Event Study of Credit Rating Announcement in the Tokyo Stock Market

Michiko Miyamoto

***Abstract*—This research examines the market reaction to announcements of credit rating assignments for debt issued by Japanese companies before the subprime loan problem. In this study with Japanese companies, the market reacted positively with negative announcement. Stock prices seem to react before the information of rating changes is announced. Market participants seem to act on rumors of rating changes.**

***Index Terms*—Event study, credit ratings, Tokyo stock market.**

I. Introduction

Credit rating by the rating agencies has been cited as one of the causes of the subprime loans problem that triggered the global financial crisis beginning in late 2006. Standard & Poor's (S&P), Moody's Investors Service and Fitch Ratings gave top ratings to many securities built on the questionable loans, making the securities seem as safe as a Treasury bond. A lot of institutional investors bought mortgage-backed securities substantially based on their ratings without fully understanding what they have bought, in part because the market has become so complex [1].

The subprime loan problem became more serious when S & P and Moody's significantly lowered the ratings of mortgage-backed securities related to subprime which caused volatility and panic in the US stock, and many investors had questioned about the ability of rating agencies. Earlier, Enron, the world's largest energy wholesaler, filed for bankruptcy on December 2, 2000, announced that they would reduce equity capital amount to $ 1.2 billion due to accounting errors. Enron's huge losses of more than $ 1 billion are generated in the third quarter on October 15, two months before. Moody downgraded Enron's long-term debt rating from Baa1 to Baa2 on 29 October, while S & P's rating was unchanged at BBB+ on October 16. Later, both rating agencies made the rating of Enron as "speculative-grade" on November 28; it was just four days before its bankruptcy. As a result, some distrust against rating companies was increased among investors.

How would Japanese investors value credit rating agencies' information?

Rather than predicting the future of issuers, rating agencies have rated issuers based on the current state of various factors. Therefore, the state of emergency, such as subprime loans crisis arise, reduces the reliability of the rating agencies. The power and influence of the credit rating agencies, as well as questions regarding conflict of interest and transparency, have been controversial issues [2]. The purpose of this study is to investigate the impact of credit ratings by the Japanese rating agency; Rating and Investment Information, Inc. (R&I), have on the Japanese stock market. The author applies an event study method to isolate the events and measure the abnormal returns. To estimate the expected market return, the author uses the market model on estimation periods of 60 to 120 days. The sample contains 383 individual credit rating changes from 221 firms listed on the Tokyo Stock Exchange and considers all uncontaminated credit rating changes issued by R&I on the Japanese market during the time period of 2001 to 2007.

The rest of the paper is organized as follows. Section II introduces previous research about ratings and event study. The hypotheses are stated in Section III. Section IV describes the analytical method. Section V presents the results of the event study for rating changes. Section VI presents a summary.

II. Literature Review

Credit ratings are the "overall debt capacity" and "creditworthiness to pay the debt" which are examined by each rating agency. Certain codes (for example, AA +) can differentiate issuers, and provide information to investors.

Financial Services Agency, Japanese agency on overseeing banking, securities and exchange, and insurance, designates Moody's, S & P, Fitch Ratings Japan, Japan Credit Rating Agency, and R & I as the rating agencies. Ratings are commonly known in the United States in the early 20th century as the private sector represents the probability of bankruptcy for the original issue. Since the degree of risk of bonds was determined, based on publicly available information, the ratings initially became known to investors as a material for bond investment decisions. R & I has a long history as a credit rating company. In March 1975, R & I, as an in-house unit set up by Nihon Keizai Shimbun, Inc. (currently Nikkei Inc.) begins research on bond ratings. The unit becomes an independent body called The Japan Bond Research Institute (JBRI) in April 1985. Japan Rating and Investment Information, Inc. is established through the merger between JBRI and NIS in 1998, renamed "Rating and Investment Information, Inc." in 2000.

The management of a company usually has better and more information on the company's performance and its future perspectives than external stakeholders [3]-[5].

The lack of information, or information asymmetry between issuers and stakeholders, give rise to an undervaluation of "good" quality and an overvaluation of

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"bad" quality in the market [6]. Raynes [7] continues to explain that there is a need for reduction of information asymmetry and thus need of third-party valuation. Ratings are expected to have the ability to mitigate these information asymmetries.

Holthausen & Leftwich [8] studied 1,014 rating changes by S&P and Moody's effect on companies in the US over the period of 1977-82 and found that negative credit rating changes from both firms were associated with negative abnormal returns. On the contrary, Positive credit rating changes showed little to no evidence of positive abnormal returns in the US market.

TABLE I: ISSUER RATING BY R&I

Category	Definitions
AAA	Highest creditworthiness supported by many excellent factors.
AA	Very high creditworthiness supported by some excellent factors.
A	High creditworthiness supported by a few excellent factors.
BBB	Creditworthiness is sufficient, though some factors require attention in times of major environmental changes.
BB	Creditworthiness is sufficient for the time being, though some factors require due attention in times of environmental changes.
B	Creditworthiness is questionable and some factors require constant attention.
CCC	Creditworthiness is highly questionable and a financial obligation of an issuer is likely to default.
CC	All of the financial obligations of an issuer are likely to default.
D	R&I believes that all of the financial obligations of an issuer are in default.

(Source: Rating Determination Policy, ©Rating and Investment Information, Inc.)

Barron *et al*. [9] found similar results when they conducted their research in the UK market. Björklund and Sharafuddin [2] study the impact of credit ratings by Moody's on the Swedish market. They found that the Swedish stock market is susceptible to Moody's negative credit ratings but almost unaffected by the positive credit ratings. Pacheco [10] investigates the effect credit ratings issued by Moody's have on Portuguese companies both before and after the financial crisis of 2008. Pacheco found evidence of association between the issuance of a negative credit rating and negative abnormal returns. He also found that the Portuguese market reacted more strongly after the financial crisis, indicating increased sensitivity to credit ratings during financial turmoil. Timmermans [11] investigates three major rating agencies, such as S&P, Fitch and Moody's, during the period 1997-2012 for the European market, using daily stock prices for the MSCI Europe index. The findings include, first, downgrades result in negative significant abnormal returns. Second, upgrades result only for the period preceding the event date in negative significant abnormal returns. Third, small firms and financial firms have stronger reactions to credit rating downgrades. Elayan *et al.* [12] studied the impact of credit-rating announcements on share market prices for firms in a small market, *i.e.*, the New Zealand market, and found that the announcements of a credit rating assignment are associated with a positive and statistically significant market reaction from New Zealand share prices, which is consistent with the certification effect of a credit rating.

Ma *et al.* [13] studied rating changes by Moody's, S&P, Japan Credit Rating Agency, and R&I effect on 55 Japanese companies over the period of 1996-2002. They found both positive and negative credit ratings lead to statistically significant abnormal rate of returns. Katsuta and Ma [14] investigate S&P and R&I during the period of 2000 to 2003. They found that the market reacted on negative credit ratings which were statistically significant, however, almost unaffected by the positive credit ratings. The author investigates rating changes of 221 firms by R&I over the period of 2000-2007, just before the financial crisis of 2008.

III. HYPOTHESES

Many researches have investigated the impact of credit rating announcements in several share markets such as USA, UK, Europe, Australia, and New Zealand. According to the statistics of stock exchanges around the world as of September 2014, the Tokyo Stock Exchange, or TSE, is one of the largest stock markets in all of Asia, with over 2.3 billion shares exchanging hands each trading day, where 1,822 listed companies have a total market capitalization of $4.46 trillion (USD) [15]. New York Stock Exchange (NYSE) has 1,867 listed companies with a total market capitalization of 16.6 trillion. The London Stock Exchange has 3,307 listed companies with a combined market capitalization of $3.9 trillion. It shows that the Japanese market is relatively small compared to the US market, but the average firm size is larger than those of London Stock Exchange, even though fewer companies are traded. Previous studies in large markets such as US and UK have demonstrated that significant negative reaction to negative credit rating announcements. If Japanese market were considered as a large market, the following hypotheses are proposed:

Hypothesis 1: Credit assignments and credit rating affirmations for Japanese firms are expected to generate a significant positive or negative market reaction.

Hypothesis 2: A positive (negative) outlook is expected to be associated with a significantly positive (negative) share market reaction. Similarly, upgrade (downgrade) rating announcements will be associated with significant excess positive (negative) stock returns.

IV. METHODOLOGY

A. Data Description

The author collects the announcement of rating assignment of Rating and Investment Information, Inc. (R&I), which provides credit ratings for issuers and obligations in a broad range of sectors, including corporates, for the period of November 2000 to October 2007. Those have credit ratings for an entire observation period of seven years are used for analysis. The corresponding stocks for total daily return index listed on the Tokyo stock market was collected from Yahoo Finance. The stock daily return data are used from a period of day t-139 to t+10, where t is the announcement date. There are 221 corporations with credit ratings over the observation period with 383 rating changes. Companies of the industry classification of grocery, textiles, pulp and paper, chemical, pharmaceutical, petroleum and coal products, rubber products, glass, stone and clay products, iron and steel, non-ferrous metals, metal products, machinery, electrical

equipment, transportation equipment, precision equipment, other manufacturing sector are defined as "manufacturing sector." In addition, banking, securities, property and casualty insurance, and other financial industry are defined as "financial sector." Other companies are defined as "non-manufacturing sector," and "non-financial sector." See percentages of each industry sector in Fig. 1.

Table I presents numbers of credit rating changes by industries and Table V shows numbers of credit rating changes by different industry sectors.

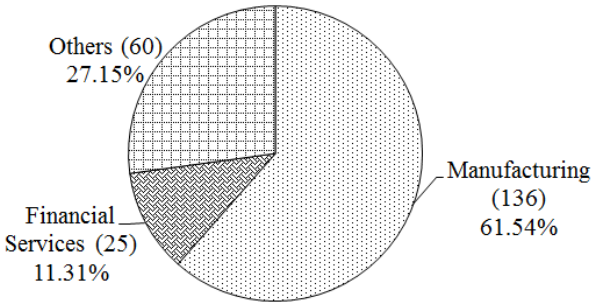

Fig. 1. Percentages of each industry sector.

TABLE I: NUMBERS OF CREDIT RATING CHANGES BY INDUSTRIES

	Number of Corporations	Number of Rating Changes
Total	221	383
Down Grade	-----	187
Up Grade	-----	196
Manufacturings	136	236
Down Grade	-----	119
Up Grade	-----	117
Non-manufacturing	85	147
Down Grade	-----	68
Up Grade	-----	79
Financial services	25	49
Down Grade	-----	24
Up Grade	-----	25
Non-financial services	196	334
Down Grade	-----	163
Up Grade	-----	171

B. Event Study

The event study methodology is the appropriate tool to investigate the relation between a credit rating change announcement and a stock price reaction. Event studies yield as an outcome abnormal returns (ARs), which are cumulated over time to cumulative abnormal returns (CARs) and then averaged over several observations of identical events to averaged abnormal returns (AARs) and cumulative averaged abnormal returns CAARs. These event study results are then oftentimes used as dependent variables in regression analyses. Returns of day t-139 to day t-10 were used to estimate the parameters of the market model, where the Tokyo Stock Price Index (TOPIX) is a proxy of market index. Then a market model is estimated for each firm during this period by regression firm-specific returns on TOPIX returns. The abnormal return of the *i* th stock, is obtained by subtracting the normal or expected return in the absence of the event, from the actual return in the event period. For any security *i* the market model equation is expressed as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (1)$$

Determine Abnormal Return (AR) in event windows and post-event windows using the estimated result of estimated market model as follows:

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}) \quad (2)$$

where t=-139, ..., -10,

CAR for the event period from is obtained as follows:

$$CAR_i = \sum_{k=t_1}^{t_2} AR_{ik} \quad (3)$$

C. Determine a Length of the Event Window

For each five industrial categories (aggregated, manufacturing sector, non-manufacturing sector, financial sector, non-financial sector), CAR are calculated for an event window of one day, eleven days, and twenty-one days with t-statistics and the homogeneity of variance tests to test statistical significance. The homogeneity of variance test makes a statistical comparison between the variances of two or more data sets. The hypotheses for the homogeneity of variance tests are:

H_O: there is no difference between the two or more variances.

H_A: there are differences between two or more variances.

All of the results are less than 0.05, so they reject the H_O and accept the H_A (see Tables II, III, IV).

TABLE II: AGGREGATED (THE EVENT WINDOW: ONE DAY)
TEST FOR HOMOGENEITY OF VARIANCE

Variables	Method	Numerator DF	Denominator DF	F Value	Pr > F
CAR	Folded F	195	186	18.39	<.0001

T-STATISTICS

Variables	Method	Variance	df	t-statistics	Pr > |t|
CAR	Pooled	Equal	381	-0.73	0.4676
CAR	Satterthwaite	Unequal	217	-0.74	0.4585

TABLE III: AGGREGATED (THE EVENT WINDOW: 11 DAYS)
TEST FOR HOMOGENEITY OF VARIANCE

Variables	Method	Numerator DF	Denominator DF	F Value	Pr > F
CAR	Folded F	195	186	1.84	<.0001

T-STATISTICS

Variables	Method	Variance	DF	t-statistics	Pr > |t|
CAR	Pooled	Equal	381	2.28	0.0231
CAR	Satterthwaite	Unequal	359	2.3	0.0222

The results of t-statistics for 21-day are statistically significant at *p*-value of < 0.0001. In another word, there are statistically significant differences between upgrade and downgrade of credit ratings when the event window is 21 days. Those of manufacturing sector, non-manufacturing sector, financial sector, non-financial sector also show 21-day as statistically significant, so 21-day is selected as the event window for this study.

TABLE IV: AGGREGATED (THE EVENT WINDOW: 21 DAYS)
TEST FOR HOMOGENEITY OF VARIANCE

Variables	Method	Numerator DF	Denominator DF	F Value	Pr > F
CAR	Folded F	195	186	2.08	<.0001

T-STATISTICS

Variables	Method	Variance	DF	t-statistics	Pr > |t|
CAR	Pooled	Equal	381	4.64	<.0001
CAR	Satterthwaite	Unequal	348	4.68	<.0001

D. Testing for Significance

A test statistic is computed to check whether the average abnormal return for each stock is statistically different from zero as follows.

$$t = \frac{\overline{AR}}{SD_{AR}} \times \sqrt{N} \quad (4)$$

where SD_{AR} is standard deviation, $\overline{AR}$ is average abnormal return, and N is the number of companies.

V. RESULTS

Average abnormal returns (AAR), cumulative average abnormal returns (CAAR), for aggregated, manufacturing sector, non-manufacturing sector, financial sector, and non-financial sector for the period from 10days before to 10 days after the announcement day during 2000-2007 are calculated.

TABLE V: NUMBERS OF CREDIT RATING CHANGES BY INDUSTRY SECTORS

Industry Classification		N of listed companies	Companies with ratings	Number of Rating changes							
				7	6	5	4	3	2	1	TTL
Agriculture, Forestry and Fishing Industry		10	1	-	-	-	-	-	-	-	0
Mining industry		7	3	0	0	0	0	0	1	0	1
Contruction Industry		216	56	0	0	0	0	0	1	5	6
Manufacturing	Grocery	151	45	0	1	0	1	0	3	6	11
	Textiles	80	18	0	0	0	0	0	1	4	5
	Pulp and paper	28	10	0	0	0	0	2	0	1	3
	Chmical	222	63	0	0	1	1	1	7	10	20
	Pharmaceutical	51	24	0	0	0	0	0	0	5	5
	Petroleum and coal products	15	7	0	0	0	0	0	1	0	1
	Rubber products	21	6	0	0	0	0	0	1	0	1
	Glass, stone and clay products	70	12	0	0	0	0	1	0	3	4
	Iron and Steel	57	20	0	0	0	0	0	0	5	5
	Non-ferrous metals	42	17	1	0	0	0	0	2	3	6
	Metal products	101	15	0	0	0	0	0	1	0	1
	Machinery	253	49	0	0	0	0	5	4	7	16
	Electrical equipment	312	85	0	0	0	0	3	16	17	36
	Transportation equipment	106	46	1	1	0	0	1	5	6	14
	precision equipment	53	12	0	0	0	0	0	1	0	1
	other manufacturing	118	25	0	0	0	0	0	0	7	7
Utilities	Electricity/Gas	25	19	0	0	0	0	0	0	6	6
Transportion/ Communication	Land transportation	65	35	0	0	0	1	0	2	9	12
	Shipping industry	18	4	0	0	0	0	0	2	1	3
	Air freight	6	3	0	0	0	0	2	0	0	2
	Warehouse	45	8	0	0	0	0	0	0	2	2
	Telecommunications	370	26	0	0	0	1	0	1	1	3
mercantile	Wholesale	383	53	0	0	1	0	0	3	3	7
	Retails	398	66	0	0	0	0	2	3	5	10
Financial Services	Banking	106	85	0	0	0	0	2	6	3	11
	Securities	42	21	0	0	0	0	1	2	1	4
	Nonlife insurance	15	14	0	0	0	1	2	1	2	6
	Life Insurance		33	-	-	-	-	-	-	-	0
	Others	58	48	0	0	0	0	1	0	3	4
Real Estate		142	24	0	0	0	1	2	0	1	4
Services		387	38	0	0	0	0	0	0	4	4
Total		3973	991	2	2	2	6	25	64	120	221

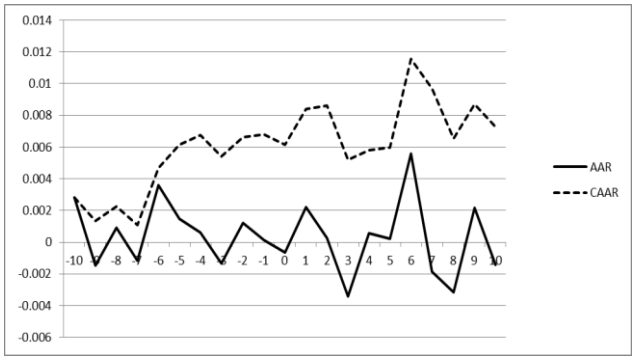

Fig. 2. Aggregated cumulative average abnormal returns for downgrades (*N*=187).

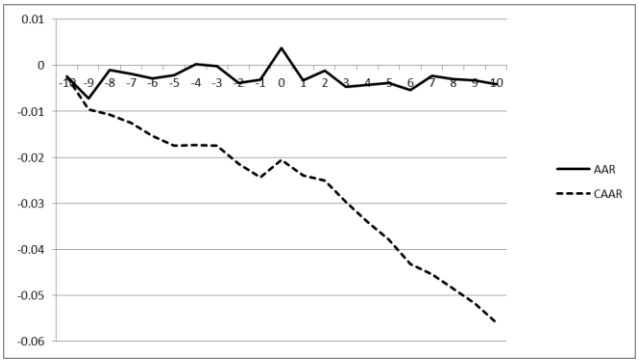

Fig. 3. Aggregated cumulative average abnormal returns for upgrades (*N*=196).

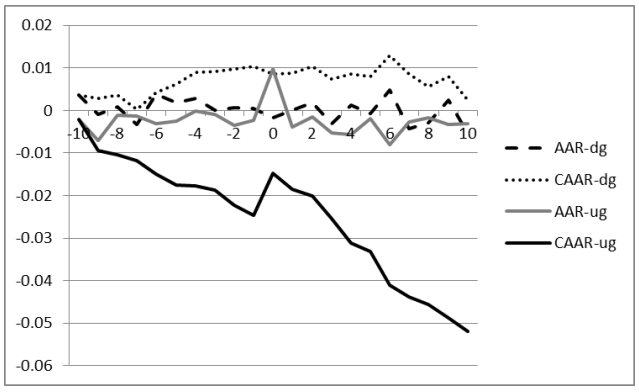

Fig. 4. Manufacturing sector (dg: downgrade, ug: upgrade).

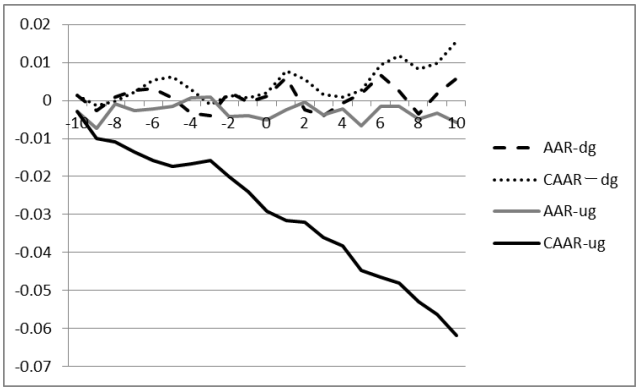

Fig. 5. Non-manufacturing sector (dg: downgrade, ug: upgrade).

Fig. 2 shows the result for aggregated AAR and CAAR for downgrade, and Fig. 3 shows that of upgrade. AAR had kept above zero, but the reaction of CAAR was unstable, going up and down for downgrades announcement.

On the contrary, AAR had remained almost unchanged, however, CAAR shows negative reactions for upgrades. For every sector, rating upgrades are associated with negative market returns, while announcement of downgrades are associate with positive returns. Brooks *et al.* [16] confirm that only rating downgrades have a significant impact on stock returns and that amidst rating agencies, S&P has the greatest impact on market returns.

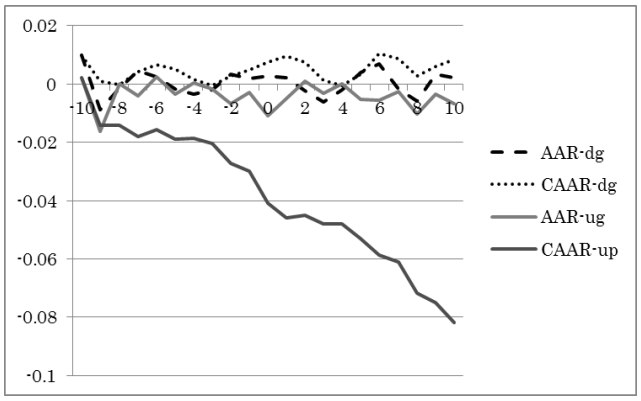

Fig. 6. Financial service sector (dg: downgrade, ug: upgrade).

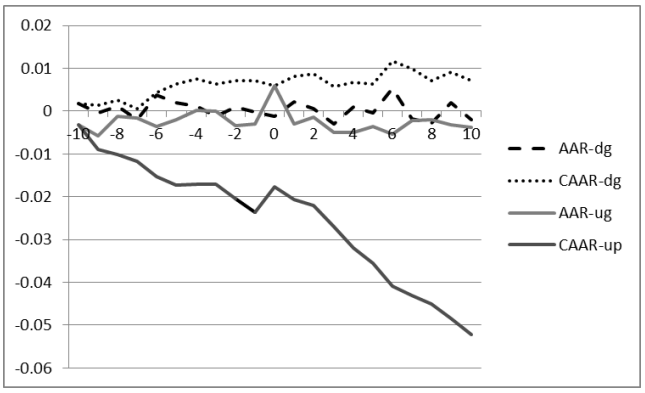

Fig. 7. Non-financial service sector (dg: downgrade, ug: upgrade).

VI. Conclusion

This research examines the market reaction to announcements of credit rating assignments for debt issued by Japanese companies. Previous studies in the US, the UK find that negative rating actions generate significant negative excess returns while positive changes are not associated with significant reactions.

In this study with Japanese companies, the market reacted positively with negative announcement. Stock prices seem to react before the information of rating changes is announced. For upgrades, an investor seems to buy stocks before the event days in anticipation of upgrades, and the investor would sell the shares as soon as the announcements of upgrades are made. The stock movement of a company, called OSG, for example, has been upgraded twice in seven years. As figure 8 shows, the stock goes up until 40-business-day before the event date, however, it is dropped quickly right after the event day.

On the other hand, NEC Corporation has been downgraded twice in 7 years. The stock stops going down until the event date, and started risen after the event date. Those investors in anticipation of the downgrade, seems to be selling NEC shares before the event date. As soon as the downgrade news came out, they started purchasing NEC shares, since adverse factors had already been discounted (see Fig. 9).

Fig. 8. OSG's stock movement.

Using the data before the subprime loan problem, this study was led to the conclusion of Hypothesis 2: A positive (negative) outlook is expected to be associated with a significantly positive (negative) share market reaction. Similarly, upgrade (downgrade) rating announcements will be associated with significant excess positive (negative) stock returns. This is, before the rating change of information is announced, stock prices react, as the previous studies mention. Market participants seem to act on rumors of rating changes.

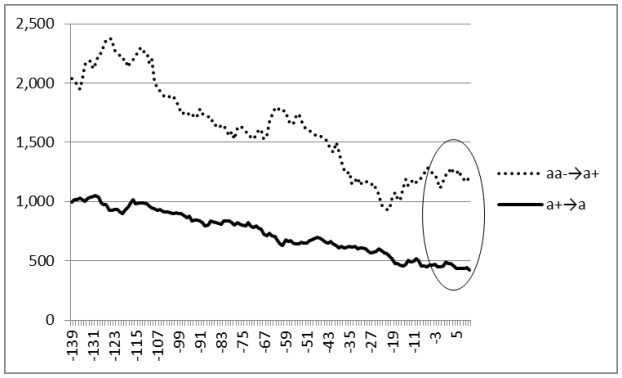

Fig. 9. NEC's stock movement.

The similar study with data after the subprime loan problem is expected in near future.

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