



Impact of Analytical AI on Equity Volatility

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Abstract

This study specifically examines how the news of publicly traded companies implementing analytical AI can affect investor sentiment and behaviour, as measured through short term changes in return volatility of stocks and average returns. Using an event study methodology, this study analyzes three publicly traded companies—Walmart, Hilton, and Amazon—each with a specific and dateable disclosure of analytical AI implementation. For each company, daily returns and return volatility were compared across pre and post event windows of 1, 5, and 7 trading days, using independent two sample t-tests and Levene's tests of equality of variances. Ordinary least squares regressions were also estimated to assess whether the event date predicted returns beyond what the volatility would suggest. Contrary to the study's hypothesis that AI implementation disclosures would be associated with increased short term volatility, no company exhibited a statistically significant change in volatility at any window length. However, Hilton demonstrated a statistically significant decline in average returns at both the 5 day and 7 day windows, a result not detected in the regression analysis, suggesting that any sentiment effect present may be short-lived and concentrated immediately around the event. Given the small sample size and the number of statistical comparisons conducted, these findings are best interpreted as exploratory into potential effects of news about AI implementation by certain corporations rather than conclusive evidence of a broader relationship between analytical AI disclosures and investor sentiment.

Introduction

Artificial Intelligence continues to take various industries in today's economy by storm. Different types of AI have been implemented in order to develop efficiency and solutions for problems. This has also changed the way investors and the overall public view corporations, as many businesses begin to incorporate AI in their practices. This sentiment, especially when talking about publicly traded companies, can vastly impact the market. Sentiment is largely caused by news on these corporations implementations and endeavours. To that end, this paper attempts to answer the following question: How does news about publicly traded companies implementing analytical Artificial Intelligence, as constituted by machine learning systems that analyzes data to support decision making in order to increase revenue and efficiency for said companies, impact investor sentiment and behaviour around the companies' stock price? This study measures investor sentiment indirectly through observable price behaviour, specifically short term stock return volatility and average returns, rather than through direct sentiment indicators such as options based measures or text based sentiment analysis. This approach followed Barunik (2020), who demonstrates that a stock's volatility relative to its historical average can itself serve as a meaningful substitute for underlying shifts in market sentiment. Implementation of analytical Artificial Intelligence by publicly traded companies is hypothesized to overall cause higher amounts of measurable, short term stock return volatility during the trading days around a specific event, as investors may reassess positioning and risk with changes in technology and decision making. Narrower event windows are also hypothesized to show an overall higher volatility and more pronounced impact after a specific news event has occurred, and will gradually diminish as the market adapts and adjusts to the news of AI implementation over time.

Literature Review

In order to assess how the incorporation of analytical AI can actually impact sentiment, we must first incorporate a variety of existing sources that include information on the importance of sentiment as well as how it is tracked, and the ways in which analytical AI can be implemented to generate growth. Sentiment can be defined as investors' collective optimism or pessimism about a stock's future cash flows and risk that is not fully justified by fundamentals. Unlike idiosyncratic noise trading, which reflects random errors across individual investors, sentiment is systematic: it moves broadly across investors at the same time, often driven by many cognitive biases. There can be different outlooks on the way that investor sentiment is approached as well, such as bottom up and top down (Baker 2007). Similarly, a study by Ballinari and Behrent (2021) focuses on a comparison of 9 different sentiment estimation techniques, specifically based on that of social media. It concentrates more specifically on text, and the two ways that it can be analyzed in order to gauge sentiment. One tracks negative and positive wording in order to gain a better idea of sentiment on platforms such as Twitter and Instagram, while the other trains an AI model in order to track and recognize tone. This study does not adopt text based or social media sentiment measures directly, primarily due to the practical difficulty of obtaining consistent and comprehensive social media data across an 8 year sample period for the three different companies. A study by Arindam Bandopadhyaya (2008) demonstrates that the Put-Call ratio is the best method for studying investor sentiment, as it specifically demonstrates whether investors believe a certain stock's price will tend to increase or decrease. Once companies decide to utilize Artificial Intelligence to make decisions and analyze data to a higher extent, the change in PCR can be analyzed in order to see how sentiment stayed consistent or

changed. Jozef Barunik (2020) states in his study that looking specifically at how a stock price fluctuates, or its volatility compared to its overall average can provide insight on sentiment. Based on sentiment, the market would project Bullish or Bearish prices compared to previous averages.

According to a study by Yu et al. (2026), different types of AI are overall implemented by companies in the S&P 500 index. For example, about 10% of companies implement AI for actual production uses, and those companies with a deep implementation of Artificial Intelligence have higher profit margins than those who are recently implementing AI in their operations. AI implementation has also led to higher firm valuation, although this does not necessarily directly tie to investor sentiment or stock valuation. It is worth noting that this relationship may reflect reverse causality: profitable, well capitalized firms may simply have greater resources available to invest in AI, rather than AI adoption itself driving the observed margin and valuation gains. The study does not establish which direction the relationship runs. Businesses utilize analytical Artificial Intelligence in order to make projections and decisions for the future. As demonstrated in a study conducted by Sareen Rachakatla (2023), analytical AI can be used for various decisions, including analyzing target markets, customer behaviour, and even using it to analyze data and make decisions for supply chain optimization and operational uses by corporations.

Methodology

In order to test the hypothesis of publicly traded companies implementing analytical AI's association with short term increases in stock return volatility, this study employs an event study

methodology applied to three publicly traded companies: Walmart (WMT), Hilton (HLT), and Amazon (AMZN). These businesses were specifically selected due to the fact that they each have specific, dateable news events in which they clearly disclose AI implementation. Furthermore, the companies have variability in reasons and methods of implementation as well as overall impact of news. Walmart's disclosure, made on October 25, 2023, centered on a "next generation supply chain" system, which uses real time data and analytical AI in order to optimize inventory placement across stores and regions, ensuring that regional demand patterns are met more precisely. Amazon's disclosure, on the other hand, occurred on June 11, 2025. Their system focused on an AI powered demand forecasting model which included time bound data as well as allowing warehouse robots to interpret commands. Hilton's disclosure, made on February 11, 2026, differed from the other two both in format and scope. The news of implementation emerged in the yearly Q4 2025 earnings call, where AI was said to be incorporated in order to drive operational and distribution efficiencies. Hilton aims to make supported decisions regarding customer relations as well partnerships using analytical AI models. For each company, event windows were specifically constructed by identifying the trading day nearest to the news event date and extracting a symmetric number of trading days immediately before (pre-event) and after (post-event) that date. In order to actually assess whether the length of the trading window has a substantial impact on the return volatility for each company after a news event, three window lengths were tested for each event: 1 trading day, 5 trading days, and 7 trading days pre and post event. This multi-window approach allows for comparison of whether any effect is concentrated immediately around the event or persists over a longer adjustment period, which is consistent with the hypothesis that a narrower window could show a more pronounced effect. For each company and each window length, average

daily returns and return volatility (measured as the standard deviation of daily returns) were calculated separately for the pre-event and post event periods. In order to test for a statistically significant difference in average returns between the pre and post event periods, an independent two sample t test was conducted. To test for a statistically significant difference in volatility between the two periods, Levene's test of equality of variances was conducted. A significance threshold of $\alpha = 0.05$ was used for both tests. In addition to the pre and post window comparisons, ordinary least squares (OLS) regressions were estimated for each company in order to explore the relation between volatility and returns around the event date. Specifically, daily returns were regressed on two lagged values of the 21 day rolling volatility (1 and 2 trading days lagged) and an indicator variable equal to 1 on the specified event date and 0 otherwise. The latter specification captures a differential effect on the daily return on the specified event date beyond the relation to volatility estimated over the preceding 21 day period. Two design limitations of this regression specification are worth noting up front. First, this regression does not include a market or benchmark return, such as the daily return on the S&P 500 index, as a controllable variable, which is the standard baseline for a regression of this kind. Second, because this regression evaluates a single day event indicator against several years of daily trading data, the model has limited statistical power to detect a short lived effect, even if one may potentially be present. Given these limitations, the full sample regression is expected to show low explanatory power almost by design, since a short lived, event specific effect is unlikely to be detectable when compared against years of ordinary daily trading data. Accordingly, this regression is best understood as a comparison check against the more sensitive pre/post comparison reported later in this paper.

Results

Before actually looking at the effect of the news events, baseline volatility was calculated for each corporation across the full sample period (January 2018 through August 2026) to contextualize any event-window findings. Measured as the Standard Deviation of daily returns, Amazon demonstrated the highest overall volatility (0.0218), followed by Hilton (0.0191), and least of all Walmart (0.0142). This order is generally consistent with each company's sector and market capitalization profile. For example, Walmart's larger and more stable retail operation system generally corresponds to a lower baseline volatility, while Amazon, with its rapid growth orientation and constant development, shows a much higher baseline volatility. This baseline volatility reflects each company's overall return dispersion across the full sample period but is not adjusted for market wide movements. As shown in Figure 3 below, all three companies experienced sizable, broad based volatility spikes in early 2020 and 2022 that were unrelated to AI announcements. Without subtracting a market benchmark such as the S&P 500s from each company's daily return, it is difficult to fully separate firm specific reactions to the AI disclosures from these broader market wide conditions.

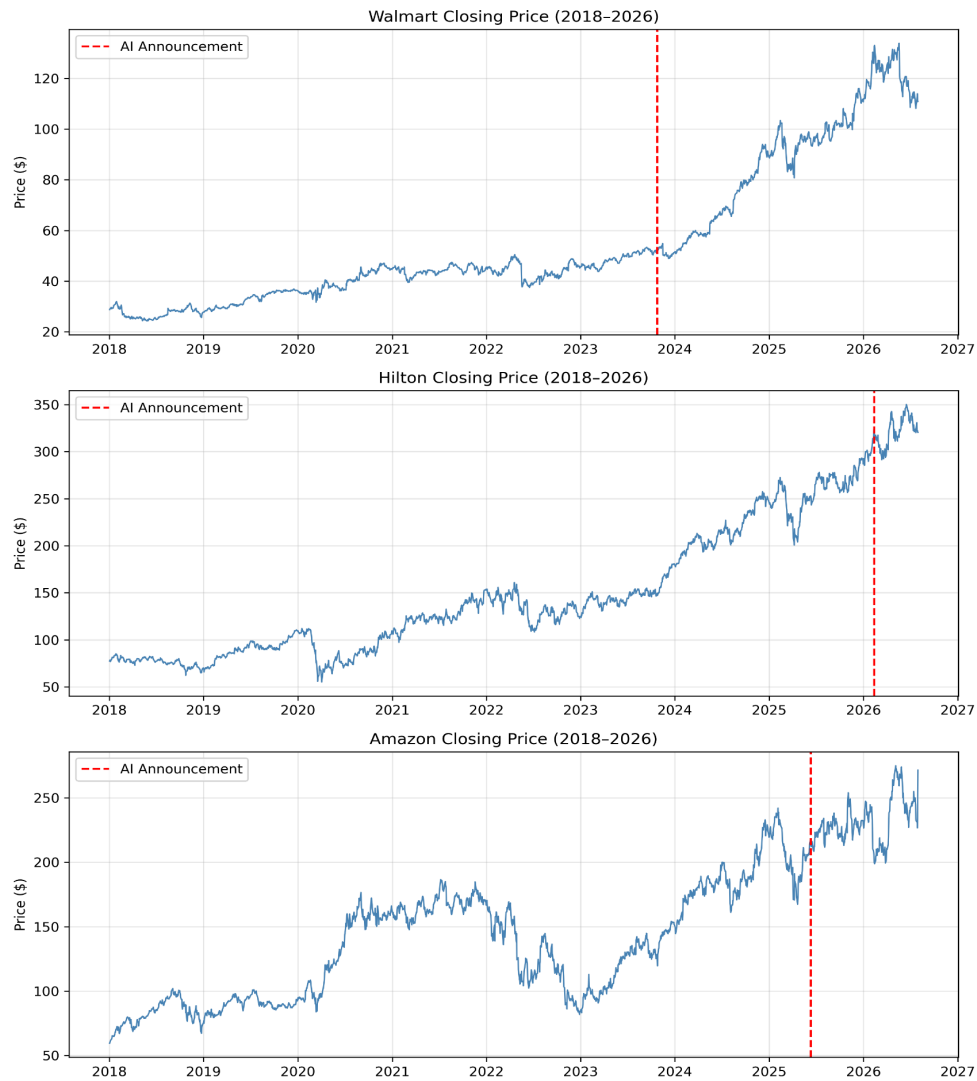


Figure 1. Closing stock price history with AI implementation announcements marked for each company.

In order to test whether the identified implementation event dates had a statistically significant differential impact on daily returns, beyond that explained by recent volatility patterns, an OLS regression for each company was estimated using two lagged values (1-day and 2-day) of 21 day rolling volatility and a binary indicator for the event date. This specification is designed to isolate the event date's effect from the broader volatility environment surrounding it. If investor sentiment really did shift meaningfully due to the AI disclosure, the event date coefficient would

be expected to capture a return effect that is different from what general recent volatility trends would predict. Across all three companies, the regression models did not show any statistically significant explanatory power overall. This outcome is consistent with the low statistical power inherent in comparing single day indicator against years of daily trading data, as noted in the Methodology section, rather than indicating a genuine absence of any effect. For Walmart, the model produced an R^2 of 0.000 ($F = 0.139$, $p = 0.937$), with the event date coefficient ($\beta = -0.0036$, $p = 0.801$) not reaching significance. This may show that Walmart's October 25, 2023 disclosure of AI powered inventory management system did not have any clear measurable effects on returns once the model adjusted and accounted for recent volatility, although the announcement was concrete and precise itself. Hilton's model also did not show a significant fit ($R^2 = 0.000$, $F = 0.250$, $p = 0.861$), with an event date coefficient of $\beta = 0.0040$ ($p = 0.833$). This result is notable given that Hilton's disclosure, embedded within a Q4 2025 earnings call rather than a standalone explicit AI announcement by the company, was the only one to produce a statistically significant result discussed in the pre/post window comparison below. This suggests that Hilton's regression may not have detected the effect as the model compared the single event day against the company's entire return history. A short shift in returns may easily be minimized when being measured against a large amount of data, even if the effect becomes clear when the analysis is narrowed. Amazon's model showed higher explanatory power ($R^2 = 0.002$, $F = 1.696$, $p = 0.166$), though still not statistically significant. Notably, Amazon's two lagged volatility terms were independently significant at the 5% level (Lag 1: $\beta = -0.6088$, $p = 0.048$; Lag 2: $\beta = 0.6266$, $p = 0.042$), which suggests a short term mean-reverting relationship between recent volatility and returns that exist independently of the AI announcement. This indicates that Amazon's returns are sensitive to its own recent volatility

patterns. However, Amazon's event-date coefficient ($\beta = -0.0212$, $p = 0.333$) was not statistically significant, indicating that the AI disclosure itself did not produce a substantial deviation in returns compared to what the stock's ordinary volatility dynamics would already predict. Taken together, these regression results do not provide evidence that the AI implementation event date, evaluated as a single day indicator against each company's multi-year return history, was associated with a measurable shift in daily returns. This also points to a key methodological point carried into the event window analysis: a single day indicator measured against years of data may be too diluted to actually detect a short lived sentiment reaction, even if one is present in the days immediately around the event. The pre/post window comparison, conducted at 1, 5, and 7 day trading windows for each company, provides more depth and nuance than the general regression analysis. At the narrowest window (1 day), pre and post-event trading volatility, t statistics, and p values could not be determined as a 1 day trading window and single day sample does not provide basis for calculating variance; only the directional change in average return could be assessed at this window length. Table 1 summarizes the results for the 5 and 7 day windows, where full statistical testing was possible.

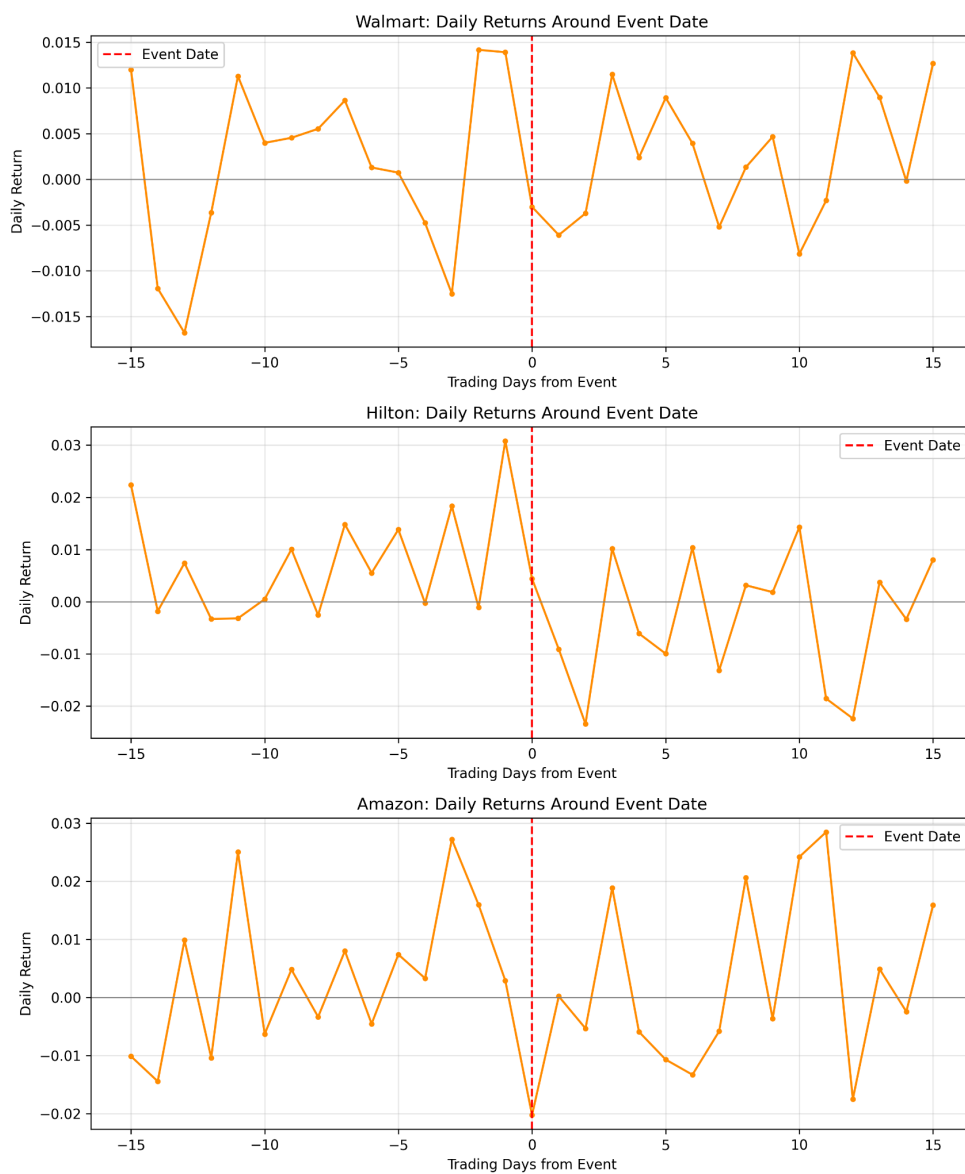


Figure 2. Daily returns in the window immediately surrounding each event date.

Company	Window (days)	Pre Avg Return	Post Avg Return	Return Change	t stat	t p-value	Returns Sig.	Levene p-value	Vol. Sig.
Walmart	5	0.0023	0.0026	0.0003	0.047	0.9642	No	0.3662	No
Walmart	7	0.0031	0.0017	-0.0014	-0.305	0.7664	No	0.4522	No
Hilton	5	0.0123	-0.0077	-0.0200	-2.484	0.0382	Yes	0.6242	No
Hilton	7	0.0117	-0.0059	-0.0176	-2.783	0.0166	Yes	0.9696	No
Amazon	5	0.0114	-0.0006	-0.0119	-1.725	0.1232	No	0.9631	No
Amazon	7	0.0086	-0.0032	-0.0118	-2.103	0.0573	No	0.8450	No

Table 1. Pre/Post Event Window Comparison (5-day and 7-day windows)

Walmart's stock did not show any statistically significant change in average returns at either the 5 day window ($t = 0.047$, $p = 0.964$) or 7 day window ($t = -0.305$, $p = 0.766$), and volatility did not significantly change at either window (Levene $p = 0.366$ and $p = 0.452$ respectively). This result is consistent with the findings stated above, where Walmart's event date coefficient was also far from significance ($p = 0.801$). Taken together, both methods suggest that Walmart's October 25, 2023 disclosure of AI implementation was most likely treated by investors as a routine operational efficiency measure rather than a large signal warranting a reassessment of the company's risk. Hilton, on the other hand, was the only company to show a statistically significant difference in average returns between the pre and post event periods, at both the 5 day window ($t = -2.484$, $p = 0.038$) and the 7 day window ($t = -2.783$, $p = 0.017$). In both cases, average daily returns declined following the event: from 0.0123 to -0.0077 at the 5 day window, and from 0.0117 to -0.0059 at the 7 day window. Despite this significant shift in average returns, Hilton's volatility did not significantly change at either window (Levene $p = 0.624$ and $p = 0.970$, respectively), which indicates that the detected effect was concentrated in the direction and magnitude of returns rather than in the degree of return dispersion. Amazon's average returns declined numerically following its event date at both windows (5 day: 0.0114 to -0.0006; 7 day:

0.0086 to -0.0032), and the 7 day window approached but did not cross the significance threshold ($t = -2.103$, $p = 0.057$). Amazon's volatility did not change significantly at either window (Levene $p = 0.963$ and $p = 0.845$). At the 7 day window, the t-test failed to reject the null hypothesis at the conventional 0.05 threshold ($p = 0.057$). The direction of the estimated effect was negative, consistent with the pattern observed at the 5 day window, though this result does not provide evidence of a shift in sentiment. The significant lagged volatility terms found in Amazon's regression reflect a mean reverting relationship that is a well documented and generic feature of daily returns for most liquid large-cap stocks, rather than something unique to Amazon or to AI related news specifically. This regularity should therefore be treated as a separate feature of the data, unrelated to the event date finding discussed above.

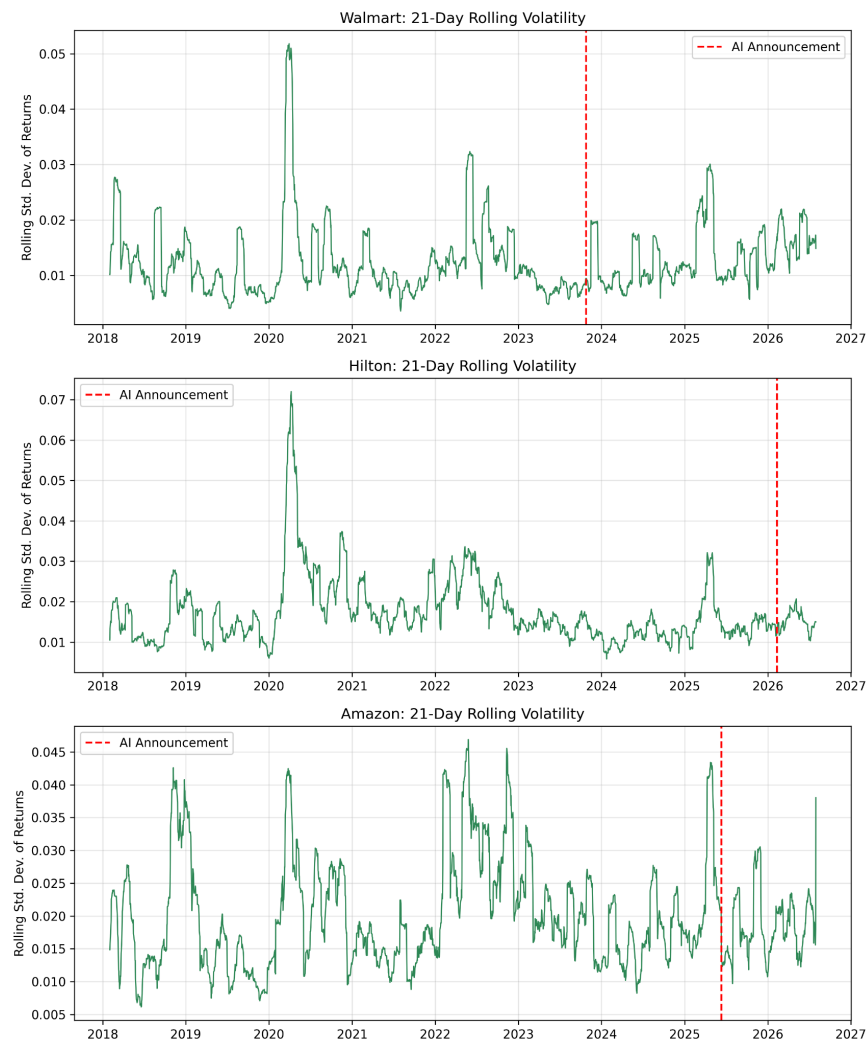


Figure 3. Rolling Volatility with AI implementation announcement days marked.

As shown in Figure 3, rolling volatility for all three companies fluctuates considerably across the full sample period, driven largely by broader market events. None of the three companies show a distinct and sizable spike in volatility coinciding with their AI disclosure date, visually enforcing the Levene's test results above.

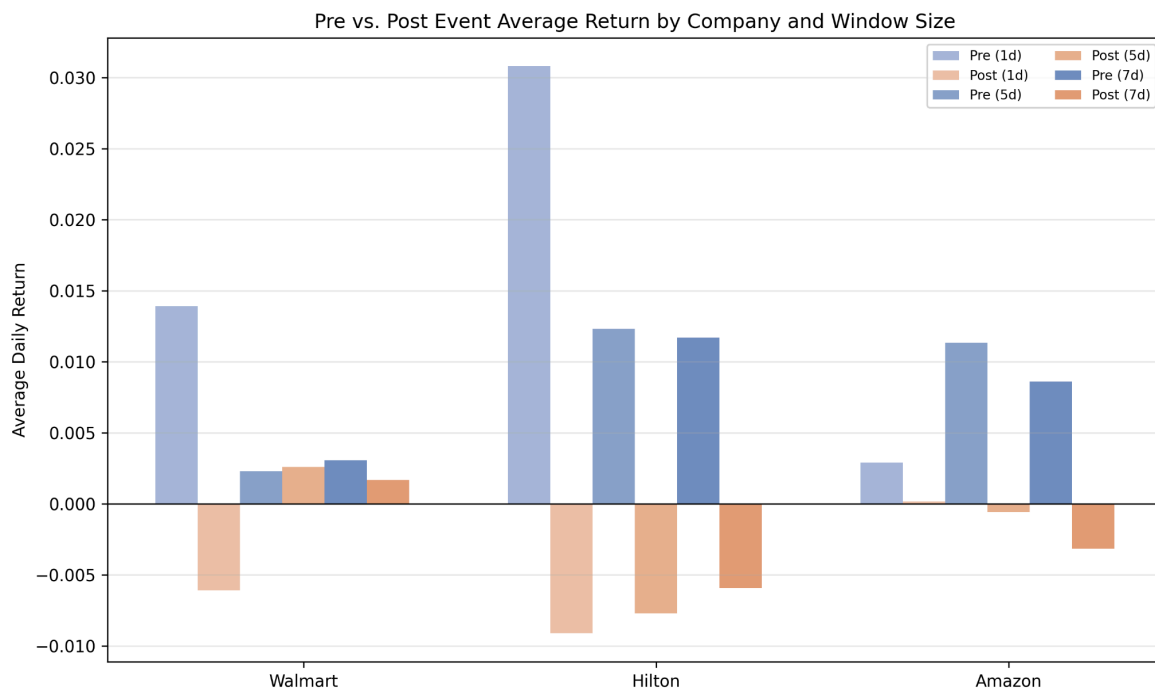


Figure 4. Pre vs. Post event average return by company and window length.

Figure 4 visualizes the return comparisons summarized in Table 1. Walmart's and Amazon's pre and post event bars remain close in height along all window lengths, consistent with the absence of a significant shift for each company. Hilton's bars, in contrast, show a visible decline from a positive pre-event average to a negative post-event average at both the 5 and 7 day windows.

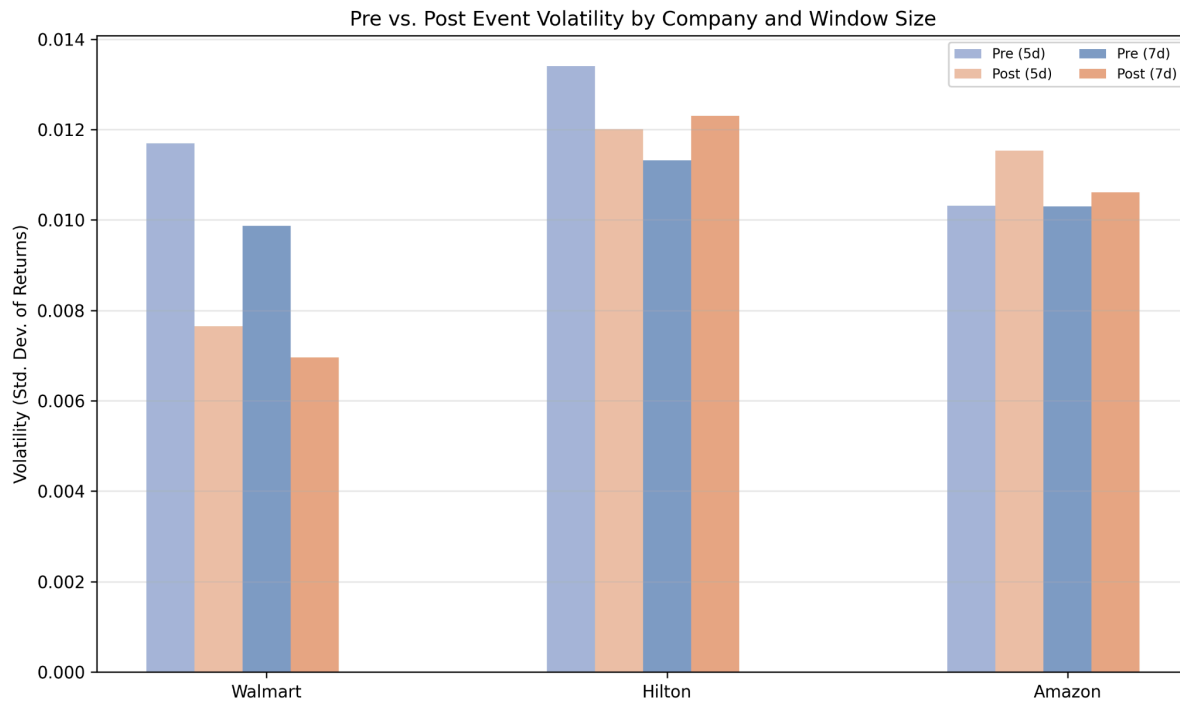


Figure 5. Pre vs. Post event volatility by company at each window length.

Figure 5 presents the corresponding comparison for volatility. Unlike Figure 4, the pre and post event bars remain broadly similar in height across all three companies, including Hilton, reinforcing that the detected effect was concentrated in returns rather than return dispersion.

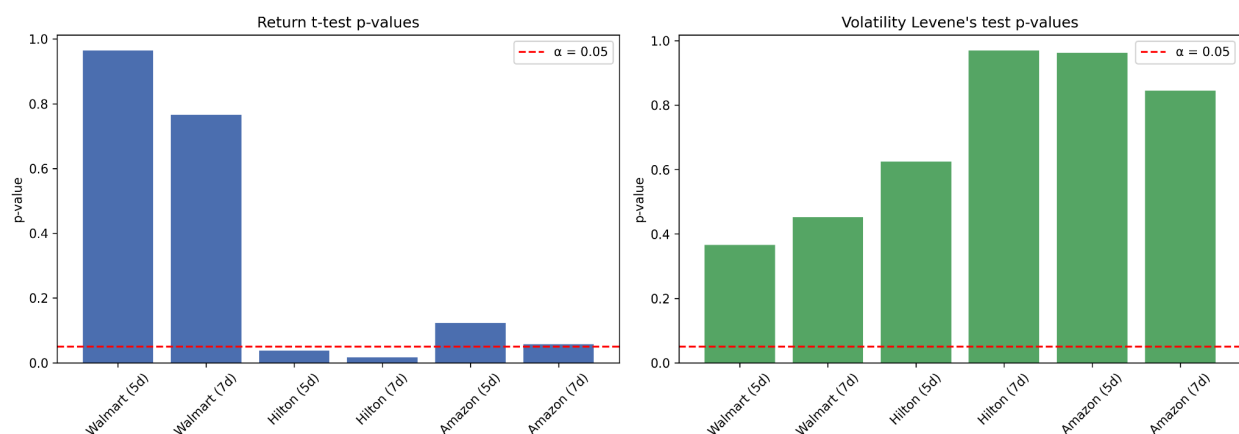


Figure 6. Summary of statistical significance across all tested companies and windows.

Figure 6 consolidates the significance of every comparison conducted in this study. Across both panels, only Hilton's two return based comparisons fall below the $\alpha = 0.05$ line, while every other bar remains above it, underscoring that significant evidence was limited to a single company and a single measure out of eighteen total comparisons.

Across the three companies and three window lengths that were tested, Hilton was the only company in which a statistically significant result in average returns was demonstrated, and this effect was present at both the 5 day and 7 day windows but not measurable at the 1 day window. No company exhibited a statistically significant change in return volatility, as measured by Levene's test, at any window length where testing was possible. The regression results, which isolated the event date as a single day indicator across the full sample period, did not find a statistically significant event day effect for any company, suggesting that the effect detected in the window comparison for Hilton is better characterized as a short-term shift concentrated in the days surrounding the event, rather than a persistent or broadly measurable relationship across the full historical sample.

It is worth noting that this pattern runs counter to the study's hypothesis that narrower windows would show a more pronounced effect that diminishes as the window widens. In practice, the opposite occurred: Hilton's 7 day t-statistic was larger in magnitude than its 5 day t-statistic, and Amazon's 7 day result was closer to significance than its 5 day result. This suggests that a full return reaction may take several trading days to materialize, or that 5 versus 7 days is too narrow a comparison to reveal the diminishing pattern the hypothesis anticipated.

Limitations

Several limitations of this study should be acknowledged when these results are being interpreted. First, the sample size is small, only three publicly traded corporations. Therefore, these findings are best understood as an exploratory case that could be looked at for what impacts of AI in the market could occur, but should not be generalizable to the market as a whole about how analytical AI disclosures affect investor sentiment for all publicly traded companies. A much larger sample would be necessary in order to determine whether the significant return shift detected for Hilton reflects a broader phenomenon or is specific to these events. Second, this study conducted eighteen statistical tests in total across the t-test and Levene test analyses, in addition to three separate OLS regressions. When a threshold of $\alpha = 0.05$ is applied across this many tests, some significant results would be expected to occur by chance alone. The single significant finding for Hilton should therefore be interpreted with caution, and would benefit from replication using a larger sample. Third, Hilton's event date is a less clean measure of analytical AI implementation than Walmart's or Amazon's. While the other two are demonstrated in an explicit AI announcement, Hilton's announcement was in a Q4 2025 earnings call. Because the announcement was disclosed simultaneously with other variables, the significant shift around this may reflect the general earnings results. This study specifically measured raw stock returns rather than market adjusted, or abnormal, returns. A more standard event study approach would compare each company's return to a market benchmark, such as the S&P 500, over the same period, to isolate the company specific reaction from broader market movement. This limitation is relevant due to the broad market wide volatility spikes visible in Figure 3 during early 2020 and 2022, which reflect general market conditions rather than firm specific reaction. Without market adjustment, such conditions cannot

be cleanly distinguished from a genuine firm specific response to AI disclosures using the approach utilized here.

Conclusion

This paper set out to examine how specifically the news of publicly traded companies implementing analytical AI affects investor sentiment and behaviour, as measured through short term stock changes in volatility and returns. Using an event study methodology that assessed the companies of Walmart, Amazon, and Hilton, the results provided mixed but informative evidence. Notably, this study's original hypothesis, that news about AI implementation by publicly traded companies would be correlated to increased volatility, was not supported. No company exhibited a statistically significant change in volatility, measured using Levene's test, at any window length. This suggests, for the events examined here, an AI adoption disclosure may not be likely to introduce genuine uncertainty about how the stock trades. The study's related hypothesis that narrower event windows would show a more pronounced effect that gradually diminishes as the window widens was also not supported: where a significant return effect was present, it was slightly stronger at the 7 day window than at the 5 day window for both Hilton and Amazon, the opposite predicted pattern. This indicates that, within the range of windows tested, any return reaction of AI disclosure may take a few trading days to develop rather than being strongest immediately after the event. Taken as a whole, this study's findings are best understood as suggestive rather than conclusive. The significant result exhibited by Hilton may be due to a small sample size as well as confounding variables exhibited in the Q4 earnings statement. Ultimately, the results show that in the three corporations studied, AI disclosure will not show significant results in volatility in the ways in which the stock trades. In the future,



studies with greater sample sizes could look at industry and market wide data in order to generalize further to the market.



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