.100)	(0.042)	(0.036)	(0.040)
Size Premium	0.542***	0.085	-0.404***	-0.265***	0.141
	(0.142)	(0.181)	(0.076)	(0.065)	(0.072)
Value Premium	-0.876***	-0.622***	-0.173**	-0.151**	0.004
	(0.122)	(0.155)	(0.066)	(0.056)	(0.062)
AI Event	-0.003*	0.001	0.001	0.001	-0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Constant	0.002*	0.000	0.000	0.000	0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Observations	1,006	1,006	1,006	1,006	1,006
R-squared	0.365	0.169	0.09745	0.308	0.422

Estimated standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 3 shows that the coefficients for the (R_{mt}- R_f) are positive and statistically significant, indicating that the stocks move in the same direction as the market and are sensitive to market movements. NVDA shows the highest sensitivity (1.731), and HSY shows the lowest (0.395). NVDA's positive SMB coefficient (0.542) suggests it benefits from small-cap outperformance before COVID-19, while COST and HSY's negative SMB coefficients imply a tilt toward large-cap stocks. The HML coefficients for NVDA, TSLA, HSY, and COST are all negative and significant, reflecting a preference for growth stocks. NVDA is the only stock with a negative, significant Post_AI coefficient, likely tied to early AI ethics concerns such as the Obama deepfake

controversy. MAR demonstrates the strongest model fit, with an adjusted R^2 of 0.422, indicating the model explains 42.2% of the variation in its stock returns.

2. Short-Term Impact: Trump's AI Executive Order (February 11, 2019)

Table 4: The Impact of Trump's Executive Order on Industry Excess Return (CAPM)

VARIABLES	(1) Expected Excess Return (NVDA)	(2) Expected Excess Return (TSLA)	(3) Expected Excess Return (HSY)	(4) Expected Excess Return (COST)	(5) Expected Excess Return (MAR)
Excess Return on the Market Portfolio	2.069***	1.362***	0.241***	0.793***	1.102***
	(0.104)	(0.170)	(0.056)	(0.048)	(0.057)
AI Event	0.003	0.003	0.001	0.000	0.001
	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
Constant	0.002	-0.000	0.000	0.001	-0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Observations	299	299	299	299	299
R-squared	0.443	0.112	0.035	0.354	0.426

Estimated standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 4 presents CAPM estimates immediately surrounding Trump's AI Executive Order. All firms exhibit highly significant market betas—NVDA (2.07) and TSLA (1.36) most responsive, highlighting the overarching influence of market-wide movements. The post-order dummy never achieves statistical significance, indicating the policy announcement alone did not materially alter average excess returns in the following window. The relatively high R^2 for NVDA (0.443) and MAR (0.426) suggests market dynamics dominated their return variation, whereas HSY's low R^2 (0.035) points to stronger firm-specific factors in consumer staples. Overall, these results imply that although the Executive Order may have provided a modest sentiment boost, its direct impact on stock performance was largely eclipsed by broader market trends and idiosyncratic influences.

Table 5: The Impact of the Trump's AI Executive Order on Industry Excess Returns

VARIABLES	(1) Expected Excess Return (NVDA)	(2) Expected Excess Return (TSLA)	(3) Expected Excess Return (HSY)	(4) Expected Excess Return (COST)	(5) Expected Excess Return (MAR)
Excess Return on the Market Portfolio	1.784***	1.585***	0.390***	0.770***	1.102***
	(0.100)	(0.182)	(0.056)	(0.049)	(0.067)
Size Premium	0.728**	0.560	-0.741***	-0.453***	0.165
	(0.225)	(0.409)	(0.127)	(0.109)	(0.150)
Value Premium	-0.472**	-0.492	-0.267**	-0.279***	0.074
	(0.171)	(0.309)	(0.096)	(0.083)	(0.114)
AI Event	0.004	0.011	0.001	0.002	0.001
	(0.004)	(0.007)	(0.002)	(0.002)	(0.003)
Constant	-0.003	-0.009	0.000	-0.001	-0.001
	(0.004)	(0.007)	(0.002)	(0.002)	(0.002)
Observations	299	299	299	299	299
R-squared	0.519	0.199	0.223	0.475	0.487

Estimated standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 5 shows that the coefficients for the (R_{mt}- R_f) are positive and statistically significant, indicating that the stocks are sensitive to market movements. NVDA and TSLA show the highest sensitivities (1.784 and 1.585), while HSY shows the lowest (0.390). The SMB coefficients for NVDA, HSY, and COST are significant and larger than in Table 3, suggesting stronger exposure to firm size effects. For the HML factor, NVDA, HSY, and COST display significant negative coefficients, highlighting their growth orientation. Model fit improves across all stocks, with NVDA achieving the highest adjusted R^2 of 0.519, meaning the model explains 51.9% of its return variation.

B. Post-COVID

1. Short-Term Impact: Alexa Conversations Launch (July 22, 2020)

Table 6: The Impact of the launch of Alexa on Industry Excess Returns (CAPM)

VARIABLES	(1) Expected Excess Return (NVDA)	(2) Expected Excess Return (TSLA)	(3) Expected Excess Return (HSY)	(4) Expected Excess Return (COST)	(5) Expected Excess Return (MAR)
Excess Return on the Market Portfolio	1.382***	1.279***	0.799***	0.557***	1.094***
	(0.123)	(0.128)	(0.043)	(0.034)	(0.093)
AI Event	-0.002	-0.007	0.002	0.001	0.004
	(0.003)	(0.005)	(0.002)	(0.001)	(0.004)
Constant	0.003	0.008	-0.002	0.000	-0.004
	(0.002)	(0.004)	(0.001)	(0.001)	(0.003)
Observations	299	299	299	299	299
R-squared	0.545	0.225	0.503	0.435	0.287

Estimated standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 6 reports CAPM estimates for the five firms surrounding the post-COVID launch of Alexa. All market betas remain highly significant—NVDA (1.38), TSLA (1.28), HSY (0.80), COST (0.56), and MAR (1.09), confirming that broad market movements continued to drive excess returns. The POST_AI dummy coefficients are small, mixed in sign, and never statistically significant—TSLA's modest negative shift (–0.0066) and MAR's slight positive uptick (0.0041) both lack significance, indicating that the Alexa announcement did not meaningfully alter short-term return levels. R^2 values vary from 0.225 for TSLA to 0.545 for NVDA, with strong explanatory power for NVDA and HSY (0.503) and lower fit for TSLA, suggesting greater idiosyncratic volatility in EV stocks. Overall, this evidence suggests that, even after a major

product launch, traditional market risk factors overwhelmingly governed stock performance, and the Alexa debut failed to produce a discernible immediate repricing across these sectors.

Table 7: The Impact of the Alexa Launch on Industry Excess Returns

VARIABLES	(1) Expected Excess Return (NVDA)	(2) Expected Excess Return (TSLA)	(3) Expected Excess Return (HSY)	(4) Expected Excess Return (COST)	(5) Expected Excess Return (MAR)
Excess Return on the Market Portfolio	1.531***	1.412***	0.801***	0.607***	0.884***
	(0.055)	(0.137)	(0.051)	(0.034)	(0.094)
Size Premium	0.195	1.228***	-0.134	-0.238**	0.506*
	(0.119)	(0.296)	(0.110)	(0.075)	(0.204)
Value Premium	-0.917***	-0.926***	0.100	-0.280***	0.967***
	(0.068)	(0.170)	(0.063)	(0.043)	(0.117)
AI Event	-0.001	-0.003	0.002	0.001	0.003
	(0.002)	(0.006)	(0.002)	(0.001)	(0.004)
Constant	0.000	0.005	-0.003	-0.001	-0.003
	(0.002)	(0.005)	(0.002)	(0.001)	(0.003)
Observations	299	299	299	299	299
R-squared	0.774	0.353	0.517	0.564	0.479

Estimated standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 7 shows that the coefficients for the (R_{mt}- R_f) are positive and statistically significant, but generally lower than in the pre-COVID period, except for HSY, which slightly increases. NVDA and TSLA show the highest sensitivities (1.531 and 1.412), while COST shows the lowest (0.60). The SMB coefficients for TSLA and COST are significant, with TSLA's positive value suggesting a post-COVID shift toward small-cap outperformance. NVDA, TSLA, and COST display significant negative HML coefficients, reinforcing their growth orientation, while MAR shows a significant positive HML coefficient (0.967), indicating a tilt toward value. Model fit improves post-COVID, with NVDA achieving the highest adjusted R^2 of 0.774, suggesting market factors become more dominant.

2. Long-Term Impact: ChatGPT Release (November 30, 2022)

Table 8: The Impact of ChatGPT's release on Industry Excess Returns (CAPM)

VARIABLES	(1) Expected Excess Return (NVDA)	(2) Expected Excess Return (TSLA)	(3) Expected Excess Return (HSY)	(4) Expected Excess Return (COST)	(5) Expected Excess Return (MAR)
Excess Return on the Market Portfolio	1.799***	1.593***	0.555***	0.713***	1.090***
	(0.053)	(0.078)	(0.030)	(0.026)	(0.044)
AI Event	0.002	-0.001	-0.001	0.000	0.000
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Constant	0.000	0.001	0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	1,006	1,006	1,006	1,006	1,006
R-squared	0.493	0.258	0.227	0.393	0.335

Estimated standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 8 summarizes CAPM regressions over a two-year window surrounding ChatGPT's release. All five firms exhibit highly significant market betas—NVDA (1.80), TSLA (1.59), HSY (0.56), COST (0.71), and MAR (1.09)—confirming that broad market swings continued to dominate excess returns. The POST_AI dummy captures any lasting shift post-ChatGPT: only NVDA's coefficient (≈ 0.0023, $p < 0.01$) is significant, suggesting a modest positive repricing tied to renewed investor enthusiasm for AI chips. For TSLA, HSY, COST, and MAR, POST_AI estimates are essentially zero and insignificant, indicating no durable impact on their long-term return profiles. R^2 values range from 0.23 (HSY) to 0.49 (NVDA), with NVDA and COST showing the strongest model fits. Overall, while market risk remains the key return driver, ChatGPT's release appears to have produced a notable long-term uplift only for NVDA.

Table 9: The Impact of the ChatGPT Release on Industry Excess Returns

VARIABLES	(1) Expected Excess Return (NVDA)	(2) Expected Excess Return (TSLA)	(3) Expected Excess Return (HSY)	(4) Expected Excess Return (COST)	(5) Expected Excess Return (MAR)
Excess Return on the Market Portfolio	1.693***	1.407***	0.609***	0.704***	1.051***
	(0.046)	(0.075)	(0.029)	(0.027)	(0.045)
Size Premium	-0.093	0.840***	-0.367***	-0.296***	0.523***
	(0.083)	(0.134)	(0.052)	(0.047)	(0.080)
Value Premium	-0.927***	-0.782***	0.220***	-0.267***	0.629***
	(0.052)	(0.085)	(0.033)	(0.030)	(0.051)
AI Event	0.003*	-0.003	-0.001	0.000	0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Constant	0.001	0.001	0.000	0.001	-0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Observations	1,006	1,006	1,006	1,006	1,006
R-squared	0.648	0.374	0.316	0.450	0.454

Estimated standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 9 shows that the coefficients for the (R_{mt}- R_f) are positive and statistically significant, indicating that the stocks are sensitive to market movements. NVDA and TSLA show the highest sensitivities (1.693 and 1.407), while HSY shows the lowest (0.609). SMB coefficients vary, with TSLA, HSY, COST, and MAR showing significance; positive values for TSLA and MAR suggest increased small-cap exposure post-COVID. NVDA shows a significant negative HML coefficient (-0.927), while MAR's positive HML coefficient (0.629) indicates a value tilt. NVDA is the only stock with a positive, significant Post_AI coefficient, suggesting a favorable long-term AI impact. Model fit declines post-COVID, but NVDA maintains the strongest fit with an adjusted R^2 of 0.648.

V. Conclusion

This study sets out to quantify how four high-profile AI milestones—from the 2018 Obama deepfake video through the 2022 public release of ChatGPT—affect U.S. stock returns and systematic risk across five representative firms spanning technology (NVDA, TSLA), consumer staples (HSY), retail (COST), and hospitality (MAR). By combining traditional financial statement analysis with both CAPM and Fama–French 3-factor regressions, and by comparing ±1-year (short-term) and ±4-year (long-term) windows around each event, we draw three overarching conclusions.

First, market risk remains the predominant driver of daily excess returns in all periods. Across every event and firm, the coefficient on market excess return (R_{mt}- R_f) is positive and highly significant, with NVDA and TSLA consistently exhibiting the highest betas (often >1.5) and HSY the lowest (≈0.4–0.8). R^2 values likewise underscore that CAPM explains up to 55–65% of NVDA's and MAR's return variance, but far less for HSY (≈10–25%), reflecting stronger idiosyncratic factors in consumer staples.

Second, AI events generally do not produce large, uniform abnormal returns. The POST_AI dummy is almost always statistically insignificant in the short term; the only notable exception is a small negative effect for NVDA after the Deepfake event and a modest positive repricing for NVDA in the long-term post-ChatGPT. Fama–French estimations echo this muted response: size (SMB) and value (HML) premiums shift meaningfully only for tech-centric firms, reinforcing a growth tilt in NVDA and TSLA but little change for defensive names. Moreover, our cross-sector financial analysis highlights how AI narratives disproportionately shape investor sentiment and valuations in high-innovation firms, whereas traditional staples and service

companies remain anchored to fundamentals. The Fama-French 3-factor model explains stock return variation better than the CAPM model, with higher R^2 values across the firms analyzed.

In conclusion, AI's impact on stock returns is nuanced, varying by sector, firm fundamentals, and event type, with key implications for diversification, risk assessment, and strategic positioning in an AI-driven economy. However, this study faces limitations due to the lack of standardized measures of firms' AI adoption, a small sample of four AI events and five U.S. stocks, and potential model constraints, which limit generalizability and may not fully capture AI-specific risks; future research could expand event scope, stock diversity, and model factors, and incorporate post-2024 data for longer-term insights.

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