

Toshiba's market valuation in the midst of a long term turmoil

Serge Rey* • Sophie Nivoix**

Abstract Since 2008 Toshiba is experiencing a major fraud and financial scandal, which has impaired its stock price, governance and reputation. As this conglomerate is one of the largest and more ancient Japanese industrial group, it is highly interesting to analyze the impact of this situation on the main financial indicators of the company in a long run perspective. Our study underlines that while the risk level of the firm was increasing the returns and stock price were dropping. Such an evolution really endangered the group, as showed by the stock market ratios. In addition, the calculation of abnormal returns confirms that the news considered *a priori* as good (or bad) generated cumulative increases (or decreases) in the returns of the Toshiba stock.

Keywords: Toshiba; Japan; abnormal return; risk; auditing; scandal

JEL Classification: G00; G14; G32; G33

1. Introduction

Toshiba, founded in 1875, is one of the largest Japanese industrial group, with close to 4000 billion yen sales in 2017. The group includes more than 140 000 employees throughout the world, and operates in electronic devices, digital solutions, social infrastructures and energy business. Its development has been done in line with the Japanese economic rise over the last century. But since its historical high of 1169 yens in July 2007, the Toshiba stock price fell dramatically to a historical low of 158 yens in February 2016. Such a tremendous value drop was caused by several accounting and fraud scandals, by the costly acquisition of Westinghouse electric company in 2007, the bankrupt of this subsidiary in 2017, as well as the consequences of the financial crisis. The sustainable development and energy issue is important here as Westinghouse is operating in the nuclear power industry, while Japan experienced the Fukushima catastrophe in 2011.

We intend to investigate the impact of the major events concerning Toshiba both on the financial situation and on its share price and volatility, considering

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that according to the efficient market hypothesis the stock price adjustment should be immediate (Fama et al., 1969). Many event studies (McKinlay, 1997) focused on the market reaction after specific announcements, such as earnings surprises, fraud or disasters (Jaussaud et al., 2015). The issue is to determine the effects of events on main indicators of risks and returns and the amplitude of the market price and volatility reaction, i.e. abnormal stock returns in relationship with the kind of event in a specific firm.

It is all the more interesting that Toshiba is a major worldwide company in the industries of energy and infrastructures, community solutions, electronic devices and components, and lifestyle products¹.

In order to understand the long run evolution of the group, we investigated the financial situation of Toshiba from 1997 to 2017. This includes the analysis of the main return and risk key indicators as well as its stock price evolution. As our results point out, the hitherto unknown financial issues of Toshiba are associated with a sharp long term drop of its stock. In addition, the calculation of abnormal returns confirms that the news considered *a priori* as good (or bad) generated cumulative increases (or decreases) in the returns of the Toshiba stock.

Section 2 presents the context of the events and section 3 lists the main events on the period 1987-2019. Section 4 proposes an empirical analysis of financial ratios, while section 5 shows the impact of news on abnormal returns. Section 6 concludes.

2. The general context of the events

2.1 *The main information about the scandals*

The fraud events over 2008-2017 took place during a difficult economic period, both at the worldwide and at the Japanese levels. Indeed, the OECD (2017) anticipated that the fiscal support in Japan was expected to fade in 2018, despite an estimated growth close to 1%. In 2018, the primary deficit of the country was -3.7%, which is well above the government's benchmark of 1% of GDP, leading to a further rise in the government debt to GDP. Moreover, the 2019 deficit should reach -3.8%. As for companies themselves, the OECD indicates that because of the increasing integration of the country in global value chains, especially in Asia, the benefits of international trade are concentrated in large firms, such as Toshiba for instance.

It is important to note that Toshiba is a major worldwide company in the industries of energy and infrastructures, community solutions, electronic devices and components, and lifestyle products. Toshiba group comprised in 2016 more than 550 consolidated subsidiaries and 188 000 employees, but the seminal firm was created in 1875 (Tanaka manufactures), and its actual name was given in 1939 as a short name of firm after the merger between Tokyo Denki and Shibaura Seisakujo. Before world war II Toshiba was a member of Mitsui zaibatsu, and since then it is affiliated to the Mitsui keiretsu.

As will be detailed in the timeline of the events, the problem Toshiba is facing is not only about accounting irregularities in 2008-2014 fiscal years. The fraud, which

¹ source: https://www.toshiba.co.jp/about/press/2017_07/pr1801.htm.

was revealed by third parties at the Securities and Exchange Surveillance Commission (SESC), lasted several years and both internal and external controls failed. Rahman and Bremer (2016) identified five main causes: “domineering top management, compliant middle-managers who embody the worst of the salaryman mentality, duplicitous auditors, percentage-of-completion method accounting abuse, and the secular decline in several of the company’s business lines”.

As any company operating in a fast growing high-tech industry, Toshiba can experience hard times if it misses a major technological innovation. Meanwhile, the diversification of the group can help to mitigate such threat. The main issue here is that Toshiba not only had low incomes but tried to hide this weakness with fraudulent use of the “percentage-of-completion” accounting method, which is relevant for long term projects. The violation of the principles of this method lies in the estimation of progress toward completion of the projects, as it “implies the ongoing recognition of revenue and income related to longer-term projects”². Such a method requires a good ability of the firm to estimate the gains and losses related to every stage of completion, and to assess the remaining costs to complete the project in every fiscal year.

These irregularities took place during the 2008-2014 period and involved a 2 billion USD global amount. Moreover, the top management of Toshiba forced the executives to act fraudulently and the accounting audit did not unveil these wrong reports and the earnings’ artificial inflation. The goal of the overstatement of profits was not only the refusal to announce losses, but also to win new major contracts.

Such a governance scandal is all the more negative for the firm reputation that, as mentioned in the concluding remarks of the independent Investigation Report (2015), Toshiba “became a ‘company with committees, etc.’ (*iinkai-to secchi kaisha*) early on, and has been recognized as a front runner in (...) having an advanced corporate governance structure”. Because of this betrayal of trust, a 143 year-old successful company thus became a foil and a shame instead of a model.

2.2 The auditing failure

As for the auditor, Ernst&Young (EY) ShinNihon LLC has been built through several mergers and acquisitions since its establishment in 1967 (see appendix 1), and had 6250 employees and more than 4000 customers in July 2017. Interestingly, this prominent auditing company became a limited liability company (LLC) in 2008, i.e. just when Toshiba began its frauds. In a LLC the members of the company cannot be held personally liable for the company’s liabilities, and it mixes the features of a corporation and a partnership (considering the taxation of its members, as losses can be used to offset other income). It is worth to mention that an LLC is “easier to set up than a corporation, and it provides more flexibility”, but the “creditors may be able to pierce the corporate veil of an LLC in case of fraud or when legal and reporting requirements haven’t been met”³. Rahman and Bremer (2016) even suggested that “it is likely that the auditor cooperated in hiding the scandal”.

² <https://www.accountingtools.com/articles/2017/5/15/percentage-of-completion-method>

³ http://www.investopedia.com/terms/l/limited_company.asp

On 22nd December 2015, Japan's financial regulator fined the audit company 2.1 billion yens after its poor auditing of Toshiba accounts. This amount is close to two years of auditing fees paid by Toshiba. As for the auditing fees, they are far lower in Japan compared with the United Kingdom and the United States, with respectively 3.2, 5.3 and 11.8 basis point of turnover, while the international average is 5.6 basis point⁴. Toshiba's fees are even lower than the Japanese average, as the company paid EY ShinNihon only 1.5 basis point of its turnover. Nevertheless, Toshiba considered that such fees were "appropriate", and stated that the very value of this remuneration was not an issue of the auditing process seeing that the company received a "necessary and sufficient audit".

Moreover, the Financial Services Agency (FSA) suspended Ernst & Young ShinNihon LLC from accepting new engagements during the first three months of 2016. Toshiba indicated at the same time that it would not renew its auditing contract with this company for the fiscal year starting in April 2016⁵ and it chose to be audited by PricewaterhouseCoopers (PwC) Arata. The FSA explained its decision by the "negligence of due care"⁶ of the financial statements of Toshiba Corporation for fiscal years 2009, 2011 and 2012. It is also worth to mention that the FSA issued an administrative order to suspend certified public accountants who are partners of the firm, from providing services for 1, 3 or 6 months.

Such a major financial scandal reminds the Enron debacle in 2001, and in 2002 Arthur Andersen, one of the former "Big five" of the world auditing sector, which hid accounting information about this firm to some extent. It is rather funny to mention that after the Arthur Andersen auditing failure, the American Institute of Certified Public Accountant reported on February 2002 that Ernst & Young indicated that "no client is too big to say 'no'" (Zulauf and Grierson, 2002).

More recently, in 2009 the Indian leader of computer services Satyam, was responsible for data theft and staff bribery. Enron collapsed in 2001, and Satyam merged with Mahindra in 2009, which is not the case of Toshiba, but some common features can be pointed out. Indeed, the major issue was also related to financial reporting, disclosure, and the role of Enron's board of directors and top management. The other common characteristics are that the scandal implied an auditing major group, considered as innovative in its business. The betrayal was all the more painful that Enron put forward four values, i.e. communication, respect, integrity and excellence (Lundblad and Berger Davidson, 2003); in the same way as Toshiba mentions in its website and communication documents that it is "Committed to people, committed to the future", and wants to "serve the needs of all people, especially our customers, shareholders and employees". The group also adds that "managers provide leadership, inspiration and strategic direction, cultivate our organizational power (...) to realize sustainable, sound growth and profit"⁷.

⁴ <http://www.reuters.com/article/us-toshiba-accounting-auditor-idUSKCN0Q32OY20150729>

⁵ <http://www.reuters.com/article/us-toshiba-accounting-ernst-idUSKBN0U505S20151222>

⁶ <http://www.fsa.go.jp/en/news/2015/20151222-2.html>

⁷ <https://www.toshiba.co.jp/worldwide/about/commitment/vision.html>

3. Toshiba's financial key facts and Tokyo Stock Exchange listing department reactions

3.1 The recent timeline

In order to assess the stock valuation's consequences of major events during a long timespan, we selected some key dates of Toshiba's recent activities that may have impacted its stock volatility during the last 35 years. The events that have potential industrial or financial or strategic consequences on the group's businesses are the following ones. While we mainly consider microeconomic events that directly affect the company, we also take into account some more macroeconomic events such as the Fukushima disaster.

-22nd June 1987: Toshiba and the Norwegian firm Kongsberg Vaapenfabrikk exported sensitive military equipment to the former Soviet Union while the cold war was not over. The issue is that the machineries sold gave the technical possibility to the USSR to build quieter submarine propellers, making submarines more difficult to detect⁸. Obviously, this industrial and military scandal was a bad news.

-29th October 1999: Toshiba agreed to a \$2.1 billion settlement after having sold more than 5 million defective laptops in the United States. The technical issue concerned the semiconductor chips which control the floppy-disk drives. After a six month-class action in Texas, the group also said it would give customers some cash rebates and free products⁹. This was really bad news seeing that the competition is fierce in this industry on a worldwide scale.

-16th October 2006: acquisition of Westinghouse Electric Company for \$5.4 billion was completed, with Toshiba obtaining a 77% shares. Considering the growth expectations and the industrial anticipated synergies, this was considered as good news.

-11th March 2011: Fukushima catastrophe including a major earthquake, a tsunami on the Tohoku shores and the largest nuclear accident ever experienced in Japan. There is no need to mention how awful was this event.

-19th May 2011: Toshiba acquires Landis+Gyr for 2.3 billion USD. In the same way as the acquisition of Westinghouse in 2006, this was seen as good news with positive business forecasts.

-21st July 2015: Toshiba Corp chief executive and President Hisao Tanaka steps down after the group admitted overstating its profits by more than 150 billion yens between 2008 and 2014, and the Investigation Committee concluded that Toshiba reported false profits on 20th July 2015. This was one of the major bad news of the Toshiba long term scandal.

-15th March, 2016: the group published an "Improvement plan and situation report" six months after its stocks were labelled as securities on alert. This plan referred to the Principles of companies in scandal issued by the Japan Stock Exchange Regulation. The plan includes better practices such as clarification of responsibilities, strengthening of monitoring, reviewing the chain of command for financial accounting, or enhancing

⁸ Source: New York Times

⁹ Source: <https://www.zdnet.com/article/toshiba-to-pay-2b-settlement-on-laptops/>

the information disclosure¹⁰. In order to promote organizational reforms, the group also set up the “Toshiba rebuilding initiative” in December 2015, while the net income of the company dropped at the end of 2015 fiscal year from -37.8 billion of yens to -460 billion one year later. This news was supposed to be good, as it showed the way of a safer management and the end of the financial scandal.

-29th March 2017: Toshiba approves the file for chapter 11 bankrupt of Westinghouse, which exhibits a 9.8 billion USD debt. This is the most difficult event to assess, as it can be seen as both a good and a bad news. The investors may have been scared by such large debt and by the losses Toshiba had to bear. Meanwhile they were probably relieved to know that this financial nightmare was over for Toshiba.

-18th July 2017: A news is reported by Toshiba, concerning the amicable settlement of a dispute with SanDisk, a subsidiary of WesternDigital. In short, WesternDigital did not win its case in the California court and Toshiba is entitled to continue its activities and conclude contracts, even before the signing of the amicable agreement with WesternDigital, expected 10 days later¹¹. In addition, on July 19, 2017, the San Francisco Court of Appeal authorized Toshiba to continue to protect its data and intellectual property against Western Digital¹². Therefore, this event is a good news.

-1st August 2017: Toshiba share is demoted to the second ranks of the Tokyo Stock Exchange (TSE), and it is replaced by Seiko Epson in the Nikkei 225 index. This kind of news is obviously bad, but as it is usually anticipated by the market weeks before its official announcement, it is difficult to assess at that date.

-1st June 2018: Toshiba spun off its lucrative semiconductor Toshiba Memory subsidiary under a 2 trillion-yen (\$18.3 billion) deal, but will keep 51.1 of the voting rights. This earning is expected to help the group to re-enter the TSE 1st section in the coming three years. Toshiba will still own 33.4 % of the voting rights. Meanwhile, Toshiba now has to be able to create new sources of profits as Toshiba Memory represented 90 % of its operating profits¹³.” As a consequence this is good news for the group.

-13th February 2019 : Toshiba reduced its operating profit forecast for the 2018-2019 fiscal year (from 60, as announced las November, to only 20 billion JPY), because of losses and additional costs related to its semiconductor manufacturing equipment and energy businesses. The profit net earnings of this branch were reduced from 920 billion JPY to 870 billion while the whole group’s net profit is expected to rise 8.2 % thanks to the sale of Toshiba Memory in 2018. According to these recent news, after a 0.6% operating margin (operating profit/sales) this year, Toshiba still hopes to reach more than 4 % for the coming fiscal year (2019-2020), and it even forecasts to reach 8% for fiscal year 2023¹⁴. Thus, whatever the future profits might be, in the short run this was bad news.

¹⁰ 2016 Toshiba Annual report, Operational review, p.8

¹¹ Source : https://www.toshiba.co.jp/about/press/2017_07/pr1801.htm

¹² Source : https://www.toshiba.co.jp/about/ir/en/news/20170719_1.pdf

¹³ Source : <http://www.asahi.com/ajw/articles/AJ201806020030.html>

¹⁴ <https://www.japantimes.co.jp/news/2019/02/13/business/corporate-business/toshiba-cuts-fiscal-2018-profit-outlook-sluggish-semiconductor-sector/>

3.2 The consequences on Toshiba listing in 2017

The group has shown a misbehavior several times in the last decade, and probably during a longer timespan. Indeed, the independent Investigation Committee Report (2015) pointed out long run pressures from the top executives on the employees to hide the true financial situation of the firm after the 2008 financial crisis.

After a long term investigation, the Japanese Securities Exchange and Surveillance Commission concluded in January 2017 that the accounting frauds of the group were done on the instruction of the top executives. Problems were found in all six Toshiba's major divisions, including overruns, construction delays, profit overstating, booking of future profits early or pushing back losses¹⁵.

Considering the Toshiba share listing, the Tokyo Stock Exchange (TSE) designated Toshiba stock "on alert" and imposed a listing agreement violation penalty of 91.2 million yens on 15th September 2015. The company fell under the case where the listed company made a false statement in its securities report, and the TSE pointed out that "the improvement of the internal management system" was required, according to the Securities Listing Regulations, Rule 501, Paragraph 1, Item 2, Sub-item a. Moreover, under the Securities Listing Regulations, Rule 509, Paragraph 1, Item 1, the TSE noticed that "there were matters requiring investigation other than the accounting processing". The Independent Investigation Committee, set up on April 3rd 2015, was expected to complete its investigation by mid July 2015, but postponed its report from 30th June to 31st August 2015, and then to 7th September 2015, for fiscal year end of March 2015. As mentioned by the TSE listing department on 15th September 2015, "these disclosures revealed that the company conducted inappropriate accounting, including postponing the recording of losses from the fiscal year ended March 2009" until 2015, and that the overstatement of the total net income climbed up to 155.2 billion yens. The reason indicated by the TSE for such a misconduct was the "company's excessive pursuit of recording short-term profit (...) difficult to achieve in the course of ordinary business activities. (...) there were actions possibly taken as a result of instruction from the management to the business divisions". The TSE also mentions that the governance was poor and that the management control was aware of the regulation violations: "Even though some directors and audit committee members had knowledge of the beginnings of the inappropriate accounting, the information was not shared". More generally, it is a concern for Japanese market authorities that such a behavior may also impair the confidence of shareholders and investors in the Japanese stock market, and beyond this it may have an impact on the good integration of company information by the market.

Considering the numerous events and news about Toshiba accounts since three decades, we cannot set up a common event study focused on one or two dates, with pre and post-event analysis. Indeed, there is a continuous process of bad news impacting the consolidated accounts of the group as well as its stock price. This is why we focused on a long time period to study both corporate finance and market finance data.

The financial and stock market data come from Toshiba website and the International

¹⁵ <http://www.fraud-magazine.com/current.aspx>, website of the US Association of certified fraud examiners

Factset database. We will analyse the impact of news on the Toshiba group using two complementary approaches. The first will deal with the consequences of fraud on Toshiba's financial ratios over the period 1997-2016. The second will be to analyse the impact of good and bad news on Toshiba's share price for the period 1987-2017.

4. Accounting fraud and financial ratios

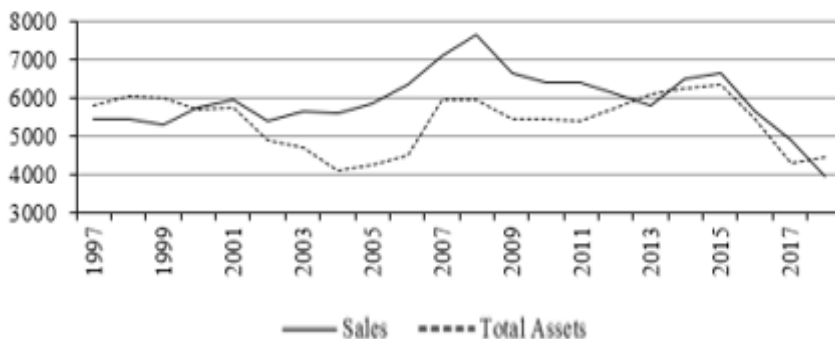
This empirical part includes the main corporate finance features of Toshiba, considering both risk and return indicators, as well as the impacts on the main market ratios of the stock and the share price variations themselves in the long run.

4.1 Corporate finance features

As explained above, the accounting fraud of Toshiba began in 2008 after a historical high and was caused by the pressure of the senior management to hide the poor sales. As a matter of fact, figure 1 shows the sales increase from fiscal year 1997 to 2008 (+40.6%) followed by a 13.2% decline in 2009 and another 26.8% drop between 2009 and 2016. The Earnings Before Interest and Taxes (=EBIT) and net income also exhibited large increases between 1997 and 2008, whereas they became largely negative in 2009 as well as in 2016, with moderate positive values in between. The 2008-2017 period is worse than a "lost decade" for Toshiba, seeing that in 2017 there is no hint of a real business recovery.

Considering the balance sheet of the group, the total assets exhibited in 2015 a value close to its previous level in 2008 and in 1997, before decreasing in fiscal year 2016 and 2017. Such a flat trend shows that overall Toshiba did not create much financial value over the last two decades. In a mature or declining market this would not be a poor achievement, whereas in the fast growing markets where Toshiba operates it questions the confidence investors can put in the growth potential of the firm.

Figure 1. Sales and total assets of Toshiba over the 1997-2017 period

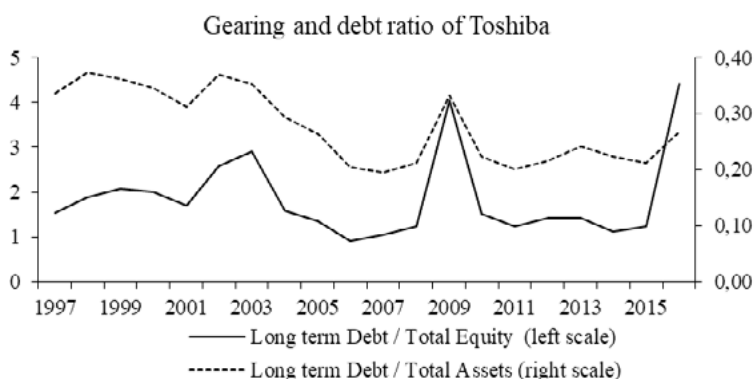


A weak expansion may not be a problem in itself if a company experiences a low risk level and a sufficient return level. Thus, we calculated the debt and return indicators of Toshiba, in order to assess its risk-return equilibrium. Figure 2 presents

two of the most significant debt ratios. First, the total debt ratio (total debt/total assets) shows that the debt level of Toshiba remained moderate during the past 20 years, between 0.20 and 0.37. Unsurprisingly the recent rating of Toshiba debts is poor, as in 2017 its long term debt was rated CCC- by Standard & Poor's, Caa1 by Moody's and B by Rating & Investment Inc. Its short term debt was respectively rated C, Not Prime, and B. The Caa1 rating was issued by Moody's on 28th December 2016, and the market reaction was a 23% drop of the stock price, close to its 21st century lowest price. These speculative grades are the outcome of a long term downgrading process, as Toshiba was rated B2 by Moody's in February 2016, and Baa2 between September 2009 and June 2014 (which was an investment grade rating). In October 2008 Moody's changed Toshiba A3 rating outlook to negative.

Meanwhile, the gearing ratio (long term debt/total equity) indicates the structure of the long term financing and the potential leverage effect of the firm. The higher the gearing, the higher the leverage effect, whether positive or negative. As a moderate gearing ratio is close to 1, we can see that Toshiba has been exhibiting a fairly high to very high gearing during the last 20 years. This means that the firm relies more on debt than on equity to finance its activity. Whereas it is easily understandable when the net income is negative, in case of profits the firm should carefully use them to invest and develop its business. The extremely high gearing in 2009 (4.05) and in 2016 (4.41) has been followed by a negative value in 2107 after a negative net income in fiscal year 2016 and in 2017 (non-significant gearing of -2.18, not shown in the figure). It is worth to mention that the 2009 and 2016 (and 2017 in fact) situations with a historical increase of the gearing above 4 are uncommonly risky for such a large firm. Unsurprisingly, these are the two worst years of the company, with consequences that can still be felt many months after these fiscal years.

Figure 2. Gearing and debt ratio of Toshiba

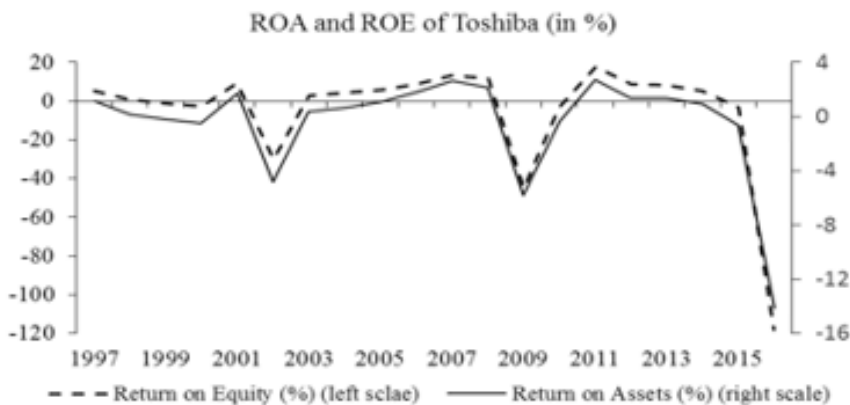


As a consequence, because of its poor net incomes, Toshiba has not benefited from a positive leverage effect in the past years to boost its return, whereas it was impaired by a low economic return, as can be seen in figure 3. As the long term debt level is moderate compared to the total assets, we can conclude that the firm is strongly relying on operating liabilities to finance its short term assets. As Toshiba has a strong

negotiation power with its suppliers, which are mainly included in the Mitsui keiretsu, it can incent them to accept hard commercial conditions and thus improve Toshiba's cash situation.

The comparison of Return On Equity (net income/equity) and Return On Asset (operating income/total assets) confirms the negative leverage effect in 2002, 2009 and 2016. In 2017 (end of the previous fiscal year end in March), both the net income and the shareholders' equity were negative, thus the ROE has not been calculated. Moreover, the long term level of the ROA is weak (between -5.79% in 2009 to 2.70% in 2011), with sharp drops in 2016 (-14.14%) and 2017 (-22.62% for fiscal year ending in March 2017). Considering the ROE, except in 2011 (11.96%), the values never reached the usually required level by the investors in relationship with the risk level of the group, despite the low long term interest rates in Japan, which declined from 2.5% to -0.1% over the analyzed period. Because of the 2002, 2009, 2010, 2015, 2016 and 2017 losses, the ROE exhibited negative values, and the equity became negative in 2017. As mentioned above, these dramatically low values were released 5 months overdue after the end of fiscal year (and of March 2017).

Figure 3. ROA and ROE of Toshiba (in%)



4.2 Impacts on the market valuation ratios

Considering the previous risk and return indicators, the market valuation of Toshiba has been unsurprisingly poor and shaky. Looking at the past values of the price-to-book and price-earnings ratio, we can notice huge variations (figure 4). The price-to-book reflects the comparison between the market and the accounting value of the stock, and the higher it is the more confident the market is in the future development of the firm. This ratio fluctuated between 1.4 and a historical high of 3.4 in 2000, in relationship with the internet bubble. Interestingly, despite the very low book value of the firm in 2016 after its huge losses, the ratio was only 2.81. As the shareholders' equity represented only 6% of the total liabilities, this means that the market valuation of the group reached less than 20% of its total liabilities. As a consequence, the apparently usual values of this ratio hide a real lack of confidence of the investors in Toshiba,

and not only in 2017 where the ratio became negative (not shown in figure 4). If the historical low of 2016 and 2017 was just a short period crisis, the market valuation would have been far higher and this ratio would have climbed to more than 5.

Figure 4. Price-to-book and PER of Toshiba over the 1997-2017 period



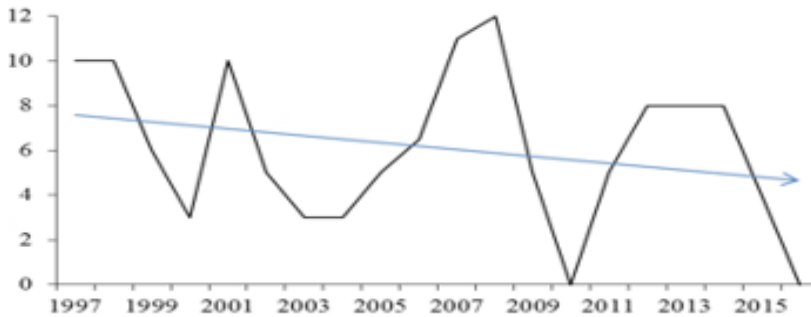
The PER experiences such large changes over the whole period that figure 4 presents only the values under 40 to ease the reading. As the usual PER values are close to 15 or 20, we can notice that Toshiba stock has rarely exhibited such figures. Either the PER was extremely high or it was too low. Its high values were for instance more than 200 in 1998 because of a very small earning per share, and over 50 in 2003 and 2004 for the same reason. Indeed, such values were not related to a high stock price, and did not mean that the market made optimistic income forecasts. At the opposite, when the net income was negative the PER dropped under 0 and is not represented in figure 4 (values are set to 0). Finally, there were few years with a moderate PER (2007, 2008 and 2011 to 2013), which creates much uncertainty and risk for the investors. This underlines the high risk level they had to accept, despite the poor returns.

We can thus wonder whether this uncertainty has been partly compensated by a good dividend yield, with the potential risk of a lack of cash for the firm. As shown by figure 5, the dividends were suspended in 2010, 2016 and 2017, but during the other 17 years out of 21 the company continued to pay dividends. As the dividend yield was always low (under 2% except in 2012), it may indicate a cautious pay-out policy, but the reality is somewhat different. Indeed, despite its low profits and several annual losses, Toshiba continuously paid dividends to its shareholders until 2010, when the company experienced a second consecutive loss after its bad income of 2009, and again until the repeated losses in 2016. This means that after 2008 the company not only disclosed irregular accounts, but it tried to send an optimistic signal to the stock market according to the signalling theory (Ross, 1977). Moreover, the pay-out ratio remained high, even during bad performing years: 34% in 2001 despite a weak income per share, 44% in 2012, 39% in 2013 and up to 62% in 2014, which was far over the average 25% pay-out in Japan during this period¹⁶.

¹⁶ <https://seekingalpha.com/article/2688275-on-the-dividend-payout-ratio-of-japanese-stocks>

As mentioned by Fama and French (1988), the signalling power of dividend yields to indicate future stock returns increase with the forecasting horizon. They explain this result by the increasing effect of return autocorrelation on the value of variance as the timespan gets longer. They also indicate that the effects of unexpected returns or dividends on the price are mitigated by the impact of the discount rate on these future financial flows.

Figure 5. Dividend per share of Toshiba over the 1997-2017 period



Such signals are reliable if they are confirmed by other financial indicators. This was less and less the case, and the pay-out impaired the cash level of the company, which endangered it even more. In the next sub-section we will describe the effects of the scandal on the stock price of the firm.

5. Consequences of news on Toshiba stock prices

5.1 Measuring abnormal returns

Despite major technical breakthroughs, like the NAND flash memory in 1989 or the Solid State Disk in 1991, we did not include these events because their announcements could not be identified with a specific date. Moreover, the scientific innovations are the result of a long process rather than a single decision or event.

The events studied here concern both specific announcements about Toshiba and natural events that have a more global impact, such as the Fukushima disaster.

A significant investor reaction to these announcements can lead to abnormal returns, i.e. differences between the firm's share return and its normal return. We define the normal return as the expected return conditional on a set of information Φ

independent of the event that occurs at date τ , with $R_{\tau}^* = E(R_{\tau} / \Phi_{\tau})$. In other words, if we study the impact of an event over a given period, which we will call the event window, the normal performance will have to be defined on a separate window/estimation period that is not affected by that event. A sufficiently long estimation period is used before the event window.

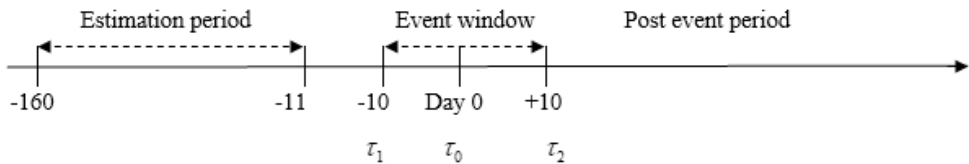
The event window covers periods before and after the event. The pre-event period is justified when information can be disseminated on the markets, which may lead to a price reaction following changes in investors' expectations. After the event, these

same investors will be able to revise their expectations and reallocate the composition of their portfolios accordingly. If there is no procedure to define optimally the event window, it must be long enough to understand the market's reaction to the information. In a study of 600 ads for 30 Dow Jones Industrial Index companies over the period January 1989 to December 1993, MacKinlay (1997) used a 41-day, 20-day before and 20-day after announcement window and a 120-day before this event period for normal return estimation.

Here we consider that 10 days before and 10 days after the event date, i.e. a 21-day window, are sufficient to account for the effects of announcements. This relatively short window is justified because as Fama (1998 p. 283) notes: "The assumption in studies that focus on short return windows is that any lag in the response of prices to an event is short-lived".

For the estimation of the normal return, a period of 150 days is used as shown in the figure 1.

Figure 1. Time line for event analysis



The abnormal return is the difference between the observed performance R_t of the stock on a given date t and the expected or normal performance R_t^* for that same date. The stock return is $R_t = \ln(S_t / S_{t-1})$, with S the stock price, and the abnormal return for an e event on event window is $AR_{e,\tau} = R_{e,\tau} - R_{e,\tau}^*$.

There are generally two models that can be used to estimate normal (expected) return. The first and simplest approach is to use a constant average return (noted \bar{R}) over the estimation period, i.e.

$$\begin{aligned} R_t &= \mu + \zeta_t \\ E(\zeta_t) &= 0 \\ \text{var}(\zeta_t) &= \sigma_\zeta^2 \end{aligned} \quad (1)$$

with $t = -160, \dots, -11$ and ζ a stochastic error term with an expected mean of zero and a constant variance. The abnormal return is:

$$AR_{e,\tau} = R_{e,\tau} - \bar{R} \quad (2)$$

The second approach is based on a market model. This model relates the security's

performance to the performance of the market portfolio¹⁷, noted R_m . We retain a linear relationship and the market model is based on Sharpe (1964) well-known Capital Asset Pricing Model, with β representing the sensitivity of the stock return to the market portfolio return:

$$\begin{aligned} R_t &= \alpha + \beta.R_{m,t} + \varepsilon_t \\ E(\varepsilon_t) &= 0 \end{aligned} \quad (3)$$

$$\text{var}(\varepsilon_t) = \sigma_\varepsilon^2$$

with ε an error term of zero mean and constant variance.

Therefore, the normal/expected return is

$$R_t^* = \hat{R}_t = \hat{\alpha} + \hat{\beta}.R_{m,t} \quad (4)$$

The symbol (^) represents estimated coefficients and α , β are estimated with 150 daily returns. We consider the stability of the pre-event model for the event period. Thus, the estimated abnormal yield () for each period of the event window will be:

$$\square AR_{e,\tau} = R_{e,\tau} - \hat{\alpha} - \hat{\beta}.R_{m,e,\tau} \quad (5)$$

A third and even simpler form of the model is to define abnormal performance as the difference between stock performance and market performance by τ . In practice, the Nikkei 225's performance is used as an indicator of the market portfolio's performance. However, as MacKinlay (1997 p.18) points out, "*The benefit from using the market model will depend upon the R^2 of the market model regression. The higher the R^2 the greater is the variance reduction of the abnormal return, and the larger is the gain*".

To investigate abnormal returns, it is necessary to accumulate them on the event window. The estimated cumulative abnormal return (CAR) is:

$$CAR_e(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{e,\tau} \quad (6)$$

where AR is respectively calculated from the constant average return (equation 2), the market model return (equation 3) and the Nikkei 225 performance.

5.2 Plots of cumulative abnormal returns

The financial and stock market data come from Toshiba website and the International Factset database. For each date of the event window, the abnormal return is calculated and then we deduce the cumulative abnormal returns over the entire event window, according to the relationship (6). In a second step, the average cumulative return ($ACAR$) for each date τ is calculated as:

$$ACAR\tau = \frac{1}{Ne} \sum_{e=1}^{Ne} CAR_{e,\tau} \quad (7)$$

With Ne represents the number of e events, $e=1, \dots, N$.

Events are represented by either good news, or bad news. However, how to discriminate between bad and good news? There are two ways to approach the question.

¹⁷ We are interested here in a one-factor model. Other multifactor models can be used. See among others Ziobrowski et al. (2004).

Either we look at the effects of a news item or we qualify it ex-post as bad or good depending on the response of the stock price. For example, by studying the responses of the dollar exchange rate, Laakkonen and Lanne (2009 p.8) classify news as positive (good) if the announcement effect produces an appreciation of the dollar and negative (bad) if it results in a depreciation.

Either one is interested a priori/ex-ante in the nature of the news and on the basis of the anticipated effects it is considered as bad or good. In a certain way, news are classified according to expectations, the expected effects of the dissemination of information. For example, if we consider firm-specific information, announcements of acquisitions, conflict resolution or improvements in economic and financial performance will be classified as good news. In contrast, news revealing a drop in performance, a downgrading of the rating by the agencies, the resignation of executives following a scandal or a global shock of extreme violence such as the Fukushima disaster will be considered a priori as bad news.

By focusing mainly on specific-firms information and aggregating the effects on returns for different periods, we do not explicitly take into account the state of the market and avoid the difficulties that could result. Indeed, if investors are uncertain about the state of the market, responses to good and bad news may be asymmetric (Conrad et al 2002, p.2508). Thus, a good news will have little effect on a market that has been performing well for a relatively long period. On the contrary, if the state of the market is bad the same news will increase the probability that the state of the market will improve significantly. On the other hand, a bad news will strongly degrade a bull market while it may have little effect on a strongly degraded market. In other words, we analyze the aggregate effects of news considered ex-ante as either good or bad, whatever the state of the market.

According to these criteria, we retain five bad news and five good news. The table 1 gives details of each news. If the news are considered as good (respectively bad) the stock market should anticipate a future increase (resp. decrease) of the sales and profits of Toshiba and thus the stock price should lead to abnormal positive (resp. negative) returns.

Table 1. Classification of the news

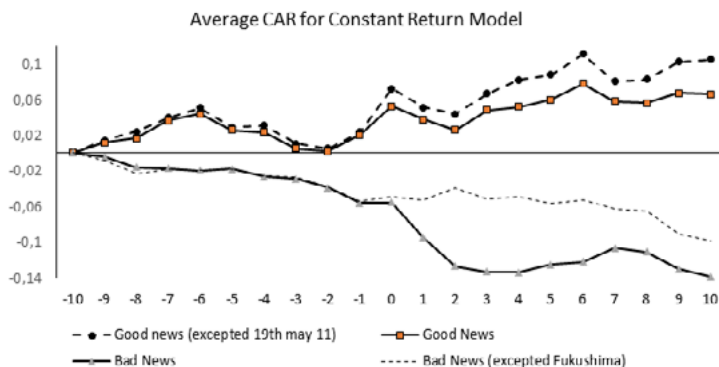
Good news	Bad news
<ul style="list-style-type: none"> • 16th October 2006 (acquisition of Westinghouse) • 19th May 2011 (acquisition of Landis+Gyr) • 15th March, 2016 (publication of an improvement plan after scandal) • 1st June 2018 (spin off of lucrative semiconductor subsidiary) • 18th July 2017 (amicable settlement of the dispute with SanDisk) 	<ul style="list-style-type: none"> • 22nd June 1987 (military security scandal) • 29th October 1999 (industrial drawback) • 11th March 2011 (Fukushima catastrophe, as TEPCO is an industrial partner) • 21st July 2015 (president Hisao Tanaka steps down) • 13th February 2019 (downgrading of group's operating profit forecast)

The following figures show the average cumulative returns curves for good and bad news. We did not include two events for which the interpretation was more complex. First, on 29th March 2017 the Chapter 11 bankrupt for Westinghouse can be seen as bad news for this subsidiary, but also as good news for Toshiba. Indeed, this event meant that the group would not have to suffer from the losses from its US subsidiary anymore. As a matter of fact, the market seemed to be relieved by the end of this costly acquisition 11 years before.

Second, considering the 1st August 2017, the bad news of the delisting of Toshiba from the First section of the Tokyo Stock Exchange was an information the investors had integrated weeks before. Thus, it was no surprise at that date, but only a confirmation, and may be a relief, after a long series of warnings and alerts from the market authorities since nearly one year (the first serious warning happened in September 2016). And there was even some speculation, as the Japan Times indicated on the 1st August 2017 : “*At the TSE on Monday, Toshiba’s last trading day on the first section, it ended at ¥246.00, up ¥6.80, or 2.8 percent, from Friday on speculative buying aimed at obtaining short-term profits*”¹⁸. Moreover, on Toshiba website, there is nothing about this in the press releases on 1st August 2017, but on the 3rd August the company mentions an investment announcement of 195 billion yens in the Toshiba Memory subsidiary on flash memories¹⁹. Finally, on 10th August Toshiba presented, after 2 months delay, both its very bad results of fiscal year 2016-2017 (ending in March 2017), which were already anticipated by the market after such a long wait²⁰, and its slightly better results for the first semester of 2017²¹. Then the future seemed a little more attractive for the investors.

Figures 1 to 3 show the average of cumulative abnormal return from the market model return for good and bad news.

Figure 1. Daily Cumulative Abnormal Returns for constant return model



¹⁸ Source : <https://www.japantimes.co.jp/news/2017/08/01/business/corporate-business/toshiba-shares-demoted-first-section-tokyo-stock-exchange/>

¹⁹ Source : https://www.toshiba.co.jp/about/ir/en/news/20170803_1.pdf

²⁰ Source : <https://www.toshiba.co.jp/about/ir/en/finance/er/er2016/q4/ter2016q4e.pdf>

²¹ Source : <https://www.toshiba.co.jp/about/ir/en/finance/er/er2017/q1/ter2017q1e.pdf>

Figure 2. Daily Cumulative Abnormal Returns for market model

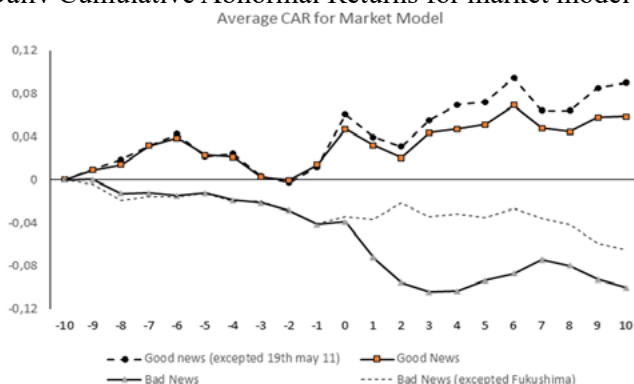
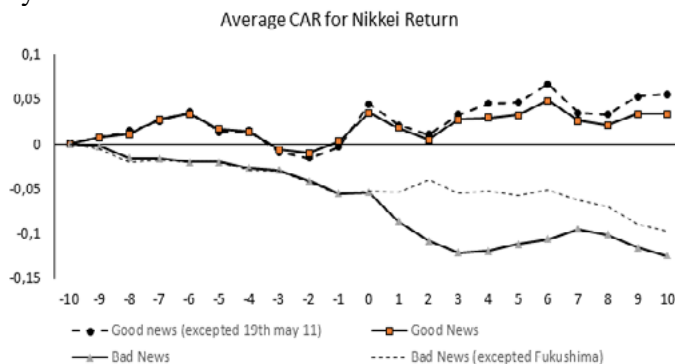


Figure 3. Daily Cumulative Abnormal Returns for Nikkei return model



We can notice that for both good and bad news the CAR changes were fairly similar for the three of them, which indicates that the three methodologies provide convergent results. The largest CAR was not always the same, depending on the pre-event Toshiba prices and the Nikkei 225 values and general market conditions. The three figures exhibit positive reactions of the market to good news and negative returns after bad news. This shows that the market is fairly efficient according to the semi-strong form (Fama et al., 1989). Meanwhile, one single event may highly influence the results, as the Fukushima event did. For instance, in all figures, the market reaction to bad news is not so negative if this very particular event is removed. In the same way, if the supposedly positive event of the acquisition of Landis+Gyr on 19th May 2011 is removed, the returns of Toshiba stock are higher according to all calculation methods for CAR.

Table 1. Comparison of the three CAR calculation methods

	Strengths	Weaknesses
CAR1	Simple and straightforward	Less significant if Toshiba experiences another shock during the [-160 ; -11] period

	Strengths	Weaknesses
CAR2	Simple and straightforward	Less significant if some macro-economic factors did influence the Nikkei and not Toshiba during the [-160 ; -11] period
CAR3	Close to the CAPM logic	One single factor (Nikkei index) is insufficient to explain Toshiba returns ($R^2=0.02$ for example)

The differences between the three CAR (table 1) depend highly on the price changes of Toshiba and the Nikkei 225 over the 5 pre-event months (for CAR1 and CAR3, see equation 2), and mainly on the macro-economic events impacting the index during the event period (for CAR2, see equation 5).

5.3 Volatility-return relationship

To compute volatility, we use daily prices P_t and returns R_t . If $R_t = 100 \cdot \ln(P_t/P_{t-1})$, then $R_t = \mu + \varepsilon_t$, for which μ is the average of R_t , conditional on past information ψ_{t-1} . Before estimating the GARCH model (Bollerslev, 1986; Engle, 1982), we test for the presence of ARCH effects in the residuals ε_t of the stock return model. With a null hypothesis of no ARCH effects, the statistic test is $M = T \cdot R^2 \sim \chi^2(p)$, where T is the sample size (here $T=8032$ observations), and R^2 is computed on the basis of an $AR(p)$ process for ε_t^2 . Considering the ARCH effects, with a 10-day lag, Table 2 exhibits significant values. The $T \cdot R^2$ and F -statistics are significant at the 0.1% error level, indicating that the null hypothesis (i.e., no ARCH effect) can be rejected.

Table 2. ARCH effect test

Toshiba Stock Return				
Lags	$M = T \cdot R^2$	p-value	F -Statistic	p-value
10	36.6041	0.0001	3.6713	0.0001

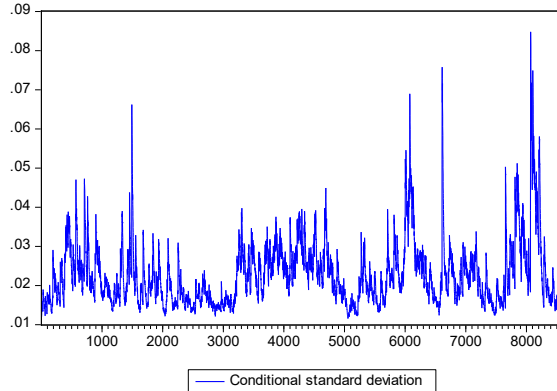
Furthermore, volatility σ can be computed with the standard deviation of daily returns in a GARCH model, defined by $\sigma = \sqrt{h}$, where h is the conditional variance derived from GARCH(1,1), such as:

$$h_t = \delta + \alpha \cdot \varepsilon_{t-1}^2 + \beta \cdot h_{t-1} \quad (1)$$

where $\delta > 0$, $\alpha \geq 0$, and $\beta \geq 0$, because these conditions are sufficient to ensure a positive h_t . Then ε_t is the residual of an underlying process for a set of information

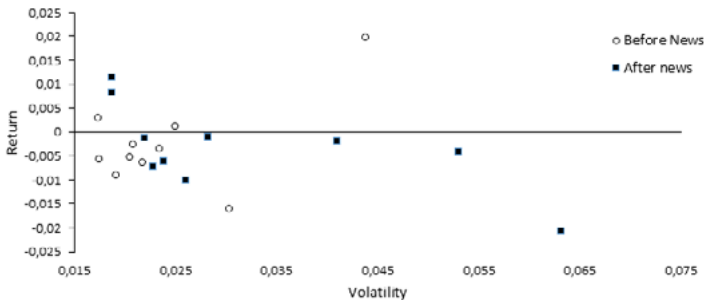
ψ , such that $\varepsilon_t / \Psi_{t-1} \sim N(0, h_t)$, so it is a weak white noise (implying a constant, finite variance). Unconditional expected variance exists when the process is covariance stationary, that is $\alpha + \beta < 1$ ²². Figure 4 provides the volatility over the period 1985-2019.

Figure 4. Volatility of Toshiba stock 1985-2019



The stock prices variations are naturally affected by the macro-economic conditions, and figure 4 shows that for Toshiba some volatility peaks are clear in 2008 during the subprimes crisis (days 6000 to 6200) and in 2011 during the Fukushima disaster (days 6600 to 6700). Another volatility factor is related to the portfolio adjustment of large Japanese or international investors and shareholders, such as pension funds, banks and insurance companies. Some of these investors may have been progressively less confident in Toshiba's future activities and profits, and they could have rebalanced their portfolios while underweighting this firm or its industry, or even underweighting Japan vs. Korea or China, as these countries may experience a larger growth than Japan in the future.

Figure 5. presents the relationship between volatility and return, ten days before (average on 10 days) and ten days (average on 10 days) after each news.



²² The estimate of equation 1 is; $h_t = 8.10^{-6} + 0.0713\varepsilon_{t-1}^2 + 0.9168h_{t-1}$ with all coefficients statistically different of zero at the 1% error level.

Before the events the volatilities are generally lower, which shows that everything has not been anticipated by the market (no insider trading or predictability of events, especially for Fukushima). The event is quickly integrated by the market, but it is logical that a temporary higher momentum of prices is noticeable on a few days after the event. Regarding profitability, it is on average the same before and after the event, which can be explained by the mix of good and bad news in our set of observations. In terms of informational efficiency the volatility was expected to rise, and it probably went down again after the observation window. It would have been embarrassing for the market efficiency if after the event there had been a big difference in profitability in the same direction for all events, because that would have meant that the market could not distinguish between good and bad news. Eventually, except for the Fukushima earthquake and accident, one single event is not too influential in Toshiba's risk/profitability balance on the market, and the memory of the event does not persist for too long. Overall, volatility appears as lower before the news, except for March 2016.

6. Conclusion

Considering the informational efficiency, this study focused on the stock price reaction of Toshiba after major events during the last 35 years. These events included important industrial acquisitions, one military scandal, a recent financial fraud and the environmental and energy Fukushima catastrophe. The leading position of this Japanese group and its worldwide activities, it was interesting to study the investors' reaction to announcements that may widely improve or impair its future activities. Our results show that the distinction between good and bad news is sometimes tricky, as the market may have anticipated the event. Meanwhile, on average there is a positive market reaction on Toshiba stock price after good news and negative returns after bad news. Moreover, we noticed that there is no influence of the choice of the cumulative abnormal return method on our conclusions. Finally, the econometric analysis indicates that the volatility of Toshiba stock price is generally lower before the events, whether good or bad, which shows that in most cases the announcements were not anticipated. We can also add that except for the Fukushima accident, we can see that one single major event does not strongly influence the results. As a consequence, the information is quickly integrated by the stock market and the semi-strong form of efficiency cannot be rejected for this company.

Abbreviations

EBIT: Earnings Before Interest and Taxes

EY: Ernst&Young

FSA: Financial Services Agency

PER: Price Earning Ratio

PwC: PricewaterhouseCoopers

ROA: Return On Asset

ROE: Return On Equity

SESC: Securities and Exchange Surveillance Commission

TEPCO: Tokyo Electric Power Company**Funding**

Not applicable

Availability of data and materials

The data for the variables of this study were extracted from the International Financial Statistics (International Monetary Fund) and from the International Factset database.

Authors' contribution

SN provides the ideas of this paper and collected the data. SN and SR carried out the empirical work in parallel and each wrote a part of the article. Both authors read and approved the final manuscript.

Appendix 1**History of Ernst & Young ShinNihon LLC**

-January 1967: Tetsuzo Ota & Co. established

-December 1969: Showa Audit Corporation established

-October 1985: Tetsuzo Ota & Co. merged with Showa Audit Corporation to create Showa Ota & Co.

-January 1986: Century Audit Corporation established

-April 2000: Showa Ota & Co. merged with Century Audit Corporation to create Century Ota Showa & Co.

-July 2001: Century Ota Showa & Co. changed its name into Shin Nihon & Co.

-April 2004: Shin Nihon & Co. became a member of Ernst & Young, and changed its name into Ernst & Young ShinNihon

-July 2008: Ernst & Young ShinNihon changed its name and form of incorporation into Ernst & Young ShinNihon LLC

Source: Ernst & Young ShinNihon LLC website

Appendix 1:**Table A1.** Market model regression

Event	Coefficient of Nikkei	Constant	R²
22 th June 1987	1.2287*** (0.00)	-0.0023 (0.28)	0.1705
29 th October 1999	1.0169*** (0.00)	-0.0016 (0.33)	0.3243
16 th October 2006	0.9368*** (0.00)	0.0009 (0.33)	0.4809

11 th March 2011	0.8694*** (0.00)	0.0003 (0.75)	0.4260
19 th May 2011	1.5764*** (0.00)	9.10 ⁻⁶ (0.99)	0.6823
21 st July 2015	0.5341*** (0.00)	-0.0019 (0.23)	0.0657
15 th March 2016	0.9875*** (0.00)	-0.0037 (0.11)	0.2933
29 th March 2017	1.1564*** (0.00)	-0.0026 (0.45)	0.0817
1 st August 2017	0.8959* (0.09)	-0.0051 (0.23)	0.0186
1 st June 2018	0.6276*** (0.00)	-0.0009 (0.58)	0.1161
13 th February 2019	0.6422*** (0.00)	0.0004 (0.79)	0.1548

***, * indicate significance at 1% and 10% levels, respectively.

References

- Alexander C, Lazar E, Stanescu S (2013), Forecasting VaR using analytic higher moments for GARCH processes, *International Review of Financial Analysis*, 30: 36-45.
- Conrad J, Cornelli B, Landsman W (2002), When Is Bad News Really Bad News? *The Journal of Finance*, 17(6): 2507-2532.
- Fama EF (1998), Market Efficiency, Long-Term Returns, and Behavioral Finance, *Journal of financial economics*, 49: 283-306.
- Fama EF, Fisher L, Jensen MC and Roll R (1969), The Adjustment of Stock Prices to New Information, *International Economic Review*, 10(1): 1-21.
- Fama EF, French KR (1988) Dividend Yields and Expected Stock Returns, *Journal of Financial Economics*, 22(1): 3-25.
- Jaussaud J, Nivoix S, Rey S (2015), The Great East Japan Earthquake and stock price", *Economic Bulletin*, 35(2): 1237-1261.
- Investigation report, Independent Investigation Committee for Toshiba Corporation, 20 July 2015.
- Laakkonen H, Lanne M (2009) Asymmetric News Effects on Exchange Rate Volatility: Good vs. Bad News in Good vs. Bad Times, *Studies in Nonlinear Dynamics & Econometrics*, 14(1): 1-38
- Lundblad H, Berger Davidson N (2003,) Enron/Off: A Morality Play in Three Acts, *International Business & Economics Research Journal*, 2(3): 105-119.

-
- MacKinlay AC (1997), The Event Studies in Economics and Finance, *Journal of Economic Literature*, 35: 13-39.
- Narayan PK, Liu R (2018), A new GARCH model with higher moments for stock return predictability, *Journal of International Financial Markets, Institutions and Money*, 56: 93-103
- OECD (2017), Japan – Economic forecast, June 2017
- Rahman KM, Bremer M (2016), Accounting irregularities at Toshiba: An Inquiry into the Nature and Causes of the Problem and its Impact on Corporate Governance in Japan, *Global Advanced Research Journal of Management and Business Studies*, 5(4): 88-101.
- Rey S, Nivoix S (2018), [Dynamics of Tokyo Electric Power Company and the Nikkei: 1985 to 2016 including the Fukushima disaster](https://doi.org/10.11130/jei.2018.33.1.979), *Journal of Economic Integration* 33(1): 979-1010. DOI: <https://doi.org/10.11130/jei.2018.33.1.979>
- Ross SA (1977), The Determination of Financial Structure: The Incentive-Signalling Approach, *The Bell Journal of Economics*, 8(1): 23-40.
- Sharpe, W.F. (1964), “Capital Asset Prices: a theory of equilibrium under conditions of risk”, *Journal of Finance*, 19(3): 425-442.
- Ziobrowski, A.J., Cheng, P., Boyd, J.W. and B.J. Ziobrowski (2004), “Abnormal Returns from the Common Stock Investments of the U.S. Senate”, *Journal of financial and quantitative analysis*, 39(4): 661-676
- Zulauf L, Grierson P (2002), Enron: The Good, The Bad, The Lessons, *International Business & Economics Research Journal*, 1(11): 49-67.