Scientific Research Publishing

iBusiness, 2025, 17(3), 218-227
https://www.scirp.org/journal/ib
ISSN Online: 2150-4083
ISSN Print: 2150-4075

The Effects of Cashierless Technology on Amazon's Stock Price

Ngoc My Hai Nguyen (Jearlie)

Australian International School, Ho Chi Minh, Vietnam
Email: haingocnguyenmy0808@gmail.com

How to cite this paper: Nguyen, N. M. H. (2025). The Effects of Cashierless Technology on Amazon's Stock Price. *iBusiness, 17,* 218-227.
https://doi.org/10.4236/ib.2025.173014

Received: April 27, 2025
Accepted: September 26, 2025
Published: September 29, 2025

Abstract

The purpose of this study is to investigate how cashierless technology affects Amazon's stock market performance using scatterplot graphics, T-tests, and regression analysis. The paper analyses changes in Amazon stock return and volatility before and after the launch of cashierless technology in Amazon's first grocery store. The results show a significant decrease in volatility, which suggests that the market sees the cashierless technology as a way to make things more stable. But there isn't a statistically significant difference in stock returns, indicating that while innovation may influence risk perception, it does not necessarily translate into short-term gains.

Keywords

Cashierless Technology, Volatility, Amazon's Grocery Stores, Stock Returns, Financial Market

1. Introduction

In the era of the digital world, cashierless technology has emerged as a transformative innovation for the retail industry. Many large retailer leaders, such as Amazon, have implemented this revolution in their grocery stores. One of the stores that made a big splash with cashierless technology was Amazon Go in Seattle, Washington, launched in January 2018. This store brought the technology closer to a wide range of consumers, both domestically and internationally, and even inspired other retail chains such as Walmart and Whole Foods Market to adopt similar innovations later on. Thanks to its convenience—reducing waiting times, minimizing contact, and eliminating the need for cashiers—this technology gave Amazon a distinct advantage in the grocery industry. This advantage is not only reflected in Amazon's operational efficiency and profitability, but has also had a particularly positive impact on Amazon's financial market performance.

This paper looks at important factors such as stock valuation, rolling volatility, and Amazon's returns from its initial public offering (IPO) in 1997 to the present. It does this by recognising the link between cashierless technology and the stock market. Using real-world data from Amazon, the study looks at how the stock market and the introduction of cashierless technology affect each other. This provides insightful and practical perspectives on how the company's stock value and risk profile have evolved alongside technological advancements. This paper contributes to the growing literature on the intersection of technological innovation and financial market behavior by offering focused empirical analysis of how cashierless technology affects stock performance. We present more robust empirical evidence by combining many different methodologies, such as descriptive analysis, T-test, and regression analysis. We use the most updated data set. This paper provides one of the first empirical analyses of the impact of cashierless technology on a major company's stock behavior while previous researches primarily focus on operational benefits or consumer adoption of retail technology. This study contributes to capital market reaction. The findings offer practical implication for investor, coportate decision makers, policy makers interested in understanding how market participants evaluate and respond to technological shift in retail sector. This paper proceeds as follows: Section 2 provides background information on the existing literature. Section 3 highlights empirical findings, and Section 4 concludes the paper.

2. Literature Review

Various methodologies have been used and employed to investigate the effect of cashierless technology as the Wilcoxon test (Gazzola et al., 2022); an AI-based model (Ghazwani et al., 2022; Nouzri & Ejjami, 2024; Lee et al., 2022; Nassar et al., 2019); structural equation model (SEM) (Kwon & Ahn, 2023; Schultz & Paetz, 2025; Szabó-Szentgróti et al., 2023; Ashraf et al., 2014); regression analysis (Agrawal & Mittal, 2024; Ponte & Bonazzi, 2021; Zhang et al., 2024); descriptive analysis (Schögel & Lienhard, 2020; Polacco & Backes, 2018; Gazzola et al., 2022; Green, 2021); genetic althorigm (Lin et al., 2020).

Many studies related to cashierless technology have focused on various regions, such as India (Srivastava & Pal, 2024; Varma et al., 2024); Italy (Gazzola et al., 2022); the United States (Agrawal & Mittal, 2024; Polacco & Backes, 2018); the UAE (Nassar et al., 2019); Pakistan (Ashraf et al., 2014); Canada (Ashraf et al., 2014); Malaysia (Lee et al., 2022); Korea (Kwon & Ahn, 2023), Saudi Arabia (Ghazwani et al., 2022); France (Nouzri & Ejjami, 2024); Hungary (Szabó-Szentgróti et al., 2023).

The variables used in the literature often vary, including descriptive statistics (Schultz & Paetz, 2025; Gazzola et al., 2022); smart technologies-related variables (Gazzola et al., 2022); purchase intention and recommendation intention (Kwon and Ahn, 2023), performance expectancy (Schultz & Paetz, 2025); customer buying patterns data (Wankhede et al., 2018); demand and time dimensions (Zhang

et al., 2024); total number of POS transaction (Kim et al., 2025); intention to shop online (Ashraf et al., 2014); consumer experience and satisfaction (Nouzri & Ejjami, 2024). According to the literature review, it is clear that most existing papers have focused on consumer adoption, operational efficiency, or technological design of the cashierless system, while very few have examined the capital market reaction. This gap provides the main motivation for this study. The extensive literature review is presented in Table 1.

Table 1. Summary of literature review.

Authors	Years	Regions	Key variables	Main findings	Methods
Gazzola et al.	2022	Italy	Gender, age, knowledge of some technologies	Awareness is rising; Italy is not fully ready yet	Frequency analysis, Wilcoxon test
Ghazwani et al.	2021	Saudi Arabia	Financial anxiety, convenience, checkout types	High-convenience users prefer AI checkout, financial anxiety increases purchase intent	Survey frequency analysis
Kwon & Ahn	2023	Global	Attitudes, values, intention	Attitudes predict shopping intention	PSL-SEM
Agrawal & Mittal	2024	USA	Sentiment on Amazon	Most stores' features increase the experience	Regression
Ponte & Bonazzi	2021	Italy	Risk, expectancy behavior	Cashierless speeds up checkout and improves comfort	Regression
Polacco & Backes	2018	USA	Technology used, workforce, shopping progress	Offer convenience for cashierless; the high cost may offset benefits	Descriptive
Schultz & Patez	2025	Global	Privacy, technology affinity, expectancy	Cashierless system improves in-store experience by reducing waiting time and increasing convenience	SEM
Zhang et al.	2024	USA	Demand and time	Cashierless technology shifts shopping time and improves convenience	Regression
Schögel & Lienhard	2020	USA	Technology integration supply chain	Highlight design and adoption challenges for cashierless technology	Descriptive
Green	2021	USA	Image, HCM, surveillance	Amazon Go reflects surveillance capitalism; emotional responses vary	Qualitative analysis
Wankhede et al.	2018	USA	Customer buying pattern	Amazon Go enhances offline shopping flows	Qualitative and quantitative analysis
Szabo-Szentgroti et al.	2023	Hungary	Behavioral intention, price sensitivity, expectancy	Performance, effort, and hedonic factors affect intention; price sensitivity is not significant	SEM
Kim et al.	2025	Korea	POS data, consumer ratio,	Self-Service Technologies (SSTs) are reshaping retail and improving efficiency	DID framework
Nouzri & Ejjami	2024	France	Experience satisfaction	AI improves efficiency and personalization with ethical concerns	Literature review
Lee et al.	2022	Malaysia	Product images	Cashierless system achieves high accuracy and speed	Deep learning

Continued

Lin et al.	2020	Global	Number of selected commodities	Smart carts use image recognition and planning for better shopping	Genetic algorithm
Ashraf et al.	2014	Pakistan & Canada	Trust, intention, perceived usefulness	Extended TAM shows cultural differences in adoption	SEM
Nassar et al.	2019	UAE	Experiment with grocery data sets	Adversarial patches can trick smart store machine learning systems	Machine learning
Varma et al.	2024	India	Technology consumer experience data	Amazon Go stores use sensor fusion, computer vision, and deep learning algorithms to make shopping easy and smooth	Case study
Srivastava & Pal	2024	India	Chatbot, face recognition, smart systems, demographics	Most people like the retail chatbot; however, different groups of consumers have different preferences	Cluster analysis

3. Empirical Evidence and Methods

3.1. Pairwise T-Test

The T-test aims to evaluate the null hypothesis (H0), which typically shows that there's no difference between the mean of the two groups being compared. The alternative hypothesis (H1) implies that there is a significant difference:

H0: $\mu_1 = \mu_2$.

H1: $\mu_1 \neq \mu_2$.

3.2. Regression Analysis

$$Y_t = \beta_0 + \beta_1 Dum1_t + \varepsilon_t$$

where Y_t is the dependent variable for observation t, which refers to the daily return and volatility. The volatility of Amazon is measured by employing the 30 dates, rolling standard deviation of daily return. β_0 is the constant term, representing the expected value of the dependent variable when all independent variables are zero.

β_1 is a coefficient for the dependent variable which includes dummy variable. The dummy variable takes zero before the introduction of cashierless technology, while it takes one after the introduction of cashierless technology. This coefficient shows how much the dependent variable changes after the introduction of cashierless technology.

ε_t is the error term, which represents the difference between the actual value and the predicted value from the model.

3.3. Data

We obtained data from Google Finance for Amazon's stock (ticker symbol AMZN), covering daily closing price for the period from 11th November 1997 to 22nd Jan 2018. Volatility of AMZN is measured by employing the 30 days rolling standard deviation of daily returns. A return is also calculated by using logarith-

mic differences of price. We employ the adjusted closing price to calculate return and volatility. We also created a dummy variable to capture the effect of cashierless technology which takes one after the introduction of cashierless technology and zero otherwise (Table 2).

Table 2. Descriptive statistics for before the cashierless technology, after the cashierless technology, and the total period.

Variable	Period	Obs	Mean	Std. dev	Min	Max
Close	Before cashierless	5207	9.536	12.844	**0.07**	66.37
	After cashierless	1771	**131.194**	40.024	66.98	**242.06**
	Total	6978	40.412	**57.731**	0.07	242.06
Volatility	Before cashierless	5205	0.**033**	**0.21**	**0.005**	**0.104**
	After cashierless	1771	0.02	0.008	0.006	0.049
	Total	6976	0.03	0.02	0.005	0.104
Daily return	Before cashierless	5206	0.00125	**0.039**	**−0.288**	**0.304**
	After cashierless	1771	**0.0072**	0.022	−0.151	0.127
	Total	6977	0.0011	0.035	−0.288	0.304

3.4. Descriptive Statistic

Table 2 provides descriptive statistics for Amazon's stock, including the closing price, volatility, and daily return across total sample period as well as subperiods before and after the introduction of cashierless technology.

For the total period, the closing price had 6978 observations with a mean of 40.412 and a standard deviation of 57.731, ranging from a minimum of 0.07 to a maximum of 242.06. The volatility has 6976 observations with a mean of 0.03 and a standard deviation of 0.02, ranging from a minimum of 0.005 to a maximum of 0.104. The return has 6977 observations with a mean of 0.0011 and a standard deviation of 0.035, ranging from a minimum of −0.288 to a maximum of 0.304.

Before the introduction of cashierless technology, the closing price has 5207 observations with a mean of 9.536 and a standard deviation of 12.844, ranging from a minimum of 0.07 to a maximum of 66.37. The volatility has 5205 observations with a mean of 0.033 and a standard deviation of 0.021, ranging from a minimum of 0.005 to a maximum of 0.104. The return has 5206 observations with a mean of 0.00125 and a standard deviation of 0.039, ranging from a minimum of −0.288 to a maximum of 0.304.

After the introduction of cashierless technology, the closing price has 1771 observations with a mean of 131.194 and a standard deviation of 40.024, ranging from a minimum of 66.98 to a maximum of 242.06. The volatility has 1771 observations with a mean of 0.02 and a standard deviation of 0.008, ranging from a minimum of 0.006 to a maximum of 0.049. The return has 1771 observations with a mean of 0.0072 and a standard deviation of 0.022, ranging from a minimum of −0.151 to a maximum of 0.127.

In Figure 1, we compare the price of Amazon from January 1995 to February 2025; the dashed red line represents the introduction of cashierless technology. It is clear that the price dramatically increases after the introduction of cashierless technology. It is clear that the price of Amazon has dramatically increased after the introduction of cashierless technology, suggesting that cashierless technology has a positive effect on the performance of Amazon's company.

Figure 1. Price of Amazon.

Figure 2 shows the 30-day rolling volatility of Amazon's stock returns, illustrating changes in risk following the introduction of cashierless technology from January 1995 to 2025; the red dashed line represents the introduction of cashierless technology. It is obvious that the volatility has dramatically decreased after the introduction of cashierless technology, which can be explained by reduced uncertainty and increased investor confidence. The adoption of innovative technology likely signals operational efficiency and future cost-saving, leading to more stable expectation about the company's future performance.

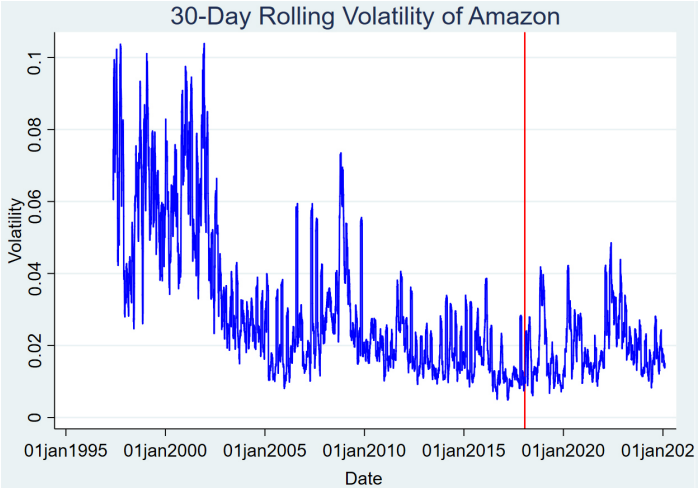

Figure 2. 30-Day rolling volatility of Amazon.

Figure 3 shows the daily returns of Amazon's stock, capturing fluctuations before and after the introduction of cashier-less technology. The red dashed line represents the introduction of cashierless technology. The return of Amazon decreases following the implementation of cashierless technology, possibly because the innovation was already priced in by the market, leading to a lower return afterward. The red dashed line represents the introduction of cashierless technology.

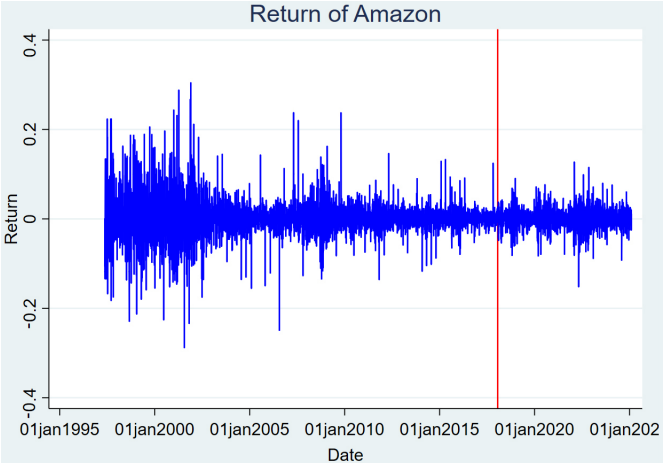

Figure 3. Return of Amazon.

4. Findings

The mean of volatility is 0.033 before the introduction of cashierless technology, while it is 0.02 after the introduction of cashierless technology (Table 3). The t-test is 24.55, indicating that the difference in volatility is statistically significant. At the same time, the p-value is 0.000, which is less than 0.05, suggesting that the difference between before and after the cashierless technology is statistically significant at 5% level. It is clear that volatility is higher before the introduction of cashierless technology.

Table 3. Two-sample t-test with equal variances for volatility.

	obs1	obs2	mean1	mean2	dif	St. err	t value	*p* value
Volatility	5205	1771	0.033	0.02	0.013	0.001	24.55	0.000

Note: We thank you for this point. We insert the following footnote. Our parametric T-test results are consistent with the non-parametric Mann-Whitney.

The mean of daily return is 0.012 before the introduction of cashierless technology, while it is 0.007 after the introduction of cashierless technology (Table 4). The t-test is 0.55, indicating that the difference in volatility is statistically significant. At the same time, the *p* value is 0.589, which is higher than 0.05, suggesting that the difference between before and after the cashierless technology is not statistically significant at 5% level. The mean value of daily return is quite identical for both before and after the introduction of cashierless technology.

Table 4. Two-sample t-test with equal variances for return.

	obs1	obs2	mean1	mean2	dif	St. Err	t value	*p* value
Daily return	5206	1771	0.012	0.007	0.001	0.001	0.55	0.589

Note: We thank you for this point. We insert the following footnote. Our parametric t-test results are consistent with the non-parametric Mann-Whitney.

Table 5 presents the result of two different regression models, where the dependent variables are volatility and return of Amazon. Each column represents to a district model which explanatory variable is dummy. The dummy variable takes one after the introduction of cashierless technology while taking zero before the introduction of cashierless technology. If the results are statistically significant at 1% level we indicated by (***), the 5% level (**), and the 10% level (*).

Table 5. Regression analysis.

	(1)	(2)
VARIABLES	rolling_volatility	daily_return
dum	−0.0128***	−0.0005
	(0.0004)	(0.0007)
Constant	0.0328***	0.0012**
	(0.0003)	(0.0005)
Observations	6976	6977
R-squared	0.0795	0.0000

Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

In model 1, the dummy variable is negative associated with volatility of Amazon, with a coefficient −0.0128. The finding suggests that the volatility of Amazon decreased after the introduction of cashierless technology.

In model 2, there is no statistically significant relationship between return of Amazon and dummy variable. The finding suggests the return of Amazon was not influenced the introduction of cashierless technology. The low R2 indicates the limited explanatory power for return model.

5. Conclusion

This paper explores whether Amazon's adoption of cashierless technology has significant effects on its stock performance. The empirical analysis indicates that stock volatility has witnessed a significant decrease following the implementation of cashierless technology, implying an increase in market stability or investor confidence. However, the average stock returns have not shown a substantial change, suggesting that while cashierless technology may reduce the uncertainty, it does not immediately drive up stock price. The finding of this paper is important for managers, policy makers, and consumers.

Future research could explore long-term impacts, cross-company comparisons to further understand how innovations shape stock market dynamics. Furthermore, a market-adjusted model could be applied to account for overall market movements.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Agrawal, S. R., & Mittal, D. (2024). Cashier-Free Checkout System: To Improve In-Store Shopping Experience. *International Journal of Retail & Distribution Management, 52,* 612-625. https://doi.org/10.1108/ijrdm-09-2023-0539

Ashraf, A. R., Thongpapanl, N., & Auh, S. (2014). The Application of the Technology Acceptance Model under Different Cultural Contexts: The Case of Online Shopping Adoption. *Journal of International Marketing, 22,* 68-93. https://doi.org/10.1509/jim.14.0065

Gazzola, P., Grechi, D., Martinelli, I., & Pezzetti, R. (2022). The Innovation of the Cashierless Store: A Preliminary Analysis in Italy. *Sustainability, 14,* Article 2034. https://doi.org/10.3390/su14042034

Ghazwani, S., van Esch, P., Cui, Y. G., & Gala, P. (2022). Artificial Intelligence, Financial Anxiety and Cashier-Less Checkouts: A Saudi Arabian Perspective. *International Journal of Bank Marketing, 40,* 1200-1216. https://doi.org/10.1108/ijbm-09-2021-0444

Green, K. M. (2021). *Super-Big Market-Data: A Case Study, Walkthrough Approach to Amazon Go Cashierless Convenience Stores*. Doctoral Dissertation, University of Illinois at Chicago.

Kim, J., Kwon, H. E., Lee, D., Lee, H., & Lee, K. (2025). From Human Cashiers to Machine: An Empirical Analysis of Self-Service Technologies in the Retail Stores. In *Proceedings of the 58th Hawaii International Conference on System Sciences* (pp. 1-10).

Kwon, J., & Ahn, J. (2023). Effects of Perceived Values on Affective and Conative Attitudes in Cashierless Store Services. *International Journal of Quality and Service Sciences, 15,* 259-272. https://doi.org/10.1108/ijqss-11-2022-0118

Lee, R. Y., Chai, T. Y., Chua, S. Y., Lai, Y. L., Wai, S. Y., & Haw, S. C. (2022). Cashierless Checkout Vision System for Smart Retail Using Deep Learning. *Journal of System and Management Sciences, 12,* 232-250.

Lin, P. H., Lin, C. Y., Hung, C. T., Chen, J. J., & Liang, J. M. (2020). The Autonomous Shopping-Guide Robot in Cashier-Less Convenience Stores. *Proceedings of Engineering and Technology Innovation, 14,* 9-15. https://doi.org/10.46604/peti.2020.3961

Nassar, M., Itani, A., Karout, M., El Baba, M., & Kaakaji, O. A. S. (2019). Shoplifting Smart Stores Using Adversarial Machine Learning. In *2019 IEEE/ACS 16th International Conference on Computer Systems and Applications (AICCSA)* (pp. 1-6). IEEE. https://doi.org/10.1109/aiccsa47632.2019.9035236

Nouzri, O., & Ejjami, R. (2024). Integrating Artificial Intelligence in Autonomous Cashier Systems: A Study on Functional Schema Design and Its Impact on Supermarket Operations. *Journal of Next-Generation Research 5.0, 1,* 1-25. https://doi.org/10.70792/jngr5.0.v1i1.9

Polacco, A., & Backes, K. (2018). The Amazon Go Concept: Implications, Applications, and Sustainability. *Journal of Business and Management, 24,* 79-92. https://doi.org/10.1504/jbm.2018.141263

Ponte, D., & Bonazzi, S. (2021). Technology Analysis & Strategic Management Physical Supermarkets and Digital Integration: Acceptance of the Cashierless Concept. *Technology Analysis & Strategic Management, 35,* 1178-1190. https://doi.org/10.1080/09537325.2021.1994942

Schögel, M., & Lienhard, S. (2020). Cashierless Stores—The New Way to the Customer? *Marketing Review St. Gallen, 37,* 38-47.

Schultz, C. D., & Paetz, F. (2025). The Way Out—Customer Benefits and Self-Service Satisfaction in Cashierless Shopping Systems. *Journal of Retailing and Consumer Services, 85,* Article 104280. https://doi.org/10.1016/j.jretconser.2025.104280

Srivastava, K., & Pal, D. (2024). Importance of AI Attributes in Indian Retail Stores: A Conjoint Analysis Approach. *International Journal of Retail & Distribution Management, 52,* 355-371. https://doi.org/10.1108/ijrdm-11-2022-0456

Szabó-Szentgróti, E., Rámháp, S., & Kézai, P. K. (2023). Systematic Review of Cashierless Stores (just Walk Out Stores) Revolutionizing the Retail. *Management & Marketing, 18,* 427-448. https://doi.org/10.2478/mmcks-2023-0023

Varma, A., Varde, Y., Ray, S., & Mishra, N. (2024). Reinventing the Retail Experience: The Case of Amazon Go. *World Journal of Advanced Research and Reviews, 21,* 1123-1133.

Wankhede, K., Wukkadada, B., & Nadar, V. (2018). Just Walk-Out Technology and Its Challenges: A Case of Amazon Go. In *2018 International Conference on Inventive Research in Computing Applications (ICIRCA)* (pp. 254-257). IEEE. https://doi.org/10.1109/icirca.2018.8597403

Zhang, Z., Shin, H., & Holl, D. (2024). *Just Walk Out, Just in Time: How Cashierless Technology Shifts When and What Customers Buy.* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4938644