

The Extreme Decline of Investor Sentiment and Market Efficiency: Evidence from the Electric Appliances Industry in Japan

Chikashi Tsuji (Corresponding author)

Graduate School of Systems and Information Engineering,

University of Tsukuba

1-1-1 Tennodai, Tsukuba, Ibaraki 305-8573, Japan

Tel: +81-29-853-2111 E-mail: mail_sec_low@minos.ocn.ne.jp

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Abstract

This paper aims to clarify whether weak form market efficient hypothesis holds in markets with deteriorated investor sentiment by focusing on the return dynamics of the Japanese electric appliances industry stocks. The contributions derived by our empirical analysis are as follows. First, this paper revealed that when investor sentiment is very stable, two successive days' returns have no relation. Hence in markets with very stable sentiment, weak form market efficient hypothesis holds. Second, we clarified that when investor sentiment is deteriorated, two successive days' returns are statistically significantly connected. Therefore, in markets with extremely declined investor sentiment, weak form market efficient hypothesis does not hold.

Keywords: Implied volatility, Investor sentiment, Market Efficiency

1. Introduction

Investor sentiment in financial markets is more and more important as increasing studies on this topic show. Representative researches regarding this market sentiment were conducted by such studies as Lee et al. (1991), Barberis et al. (1998), Neal and Wheatley (1998), Daniel et al. (1998), Baker and Wurgler (2006), and Baker and Wurgler (2007). Moreover, many new studies follow the above papers are also seen in Tsuji (2006), Kurov (2010), Berger and Turtle (2012), Baker et al. (2012), Alimov and Mikkelsen (2012), and Stambaugh et al. (2012). However, as far as we know, there seems to be little study which tests the market efficiency when market sentiment is extremely declined. Therefore, this paper aims to clarify whether weak form market efficient hypothesis of Fama (1970) holds in markets with deteriorated investor sentiment. This is our main objective of this paper. We focus on the Japanese electric appliances industry stocks because this is one of the most representative industries in Japan.

Our contributions in this paper are as follows. First, this paper reveals that when investor sentiment is very stable, two successive days' returns have no relation. Thus in markets with very stable sentiment, weak form market efficient hypothesis holds. Further, we also clarify that when investor sentiment is deteriorated, two successive days' returns have statistically significant relations. Hence in markets with extremely declined investor sentiment, weak form market efficient hypothesis does not hold. This finding is the most important contribution in this paper.

The rest of the paper is organized as follows. First, Section 2 explains the research design and data for our analysis, Section 3 documents the empirical results and interpretation, and Section 4 concludes the paper.

2. Data and Research Design

First, we define the markets with extremely declined sentiment and the markets with very stable sentiment. We use the implied volatility (IV) derived from the Nikkei 225 options as an investor sentiment measure of stock markets. The data are from Osaka University, and the full sample period of our daily IV data is from January 5, 1998 to April 28, 2011. By using these IV values, for our empirical tests, we first set extremely low IV dates as those when IV is less than the value of 13.5. On the other hand, we regard extremely high IV dates as those when IV exceeds the value of 80.0. As displayed from Panels A to M of Figure 1, only 13 days are recognized as extremely low IV dates. Namely, these thirteen days are the dates when market sentiment is very stable in our research design. More specifically, those days are February 6, 2004, November 26, 2004, March 22, 2005, April 1 and 4, 2005, June 16, 23, 24, and 28, 2005, July 1, 4, 5, and 6, 2005. On the other hand, as shown from Panels A to K of Figure 2, only 11 days are recognized as extremely high IV dates. That is, these eleven days are the dates when market sentiment is deteriorated in our setting. More specifically, those days are October 16, 27, 28, 29, 30, and 31, 2008 and November 4, 7, 13, 20, and 21, 2008.

Based on the above setting, by also using return data of 116 Japanese electric appliances industry firms (from Nikkei Inc.) we perform the following cross-sectional regression.

$$RET_i^{day\ t} = \psi_0 + \psi_1 RET_i^{day\ t-1} + \tau_i. \quad (1)$$

Where the dependent variable is the return of the day when investor sentiment is very stable or deteriorated, and the explanatory variable is the return of the prior day when investor sentiment is very stable or deteriorated. This regression means the test for weak form market efficient hypothesis, because if weak form market efficient hypothesis holds, two successive returns have no relation. (For example, see Brealey et al. (2008) and Fama (1970).) To investigate the situation in markets with stable or deteriorated investor sentiment, we focus on the dates when IV is less than 13.5 and the dates when IV exceeds 80.0. Further, before implementing our regression (1), we check the correlation coefficients of two successive days' returns in markets with stable or deteriorated investor sentiment with viewing their return plots.

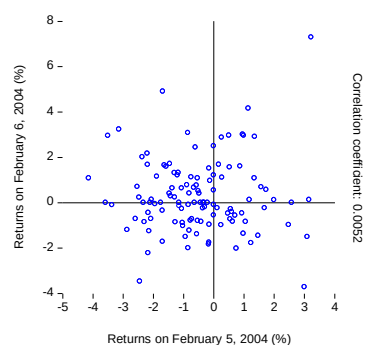
Regarding return data, they are 116 Japanese electric appliances industry companies' returns, and these companies are listed in the Tokyo Stock Exchange (TSE) First Section. Currently, the number of the electric appliances industry companies is largest in the Tokyo Stock Price Index (TOPIX). Thus we consider that this industry is highly important for the Japanese stock markets. Hence we use these companies' data in this paper. In addition, we use the method of White (1980) in our cross-sectional regressions, thus statistical significance of the coefficients of our regressions is robust to the heteroskedasticity of regression error terms.

3. Empirical Results

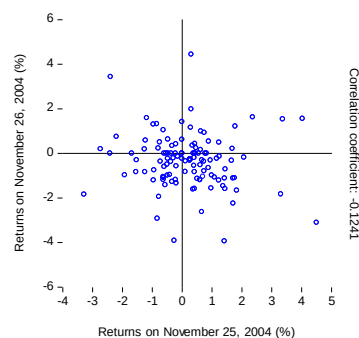
This section describes our empirical results. First, we view the return plots with checking the correlations of two successive business days' returns in markets with stable investor sentiment. As shown in Panels A to M in Figure 1, when market sentiment is very stable, correlation coefficients generally take the low values between -0.1241 to 0.2752 and the return plots generally do not focus on any quadrants. On the other hand, as indicated in Panels A to K in Figure 2, when market sentiment is deteriorated, correlation coefficients generally take the high values between -0.4597 to 0.4594 and the return plots often focus on some quadrants.

Second, more formally, Panel A of Table 1 indicates the regression results when market sentiment is very stable. In this panel, there exists no statistically significant coefficient in regression (1). Hence we understand that in the stable sentiment stock markets, the weak form market efficient hypothesis strictly holds. On the other hand, Panel B of Table 1 demonstrates the regression results when market sentiment is extremely declined. In this panel, out of eleven cross-sectional regression results, seven cases indicate the statistically significant connections between two successive business days' returns. Therefore, from this evidence, we can judge that in markets with deteriorated investor sentiment, weak form market efficient hypothesis does not hold.

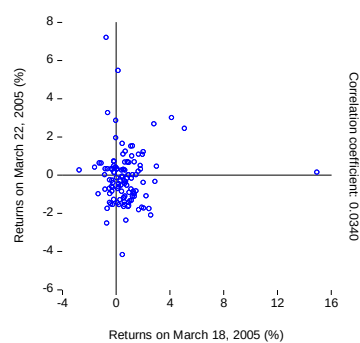
Panel A. February 6, 2004



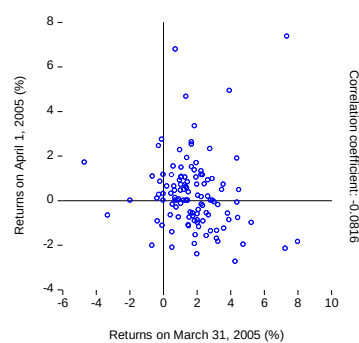
Panel B. November 26, 2004



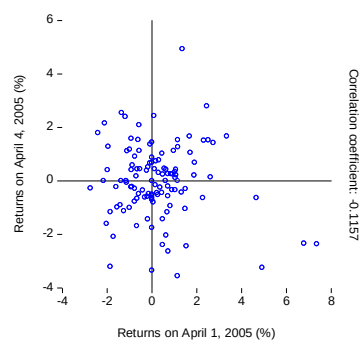
Panel C. March 22, 2005



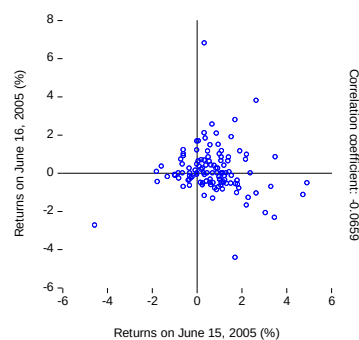
Panel D. April 1, 2005



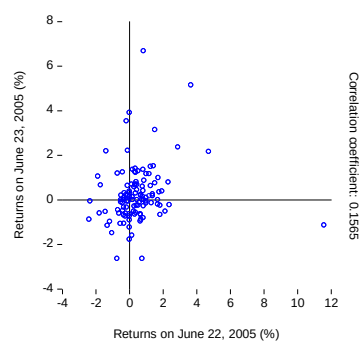
Panel E. April 4, 2005



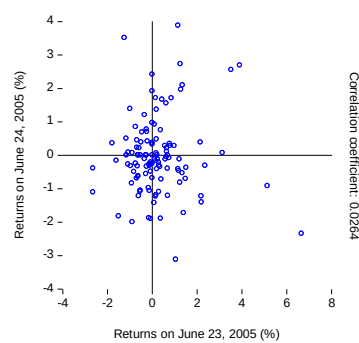
Panel F. June 16, 2005



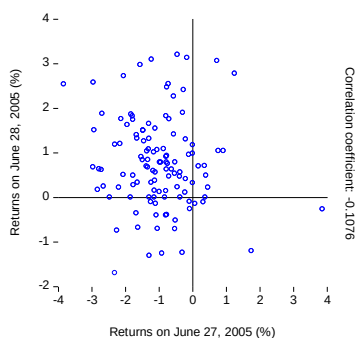
Panel G. June 23, 2005



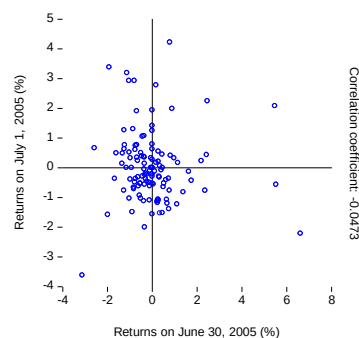
Panel H. June 24, 2005



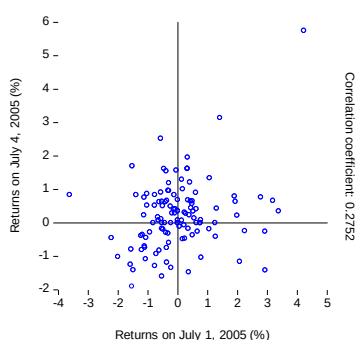
Panel I. June 28, 2005



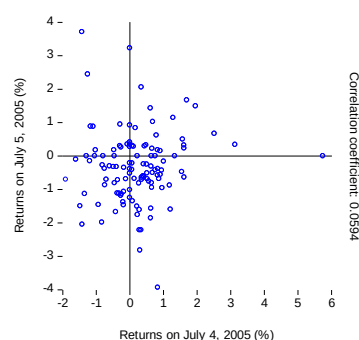
Panel J. July 1, 2005



Panel K. July 4, 2005



Panel L. July 5, 2005



Panel M. July 6, 2005

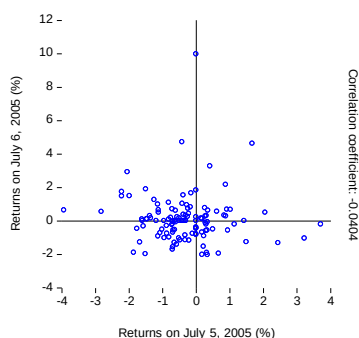
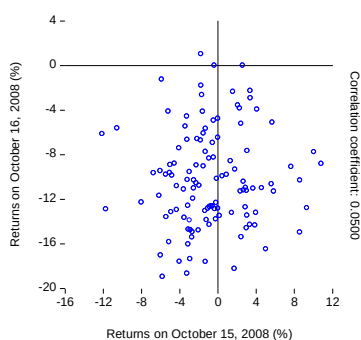
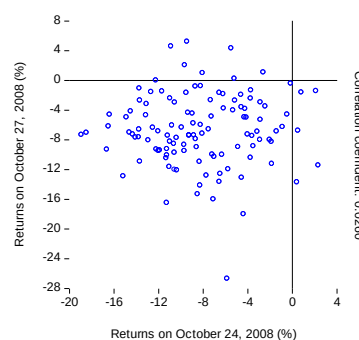


Figure 1. Japanese Electric Appliances Industry Returns of Two Successive Business Days When Implied Volatility is Less than 13.5.

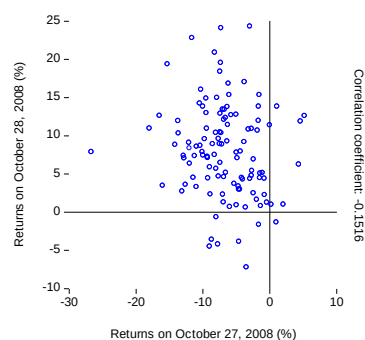
Panel A. October 16, 2008



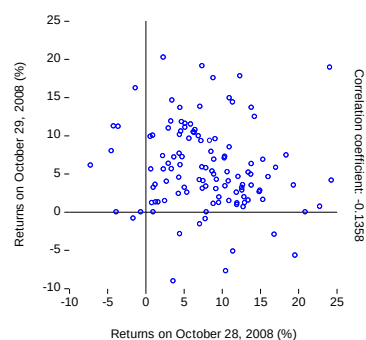
Panel B. October 27, 2008



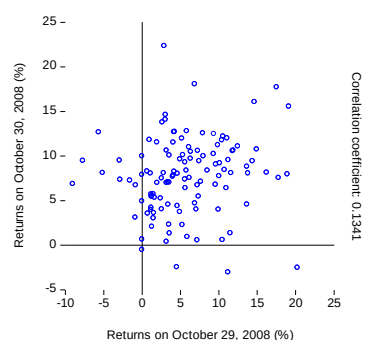
Panel C. October 28, 2008



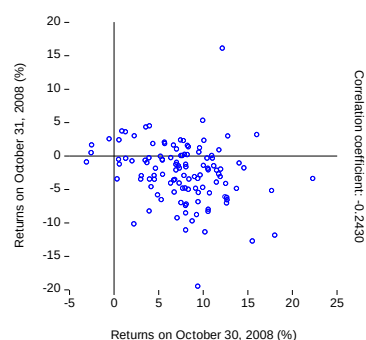
Panel D. October 29, 2008



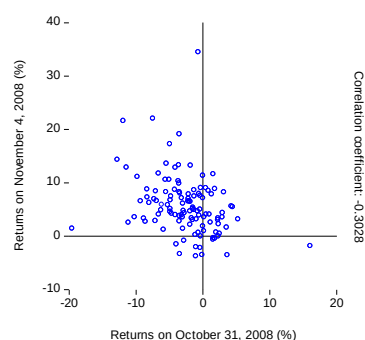
Panel E. October 30, 2008



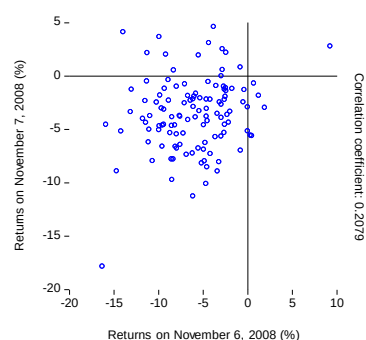
Panel F. October 31, 2008



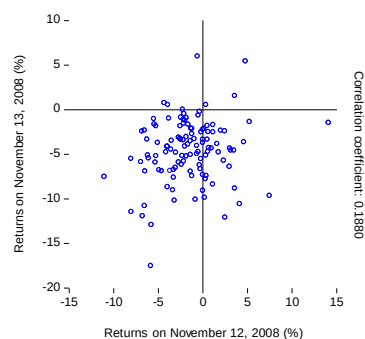
Panel G. November 4, 2008



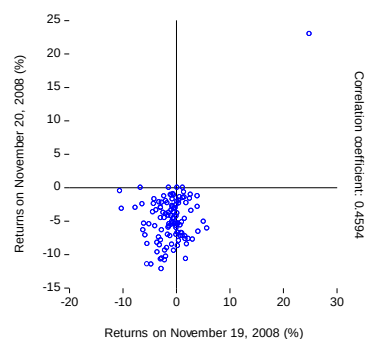
Panel H. November 7, 2008



Panel I. November 13, 2008



Panel J. November 20, 2008



Panel K. November 21, 2008

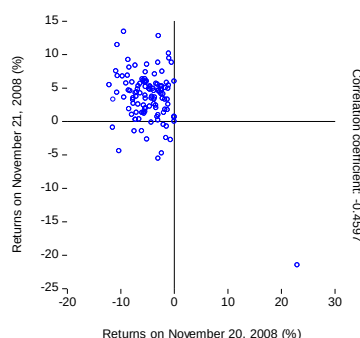


Figure 2. Japanese Electric Appliances Industry Returns of Two Successive Business Days When Implied Volatility Exceeds 80.

4. Conclusion

This paper investigated whether weak form market efficient hypothesis holds in markets with deteriorated investor sentiment by focusing on the return dynamics of the Japanese electric appliances industry stocks. The empirical research demonstrated in this paper derived the following novel contributions.

1. First, this paper revealed that when investor sentiment is very stable in stock markets, two successive days' returns had no relation. Hence we understand that in markets with very stable sentiment, weak form market efficient hypothesis holds.
2. Second, we newly demonstrated that when investor sentiment is deteriorated, two successive days' returns presented statistically significant relations. Therefore, this evidence means that in markets with extremely declined investor sentiment, weak form market efficient hypothesis does not hold. This is the most important contribution in this paper.

As above, our novel findings documented in this paper will contribute to the body of academic researches of investments and asset-pricing fields in finance. We consider that future related studies using our findings and related data may be also valuable, and these researches are our future tasks.

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Table 1. Regression results of the Japanese electric appliances industry returns of two successive business days when implied volatilities are extremely high or low

Panel A Results when implied volatilities are extremely low							
	Feb. 6, 2004	Nov. 26, 2004	Mar. 22, 2005	Apr. 1, 2005	Apr. 4, 2005	Jun. 16, 2005	Jun. 23, 2005
Constant	0.297	-0.318**	-0.151	0.403*	0.013	0.167	0.177
<i>p</i> -value	0.117	0.005	0.321	0.088	0.914	0.233	0.141
Coefficient	0.006	-0.120	0.029	-0.075	-0.097	-0.064	0.135
<i>p</i> -value	0.970	0.332	0.661	0.595	0.312	0.600	0.354
Adj. R^2	-0.009	0.007	-0.008	-0.002	0.005	-0.004	0.016
Obs.	116	116	116	116	116	116	116
	Jun. 24, 2005	Jun. 28, 2005	Jul. 1, 2005	Jul. 4, 2005	Jul. 5, 2005	Jul. 6, 2005	
Constant	-0.025	0.676**	0.025	0.210**	-0.342**	0.088	
<i>p</i> -value	0.807	0.000	0.820	0.020	0.002	0.568	
Coefficient	0.023	-0.104	-0.042	0.235	0.064	-0.056	
<i>p</i> -value	0.850	0.289	0.734	0.109	0.517	0.624	
Adj. R^2	-0.008	0.003	-0.007	0.068	-0.005	-0.007	
Obs.	116	116	116	116	116	116	
Panel B Results when implied volatilities are extremely high							
	Oct. 16, 2008	Oct. 27, 2008	Oct. 28, 2008	Oct. 29, 2008	Oct. 30, 2008	Oct. 31, 2008	
Constant	-10.156**	-6.453**	6.759**	6.750**	7.166**	-0.585	
<i>p</i> -value	0.000	0.000	0.000	0.000	0.000	0.384	
Coefficient	0.053	0.027	-0.190*	-0.123	0.105	-0.251**	
<i>p</i> -value	0.546	0.733	0.064	0.189	0.205	0.007	
Adj. R^2	-0.006	-0.008	0.014	0.010	0.009	0.051	
Obs.	116	116	116	116	116	116	
	Nov. 4, 2008	Nov. 7, 2008	Nov. 13, 2008	Nov. 20, 2008	Nov. 21, 2008		
Constant	4.853**	-2.521**	-4.277**	-4.271**	1.323		
<i>p</i> -value	0.000	0.000	0.000	0.000	0.223		
Coefficient	-0.376**	0.172*	0.188*	0.490*	-0.478**		
<i>p</i> -value	0.003	0.078	0.074	0.070	0.019		
Adj. R^2	0.084	0.035	0.027	0.204	0.204		
Obs.	116	116	116	116	116		

Notes: We use the return data of the Japanese electric appliances industry and implied volatilities derived from the Nikkei 225 options. Our full samples are 3,274 and the full daily sample period is from January 5, 1998 to April 28, 2011. We regard the markets when IV is less than 13.5 as stock markets with very stable sentiment. On the other hand, we regard the markets when IV exceeds 80.0 as stock markets with deteriorated sentiment. We perform the cross-sectional regressions for the days when market sentiment is stable (Panel A) and for the days when market sentiment is deteriorated (Panel B). In our regressions, dependent variables are the returns of the days when market sentiment is very stable or deteriorated, while explanatory variables are one day prior returns. Moreover, Adj. R^2 denotes the adjusted R -squared values and Obs. means the number of samples in our cross-sectional regressions. Further, we use the method of White (1980), thus *p*-values are robust to the heteroskedasticity of the error terms of regressions. ** denotes the statistical significance at the 5% level and * denotes the statistical significance at the 10% level.

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