Stock market reactions to new product announcements: the role of investor sentiment

Fanhao Hao
School of Management, Harbin Institute of Technology, Harbin, China

Robert Dixon
Durham University Business School, Durham University, Durham, UK

Tienan Wang
School of Management, Harbin Institute of Technology, Harbin, China

Abstract
        This paper examines whether investor sentiment influences the stock market reactions to new product announcements. A composite investor sentiment index based on six underlying proxies is built to measure the investor sentiment. With the event study methodology, we use a sample of 227 new product announcements made by 155 Chinese firms between 2006 and 2015 to demonstrate the impact of investor sentiment on the stock market reactions to new product announcements. We find that new product announcements result to a positive abnormal returns. In addition, in the short run, higher investor sentiment positively promotes this relationship and lower investor sentiment negatively moderates it. In a longer horizon, however, we find a price reversal, which implies a gradually attitude readjustment of the information by the investors. Overall, the results show that investor sentiment plays a significant role in the impact of new product announcements on the stock market.

Introduction
    Introducing new products is critical to sustain a firm's competitive advantage and long-term well-being. New products announced by listed companies are frequently regarded by stock investors as a signal foreboding stock market swings(Wang et al., 2011, Pauwels et al., 2004). For example, Apple Inc. announced a new product iPhone 5 on September 12, 2012, which drew widespread attention all over the world and mightily pushed its stock price up by 1.39%. However, on the days of Apple Inc. introducing iPhone 5s/5c and iPhone 6s/6s plus, the stock price promptly fell by -2.28% and -1.92% respectively.
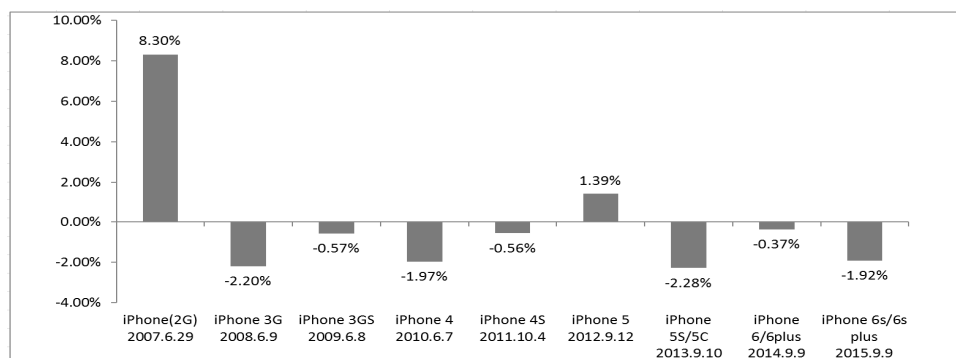

Figure 1. The stock price changes of Apple Inc. on the days of introducing new iPhone

In theoretical field, although the financial implication of new products has been a growing body of research, there is not an accordant conclusion about the stock market reactions to new product announcements. Some researchers find that new product announcements are positively associated with firm values (Lee and Chen, 2009, Chen et al., 2002, Chaney et al., 1991). Some researchers, however, argue that new product announcements do not contribute significantly to the value of firms(Harold Pardue et al., 2000, Eddy and Saunders, 1980). It has even been suggested that new product announcements might put firms at higher costs or risks, thus has negative effect on firm values(Su and Rao, 2010, Sorescu et al., 2007, Harold Pardue et al., 2000).

These contradictory findings suggest that to evaluate the impact of new product announcements on stock market reactions, we need to scrutinize carefully any factors underlying an investor's reaction mechanism to new product announcements. The traditional asset pricing theory demonstrates that the changes of stock return depends on the changes of fundamentals only(Fama and French, 1993, Fama and French, 1995, Fama and French, 2012). However, a large literature in behavioral finance demonstrates that the stock excess returns are not easily explained only by their fundamentals, and further challenges the traditional assumption that the investor reaction to new information is always rational and instantaneous. Plenty of behavioral finance literature suggests that the investor sentiment could significantly influence the way investors respond to new information and update their belief(Baker and Wurgler, 2006, Baker and Wurgler, 2007, Baker et al., 2012, Brown and Cliff, 2004, Greenwood and Shleifer, 2014). Therefore, the effect of investor sentiment could not be overlooked when investigating the stock market reactions to new product announcements.

In the present research, we examine the impact of investor sentiment on the stock market reactions to new product announcements. A composite index is built to measure the investor sentiment based on five underlying proxies. Abnormal stock returns are used to investigate the stock market reactions to new product announcements, which is calculated by using a standard event study methodology. The sample of 227 new product announcements released by 152 firms listed on Shanghai Stock Exchange and Shenzhen Stock Exchange over the period from Jan. 2006 to Dec. 2015 is used to test our hypotheses.

The remainder of this paper is organized as follows. First, hypotheses based on the literature review are discussed and proposed. Second, we describe the methods and results of our study. Finally, we discuss the results and implications, and formulate the conclusions.

Literature Review and Hypotheses
Stock Market Reactions to New Product Announcements

According to the established financial benchmark (Srinivasan et al., 2009), the effects of marketing activity on stock returns may occur through: (1) enhancing cash flows, (2) accelerating cash flows, (3) reducing vulnerability and volatility in cash flows, and (4) increasing the residual value of the firm.

First, new product announcements generate stock returns through enhancing cash flows. New products have a greater potential to unlock previously unmet customer needs, thus increase the sales and revenues, ultimately enhance cash flows and future profitability(Chaney et al., 1991) (Sorescu et al., 2007). Some evidence suggests that introducing new products can reduce selling and general administrative expenses, thus lead to the enhancement in cash flows(Bayus et al., 2003).

Second, new product announcements generate stock returns through accelerating cash flows. The success of new products depends on consumers' timely adoption of the innovation(Geyskens et al., 2002), which can be promoted by the new product announcements. (Greenwood and Shleifer, 2014, Chaney et al., 1991) argue that faster new products development can accelerate cash flows. This is especially important in large companies and high-fixed-cost industries, which need fast cash flows to fund their operations.

Third, new product announcements generate stock returns through reducing vulnerability and volatility in cash flows. New products have a greater potential to enhance the consumer satisfaction through meeting their demands, thus lead to the reducing volatility in future cash flows(Fama and French, 1995). Furthermore, the vulnerability and volatility of companies' cash flows can be reduced by completing their product portfolio with launching new products(Livnat and Petrovits, 2009, Barberis et al., 1998).

Finally, new product announcements generate stock returns through increasing the residual value of the firm. New products are widely regarded as the vital issue for long-term survival and as an engine of growth. New products announcements may not only lead to the market expansion, but also signal the successful completion of innovation project, the competitiveness of the firm, and the confidence about the future (Lee et al., 1991, Sorescu et al., 2007, Srinivasan et al., 2009, Lee, 2001, Paulson Gjerde et al., 2002).

Above all, in line with previous studies, new product announcements are expected to generate positive stock returns. Accordingly, we have the following hypothesis.

H1: New product announcements are related positively to stock returns.

Investor Sentiment

Investor sentiment can be defined as the propensity to speculate, or the degree of optimism or pessimism about stocks, which is not justified by fundamentals(Baker and Wurgler, 2006). While the classical asset pricing theory proposes that the changes of stock return depends on the changes of fundamentals only, a number of behavioral finance studies suggest that the investor sentiment could significantly influence the stock price and the way investors think and invest.

Investor sentiment can result in mispricing of stocks. Specifically, optimism can result in over-valuation while pessimism can lead to under-valuation. In general, the mispricing can be generated by biased beliefs about future cash flows by noise traders, or the limits to arbitrage(Livnat and Petrovits, 2009). Many psychological biases of noise traders, such as overconfidence, self-attribution, conservatism, and representativeness heuristic, can result in mis-valuation of the real value of the stocks (Daniel et al., 1998, Barberis et al., 1998).

Investor sentiment represents the expectations of market participants, that is, bullish (bearish) investors expect returns to be above (below) average(Brown and Cliff, 2004). Investor sentiment reflects the extent of overconfidence or over-negative(Shefrin, 2008), thereby driving the mispricing of stocks(Lemmon and Portniaguina, 2006, Stambaugh et al., 2012). The speculative demand tends to be high (low) during periods of high (low) sentiment, which pushes up (down) the contemporaneous stock prices, and lowers (increases) the future stock returns(Lang et al., 1989).

Plenty of behavioral finance literature suggests that the investor sentiment could significantly influence the way investors respond to new information and update their belief. Simões Vieira (2011) presents that stocks become underpriced (overpriced) during periods of low (high) sentiment on dividend news. Cooper et al. (2005) argue that the stock market reaction to the name change of mutual funds is significantly affected by the investor sentiment. Lang et al. (1989) find that the stock price sensitivity to good (bad) earnings news is higher during high (low) sentiment periods than during periods of low (high) sentiment. Rosen (2006) shows that the stock market reaction to a merger announcement is positively correlated with the market sentiment.

Above all, in line with previous studies, investor sentiment is expected to moderate the stock returns. Accordingly, we have the following hypothesis.

H2. Investor sentiment is positively related to the stock market reactions of new product announcements such that the higher the investor sentiment, the stronger is its effect on stock returns.

Methods

Sample and Data Collection

We collect the sample of initial announcements of new product introductions by firms listed on Shanghai Stock Exchange and Shenzhen Stock Exchange from *CSMAR* database over the period from Jan. 2006 to Dec. 2015. We select the key words and phrases such as "introduce", "launch", "new product", "received approval", "approval letter", "medicine certificates", "to market", along with other pertinent words and phrases, commonly used to describe new product introductions as keys for a database search routine.

Similar to previous studies, any new product announcements in which their firms had other announcements such as unexpected earnings or losses, dividends payout, top executive appointments or departures, and mergers and acquisitions either 3 days before or 3 days after the announcement of the new product were further excluded from the sample (Geyskens et al., 2002, Lee and Chen, 2009, Lin and Chang, 2012b).

We obtained a usable sample of 227 new product announcements made by 152 firms between 2006 and 2015. Samples of new product announcements can be found in Table 1.

Stock Number	Firm Name	Announcement Date	Announcement Description
600409	Tangshan Sanyou Chemical Industries Co Ltd	2011/10/14	The new product "Modal fibre" developed by Sanyou has passed the appraisal of China Textile Industry Association
600876	Luoyang Glass Co Ltd	2015/03/19	One of the wholly-owned subsidiaries has successfully developed and commercialized a new product called "Ultra-thin electronic glasses"
000423	Dong-E-E-Jiao Co Ltd	2014/11/29	Dong-E-E-Jiao launched a small molecule gelatin product
300119	Ringpu Biology Co Ltd	2014/10/31	Ringpu Biology Co Ltd obtained the registration certificate of new veterinary drugs
002467	Net263 Ltd	2012/09/20	Net263 Ltd launched the "263 cloud communication product"

Table 1. Examples of New Product Announcements

Measures

The Investor Sentiment Index. Based on the existing research(Qiang and Shu-e, 2009, Baker and Wurgler, 2006) and considering the reality of China's stock market and data availability, this article builds the composite investor sentiment index based on the five underlying proxies: closed-end fund discount (*CEFD*), market turnover (*TURN*), the number of IPOs (*NIPO*), the average first-day returns of IPOs (*RIPO*), the number of new investor accounts (*NNIA*), the customers' confidence index (*CCI*).

The closed-end fund discount (*CEFD*) is the average difference between the net asset values (*NAV*) of closed-end stock fund shares and their market prices. The *CEFD* in this article is defined as the closed-end fund discount on the last trading day of every month. The market turnover (*TURN*) is based on the ratio of reported share volume to average shares listed from the Shanghai Stock Exchange and Shenzhen Stock Exchange. The number of IPOs (*NIPO*) is the amount of capital raised by IPOs, and the average first-day returns of IPOs (*RIPO*) is the arithmetical average of the first-day returns of all the IPOs in the month. The number of new investor accounts (*NNIA*) is the monthly number of new investor accounts listed on the Shanghai Stock Exchange and Shenzhen Stock Exchange. The customers' confidence index (*CCI*) is used as a subjective proxy, which has been verified as an efficient indicator to reflect the Chinese investor sentiment(Ning, 2009). We take the

monthly data of *TURN, NIPO, RIPO, NNIA, and CCI* from *CSMAR* (China Stock Market & Accounting Research) database, and the monthly *CEFD* from the *Hexun.com*.

In order to exclude the influence of macroeconomic environment factor, we respectively make regression analysis to each of the underlying proxy above with the macroeconomic climate index (*MECI*) and take the regression residuals as the new sentiment proxies, where each of the proxy has first been standardized. By improving the first principal component analysis presented by (Baker and Wurgler, 2006), this article takes the principal component analysis with the weighted average of the first, second, third, and fourth principal components, with 89.72% of total variance explained, which contains more information than that of first principal component.

Finally, the investor sentiment index (*SENT*) is calculated as

$SENT_t = 0.2730* CEFD_t + 0.2067*TURN_t + 0.2553* NIPO_t + 0.2301* RIPO_t + 0.2134* NNIA_t + 0.3429*CCI_t.$

where

$CEFD_t$:	The closed-end fund discount in month t,
$TURN_t$:	The market turnover in month t,
$NIPO_t$:	The number of IPOs in month t,
$RIPO_t$:	The average first-day returns of IPOs in month t,
$NNIA_t$:	The number of new investor accounts in month t,
CCI_t :	The customers' confidence index in month t.

The trend of investor sentiment index of Chinese stock market (form January 2006 to December 2015) is plotted in Fig. 2. As shown in the figure, the range of fluctuations of the investor sentiment index is relatively large during the research time period. This proves that the investor sentiment is often fickle, which means Chinese investors would often misjudge information in the market, and eventually overreact to the noises.
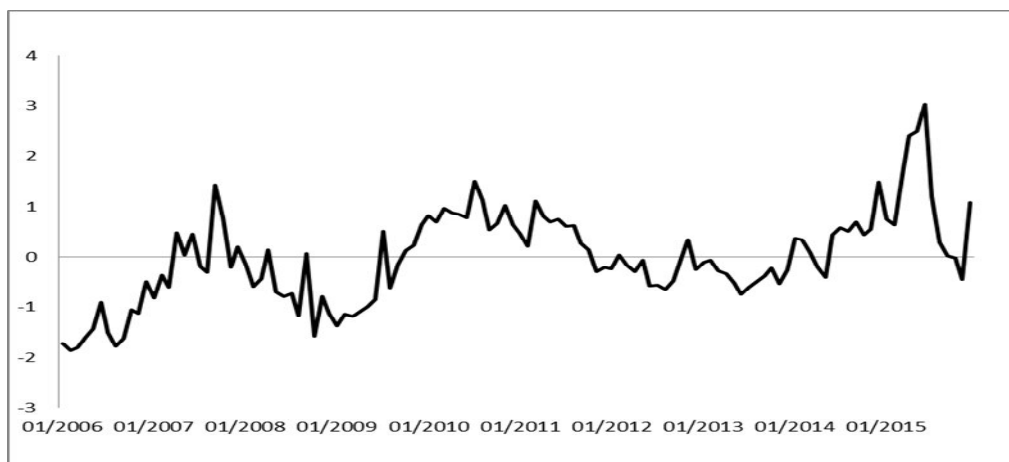

Fig. 2 The Investor Sentiment Index Trend (01/2006-12/2015)

Abnormal Stock Returns. Abnormal stock returns are used to investigate the stock market reactions to new product announcements. We calculate the abnormal stock returns using a standard event study methodology(Lin and Chang, 2012a), procedures for which are described below.

First, we estimate the values of a_i and β_i from the market model as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{1}$$

Where R_{it} is the daily return rate of stock i on day t, and R_{mt} is the daily rate of return of the stock market index. In this article, we use the Shanghai A-share Composite Index (000002) and Shenzhen A-share Composite Index (399107) as the stock market index. We estimate this equation in an estimation window, which we define here as a 120-day period from 140 to 21 days before the new product announcement day.

Second, using the a_i and β_i estimated above, we calculate the expected rate of return of every stock in the event window as follows:

$$E_{it} = \alpha_i + \beta_i R_{mt}, \tag{2}$$

where E_{it} is the expected rate of return of stock i on day t.

Then, we compute the abnormal returns (*AR*) during the event window as follows:

$$AR_{it} = R_{it} - E_{it} \tag{3}$$

where AR_{it} is the abnormal returns of stock i on day t, R_{it} is the daily return rate of stock i on day t, and E_{it} is the expected rate of return of stock i on day t.

The cumulative abnormal returns (*CAR*) are calculated by adding the abnormal daily returns in the event window as Equation (4):

$$CAR_i = \sum_{t=t_0}^{t_1} AR_{it} = \sum_{t=t_0}^{t_1} R_{it} - E_{it} \tag{4}$$

Control Variables. We include two structural variables (firm size and firm age) and two financial variables (the Tobin's q and the return on assets (*ROA*)) as control variables. Firm size and firm age are two of the most important structural characteristics of firms and are associated with the shareholder value of new product announcements(Lee and Chen, 2009). In this article, firm size is computed as the natural log of total assets at the end of the year before the new product announcement date. Firm age is the number of years from the firm established date to the new product announcement date of a firm. We control the financial characteristics of the firms with the Tobin's q and the return on assets (*ROA*). Some evidence has demonstrated that Tobin's q and *ROA* may have some effect on *CAR* (Lang et al., 1989, Rau and Vermaelen, 1998), so we use them as control variables. The Tobin's q is calculated with the market value divided by total assets at the end of the year prior to the new product announcement. *ROA* is calculated using the income in the year prior to the announcement divided by assets at the end of that year. Data of the four control variables were all collected from *CSMAR* database.

Results
Model Testing

The sample contains 152 listed firms involving a total of 227 new product announcements between 2006 and 2015 as described in Table 2. Table 3 provides some descriptive statics on the sample.

CSRC Industry Code	Industry Name	Firm Example	Number of Announcements
A	Agriculture, forestry, livestock farming, fishery	Yuan Longping High-tech Agriculture Co Ltd	4
C0	Food & Beverage	Xinjiang Tiankang Animal Science Bio-Technology Co Ltd	5
C4	Petrochemicals	Tangshan Sanyou Chemical Industries Co Ltd	11
C5	Electronics	TCL Corporation	15
C6	Metals & Non - metals	Shandong Jinjing Science & Technology Stock Co Ltd	11
C7	Machinery	Beijing Creative Distribution Automation Co Ltd	51
C8	Pharmaceuticals	Guangzhou Baiyunshan Pharmaceutical Co Ltd	30
F	Transportation	Yichang Transportation Co Ltd	2

G	IT	Anhui USTC iFlytek Co Ltd	17
H	Wholesale and retail trade	Zhejiang Zhenyuan Co Ltd	3
M	Comprehensive	Shenzhen Baoan Enterprises (Group) Co Ltd	3

Table 2. Industry Composition of Sample New Product Announcements

Variable	Mean	Min	Max	Standard Deviation
CAR (-1, 1)	.01414	-.3236	.4206	.06580
SENT	.2939	-1.5974	3.7857	.9668
SIZE	21.2193	18.8109	25.2545	.8626
AGE	12.66	2	23	4.780
Q	3.1073	.3867	12.8088	2.2381
ROA	.0730	-.2572	.3936	.0682

Table 3. Summary Statistics

Table 4 presents the cumulative abnormal returns for the 226 announcements, and Table 5 presents the daily average abnormal returns. Overall, the results show a direct positive relationship between new product announcements and their shareholder value. In particular, the CAR values of the event windows [-1, +1], [-2, +2], [-3, +3], [-4, +4], [-5, +5], [-6, +6], [-7, +7], [-8, +8], and [-9, +9] are all positive and significant, and the daily abnormal returns, one day after (day +1, $t=4.2365$, $p<0.005$) and the day of the announcement (day 0, $t=1.6562$, $p<0.05$) are all positive and significant, supporting H1.

Event Windows	CAR Value	Percentage of positive	t-test
[-1, +1]	0.016	60.78%	3.716***
[-2, +2]	0.019	59.48%	4.028***
[-3, +3]	0.023	54.74%	4.450***
[-4, +4]	0.026	52.59%	4.077***
[-5, +5]	0.022	52.59%	3.818***
[-6, +6]	0.023	53.02%	3.506***
[-7, +7]	0.020	53.88%	2.374**
[-8, +8]	0.017	52.59%	1.981**
[-9, +9]	0.012	52.46%	1.738*
[-10, +10]	0.006	52.16%	0.590
[-15, +15]	0.0002	51.29%	0.015
[-20, +20]	-0.001	46.55%	-0.688

Table 4. Cumulative Abnormal Returns for Various Windows
(*p < 0.1, **p < 0.05, ***p < 0.01.)

Event day	Average Abnormal Returns	t-test

-5	0.0001	0.054
-4	0.0012	0.653
-3	0.0028	1.235
-2	0.0015	0.816
-1	0.0003	0.158
0	0.0035	1.656*
1	0.0125	4.237***
2	0.0017	0.786
3	0.0006	0.327
4	-0.0015	-0.806
5	-0.0006	-0.348

Table 5. Abnormal Returns on New Product Announcements
($*p < 0.1$, $**p < 0.05$, $***p < 0.01$.)

To test our hypothesis 2, we estimate the following regression model:

$$CAR_{i,t} = \alpha + \beta_1 SENT_t + \beta_2 Size_{i,t} + \beta_3 Age_{i,t} + \beta_4 Tobin's Q_{i,t} + \beta_5 ROA_{i,t} + \varepsilon_i$$

where *CAR, SENT, Size, Age, Tobin's Q,* and *ROA* represent the abnormal stock returns, the investor sentiment, firm size, frim age, Tobin's Q, *ROA* respectively, and β_1 to β_5 are their corresponding coefficients, and *a* is the constant term, ε is the random error.

Dependent variables	Independent variables					R^2
	SENT	SIZE	AGE	Q	ROA	
CAR (-1, 1)	.013*** (2.681)	-.006 -1.192	.000 -.289	-.003 (-1.222)	.036 (.453)	.035
CAR (-2, 2)	.013*** 2.613	-.012** -1.976	-.000 -.037	-.006** -2.265	.133 1.561	.048
CAR (-3, 3)	.012** 2.211	-.015** -2.422	-.001 -.552	-.006** -2.260	.172* 1.943	.055
CAR (-4, 4)	.006 .941	-.014 -2.071**	.000 .044	-.005 -1.624	.158 1.566	.029
CAR (-5, 5)	.004 .615	-.013* -1.756	.000 .010	-.003 -1.011	.180* 1.710	.027
CAR (-6, 6)	.005 .688	-.011 -1.323	.000 .210	-.002 -.564	.233 1.980**	.030
CAR (-7, 7)	-.019** -2.104	-.007 -.635	.000 -.220	.003 .703	.036 .240	.031
CAR (-8, 8)	-.020** -2.243	-.009 -.841	.000 .117	.000 .023	.115 .754	.037
CAR (-9, 9)	-.029*** -2.687	-.003 -.276	-.001 -.276	.008 .1.481	.281 1.558	.058

Table 6. Regression Results
($*p < 0.1$, $**p < 0.05$, $***p < 0.01$.)

Table 6 presents the results of the regression model, which display a positive linear relationship between the investor sentiment and the CAR values of the event windows [-1, +1], [-2, +2], and [-3, +3], supporting H2. However, no significant relationship could be found in the event windows [-4, +4], [-5, +5], and [-6, +6]. In a longer horizon of event windows [-7, +7], [-8, +8], and [-9, +9], we find a price reversal, that is, a negative relationship between the investor sentiment and the CAR values.

Robustness Tests

To test the robustness of our results, a number of additional tests have been performed, which we report in Table 7. First, a 160-days estimation window, that is, from 180 to 21 days before the announcement date, was used to reexamine the model. The results are shown in Table 7, model 2, which are in accordance with the preceding results displayed in Table 7, model 1. Second, the CSI 300 Index (000300) was used as the stock market index to calculate the abnormal stock returns instead of the Shanghai A-share Composite Index (000002) and Shenzhen A-share Composite Index (399107). The results displayed in Table 7, model 3 agree well with the findings of model 1 and model 2.

	Model 1 (120 days)	Model 2 (160 days)	Model 3 (CSI 300)
	SENT	SENT	SENT
CAR (-1, 1)	.013*** (2.681)	.013** (2.365)	.012** (2.507)
CAR (-2, 2)	.013*** 2.613	.013** 2.174	.016*** 2.761
CAR (-3, 3)	.012** 2.211	.011* 1.753	.014** 2.050
CAR (-4, 4)	.006 .941	.007 .903	.012 1.458
CAR (-5, 5)	.004 .615	.004 .468	.008 .913
CAR (-6, 6)	.005 .688	.003 .323	.007 .700
CAR (-7, 7)	-.019** -2.104	-.023* -1.922	-.019 -1.552
CAR (-8, 8)	-.020** -2.243	-.023* -1.914	-.023* -1.799
CAR (-9, 9)	-.027* -1.954	-.028** -2.104	-.029** -2.104

Table 7. Robustness tests
(∗p < 0.1, ∗∗p < 0.05, ∗∗∗p < 0.01.)

Discussions and Conclusions

Which stimulates our interest in investigating stock market reaction to new product announcements is the extensive concern of academia and practitioners as well as the contradictory findings in existing literature. In this study, we demonstrated a positive stock market reaction to the new product announcements, and examined what role does investor sentiment play in this process.

Specifically, it has been found that new product announcements generate positive stock returns in the short run, which is accordance with the existing literature. Plenty of literature points to a hypothesis that the investor sentiment could positively influence the way investors respond to new product announcements, that is, the higher the investor sentiment, the stronger is the effect of new

product announcements on stock returns. In this article, we found a significant positive relationship between them in the very short-run, which is assistant with the previous studies on investor sentiment. In a longer horizon, however, we found a price reversal, that is, a negative relationship between the investor sentiment and the CAR values.

Prior research has shown that the effects of investor sentiment on stocks persist for some time and reverse in the future(Baker and Wurgler, 2006, Brown and Cliff, 2005). One possible explanation is, if investors are optimistic about the prospects for a new product, then they will bid up the stock of the introducing firms. However, as the performance of the new product or the introducing firm is revealed over time, investors may revise their views downward; hence, a stock price reversal occurs. On the other hand, investors who are not fully rational(Lee et al., 1991) overreact to the information, causing excess trading volume, and after several days revert back to their normal behavior, leading to the price reversal.

This paper sheds new light on the role of new product information plays on stock investors' decision-making processes. We challenge the traditional assumption that the stock market reaction to new information is always rational, and demonstrate the significant effect of investor sentiment on this process. This paper, in accordance with some prior research(Lee, 2001), calls for more work that incorporates behavioral finance into capital market research in operation to better understand the process by which stock market reacts to new product information.

This paper also contributes to the literature on investor sentiment in two ways. First, we examine the role investor sentiment plays in the stock market, and identify new product information as an important channel through which investor sentiment can cause mispricing of stocks. Second, we find a time-varying effect instead of a constant impact of investor sentiment on stock mispricing and provide insight into how this mispricing is later reversed.

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