

An Analysis of Stock Price Reactions to Automotive Product Recalls

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Automobile product recall has increased in recent years albeit attendant impact on stock price. Objective: the objective of this paper is to analyse the stock price effect and the stock price response time to automobile product recall for Toyota, GM and Tesla. Prior Work: the paper inclines on prior work on efficient markets and product recall effects on corporate financial value but takes a slightly different stance to focus on automobile recall effect on stock price and reaction time gap. Approach: the paper applied a t-test statistics for difference in mean stock price following automobile product recall announcements. Results: the results show that following the recall announcements, the stock prices reacted negatively at a highly significant value of $P < 0.05$ for all the three industries. Furthermore, following the announcement of recall, it took a day (for Toyota) and three days (for GM and Tesla) for the stock prices to be affected. Implication: the result provides a practical implication for investors to understand when to sell and buy stocks and to automobile industries to manage stock price risk during planned product recall. The paper offers a current case study for university business schools and provides agenda for furthering research on timing of stock price impact after automobile recall. Value: the paper reveals that (within the confines of this study) automobile product recall may take between a day and three days to influence a stock price shock.

Keywords: Automobile recall; Stock Price; Stock Markets; Product recall

INTRODUCTION

Product recall is a proactive financial and marketing strategy, which inter alia aims to protect the consumers, the society, and the environment from product usage hazards (Zhao, & Flynn, 2013). Product recalls may arise due to occasional malfunctioning of a product or its parts, which often may have escaped pre or post manufacturing quality control scrutiny. Product recalls may also be necessitated by some flaws in the design, defects, new research information about the product or parts, unplanned failure, or new requirements by regulation (Berman, 1999). Strategically, product recall is a vital proactive financial planning and risk cushioning strategy (Ledbetter, 1989). A teamwork between the production,

quality control and financial managers may result in effective risk pre-empting of malfunctioning parts or defective product, with attendant product recall. When conducted effectively and efficiently, product recall can be fundamental to avoidance of potential short or long-term negative impact on corporate finance and reputational crisis (Carroll (2009). Although in some instances product recall might involve a short-term loss, but the long-term financial and reputational salvaging can be beneficial for the company (Tsang, 2000). If a product with a defective part is unrecalled from the consumers, it may lead to health hazards or fatalities with concomitant expensive legal battle of which the settlements or compensations to victims may overwhelm the profitability and stock value of the company including corporate reputation and goodwill (Polinsky, 2018).

The efficient market hypothesis highlights that stock prices reflect all unimpeded information to bolster the unpredictability (and hence efficiency of stock markets) (Malkiel, 1989, Mazviona et al, 2021). In line with this hypothesis, some researchers have examined the likely effects of some product recalls on share value of companies, such as product recall effect on shareholder value (Davidson et al 1912); product recall effect on sellers' wealth (Hoffer et al, 1988); product recall information and security price (Pruitt et al, 1986); impact of food recalling on stock markets (Saline & Hooker (2001). However, there is scarcity of research on a combined effect of automobile product recall on stock price performance and on the time gap between announcement of recall and the impact on stock price. Furthermore, there is a paucity of extant research that has examined this phenomenon by comparing automobile industries from distant geographical regions of the world. Accordingly, this paper contributes to existing literature by filling this observed gap in existing knowledge.

Problem of The Paper

The problem of this paper is engrafted in the empirical literature equivocal stance on how product recall strategies impact the value of the corporation such as on the financial value (Chen, Ganesan & Liu, 2009). Whilst most of the previous research on the financial effect of product recalls have used regression or other correlational methods, little have applied a differential statistic to check whether significant differences exist between two scenarios (the before and after) the product recall and how this differs amongst major automobile companies. furthermore, there is apparent scarcity in existing literature regarding the number of days it may take for an automobile product recall to influence a stock market impact. Accordingly, this paper brings a new research light within this stream of research inquiries and doing so using the latest data on product recalls in the automobile industry.

Objective of Paper.

Following the above problem, the objective of this paper is to analyse the stock market effect of automobile product recalls. It aims to examine the aforesaid effect and the direction of the effect on three automobile industries namely Toyota, Tesla, and GM. A follow-up objective is to understand the time it takes for an automobile recall to trigger a stock market price effect.

LITERATURE REVIEW

Several prior empirical studies in economics and finance have analysed the effect of different product recalls on corporate financial value by focussing on assorted products. However, the empirical research results produce mixed results (Chen, Ganesan & Liu, 2009). Some have reported that product recalls affect the stock market negatively (Liu et al, 2023; Mukherjee et al, 2022). Others have reported a non-significant effect of product recall on stock value (Davidson et al, 1992; Govindaraj et al 2004).

Product recall may emanate from corporate reactive or proactive strategy; the former may arise due to an alarm incidence from the usage of corporate product (Dani & Deep, 2010; Hargis & Watt, 2010); the later may arise when a company issues a fast-track product recall without waiting for the product safety regulatory authorities (Chen, Ganesan & Liu, 2009). It can also be a proactive strategy if it arises from corporate quality testing results which shows that some parts or the entire product is prone to malfunctioning. Albeit the cause of the recall, it is imperative that some issues that accompany the product recall is gleaned from the literature to assist decision making either for product planning or for investment decisions. Amongst others, the legal implications have to be considered, this should be in tandem with the overall planning costing and management processes (Sinha, 2013). There are two groups under the harm associated with product recall, these are the product consumers and the corporate share holders (Moriarty, 2021). Whilst consumers suffer harm arising from the negative consequences of using defective products or parts thereof, shareholders have been found to suffer financial or economic harm arising from share price decline following announcements of defective parts or recalling of the product (Davidson III & Worrell, 1992). Other harms to investors include alteration of firms financial profile and corporate reputational damage of which the aftermath could lead to financial cost (Moriarty, 2021). Research findings show that product recall might be covertly more harmful to investors than can be imagined; this is because some product recalls may negatively affect share value in such magnitude that may orchestrate to collapse of small investor companies who invested in companies with defective products with attendant recalls – the case of Merck and Company is

an exemplary case of the various harms associated with defective product and the recall thereof as cited by (Neilan, 2004; Moriarty, 2021).

In another related research, Quanhong and Xin (2015) evaluated the potential motivation for corporate recalling of products and the attendant effect on corporate performance. They find that product recalling may be catalysed by different types of external environmental factors to the corporate as well as some internal factors. Additionally, and slightly divergent from popular findings, they find that corporate product recalling has the potential to offer a dual positive and negative impact on corporate performance. In a slightly different research formulation on product recall, Chen, Ganesan and Liu (2009) evaluated the effect of proactive and passive product recall on financial value of the firm by applying the Consumer Product Safety Commission recalls over twelve years. They applied the event study technique and found that irrespective of corporate product characteristics, a proactive product strategy may result in more negative impact on corporate financial value than the application of passive product recall strategy. Lie et al (2023) applied the event study method to evaluate the stock market impact of supply chain quality effect announcements. They used the market-adjusted and Carhart four-factor models to estimate abnormal effects on stock returns through the application of cross-sectional regression. Their findings show that supply chain quality effect announcements produce a negative effect on the stock market. In furthering the empirical search for stock market impact of product recall, Mukherjee et al (2022) applied methodological innovation and initiated the integration of product recall clustering technique in their research to examine the extent to which product recall clustering might affect stock market returns. They find that initial or leading product recalls have strong association up to 67% negative effect on stock market performance than follow-up product recalls. This findings shows that although initial product recalls might trigger other recalls, but the leading product recalls may have a far grander negative stock market impact than other product recalls that may follow – this is informative for both the investors and managers.

Davidson III & Worrell (1992) analysed whether and how the announcement of recall of products and the removal of products from the market affect the stock price. Their research found a negative return on stock price, and reported a higher significance of the negative returns if companies replace the products or pay back the purchase price greater than if the products are only checked and repaired. Another slant of the research on stock value impact of product recall was conducted by Govindaraj et al (1992) who analysed the magnitude of the effect and the impact on the concerned corporate competitors. The Govindaraj et al (1992) research was novel given that they analysed the effect on two companies – being the supplier of tires to an automobile company and the automobile company that uses the tires on its vehicles. Their findings show that both the supplier and user of the automobile tire whose car was involved suffered stock loss which

exceeded the related costs of the automobile recall. They further found that the stock market overreacted negatively to the recall announcement based the quantum of losses related to the recall. Their evaluation of the effect of recall on competitors' (both the tire and auto industries) show that the stock value of the competitors had a significant stock value gain as the competitors' products were close substitutes to the products that were recalled (Govindaraj et al, 1992).

A new strand of research on the effect of product recall on firm financial performance was conducted by Zhang et al (2022) wherein they examined whether corporate product failure affect the cost of capital from bank loans. Their analysis and results show that banks who lend capitals to companies charge higher cost of capital (loan price) on companies that experience product recalls. This is because product recalls create uncertainty regarding future financial health of companies and hence increase the affected companies credit risks, reputational damage, greater asymmetry of information, and deficiency in corporate governance (Zhang et al, 2022). Further findings by Zhang et al (2022) show that increase in corporate cost of capital was shown in companies with higher leverage (more debt capital from banks), and in companies whose recalls are seemly more severe in nature and on companies with dominant passive recall strategy. Further novel finding by Zhang et al (2022) show that medical products recall does not attract higher cost of debt on medical companies because the market sees medical product recall as an acceptable business code of conduct in the medical products industry. Overall, Zhang et al (2022) find a general dwindling of financial performance on firms that engage in product recall. Souiden and Pons (2009) confirm the findings of Zhang et al (2022) regarding the negative effect of product recall on company's reputation. Furthermore, Hoffer et al (1988) corroborates that automobile product recall constitute a significant effect on companies' share price; the negative effect on share price is further confirmed by Zhao et al (2013) and Singh (2013).

This current article contributes to existing research by relooking at the effect of automobile product recall on current stock market prices and the comparison of the effect on different automobile companies from two diverse parts of the world (Tesla & GM from USA) and (Toyota from Japan). The proceeding sections present the data analysis and results.

METHODOLOGY

The paper applied a quantitative technique – specifically, the application of paired t- test statistics for mean difference of two samples. In this instance, two samples of stock price performance before automobile product recall announcement and after the product announced are analysed for potential significance difference in means. This is with a view to ascertain whether

automobile product recall does influence a significant effect on the related company's stock price. It proceeds further to compare the differential effect of product recall between in three automobile companies' stock prices (Toyota, Tesla & GM). The historical stock price data for the three companies were retrieved from the archives of Investing.Com market data by Fusion Media Limited. Historical stock price data in all the samples covered 19 days before the month recall announcement and 19 days within the month of recall announcement. Data were analysed using the paired t-test statistics for mean differences.

The three automobile companies with date of media announcement, the volume of recall with brand and reason for recall appear in Table 1. The table was compiled by the author with information from the website of Toyota and Reuters.

Table 1. Automobile Recall by Toyota, Tesla & GM

	DATE RECALL ANNOUNCED	VOLUME /BRAND	REASON
TOYOTA	MARCH 3 2023 (see: Toyota, 2023)	Approximately 130,000/TUNDRA	optional Toyota genuine truck bed accessory tonneau cover that can detach from the vehicle while driving
TESLA	APRIL 7 2023 (See: Reuters, 2023b)	422/Model 3	"front suspension lateral link fasteners may loosen" (see: Reuters, 2023b)
GM	APRIL 7 2023 see: (Reuters, 2023a)	300/Self-driven	"software error in a Cruise automated vehicle (AV)" (see: Reuters, 2023a)

Results

Two main objectives of the paper were analysed in Table 2 to Table 4 and in Figure 1 to Figure 3. The objectives were to examine the effect of automobile product recall on stock market price and to understand the time it takes for the recall to influence and impact on the stock market. The t-test results in Table 2, Table 3 and Table 4 for Toyota, GM and Tesla respectively, show that their automobile product recall caused a significant impact on their stock prices at $P < 0.05$. The product recall for the three companies showed a negative stock price reactions as indicated by the negative t-statistics in Tables 2 – 4. The negative stock reaction confirms earlier literature on the negative impact of product recall on the stock market such as in (Liu et al, 2023; Mukherjee et al, 2022). Furthermore, the line graphs in Figure 1, Figure 2 and Figure 3 for Toyota, GM and Tesla respectively show that following Toyota recall announcement in February 2023, it took a day for the stock market to begin a negative reaction to the recall announcement. On the contrary, the Line graphs in Figure 2 and 3 for GM and Tesla, show that following the recall announcements from GM and Tesla, it too up to three days before the stock market began a negative reaction to the

recall announcement. This result on the number of days to stock market reaction following automobile recall adds a new insight to the existing literature findings.

Table 2. Toyota: T-Test: Paired Two Sample for Means

	<i>March</i>	<i>Feb</i>
Mean	1,8375	1,886921
Variance	0,002761	0,000331
Observations	19	19
Hypothesized Mean Difference	0	
df	18	
t Stat	-3,98573	
P(T<=t) one-tail	0,000433	
t Critical one-tail	1,734064	
P(T<=t) two-tail	0,000867	
t Critical two-tail	2,100922	

Table 3. GM - T-Test: Paired Two Sample for Means

	<i>APRIL</i>	<i>MARCH</i>
Mean	34,41	36,41578947
Variance	1,290488889	7,112181287
Observations	19	19
Hypothesized Mean Difference	0	
df	18	
t Stat	-4,353269411	
P(T<=t) one-tail	0,000191552	
t Critical one-tail	1,734063607	
P(T<=t) two-tail	0,000383103	
t Critical two-tail	2,10092204	

Table 4. Tesla t-Test: Paired Two Sample for Means

	<i>APRIL</i>	<i>MARCH</i>
Mean	176,9552632	186,8816
Variance	164,9527485	78,94258
Observations	19	19
Hypothesized Mean Difference	0	
df	18	
t Stat	-2,21079528	
P(T<=t) one-tail	0,020116465	
t Critical one-tail	1,734063607	
P(T<=t) two-tail	0,04023293	
t Critical two-tail	2,10092204	

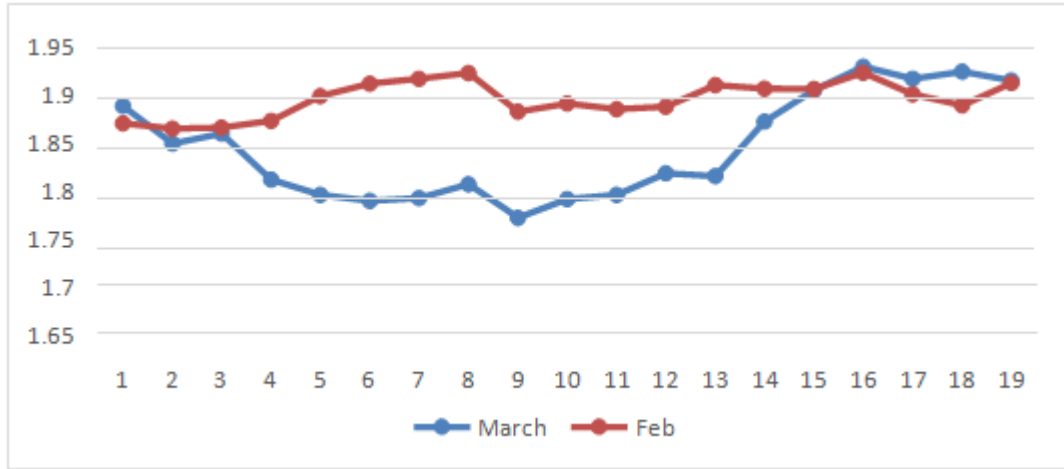


Figure 1. Line Graph of Toyota Stock Price Performa Between February and March 2023

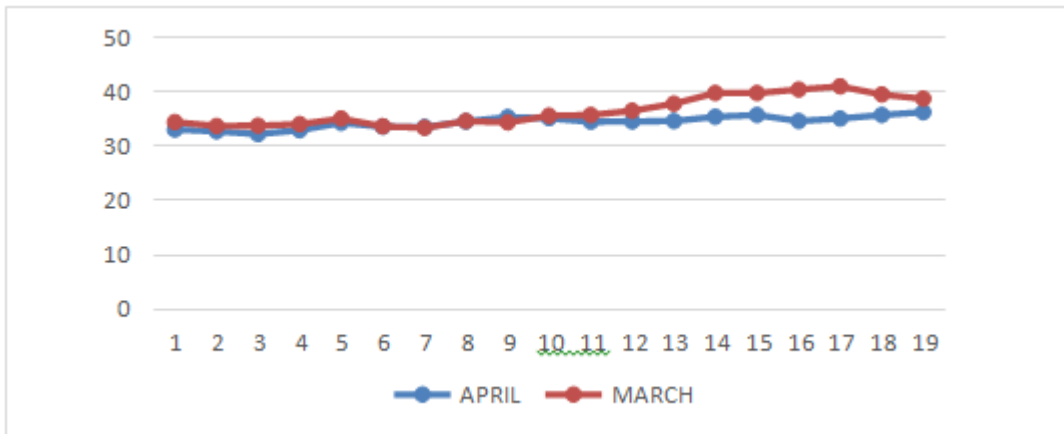


Figure 2. Line Graph of GM Stock Price Performa Between April and March 2023

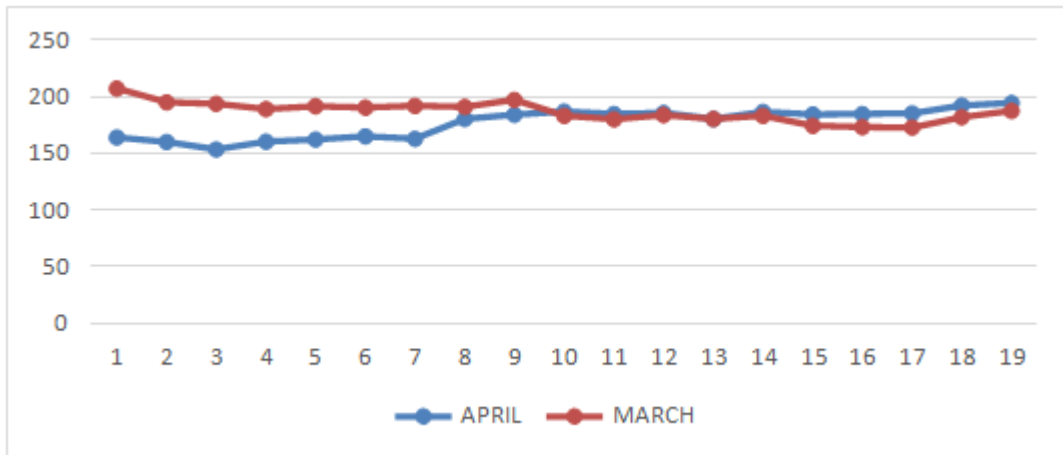


Figure 3. Line Graph of Tesla Stock Price Performa Between April and March 2023

Implication

The results show that some automobile product recall may take between a day to three days to have an impact on stock market prices. This provides a practical implication for investors to understand when to sell and buy back their stocks by applying the sell short or long hedging strategy during automobile product recalls. It also provides management of automobile industries with an advance information to manage their stock price reaction risk for their planned product recall. This paper provides a good current case paper for university business schools in studying the interaction between automobile product recall, stock market effect, timing of stock market response following automobile product announcement, and speculative or hedging investment during automobile product recalls.

Value (Contribution)

This paper is novel and contributes to a geographical spread of the stock market effect of automobile product recall by comparing industries from diverse parts of the world (Toyota from Japan with Tesla and GM from the USA). Importantly, the paper contributes a novel result, which reveals that automobile product recalls may take between a day and three days to influence a stock market price shock (specifically within the sample and time of this study).

CONCLUSION

The core objective of this paper is to examine the effect of automobile product recall on three automobile industries namely Toyota, Tesla and GM. It also aimed to understand the time it takes for an automobile recall to trigger a stock market price effect. Previous empirical studies maintain an equivocal stance on whether proactive product recall affect stock markets (Chen, Ganesan & Liu, 2009). Given the scarcity of the application of a t-test of difference statistics to check whether significant differences exist between two scenarios (the before and after) the product recall and how this differs amongst three main automobile companies, this paper contributes by bridging this gap in existing literature. Results from the t-test of difference in mean stock returns show that automobile product recall has a negative effect on stock price of the companies following product recall announcements. This finding provides a corroboration of earlier findings that used other companies. Further findings from this paper show that it may take different days before an automobile product recall announcement begins to affect stock market price reaction. This provides additional information for corporate executives in managing the stock price risks and for assisting investors in making gainful investment decisions. Given that this results rest within the

confines of the data used in this research, the paper encourages further research to examine the time gap between product recall announcements and the impact on stock market prices by using other companies to explore the likelihood of similar or different results.

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