ISSN 1023-2842
中山管理評論　　2014 年三月號
第二十二卷第一期　　p.115-156
DOI: 10.6160/2014.03.04

台灣股市投資人情緒對營收宣告後效果之影響*

Two-Period Revenue Surprises and Investor Sentiment in Taiwan

傅小芃 *Hsiao-Peng Fu*
靜宜大學財務金融系
Department of Finance,
Providence University

陳昇鴻 *Sheng-Hung Chen***
南華大學財務金融系
Department of Finance,
Nanhua University

* The authors appreciate the helpful comments from the 2013 European Financial Management Association Conference and 2013 Conference on the Theories and Practices of Securities and Financial Markets. Hsiao-Peng Fu thanks financial support from Ministry of Science and Technology, Taiwan, R.O.C. (Project number: NSC100-2410-H-126-007)
** Corresponding author: Sheng-Hung Chen

摘要

本研究發現在台灣股市中，前期市場處於投資人情緒高漲時，當個股從前期起連續兩個月公布負面的營收訊息時，該個股股價在收到訊息後的調整期的向下走勢較市場情緒低落時的向下走勢爲強，但在最接近收到訊息時的事件期，兩種市場情緒下的股價差異卻不明顯。可見前期市場情緒高漲時，負向的營收訊息未在事件期立即充分的反應於股價，卻延遲於調整期才反應，因此股價有段時間高估。本研究用認知失調解釋此延遲現象，即當負面的新訊息(由負面的營收訊息代表之)與正面的舊信念(由高漲的前期市場情緒代表之)衝突時，決策者會延遲接受衝突的負面新訊息，導致市價延遲下調，因此下調發生於調整期，而非事件期。反之，當前期市場情緒低落，個股連續兩期公布正向營收訊息時，向上調整的延遲反應的現象較弱，可見低估現象較弱。此可由 Miller (1977) 的主張解釋之，即股價低估的情形較高估的情形爲稀少。本研究更發現，上述股價延遲反應的現象持續約三到六個月，再次證實認知失調導致的延遲特質。本研究進一步發現，這種延遲反應無法由風險因素解釋之，且無視於散戶持股多寡，可見即使機構投資人亦無法免於此種認知失調行爲。另方面，放空限制愈大的股票，此延遲現象愈強烈，符合現有諸多文獻的主張，市場異常現象的成因之一係無法徹底執行套利交易。

關鍵詞：投資人情緒、營收宣告後效果、認知失調、反應不足

Abstract

Using revenue announcement data from the Taiwanese stock market, we find that stocks experiencing two consecutive negative revenue surprises will exhibit lower negative returns in *adjustment* periods when higher investor sentiment exists in prior period. In contrast, the significant return difference does not occur in *event* periods, albeit which are more close (than adjustment periods) to the very moment

when the market receives revenue news. The evidence implies an optimism-driven overpricing over event periods and a delayed downward correction in subsequent adjustment periods. We suggest the role of cognitive dissonance theory in explaining the delayed downward reaction. That is, cognitive dissonance arises when there exists conflicting signals between high investor sentiment and bad revenue surprises, resulting in delayed reaction to bad revenue surprises. The return difference is weaker for stocks with two consecutive positive revenue surprises in pessimism, implying weaker initial underpricing, and thereby corroborating the assertion by Miller (1977) that overpricing is more common than underpricing. The return difference extends for approximately three to six months, confirming the persistence of the delayed reaction predicted by cognitive dissonance theory. The differential return is insensitive to risk factors and various levels of concentrations of retail investors, yet it is stronger among stocks with more binding of short-sale constraints.

Keywords: Investor sentiment, Revenue surprises, Cognitive dissonance, Under-reaction

1. Introduction

A rich body of research has uncovered a significant impact of prior-period investor sentiment on cross-sectional stock prices.[1] Recent studies have further investigated influence of prior-period investor sentiment on market anomalies and have presented evidence of certain relationships. The results, however, are still inclusive in precisely defining the directions or driving forces of these relationships.

[1] Besides earlier work, recent studies include Brown & Cliff (2004, 2005), Baker & Wurgler (2006, 2007), Kumar & Lee (2006), Kaniel et al. (2008), Bergman & Roychowdhury (2008), Frazzini & Lamont (2008), Yu & Yuan (2011), Baker et al. (2012), and Chung et al. (2012).

Cornelli et al. (2006) utilized the gray-market prices of European initial public offerings (IPOs) as a proxy for retailer investor sentiment for the IPOs. They found that this proxy can predict first-day aftermarket prices of IPOs in good times but not in bad times. Both Lemon & Portniaguina (2006) and Baker & Wurgler (2006) found that investor sentiment is inversely related to future returns for small stocks. Gao et al. (2010) presented similar results for stocks with high idiosyncratic volatility. All these studies have attributed this inverse relationship to over-valuation during high sentiment, which is later followed by a correction in the form of a lower future return. On the other hand, some empirical results reported a positive relationship between prior-period investor sentiment and future performance of market anomalies. In their examination of 11 asset pricing anomalies,[2] Stambaugh et al. (2012) found higher profitability in zero-investment portfolios following high investor sentiment and that better performance is attributable to short positions. Accordingly, they argued that short-selling constraints play a predominant role in the positive relationship. Chung et al. (2012) also found that prior high sentiment predicts a greater profitability of the 11 anomalies they observed.[3] Besides, they suggested that the positive relationship can only exist in periods of economic expansion. Antoniou et al. (2013) found that price momentum occurs only in optimism. The conditional phenomenon is attributable to the cognitive dissonance instigated by the disclosure of bad earnings news in optimistic periods because poor performance of the losers dominates the conditional price momentum.

With respect to post-earnings announcement drift, Conrad et al. (2002) and Livnat & Petrovits (2009) reported an inverse relationship between prior-period market state (measured by P/E ratio)/investor sentiment and stock price reaction to good news. In particular, stocks with extremely good news produced lower future

[2] The 11 anomalies investigated by Stambaugh et al. (2012) are effects relative to failure probability, Ohlson's O-score, net stock issues, composite equity issues, total accruals, net operating assets, price momentum, gross profitability, asset growth, return on assets, and investment-to-assets.

[3] The 11 anomalies examined by Chung et al. (2012) are phenomena relative to size, ratio of book-to-market, dividend yield, ratio of earnings to price, age, sigma, volatility, ratio of research and development expense to assets, fixed assets, sales growth, and ratio of external finance to assets.

returns in high market state/investor sentiment periods than in low market state/investor sentiment periods. Conrad et al. (2002), however, identified a stronger negative response to bad earnings news in high market states than in low market states. Similarly, Seybert & Yang (2012) showed that subsequent to poor earnings surprises, negative returns are lower in high sentiment than in low sentiment. The authors assert that management guidance plays a role in this price correction. On the other hand, Mian & Sankaraguruswamy (2012) found a positive relationship between sentiment levels and returns post earnings news. In particular, market responses to good news are greater in optimism than in pessimism. Moreover, responses to bad earnings news are stronger in pessimism than in optimism. In addition, they found that hard-to-arbitrage stocks exhibit stronger effects, implying that investor mispricing is the cause. In brief, empirical results for relationship between prior investor sentiment and responses to earnings news are mixed.

This study extends this line of research by assessing whether market reaction to revenue surprises in the Taiwanese stock market is sensitive to investor sentiment. We predict that cognitive dissonance plays a vital role in triggering sentiment-driven reactions to revenue surprises. The reason that we study revenue surprise anomaly in the Taiwanese stock market is because firms listed on this market are required to release monthly revenue information by the 10th day of the subsequent month. As a result, market participants' attention is profoundly drawn to these monthly announcements because firms do not announce any other equally important fundamental news at such a high frequency.[4] Academic research in the US stock markets also confirmed importance of revenue surprises. In particular, US empirical evidence revealed a close relationship between revenue surprises and future earnings growth. Ertimur et al. (2003) and Ghosh et al. (2005) found that earnings surprises persist longer when they are accompanied by revenue surprises than by expense surprises. Jegadeesh & Livnat (2006a) provided evidence that revenue surprises contain incremental information content for earnings surprises of future one quarter (sometimes even for earnings surprises of future two quarters)

[4] For instance, the next regularly announced fundamental news is quarterly earnings, which are publicized at a much lower frequency, i.e., by quarters.

beyond the information content revealed by current earnings surprises.

Turning to the theory of cognitive dissonance, it asserts that individuals instinctively pursue consistency and strive to reduce inconsistency across their behaviors, beliefs, and value systems (Festinger, 1957). Previous behavioral finance research shows that cognitive dissonance is associated with various financial phenomena, including investor choices of mutual funds (Goetzmann & Peles, 1997), mispricing of assets (Drees & Eckwert, 2005), analyst forecasting errors introduced by prior errors (Friesen & Weller, 2006), analyst under-reaction to bad/good earnings news (Lin & Wu, 2009), hypothetical bias (Alfnes et al., 2010), and the disposition effect (Borghesi, 2012). This study links cognitive dissonance to the sentiment-driven reaction to revenue surprises, which has not been done previously. We predict that investors hold on to existing optimistic beliefs, and thereby react gradually to the arrival of new, contradictory negative revenue news. Therefore, an initial optimism-driven overpricing is followed by a delayed negative correction. In contrast, a pessimism-induced underpricing is expected to occur and be corrected by subsequent sluggish positive returns among stocks with newly released positive revenue news.

Extending the findings of a Taiwanese revenue surprise anomaly by Ku (2010), we expect that investor sentiment influences responses to revenue surprise as it affects responses to earnings surprises in the US stock markets. However, as mentioned previously, some evidence from the US stock markets reveals a negative relationship between prior-period sentiment and earnings anomalies, but other evidence by contrast shows a contrary positive relationship. Therefore, the results of this study can help resolve the controversial U.S. sentiment-driven earnings surprise evidence. To the best of our knowledge, no research has discussed the sentiment effect on a revenue anomaly in any stock market.[5] Most importantly, most of the existing evidence of a relationship between sentiment and market anomalies centers on developed markets, particularly in the US. Accordingly, this

[5] Baker & Wurgler (2006) and Chung et al. (2012) study the anomaly of sales growth (i.e., the difference in net sales over two consecutive years divided by sales of the previous year). By definition, annual sales growth is different from the monthly sales revenue surprises estimated in Equation (1) of this study. Consequently, the two anomalies are not likely to be the same in essence.

study contributes evidence to the limited body of knowledge that is relevant to a non-US market.

This study also contributes to the literature on revenue surprises by providing evidence of a new determinant, i.e., investor sentiment, to add to the rationales discussed in the existing literature, which include earnings surprises, price momentum, size effect (for the above three factors, see Jegadeesh & Livnat, 2006a), R&D expenses, and degree of oligopoly (for the two above rationales, see Kama, 2009).[6] The difference between this study and existing research on sentiment-driven responses to earnings surprises is that prior earnings studies mainly focused on directions of sentiment impact on an earnings anomaly (see Conrad et al., 2002; Livnat & Petrovits, 2009; Mian & Sankaraguruswamy, 2012[7]); therefore, studies conducted formal, rigorous tests for the drivers are limited (among the few, see Seybert & Yang, 2012). This study rigorously explores why investor sentiment influences a revenue surprise anomaly. In particular, we use cognitive dissonance to predict a delayed reaction of market responses when investors confront contrary signals between firm-specific revenue news and market-wide investor sentiment. To formally test the delayed reaction hypothesis, we use portfolio and regression analyses. Unlike previous sentiment-driven earnings anomaly studies, which have examined only announcement over one period, this study considers revenue announcements covering two consecutive periods. The reason for two-period analysis is that we expect that investors are more likely to accept the same-sign signal revealed by two months of news in rows, albeit their conflicting with market sentiment, than the signal revealed by only one month of news adverse to sentiment. In other words, investors' reaction to two-month same-sign news is expected to be stronger than reaction to one-month news because it is more likely that investors finally take a point of view against market-wide sentiment in witness of two consecutive months of contrary news.

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[6] Studies for revenue surprises include Hopewood & McKeown (1985), Swaminathan & Weintrop (1991), Ertimur et al. (2003), Ghosh et al. (2005), Gu et al. (2006), Jegadeesh & Livnat (2006a, 2006b), and Kama (2009), among others.

[7] Mian & Sankaraguruswamy (2012) uncovered that stocks with firm values harder to be evaluated are more sensitive to investor sentiment, claiming mispricing is the cause of the sentiment effect. We regard it as an indirect test, rather than a rigorous, direct test of the rationale.

In the existing financial literature, the study by Antoniou et al. (2013) is most similar to ours. They associated cognitive dissonance with sentiment-based price momentum. Our study differs from their study in that we directly observe market reaction upon receiving revenue news with co-existing, conflicting sentiment in prior periods. In contrast, Antoniou et al. (2013) focused on the momentum of stock prices conditional on investor sentiment; therefore, their study was unable to directly observe the impact of earnings news on stock prices.[8]

Consistent with cognitive dissonance theory, this study has found that stocks with two consecutive negative revenue surprises exhibit lower negative returns over adjustment periodsin in optimism than in pessimism, implying an initial optimism-driven overpricing followed by a delayed negative correction. The sentiment-driven return difference, in contrast, does not happen over event periods, even though which are more close (than adjustment periods) to the time when revenue news arrive in the market. Consistent with cognitive dissonance, the asymmetry evidence confirms an optimism-induced overpricing in event periods and a delayed downward correction in subsequent adjustment periods. In addition, in accordance with the argument of more seldom underpricing than overpricing by Miller (1977), the return difference is less significant for stocks with two consecutive positive revenue surprises in pessimism than in optimism, indicating weaker initial underpricing. Furthermore, as expected, a two-period analysis exhibits a larger delayed reaction than a normal one-period analysis in situations of negative revenue surprises during times of optimism. The sentiment-driven return difference extends for approximately three months for the situation of bad revenue news in optimism and six months for the situation of good revenue news in pessimism, confirming the persistence of an under-reaction as predicted by

[8] When Antoniou et al. (2013) drops losers with low standardized unexpected earnings in high sentiment periods (i.e., stocks potentially affected by the cognitive dissonance induced by bad earnings news), significant price momentum still exists in optimism; the price momentum decreases from a significant 1.925% (*t*-stat. = 4.17) to a significant 0.917% (*t*-stat. = 2.34, see Panel B2 in Table 10 of Antoniou et al., 2013). The persistence of significant price momentum after the exclusion of stocks connected with cognitive dissonance suggests that price momentum is associated with investor reaction not only with regard to earnings news but also with regard to other information/factors. Accordingly, price momentum is a contaminated measure for observing cognitive dissonance stemming from bad earnings news in optimistic periods.

cognitive dissonance theory. The return difference is robust to risk factors and various levels of concentrations of retail investors, yet it is stronger among stocks with higher extent of short-sale constraints.

The remainder of this paper is organized as follows. Section 2 derives the related hypotheses. Section 3 provides a description of the sample data and methodology. Section 4 reports empirical results, followed by conclusions in Section 5.

2. Hypothesis Development

According to the theory of cognitive dissonance, one reacts gradually to new information when the new information conflicts with prior beliefs. Applying the theory to stock markets, investors are bound to old beliefs (see Akerlof & Dickens, 1982), which results in initial mispricing followed by delayed correction. In terms of revenue surprise anomaly conditional on investor sentiment, the theory suggests that following market-wide high sentiment, optimistic prior beliefs hinder fully immediate reaction to bad revenue news in event periods. Consequently, a delayed reaction manifests in adjustment periods, where by definition event periods are more close to the very moment when the market receives revenue news. Inversely, similar binding impedes reaction for good revenue news when low sentiment exists in prior period. Accordingly, we develop two hypotheses as follows.

Hypothesis 1. Over an adjustment period, negative stock returns in response to an announcement of bad revenue news are lower in the presence of optimistic investor sentiment in prior periods than in the presence of pessimistic investor sentiment in prior periods.

Hypothesis 2. Over an adjustment period, positive stock returns in response to an announcement of good revenue news are higher in the presence of pessimistic investor sentiment in prior periods than in the presence of optimistic investor

sentiment in prior periods.

Miller (1977) showed that stockholders demonstrate a tendency toward more optimism than pessimism, resulting in overvaluation of stock prices being more common than undervaluation of stock prices. In addition, Miller suggested that short-sale constraints help to trigger overpricing. Confirming the suggestion of Miller, Stambaugh et al. (2012) showed that short-sale constraints hinder sentiment-based underpricing of market anomalies. These arguments and evidence jointly predict that the influence of cognitive dissonance is less at the arrival of good revenue news in pessimism, when underpricing occurs, than at the arrival of bad revenue news in optimism, when overpricing dominates. Consequently, the phenomenon of Hypothesis 2 is expected to be weaker than the phenomenon of Hypothesis 1.

In the existing literature, Veronesi (1999) proposed a rational expected model, in which the dilemma between market sentiment and adverse fundamental news generates incremental uncertainty and thereby higher future expected returns (to justify the higher uncertainty). As a result, the dilemma causes underpricing for scenarios of both bad news in good times and good news in bad times. The underpricing for good news in bad times is corrected and followed by more *positive* returns than in good times. A similar correction in the form of more *positive* returns occurs for underpricing for bad news in good times. Obviously, the prediction for good news in bad times is consistent with our prediction based on cognitive dissonance, whereas the hypothesis for bad news in good times is contrary to ours.

Besides the analysis of revenue surprises of one period, we also conduct a similar analysis for stocks with two consecutive months of same-sign revenue surprises. The reason for two-period analysis is that we expect that investors are more likely to accept the same-sign signal revealed by two months of news in rows, albeit their conflicting with market sentiment, than the signal revealed by only one month of news adverse to sentiment. In other words, investors' reaction to two-month same-sign news is expected to be stronger than reaction to one-month news because it is more likely that investors finally take a point of view against

market-wide sentiment in witness of two consecutive months of contrary news.

Hypothesis 3. Over an adjustment period, negative stock returns in response to announcements of bad revenue news for *two* consecutive periods are lower in the presence of optimistic investor sentiment in prior periods than in the presence of pessimistic investor sentiment in prior periods.
Hypothesis 4. Over an adjustment period, positive stock returns in response to announcements of good revenue news for *two* consecutive periods are higher in the presence of pessimistic investor sentiment in prior periods than in the presence of optimistic investor sentiment in prior periods.

In the two-period analysis, we observe sentiment-driven revenue surprise anomaly at month t in the basis of revenue news announced in months $t-1$ and t. In light of previous findings of optimism of stockholders and impediment from short-sale constraints as mentioned previously (Miller, 1977; Stambaugh et al., 2012), the cognitive dissonance effect of Hypothesis 4 is expected to be weaker than that in Hypothesis 3.

3. Data and Methodology

To measure investor sentiment, we relied on the Taiwan Consumer Confidence Index (TCCI) survey, which consists of investor expectation of whether investment opportunities will be available in the Taiwanese stock markets over the next 6 months. This TCCI survey was conducted by the Department of Statistics and Information Science, Fu Jen Catholic University, Taiwan, and supervised and disclosed by the Research Center for Taiwan Economic Development, National Central University, Taiwan.[9] With data from January 2001,

[9] We thank the Research Center for Taiwan Economic Development, National Central University, Taiwan, for providing the TCCI historical data on its website: http://rcted.ncu.edu.tw/intro.phtml#5.

this index is composed of six sub-indices that report expectations for the next six months regarding domestic price levels, household economic status, domestic macroeconomic status, employment level, opportunities to invest in the Taiwanese stock market, and possibilities to buy durable goods. The survey includes the opinions of adults (with an age of more than 20 years) randomly selected from telephone books and interviewed via telephone. The respondents express their expectations for each of the six issues in terms of scaled measures. For example, the three scaled measures for whether it is a good time to invest in the Taiwanese stock market over the next six months were *yes*, *no*, and *unknown*. The survey is conducted each month and the results are published on approximately the 27th of the month in which the survey is done.

Similar to Antoniou et al. (2013), this study uses residual sentiment as a proxy for investor sentiment by orthogonalizing the investment opportunity outlook index to macroeconomic factors so as to liberate the sentiment measure from macroeconomic effects. The macroeconomic factors we used to estimate residual sentiments are growth in the following categories: industrial production, export, employment rate, M1B,[10] bond trading volume, foreign exchange rate, and deposits in foreign currency. They are the macroeconomic factors empirically shown to be highly correlated with cross-sectional stock returns in the Taiwanese stock market (Hung et al., 2007).

To distinguish sentiment states, first, we classified all sample months into above-median and below-median residual sentiment periods. Second, similar to the approach used in prior US sentiment research (Antoniou et al., 2013), we estimated sentiment state for month $t-1$ from residual sentiments of the three months of $[t-3: t-1]$, where revenue portfolio formation month is month t. Specifically, we defined month $t-1$ as an optimistic month when all three months of $[t-3: t-1]$ fall in the above-median sentiment period. Similarly, we defined month $t-1$ as a pessimistic month when all three months are in the below-median sentiment period. Month $t-1$ is classified as a neutral month if it neither fits the definition of an

[10] M1B is a short-term monetary supply measure that is widely accepted by practitioners as being closely related to the short-term fluctuation of stock prices in Taiwan. By definition, it consists of currency, demand deposits, and check deposits.

optimistic month nor fits the definition of a pessimistic month. As a result, there are 47, 46, and 46 months classified as optimistic, neutral, and pessimistic periods, respectively.

As in previous revenue surprise research (e.g., Jegadeesh & Livnat, 2006b), we estimated the standardized unexpected revenue (SUR) as below:

$$SUR_t = \frac{Revenue_t - Revenue_{t-12} - \mu_t}{\sigma_t}, \tag{1}$$

where $Revenue_t$ is the sales revenue announced in month t, μ_t is the mean of ($Revenue_t$ − $Revenue_{t-12}$) for the 24 months of (t − 24, …, t − 2, t − 1), or $\mu_t = \frac{1}{24}\sum_{j=1}^{24}\left(Revenue_{t-j} - Revenue_{t-12-j}\right)$, and σ_t is the related standard deviation. A qualified stock must have at least 18 months of revenue to estimate *SUR*.

Data were obtained from the Taiwan Economic Journal (TEJ). To match the time period in which sentiment measure and revenue data are available, our sample included qualified common stock listed on the Taiwan Stock Exchange (TWSE) from January 1998 to July 2012. We included stocks delisted during the sample period to avoid a survivorship bias, whereas stocks with zero revenue surprises, prices below NT$1, or a market capitalization below NT$50 million on the portfolio formation date were excluded to avoid the microstructure effects related to low prices or illiquidity issues (Blume & Stambaugh, 1983). Moreover, qualified stocks need to have all necessary data to estimate returns on the various windows mentioned below. As such, our sample comprises data from 65,547 firm-months.

We used several windows to measure market responses to revenue surprises at month t. First, returns on a three-day *event* window of [−1, +1] measure the immediate responses of the market upon receiving revenue news on day 0. Second, returns for the *adjustment* window of [+2, −2] estimate how the market acts over the adjustment period beginning two days after the date of revenue announcement in month t through 2 days before the date of revenue announcement in the next month, i.e., month t + 1. The reason to observe returns in the window of [+2, −2] is that evidence of post-earnings-announcement drift uncovers that a large portion of

the drift occurs around the announcement in the next period (see, e.g., Bernard & Thomas, 1989; Freeman & Tse, 1989), and thereby, subsequent studies include days around the next announcement as a part of an adjustment period (Jegadeesh & Livnat, 2006b). Therefore, this study adopted this earnings-based methodology. Finally, we observed monthly returns over the *adjustment* window of month $t + 1$ that reflect short-term performance of investment strategies based on revenue surprises at month t.

At the announcement of revenue news in each month t, we categorized stocks into big negative (SUR1), small negative (SUR2), small positive (SUR3), and big positive (SUR4) revenue surprise portfolios; SUR1 and SUR2 (SUR3 and SUR4) portfolios consist of stocks with negative (positive) revenue surprises. We assigned an equal number of stocks into SUR1 and SUR2 (or SUR3 and SUR4) portfolios. Furthermore, we constructed two-tier portfolios on a sequential basis. To maximize the number of stocks in each bivariate portfolio, we categorized component stocks within each SUR_t portfolio into negative and positive revenue surprise portfolios on the basis of their revenue surprises at month $t - 1$. We used value weights for each portfolio as did in most Asian studies due to limited number of qualified stocks comparing to the much larger number of qualified stocks in developed markets. For the window estimated by days, we computed cumulative abnormal returns (CAR) by subtracting (from raw returns) returns on benchmark portfolios constructed on their size and book-to-market ratio, as in Fama & French (1993, 1996).

To resolve the issue of a limited number of sample months, we computed t-statistics for the average of portfolio returns in each sentiment state by regressing portfolio returns *from all sentiment-state months* on three dummy variables, with each of the dummies denoting one sentiment state but with no intercept. With respect to the differential returns between the optimistic and pessimistic states, we obtained t-statistics by regressing portfolio returns from all sentiment states on three dummy variables (without intercepts) denoting non-neutral, neutral, and optimistic months. Therefore, the regression coefficient for the dummy variable of optimism is the incremental return for optimistic periods over pessimistic periods. Unless otherwise mentioned, we used Newey-West standard errors to correct for

heteroskedasticity and autocorrelation.

4. Empirical results

Table 1 presents the descriptive statistics for the variables used in this study. Figure 1 depicts the historical trends of the investment opportunity index and the related two residual sentiments. These sentiments were estimated by regressing the investment opportunity index on (a) the concurrent measures of the seven macroeconomic factors previously discussed, and alternatively (b) the seven concurrent measures plus one-period forward measures. Each of these residual sentiments has patterns similar to the original investment opportunity index. The correlations between the original sentiment index and the two residual sentiments are 0.9183 and 0.8127, respectively.

We conducted a validation test that draws inference from the findings of Baker & Wurgler (2006) that returns on growth firms are more sensitive to investor sentiment than value firms because the values of growth firms are more difficult to evaluate. Accordingly, we expect that the negative relationship between prior sentiment and future stock returns uncovered by Baker and Wurgler is stronger among growth firms than value firms. In other words, a strong positive relationship exists between the residual sentiment at month t and the value firm premium (i.e., HML) at month $t + 1$, where HML is estimated according to the three-factor model of Fama & French (1993, 1996).[11] We regressed residual sentiment on intercept and HML, obtaining a regression coefficient of 0.265 with a t-statistic of 2.072, which confirms the validation of the residual sentiment. Furthermore, we duplicated the regression with the alternative residual sentiment as the dependent variable. The corresponding regression coefficient is also strong, i.e., 0.324 with t-stat. of 3.022.

[11] The credit for the first paper conducting the validation test based on sentiment-driven growth firm effect in Baker & Wurgler (2006) goes to Antoniou et al. (2013).

Table 1 Descriptive Statistics

This table presents summary statistics for variables used in this study. Panel A reports variables estimated for each firm at month *t*, including standardized unexpected revenues (*SUR*), price (in New Taiwan Dollars), one-month holding period returns in percentage at month *t*+1, cumulative abnormal returns for windows of [-1, +1] and [+2, -2] (see text for definitions of the windows and details of the estimation of cumulative abnormal returns), book-to-market ratio in percentage (BM) estimated following Fama & French (1993, 1996), institutional holdings in percentage, and market value (in millions, New Taiwan Dollars), occupied lending quotas in percentage, earnings forecast dispersion. The sample is composed of qualifying common stocks on TWSE from January 1998 to July 2012, with the exception of beginning in 2007 for earnings forecast dispersion. Panel B reports characteristics relative to four revenue-based portfolios, where *SUR*1, *SUR*2, *SUR*3, and *SUR4* denote stocks with big negative, small negative, small positive, and big positive revenue surprises, respectively. Panel C reveals observation months, median, standard deviation, minimum, and maximum levels of three investor sentiment measures.

	Firm-Month	Mean	Std. Dev.	Min.	Max.
Panel A: Firm level					
SUR_t	65,547	0.013	1.153	-4.490	4.695
$Price_{t-1}$	65,547	30.928	44.130	1.080	1,300
Stock $Return_{t+1}$	65,547	0.764	13.004	-56.623	148.447
CAR[-1, +1]	65,547	-0.013	3.756	-11.915	27.052
CAR[+2, -2]	65,547	-0.079	1.056	-12.994	25.091
BM_{t-1}	65,547	0.897	0.576	0.049	20
Institutional $Holdings_{t-1}$	65,547	12.050	14.175	0	81.800
Market $Value_{t-1}$	65,547	26,059	97,761	117	2,200,659
Occupied Lending $Quotas_{t-1}$	65,547	0.851	2.538	0	82.190
Earnings Forecast $Dispersion_{t-1}$	65,547	0.203	0.287	0	1.838

Panel B: Portfolio level

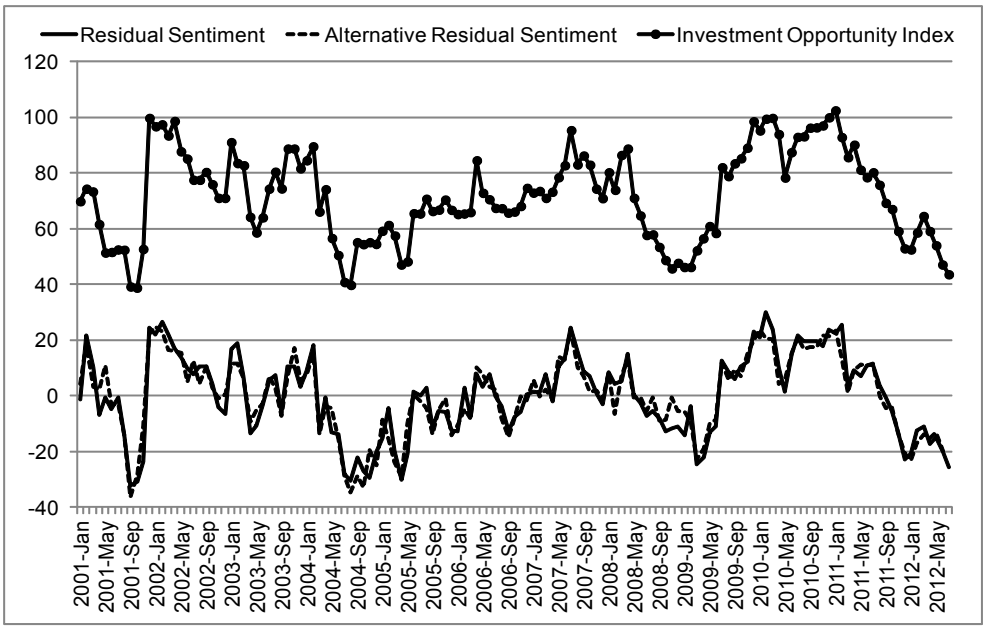
		Mean							
	Firm-Month	SUR_t	$Price_{t-1}$	Stock $Return_{t+1}$	BM_{t-1}	Institutional $Holdings_{t-1}$	Market $Value_{t-1}$	Lending Quotas Occupied $_{t-1}$	Earnings Forecast $Dispersion_{t-1}$
*SUR*1	16,046	-1.457	32.034	-0.748	0.906	12.447	27,121	0.758	0.249
*SUR*2	16,030	-0.407	28.169	0.552	0.963	11.602	23,166	0.719	0.206
*SUR*3	16,686	0.386	29.693	1.139	0.890	11.587	26,517	0.851	0.176
*SUR*4	16,785	1.414	33.658	2.060	0.832	12.540	27,304	1.064	0.178

Panel C: Investor sentiment

	Months	Median	Std. Dev.	Min.	Max.
Investment Opportunity Index	139	71	16.113	38.800	102.400
Residual sentiment	139	0.365	14.796	-32.266	30.047
Alternative residual sentiment	138	0.187	13.946	-36.291	24.679

Figure 1 Time Series of Investor Sentiment Measures

At each month, investment opportunity index is released based on survey of individuals' expectation of whether there are investment opportunities in the Taiwanese stock markets over the subsequent six months. Plotted are investment opportunity index, residual sentiment, and alternative residual sentiment. The sentiment measures are proxy by residuals of regression of the investment opportunity index on (a) concurrent measures of seven macroeconomic factors including growth in industrial production, in export, in unemployment rate, in M1B, in trading volume of bond, in foreigner exchange rate, and in deposit in foreigner currency, and (b) the concurrent measures plus their forward one-period counterparts.



4.1 Sentiment-driven Reaction to One-period Revenue Surprises

Table 2 presents an analysis of sentiment-driven returns over various windows for SUR_t portfolios formed by revenue surprises in month *t*. The results in Panel A support the findings of Ku (2010) that post-revenue-announcement drift exist in Taiwan, which is also in line with revenue surprise evidence in the US (e.g., Ertimur et al., 2003; Jegadeesh & Livnat, 2006a).

Table 2 Returns for Portfolios Ranked on One-Period Revenue Surprises

This table reports post announcement returns on revenue surprise portfolios. At each month *t*, stocks are partitioned into portfolios with big negative (*SUR*1), small negative (*SUR*2), small positive (*SUR*3), and big positive (*SUR*4) revenue surprises. The revenue surprise is computed based on equation (1). We assign an equal number of stocks into *SUR*1 (*SUR*3) and *SUR*2 (*SUR*4) portfolios. The sample is composed of qualifying common stocks on TWSE from January 1998 to July 2012. R_{t+1} in percentage is the average monthly return of time-series of value-weighted portfolio returns over month *t*+1. CAR [-1, +1] and CAR [+2, -2] are cumulative abnormal returns over respective periods of three day around the announcement in month *t*, and two days after the announcement in month *t* through two days before the next announcement in month *t*+1. The abnormal return is estimated by subtracting (from the raw return) the return on benchmark portfolio of size+BM from raw return on revenue surprise portfolio. We partition sample months into optimistic, neutral, and pessimistic periods based on residual sentiment of prior three months. The *t*-statistics for portfolio returns following optimistic, neutral, and pessimistic periods are computed by regressing all portfolio returns on three dummy variables with no intercept, each of the dummy denoting one sentiment state. As for the differential returns between the optimistic and pessimistic states, we obtain *t*-statistics via regressing returns of portfolios on three dummy variables (without intercept) denoting non-neutral, neutral, and optimistic states. As such, the regression coefficient for the dummy variable of optimistic state is the incremental returns for optimistic periods over pessimistic periods. Data in parentheses are Newey-West *t* values with correction for heteroskedasticity and autocorrelation.

Panel A: All Periods	CAR[-1,+1]	CAR[+2, -2]	R_{t+1}
*SUR*1(Big Neg.)	-0.284	-0.136	-0.392
	(-3.357)	(-5.514)	(-2.636)
*SUR*2	0.011	-0.085	-0.027
	(0.134)	(-3.435)	(-0.041)
*SUR*3	0.264	0.013	0.674
	(2.720)	(0.486)	(1.132)
*SUR*4(Big Pos.)	0.246	0.058	1.533
	(2.493)	(2.232)	(2.278)
*SUR*4-*SUR*1	0.531	0.194	1.925
	(3.530)	(5.576)	(5.611)
Panel B: Optimistic Periods			
*SUR*1(Big Neg.)	-0.279	-0.166	-2.414
	(-1.818)	(-3.729)	(-2.606)
*SUR*2	0.019	-0.128	-1.888
	(0.145)	(-3.379)	(-1.710)
*SUR*3	0.055	-0.011	-0.453
	(0.500)	(-0.304)	(-0.484)
*SUR*4(Big Pos.)	0.438	0.116	0.295
	(2.954)	(3.512)	(0.292)
*SUR*4-*SUR*1	0.717	0.282	2.709
	(3.124)	(6.171)	(5.130)
Panel C: Neutral Periods			
*SUR*1(Big Neg.)	-0.402	-0.166	-0.166
	(-3.085)	(-4.225)	(-0.178)
*SUR*2	-0.152	-0.112	-0.428
	(-1.258)	(-2.330)	(-0.422)
*SUR*3	0.364	-0.028	0.486
	(2.359)	(-0.696)	(0.484)
*SUR*4(Big Pos.)	0.081	-0.024	1.335
	(0.704)	(-0.507)	(1.212)
*SUR*4-*SUR*1	0.482	0.142	1.501
	(2.507)	(2.305)	(2.551)
Panel D: Pessimistic Periods			
*SUR*1(Big Neg.)	-0.167	-0.073	1.488
	(-1.062)	(-1.678)	(1.174)
*SUR*2	0.173	-0.013	2.339
	(1.035)	(-0.321)	(1.845)
*SUR*3	0.379	0.080	2.049
	(1.681)	(1.427)	(1.796)
*SUR*4(Big Pos.)	0.220	0.081	3.037
	(0.937)	(1.588)	(2.223)
*SUR*4-*SUR*1	0.386	0.155	1.549
	(1.115)	(2.199)	(2.345)
Panel E: Opt. - Pes.			
*SUR*1(Big Neg.)	-0.112	-0.092	-3.902
	(-0.512)	(-1.480)	(-2.485)
*SUR*2	-0.154	-0.115	-4.227
	(-0.722)	(-2.038)	(-2.514)
*SUR*3	-0.325	-0.092	-2.502
	(-1.295)	(-1.354)	(-1.696)
*SUR*4(Big Pos.)	0.218	0.035	-2.742
	(0.788)	(0.572)	(-1.615)
*SUR*4-*SUR*1	0.331	0.127	1.160
	(0.796)	(1.516)	(1.372)

In particular, hedge portfolios that purchase stocks with good revenue news and sell stocks with bad news (i.e., SUR4-SUR1) are significantly positive over all three windows. More importantly, the results in Panels B, D, and E generally fit with Hypotheses 1 and 2. First, in Panel E, for stocks with large negative revenue surprises (or SUR1), returns over an adjustment period of month $t + 1$ (i.e., R_{t+1}) are significantly lower in high sentiment compared with in low sentiment, with a difference of −3.902% (t-stat. = −2.485). The significant return difference weakly exists over the more immediate adjustment period of [+2, −2]; the return difference diminishes to −0.092% with a t-stat. of −1.480. Together with a weak return difference of −0.112% over the event period of [−1, +1], evidence of the two adjustment periods indicates a delayed reaction and is generally in line with Hypothesis 1. Furthermore, the differential returns in the adjustment periods can be traced back to evident negative returns in optimism (shown in Panel B), a direction in line with prediction of cognitive dissonance theory.

Second, corresponding to Hypothesis 2, the results for SUR4 in Panel E indicate that big-positive revenue stocks perform marginally better under pessimism than optimism in terms of future one-month returns with a difference of −2.742% (t-stat. = −1.615), although the difference does not hold for the adjustment period of [+2, −2]. However, the indifferent performance across sentiment states also occurs for the event window of [−1, +1]. Therefore, the marginal results of the adjustment period of future one-month marginally confirm Hypothesis 2. The weaker evidence is in accordance with the prediction of Miller (1977) that there would be a weaker underpricing than overpricing (see discussion in Section 2).

In brief, the empirical evidence corroborates Hypotheses 1 and 2, where Hypothesis 2, as expected, demonstrates a weaker effect. In addition, looking into drift in optimistic periods in Panel B, the drift for SUR1 manifests more slowly than SUR4, consistent with the prediction of cognitive dissonance theory that there will be a delayed reaction for SUR1 but not SUR4. In particular, negative returns for SUR1 are marginally significant for CAR [−1, +1], increases to significantly negative for CAR [+2, −2], and keeps significance for R_{t+1}, i.e., −2.414% with t-stat. = −2.606. In contrast, positive returns for SUR4 are immediately

significantly positive for CAR [−1, +1] and CAR [+2, −2], deteriorating to weak positive returns of −0.295% for R_{t+1}. On the other hand, the drift in pessimistic periods in Panel D shows a reverse dynamic. The drift of negative returns is more quickly exhausted than the drift of positive returns, reminiscent of the prediction in cognitive dissonance theory that delayed reaction happens in conflicting good revenue news. In conclusion, this sentiment-based, asymmetric, delayed reaction is consistent with cognitive dissonance theory.

Overall, the results are in line with the US findings of a negative relationship between the reaction to earnings news and sentiment states (Conrad et al., 2002; Livnat & Petrovits, 2009; Seybert & Yang, 2012) but opposed to contrary evidence of a positive relationship reported by Mian & Sankaraguruswamy (2012). Note that returns exhibit an inverse response to revenue surprises over (a) the event period of [−1, +1] for stocks with small negative revenue surprises (SUR2) in optimism or pessimism, (b) the two adjustment periods among stocks announcing small positive revenue surprises (i.e., SUR3) under optimism, and (c) the one month adjustment period among stocks with negative revenue surprises (namely, SUR1 and SUR2) in pessimism. These findings are similar to results presented by Kinney et al. (2002) and Johnson & Zhao (2012), which state that future returns are negative after positive earnings surprises or positive after negative earnings surprises.[12]

[12] The inverse price reaction is not the focus of this study and is investigated in detail in another study (Fu, 2014).

4.2 Sentiment-driven Reaction to Two-period Revenue Surprises

The analysis in this section focuses on the return performance of bivariate portfolios ranked on revenue surprises of the previous two months, namely months t and $t - 1$. The empirical evidence in Table 3 largely confirms Hypotheses 3 and 4. In particular, among the stocks already experiencing poor revenue news in the preceding month $t - 1$, the first row in Panel E shows that stocks with additional big-negative revenue surprises (or SUR1) generate significantly lower negative returns in optimism than in pessimism over the holding period of one month, with a return difference of −4.550%. The differential return decreases to marginal significance over the window of [+2, −2] and no significance over the window of [−1, +1], namely, −0.143% with t-stat. = −1.994 and −0.201% with t-stat. = −0.953, respectively. Obviously, these findings confirm Hypothesis 3. For SUR4 with good revenue news in month $t - 1$, incremental returns in optimism over pessimism are weak and in the wrong direction for both windows of [−1, +1] and [+2, −2]; however, the return difference shift into a correct direction with marginal significance over month $t + 1$, which is consistent with Hypothesis 4.[13]

It is worth mentioning that sentiment-induced incremental returns over the adjustment periods for Hypothesis 3 in the two-period analysis (i.e., −0.413% and −4.550% for CAR [+2, −2] and R_{t+1}, respectively) are significantly higher than those for Hypothesis 1 in the one-period analysis (i.e., −0.092% and −3.902% for CAR [+2, −2] and R_{t+1}, respectively). In unreported results, the t-values for the difference between the two analyses are −2.517 and −2.950 for CAR [+2, −2] and R_{t+1}, respectively. The implication is that, as discussed and expected previously, the two-period setting actually triggers larger delayed reaction than the one-period setting in terms of the effects of Hypotheses 1 and 3. The insignificant difference between Hypotheses 2 and 4 is not surprising because their original sentiment-induced reaction is weaker than Hypothesis 1 and 3.

[13] We also repeated the test in terms of residual sentiment in months $t - 1$ and t, the exact months when the two revenue surprises concerned were announced. The results for Hypotheses 3 and 4 do not materially change and will be provided upon request.

Table 3 Returns for Portfolios Ranked on Two-Period Revenue Surprises

This table reports post announcement returns on revenue surprise portfolios. At each month *t*, standardized unexpected revenue surprise (SUR) is computed based on equation (1). Stocks are partitioned into portfolios with big negative (SUR1), small negative (SUR2), small positive (SUR3), and big positive (SUR4) revenue surprises. SUR1 (SUR3) and SUR2 (SUR4) portfolios are composed of stocks with negative (positive) revenue surprises. We assign an equal number of stocks into SUR1 (SUR3) and SUR2 (SUR4) portfolios. Within each SUR_t-portfolio, component stocks are further categorized into negative and positive SUR_{t-1} portfolios, which consist of the half of component stocks in the SUR_t portfolios with relatively low and high revenue surprises, respectively, at month *t*–1. The sample is composed of qualifying common stocks on TWSE from January 1998 to July 2012. R_{t+1} in percentage is the average monthly return of time-series of value-weighted portfolio returns over month *t*+1. CAR [-1, +1] and CAR [+2, -2] are cumulative abnormal returns over respective periods of three day around the announcement in month *t*, and two days after the announcement in month *t* through two days before the next announcement in month *t*+1. The abnormal return is estimated by subtracting return on benchmark portfolio of size+BM from raw return on revenue portfolio. We partition sample months into optimistic, neutral, and pessimistic periods based on sentiment measures of prior three months. The t-statistics for portfolio returns following optimistic, neutral, and pessimistic periods are computed by regressing all portfolio returns on three dummy variables with no intercept, each of the dummy denoting one sentiment state. As for the differential returns between the optimistic and pessimistic states, we obtain t-statistics via regressing returns of portfolios on three dummy variables (without intercept) denoting non-neutral, neutral, and optimistic states, respectively. As such, the regression coefficient for the dummy variable of optimistic state is the incremental returns for optimistic periods over pessimistic periods. Data in parentheses are Newey-West *t* values with correction for heteroskedasticity and autocorrelation.

SUR_t	CAR[-1,+1]		CAR[+2, -2]		R_{t+1}	
	SUR_{t-1}		SUR_{t-1}		SUR_{t-1}	
	Negative	Positive	Negative	Positive	Negative	Positive
Panel A: All Periods						
*SUR*1(Big Neg.)	-0.291	-0.052	-0.175	-0.039	-0.724	0.254
	(-3.364)	(-0.367)	(-6.166)	(-0.944)	(-3.119)	(0.392)
*SUR*2	-0.030	0.020	-0.096	-0.048	-0.092	0.498
	(-0.313)	(0.155)	(-3.571)	(-1.169)	(-0.139)	(0.686)
*SUR*3	0.056	0.395	-0.046	0.002	0.534	0.812
	(0.439)	(3.365)	(-1.271)	(0.072)	(0.769)	(1.351)
*SUR*4(Big Pos.)	-0.152	0.424	0.007	0.092	1.599	1.774
	(-1.218)	(3.614)	(0.157)	(2.860)	(2.176)	(2.448)
*SUR*4-*SUR*1	0.139	0.429	0.181	0.141	2.323	1.544
	(0.878)	(2.360)	(4.046)	(2.827)	(4.796)	(3.130)
Panel B: Optimistic Periods						
*SUR*1(Big Neg.)	-0.326	-0.139	-0.234	-0.063	-3.082	-0.839
	(-2.540)	(-0.718)	(-4.409)	(-0.853)	(-3.178)	(-0.768)
*SUR*2	-0.077	0.066	-0.171	0.003	-2.032	-0.675
	(-0.469)	(0.300)	(-4.568)	(0.051)	(-1.998)	(-0.513)
*SUR*3	-0.077	0.200	-0.021	0.009	-0.016	-0.370
	(-0.406)	(1.631)	(-0.394)	(0.208)	(-0.013)	(-0.382)
*SUR*4(Big Pos.)	-0.162	0.480	0.010	0.132	0.338	0.420
	(-1.051)	(2.935)	(0.171)	(3.585)	(0.323)	(0.414)
*SUR*4-*SUR*1	0.164	0.619	0.245	0.195	3.420	1.259
	(0.788)	(2.336)	(3.632)	(2.598)	(5.075)	(1.841)
Panel C: Neutral Periods						
*SUR*1(Big Neg.)	-0.416	0.051	-0.195	-0.025	-0.460	0.119
	(-2.704)	(0.201)	(-4.420)	(-0.406)	(-0.461)	(0.110)
*SUR*2	-0.221	-0.156	-0.094	-0.195	-0.333	-0.482
	(-1.467)	(-0.677)	(-1.837)	(-3.484)	(-0.308)	(-0.447)
*SUR*3	0.350	0.273	-0.149	-0.034	-0.412	0.842
	(1.451)	(1.434)	(-2.616)	(-0.772)	(-0.329)	(0.858)
*SUR*4(Big Pos.)	-0.297	0.515	-0.118	0.015	1.489	1.151
	(-1.551)	(2.527)	(-1.523)	(0.241)	(1.195)	(0.975)
*SUR*4-*SUR*1	0.119	0.325	0.078	0.069	1.948	1.087
	(0.483)	(1.071)	(0.932)	(0.941)	(2.454)	(1.464)
Panel D: Pessimistic Periods						
*SUR*1(Big Neg.)	-0.125	-0.065	-0.091	-0.029	1.468	1.534
	(-0.749)	(-0.229)	(-1.895)	(-0.360)	(1.127)	(1.298)
*SUR*2	0.219	0.156	-0.019	0.053	2.191	2.752
	(1.229)	(0.695)	(-0.390)	(0.584)	(1.734)	(2.067)
*SUR*3	-0.112	0.726	0.036	0.033	2.098	2.016
	(-0.495)	(2.677)	(0.491)	(0.584)	(1.779)	(1.731)
*SUR*4(Big Pos.)	0.010	0.271	0.132	0.130	3.035	3.843
	(0.035)	(1.123)	(1.785)	(2.087)	(2.017)	(2.540)
*SUR*4-*SUR*1	0.135	0.336	0.224	0.159	1.567	2.309
	(0.374)	(0.894)	(2.771)	(1.461)	(1.534)	(2.092)
Panel E: Opt. - Pes.						
*SUR*1(Big Neg.)	-0.201	-0.074	-0.143	-0.034	-4.550	-2.373
	(-0.953)	(-0.216)	(-1.994)	(-0.306)	(-2.802)	(-1.475)
*SUR*2	-0.297	-0.090	-0.153	-0.050	-4.223	-3.427
	(-1.220)	(-0.286)	(-2.505)	(-0.460)	(-2.604)	(-1.832)
*SUR*3	0.035	-0.526	-0.058	-0.024	-2.114	-2.386
	(0.118)	(-1.768)	(-0.629)	(-0.340)	(-1.275)	(-1.576)
*SUR*4(Big Pos.)	-0.172	0.209	-0.122	0.002	-2.698	-3.422
	(-0.524)	(0.715)	(-1.275)	(0.022)	(-1.472)	(-1.878)
*SUR*4-*SUR*1	0.029	0.283	0.021	0.035	1.852	-1.049
	(0.069)	(0.615)	(0.198)	(0.265)	(1.513)	(-0.808)

Finally, note that the stock market is more efficient in pessimism than in optimism, in accordance with prior investigation of market anomalies conditional on investor sentiment (Stambaugh et al., 2012). For example, returns on hedge portfolios of SUR4-SUR1 in pessimistic periods are indistinguishable from zero in four out of six combinations of SUR_{t-1} and observation windows (i.e., two conditions of SUR_{t-1}* three windows; see Panel D), whereas weak profitability exists only for one condition in optimism (see Panel B).

4.3 Performance of the 12-month Holding Period

Recall that a vital element of the cognitive dissonance effect is persistence. Table 4 exhibits return performance for a two-period analysis over a 12-month period following announcement month *t*. For Hypothesis 3, the first row in Panel A-5 documents that high sentiment-induced delayed negative returns are sustained until month $t + 6$. However, the cognitive-dissonance-induced delayed reaction, represented by the negative returns in optimism, decreases to a insignificant level over months $t + 4$ through $t + 6$, although it is significant for months between $t + 1$ and $t + 3$ (see Panel A-2). The insignificance implies that the effect of Hypothesis 3 ends around month $t + 3$. Note that there exists reversal (i.e., positive returns) over months $t - 6$ to $t - 2$ (namely, 0.326%). With respect to Hypothesis 4, the results displayed in Panels B-2, B-4, and B-5 indicate a persistence of the sentiment effect for around six months following the announcement month. In short, both Hypotheses 3 and 4 show persistence for as long as three to six months after the announcement month of sales revenues, respectively, confirming the persistent essence of the cognitive dissonance effect.

Table 4 Returns of 12-Month Holding Period for Portfolios Ranked on Two-Period Revenue Surprises

This table reports 12-month holding period returns on revenue surprise portfolios. At the end of each month *t*, standardized unexpected revenue surprise (*SUR*) is computed based on equation (1). Stocks are partitioned into portfolios with big negative (*SUR*1), small negative (*SUR*2), small positive (*SUR*3), and big positive (*SUR*4) revenue surprises. *SUR*1 (*SUR*3) and *SUR*2 (*SUR*4) portfolios are composed of stocks with negative (positive) revenue surprises. We assign an equal number of stocks into *SUR*1 (*SUR*3) and *SUR*2 (*SUR*4) portfolios. Within each SUR_t portfolio, component stocks are further categorized into negative and positive SUR_{t-1} portfolios, which consist of the half of component stocks in the SUR_{t-1} portfolios with relatively low and high revenue surprises, respectively, at month *t*-1. The sample is composed of qualifying common stocks on TWSE from January 1998 to July 2012. Return in percentage is the average of time-series of value-weighted portfolio buy-and-hold returns with different holding periods. We partition sample months into optimistic, neutral, and pessimistic periods based on sentiment measures of prior three months. The *t*-statistics for portfolio returns following optimistic, neutral, and pessimistic periods are computed by regressing all portfolio returns on three dummy variables with no intercept, each of the dummy denoting one sentiment state. As for the differential returns between the optimistic and pessimistic states, we obtain *t*-statistics via regressing returns of portfolios on three dummy variables (without intercept) denoting non-neutral, neutral, and optimistic states. As such, the regression coefficient for the dummy variable of optimistic state is the incremental returns for optimistic periods over pessimistic periods. Data in parentheses are Newey-West *t* values with correction for heteroskedasticity and autocorrelation.

SUR_t	Panel A: Negative SUR_{t-1}					
	(*t*-6: *t*-2)	(*t*-1)	(*t*)	(*t*+1: *t*+3)	(*t*+4: *t*+6)	(*t*+7: *t*+12)
Panel A-1: All Periods						
*SUR*1(Big Neg.)	0.542	0.458	0.030	-0.313	0.506	0.758
	(1.258)	(0.650)	(0.050)	(-0.801)	(1.145)	(2.335)
*SUR*2	1.196	0.590	0.867	0.405	0.882	0.846
	(2.917)	(0.888)	(1.402)	(0.944)	(2.240)	(2.779)
*SUR*3	1.762	1.264	1.729	0.961	1.297	1.181
	(3.499)	(1.807)	(2.243)	(2.111)	(2.889)	(3.917)
*SUR*4(Big Pos.)	2.207	1.883	1.278	1.459	1.234	0.989
	(4.758)	(2.501)	(1.748)	(3.186)	(3.020)	(3.290)
*SUR*4-*SUR*1	1.664	1.425	1.425	1.772	0.728	0.231
	(5.512)	(3.017)	(3.017)	(6.990)	(2.508)	(1.152)
Panel A-2: Optimistic Periods						
*SUR*1(Big Neg.)	1.904	-0.245	-1.564	-2.190	-0.884	0.305
	(2.606)	(-0.249)	(-1.776)	(-3.975)	(-1.334)	(0.465)
*SUR*2	2.584	0.129	-0.459	-1.382	-0.227	0.192
	(4.154)	(0.155)	(-0.510)	(-2.272)	(-0.367)	(0.302)
*SUR*3	3.396	0.471	0.165	0.043	0.039	0.540
	(4.662)	(0.527)	(0.145)	(0.052)	(0.052)	(0.897)
*SUR*4(Big Pos.)	3.647	1.297	-0.281	0.214	0.237	0.300
	(5.471)	(1.264)	(-0.255)	(0.392)	(0.346)	(0.508)
*SUR*4-*SUR*1	1.742	1.542	1.542	2.404	1.121	-0.004
	(3.084)	(2.454)	(2.454)	(5.962)	(2.274)	(-0.011)
Panel A-3: Neutral Periods						
*SUR*1(Big Neg.)	1.057	0.721	0.150	-0.401	0.063	1.430
	(1.508)	(0.536)	(0.156)	(-0.599)	(0.073)	(2.525)
*SUR*2	1.911	1.261	0.542	0.230	0.640	1.508
	(2.939)	(0.931)	(0.606)	(0.317)	(0.863)	(2.885)
*SUR*3	2.830	1.820	1.712	0.181	0.958	1.613
	(3.628)	(1.425)	(1.531)	(0.214)	(1.224)	(3.021)
*SUR*4(Big Pos.)	3.181	2.891	0.873	0.925	0.798	1.479
	(4.242)	(1.956)	(0.837)	(1.093)	(1.054)	(2.709)
*SUR*4-*SUR*1	2.124	2.170	2.170	1.326	0.735	0.048
	(4.192)	(2.295)	(2.295)	(3.280)	(1.314)	(0.149)
Panel A-4: Pessimistic Periods						
*SUR*1(Big Neg.)	-1.421	0.916	1.574	1.743	2.426	0.529
	(-1.939)	(0.692)	(1.264)	(2.538)	(3.567)	(1.233)
*SUR*2	-1.005	0.370	2.596	2.460	2.294	0.838
	(-1.331)	(0.301)	(1.915)	(3.098)	(3.606)	(2.264)
*SUR*3	-1.065	1.513	3.383	2.737	2.970	1.398
	(-1.103)	(1.052)	(2.005)	(4.513)	(3.888)	(3.526)
*SUR*4(Big Pos.)	-0.320	1.441	3.333	3.320	2.734	1.197
	(-0.367)	(1.039)	(2.108)	(3.717)	(4.319)	(3.095)
*SUR*4-*SUR*1	1.101	0.525	0.525	1.577	0.308	0.668
	(2.238)	(0.617)	(0.617)	(3.146)	(0.688)	(2.028)

SUR_t	Panel A: Negative SUR_{t-1}					
	(t-6: t-2)	(t-1)	(t)	(t+1: t+3)	(t+4: t+6)	(t+7: t+12)
Panel A-5: Opt. - Pes.						
*SUR*1(Big Neg.)	3.326	-1.161	-3.138	-3.933	-3.310	-0.224
	(3.213)	(-0.704)	(-2.058)	(-4.467)	(-3.486)	(-0.286)
*SUR*2	3.588	-0.241	-3.055	-3.842	-2.521	-0.646
	(3.669)	(-0.163)	(-1.878)	(-3.841)	(-2.845)	(-0.879)
*SUR*3	4.460	-1.042	-3.218	-2.695	-2.932	-0.858
	(3.688)	(-0.615)	(-1.580)	(-2.630)	(-2.761)	(-1.191)
*SUR*4(Big Pos.)	3.967	-0.144	-3.614	-3.106	-2.498	-0.896
	(3.614)	(-0.083)	(-1.875)	(-2.966)	(-2.682)	(-1.268)
*SUR*4-*SUR*1	0.641	1.017	1.017	0.827	0.813	-0.672
	(0.856)	(0.962)	(0.962)	(1.285)	(1.221)	(-1.334)
SUR_t	Panel B: Positive SUR_{t-1}					
	(t-6: t-2)	(t-1)	(t)	(t+1: t+3)	(t+4: t+6)	(t+7: t+12)
Panel B-1: The All Periods						
*SUR*1(Big Neg.)	2.293	1.612	1.192	0.334	0.818	1.168
	(5.460)	(2.267)	(1.805)	(0.795)	(1.968)	(4.074)
*SUR*2	2.250	2.126	1.126	0.673	1.421	1.638
	(4.637)	(2.540)	(1.618)	(1.539)	(3.136)	(2.628)
*SUR*3	1.968	1.979	1.912	0.968	0.910	1.609
	(4.395)	(2.689)	(3.028)	(2.385)	(2.433)	(3.150)
*SUR*4(Big Pos.)	3.672	3.497	3.046	1.335	1.114	1.523
	(8.020)	(4.586)	(4.341)	(3.008)	(2.687)	(2.665)
*SUR*4-*SUR*1	1.316	1.728	1.728	1.059	0.298	0.431
	(4.996)	(4.119)	(4.119)	(4.071)	(1.148)	(1.189)
Panel B-2: Optimistic Periods						
*SUR*1(Big Neg.)	3.864	1.405	-0.088	-1.019	-0.406	0.609
	(6.610)	(1.317)	(-0.099)	(-1.468)	(-0.679)	(1.095)
*SUR*2	3.449	1.096	0.807	-0.824	0.113	0.637
	(4.568)	(0.923)	(0.737)	(-1.160)	(0.149)	(0.520)
*SUR*3	3.376	0.505	0.239	-0.762	-0.068	0.964
	(5.006)	(0.508)	(0.269)	(-1.251)	(-0.118)	(0.938)
*SUR*4(Big Pos.)	5.322	2.644	1.418	-0.101	-0.267	0.226
	(7.358)	(2.668)	(1.442)	(-0.177)	(-0.417)	(0.225)
*SUR*4-*SUR*1	1.458	1.239	1.239	0.919	0.139	-0.383
	(3.324)	(2.189)	(2.189)	(2.029)	(0.379)	(-0.651)
Panel B-3: Neutral Periods						
*SUR*1(Big Neg.)	2.958	2.426	2.381	-0.044	-0.020	1.873
	(4.574)	(1.807)	(2.129)	(-0.069)	(-0.027)	(3.685)
*SUR*2	3.238	1.869	1.006	0.196	1.153	2.720
	(4.109)	(1.332)	(0.965)	(0.269)	(1.962)	(2.241)
*SUR*3	2.719	2.990	1.951	1.003	0.305	2.396
	(3.684)	(1.980)	(2.026)	(1.520)	(0.500)	(2.744)
*SUR*4(Big Pos.)	4.206	4.498	3.635	0.820	0.812	2.889
	(5.432)	(2.804)	(3.294)	(1.028)	(1.071)	(2.544)
*SUR*4-*SUR*1	1.070	1.623	1.623	1.025	0.834	1.276
	(2.468)	(1.846)	(1.846)	(1.969)	(1.985)	(1.736)
Panel B-4: Pessimistic Periods						
*SUR*1(Big Neg.)	-0.030	0.996	1.314	2.136	2.958	1.031
	(-0.037)	(0.768)	(0.948)	(2.773)	(4.070)	(2.604)
*SUR*2	-0.016	3.466	1.582	2.728	3.065	1.580
	(-0.018)	(1.992)	(1.072)	(3.643)	(3.297)	(2.277)
*SUR*3	-0.290	2.465	3.622	2.741	2.565	1.461
	(-0.355)	(1.948)	(2.659)	(3.641)	(3.666)	(2.034)
*SUR*4(Big Pos.)	1.388	3.343	4.133	3.377	2.874	1.451
	(1.779)	(2.555)	(2.733)	(4.018)	(4.202)	(1.928)
*SUR*4-*SUR*1	1.419	2.348	2.348	1.241	-0.084	0.420
	(2.815)	(3.290)	(3.290)	(3.338)	(-0.153)	(0.793)
Panel B-5: Opt. - Pes.						
*SUR*1(Big Neg.)	3.894	0.409	-1.402	-3.155	-3.364	-0.422
	(3.861)	(0.244)	(-0.852)	(-3.043)	(-3.574)	(-0.618)
*SUR*2	3.465	-2.369	-0.775	-3.552	-2.951	-0.943
	(2.964)	(-1.125)	(-0.422)	(-3.442)	(-2.459)	(-0.670)
*SUR*3	3.666	-1.960	-3.384	-3.503	-2.633	-0.497
	(3.459)	(-1.218)	(-2.081)	(-3.618)	(-2.908)	(-0.396)
*SUR*4(Big Pos.)	3.933	-0.700	-2.716	-3.478	-3.141	-1.226
	(3.697)	(-0.426)	(-1.506)	(-3.427)	(-3.354)	(-0.976)
*SUR*4-*SUR*1	0.039	-1.109	-1.109	-0.322	0.223	-0.803
	(0.059)	(-1.217)	(-1.217)	(-0.550)	(0.338)	(-1.014)

4.4 Regression and Risk Analysis

In addition to the portfolio approach, this section presents a regression analysis of the relationship between investor sentiment and future portfolio returns under the setting of two-period revenue surprises. In addition, a risk analysis is conducted according to common risk models of CAPM, CAPM conditional on sentiment (Baker & Wurgler, 2006), the three-factor model presented by Fama & French (1993, 1996) and the Carhart (1997) four-factor model. By adopting the approaches in both Baker & Wurgler (2006) and Jegadeesh & Livnat (2006b), we fit the equations as follows:

$$R_{t+1} - R_{ft+1} = a + \beta_1 (DSent_{t-3:t-1}) + e_{t+1}, \tag{2}$$

$$R_{t+1} - R_{ft+1} = a + \beta_1 (DSent_{t-3:t-1}) + \beta_2 (R_{mt+1} - R_{ft+1}) + e_{t+1}, \tag{3}$$

$$R_{t+1} - R_{ft+1} = a + \beta_1 (DSent_{t-3:t-1}) + (\beta_2 + \beta_3 \times Sent^{Avg}_{t-3:t-1})(R_{mt+1} - R_{ft+1}) + e_{t+1}, \tag{4}$$

$$\begin{aligned} R_{t+1} - R_{ft+1} = {} & a + \beta_1 (DSent_{t-3:t-1}) + (\beta_2 + \beta_3 \times Sent^{Avg}_{t-3:t-1})(R_{mt+1} - R_{ft+1}) + \\ & \beta_4 SMB_{t+1} + \beta_5 HML_{t+1} + e_{t+1}, \end{aligned} \tag{5}$$

$$\begin{aligned} R_{t+1} - R_{ft+1} = {} & a + \beta_1 (DSent_{t-3:t-1}) + (\beta_2 + \beta_3 \times Sent^{Avg}_{t-3:t-1})(R_{mt+1} - R_{ft+1}) + \\ & \beta_4 SMB_{t+1} + \beta_5 HML_{t+1} + \beta_6 UMD_{t+1} + e_{t+1}, \end{aligned} \tag{6}$$

where R_{t+1} denotes returns on the *SUR* portfolios for holding month $t + 1$; R_{ft+1} is the risk-free return represented by the one month time deposit rate of the First Commercial Bank, Taiwan, in month t+1; R_{mt+1} is the return on the Taiwan Stock Exchange Capitalization Weighted Stock Index; $Sent^{Avg}_{t-3:t-1}$ is the average residual sentiment of the three months beginning in month $t - 1$ backward to month $t - 3$; *SMB*, *HML*, and *UMD* represent the effects relative to size, value firm, and price momentum, respectively. The exact computation procedure for SMB_{t+1}, HML_{t+1}, and UMD_{t+1} can be found in Fama & French (1993, 1996) and Carhart (1997).[14]

[14] For zero-cost investment portfolios, the regression Equations (2)-(6) are respectively fitted with a dependent variable of differences in excess returns between stocks with positive revenue surprises and stocks with negative surprises.

$DSent_{t-3:t-1}$ is a dummy variable equal to 0, 0.5, or 1 for sentiment states of pessimism, neutral, and optimism, respectively. Consequently, the regression coefficient for the dummy variable is the difference of returns in optimism over returns in pessimism.

In the first row of Panel A-1 in Table 5, the negative regression coefficient for *DSent* shows that among stocks with two periods of bad revenue news, future returns in high sentiment periods are on average 5.918% (*t*-stat. = −3.328) lower than those in low sentiment periods, which is in line with Hypothesis 3. The significant differential return of −4.869% (*t*-stat. = 2.457) for SUR4 in Panel B-1 is supportive of Hypothesis 4. Both these strong differences remain intact after controlling for common risk factors (shown in Panels A-2 to A-5 and Panels B-2 to B-5). Overall, the results of this regression analysis confirm those obtained using the portfolio approach and are robust to traditional risk factors.

4.5 Short-sale Constraints

Stambaugh et al. (2012) and Antoniou et al. (2013) both demonstrated that short-sale constraints play a prominent role in hindering arbitrage trading that deteriorates market anomalies conditional on investor sentiment. Therefore, we investigated whether short-sale constraints play a role for occurance of delayed reaction suggested by Hypotheses 3 and 4. Two measures were used as proxies for short-sale constraints. First, specific to this market, the ratio of occupied lending-share quotas is a direct and inverse measure of the extent of short-sale constraints. In particular, trading regulations in TWSE restrict the number of shares eligible for lending (for short-sale and other purposes) in each firm to a maximum of 25% of outstanding shares.[15] Consequently, the larger the proportion of quotas has already been occupied, the smaller proportion of quotas available for future lending, and thereby the greater constraints on short sales.[16]

[15] In fact, investors may borrow shares for purposes other than short-selling, for instance, hedge needs by institutional traders of options. However, all shares borrowed, regardless of investors' purposes, are included in the 25% ceiling.

[16] D'Avolio (2002) showed that the primary source of shares for short-sale in the US is in

Table 5 Regression and Risk Analysis

This table reports regression coefficients by regressing portfolio returns on explanatory variables relative to CAPM, CAPM conditional on sentiment, Fama & French (1993, 1996) three-factor model, and Carhart's (1997) four-factor model. The sample is composed of qualifying common stocks on TWEX from January 1998 to July 2012. At the end of each month t, standardized unexpected revenue surprise (*SUR*) is computed based on equation (1). Stocks are partitioned into portfolios with big negative (*SUR*1), small negative (*SUR*2), small positive (*SUR*3), and big positive (*SUR*4) revenue surprises. *SUR*1 (*SUR*3) and *SUR*2 (*SUR*4) portfolios are composed of stocks with negative (positive) revenue surprises. We assign an equal number of stocks into *SUR*1 (*SUR*3) and *SUR*2 (*SUR*4) portfolios. Within each SUR_t portfolio, component stocks are further categorized into negative and positive SUR_{t-1} portfolios, which consist of the half of component stocks in the SUR_t portfolios with relatively low and high revenue surprises, respectively, at month *t*–1. We partition sample months into optimistic, neutral, and pessimistic periods based on sentiment measures of prior three months. *DSent* is a dummy variable equal to zero, 0.5, and 1 for prior five-month sentiment states of pessimism, neutral, and optimism, respectively. As such, regression coefficient for the dummy variable is the spread of returns for optimism over returns for pessimism. Data in parentheses are Newey-West *t* values with correction for heteroskedasticity and autocorrelation. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

SUR_t	Panel A: Negative SUR_{t-1}							
	α	*DSent*	*RMKT*	*RMKT*Sent*	*SMB*	*HML*	*UMD*	Adj. R^2
Panel A-1: With Sentiment								
*SUR*1(Big Neg.)	2.280*	-5.918***						0.088
	(1.864)	(-3.328)						
SUR2	2.710**	-5.520***						0.074
	(2.267)	(-3.107)						
*SUR*3	2.012*	-2.914						0.019
	(1.711)	(-1.644)						
*SUR*4(Big Pos.)	3.059**	-2.876						0.016
	(2.432)	(-1.563)						
*SUR*4-*SUR*1	0.779	3.042***						0.042
	(1.140)	(2.980)						
Panel A-2: CAPM with Sentiment								
*SUR*1(Big Neg.)	1.999*	-5.503***	0.133					0.103
	(1.721)	(-3.223)	(1.639)					
SUR2	2.562**	-5.303***	0.070					0.078
	(2.230)	(-3.100)	(0.694)					
*SUR*3	1.724	-2.488	0.136					0.032
	(1.538)	(-1.471)	(1.303)					
*SUR*4(Big Pos.)	2.730**	-2.390	0.156					0.032
	(2.253)	(-1.349)	(1.282)					
*SUR*4-*SUR*1	0.731	3.113***	0.023					0.042
	(1.042)	(2.975)	(0.258)					
Panel A-3: CCAPM with Sentiment								
*SUR*1(Big Neg.)	1.845	-5.395***	0.239*	-0.261				0.112
	(1.634)	(-3.200)	(1.780)	(-1.324)				
SUR2	2.352**	-5.155***	0.215	-0.356				0.093
	(2.063)	(-3.004)	(1.279)	(-1.397)				
*SUR*3	1.480	-2.317	0.305**	-0.414*				0.051
	(1.364)	(-1.383)	(2.056)	(-1.672)				
*SUR*4(Big Pos.)	2.553**	-2.266	0.278*	-0.300				0.041
	(2.151)	(-1.290)	(1.767)	(-1.237)				
*SUR*4-*SUR*1	0.708	3.129***	0.039	-0.039				0.043
	(1.006)	(2.994)	(0.355)	(-0.219)				
Panel A-4: Fama-French with Sentiment								
*SUR*1(Big Neg.)	1.784	-4.955***	0.281**	-0.178	-0.037	-0.244**		0.150
	(1.618)	(-2.923)	(2.111)	(-0.932)	(-0.216)	(-1.996)		
SUR2	2.382**	-4.922***	0.244	-0.294	-0.117	-0.173		0.115

institutional holdings. However, in the Taiwanese stock market, two sources of shares are available for lending for the purpose of short-selling. The first source is shares initially purchased on margins, and thereby collateral for brokerage firms who lend the shares to investors for short-selling. Second, shares can be lent out through bidding systems, supervised by either the TWSE (only to specific institutional investors) or stock lending intermediaries (to investors who have had an account with the lending intermediary for at least three months). In addition, the 25% lending-share quotas previously mentioned applies to the total volume of shares lent through the two channels. Note that the estimated proportion of occupied lending-share quotas does not include the shares lent out through the bidding systems of lending intermediaries because of a lack of available data.

SUR_t	Panel A: Negative SUR_{t-1}							
	α	*DSent*	*RMKT*	*RMKT*Sent*	*SMB*	*HML*	*UMD*	Adj. R^2
	(2.097)	(-2.840)	(1.419)	(-1.192)	(-0.720)	(-1.251)		
*SUR*3	1.463	-2.095	0.327**	-0.368	-0.041	-0.133		0.062
	(1.357)	(-1.237)	(2.206)	(-1.471)	(-0.249)	(-0.864)		
*SUR*4(Big Pos.)	2.443**	-1.748	0.322**	-0.214	0.015	-0.260*		0.074
	(2.071)	(-0.980)	(2.059)	(-0.883)	(0.086)	(-1.723)		
*SUR*4-*SUR*1	0.660	3.206***	0.042	-0.035	0.052	-0.016		0.044
	(0.929)	(2.993)	(0.376)	(-0.196)	(0.367)	(-0.192)		
Panel A-5: Cahart with Sentiment								
*SUR*1(Big Neg.)	1.703	-4.788***	0.181*	-0.011	-0.032	-0.233*	0.013	0.160
	(1.517)	(-2.823)	(1.923)	(-1.252)	(-0.157)	(-1.860)	(0.077)	
SUR2	2.306**	-4.666***	0.104	-0.016	-0.058	-0.173	0.093	0.133
	(2.016)	(-2.673)	(0.936)	(-1.352)	(-0.333)	(-1.248)	(0.568)	
*SUR*3	1.646	-1.925	0.140	-0.010	-0.001	-0.164	-0.029	0.064
	(1.486)	(-1.138)	(1.293)	(-0.938)	(-0.004)	(-1.018)	(-0.155)	
*SUR*4(Big Pos.)	2.438**	-1.519	0.218*	-0.014	0.065	-0.275*	0.098	0.095
	(2.037)	(-0.854)	(1.662)	(-1.245)	(0.374)	(-1.708)	(0.528)	
*SUR*4-*SUR*1	0.735	3.269***	0.037	-0.003	0.097	-0.042	0.085	0.053
	(1.046)	(3.068)	(0.381)	(-0.412)	(0.564)	(-0.474)	(0.731)	
SUR_t	Panel B: Positive SUR_{t-1}							
	α	*DSent*	*RMKT*	*RMKT*Sent*	*SMB*	*HML*	*UMD*	Adj. R^2
Panel B-1: With Sentiment								
*SUR*1(Big Neg.)	1.795	-3.036*						0.024
	(1.652)	(-1.750)						
SUR2	2.887**	-4.707**						0.044
	(2.295)	(-2.265)						
*SUR*3	2.696**	-3.713**						0.040
	(2.547)	(-2.301)						
*SUR*4(Big Pos.)	4.245***	-4.869**						0.048
	(3.117)	(-2.457)						
*SUR*4-*SUR*1	2.475**	-1.834						0.015
	(2.509)	(-1.294)						
Panel B-2: CAPM with Sentiment								
*SUR*1(Big Neg.)	1.478	-2.575	0.148					0.043
	(1.376)	(-1.507)	(1.538)					
SUR2	3.029**	-4.917**	-0.067					0.047
	(2.472)	(-2.445)	(-0.604)					
*SUR*3	2.444**	-3.341**	0.119					0.054
	(2.424)	(-2.179)	(1.336)					
*SUR*4(Big Pos.)	4.001***	-4.508**	0.116					0.057
	(3.014)	(-2.360)	(0.942)					
*SUR*4-*SUR*1	2.547**	-1.940	-0.034					0.016
	(2.599)	(-1.405)	(-0.384)					
Panel B-3: CCAPM with Sentiment								
*SUR*1(Big Neg.)	1.365	-2.495	0.226*	-0.192				0.047
	(1.271)	(-1.456)	(1.729)	(-0.952)				
SUR2	2.869**	-4.805**	0.043	-0.271				0.055
	(2.365)	(-2.373)	(0.243)	(-0.906)				
*SUR*3	2.352**	-3.277**	0.183	-0.155				0.058
	(2.362)	(-2.127)	(1.407)	(-0.684)				
*SUR*4(Big Pos.)	3.773***	-4.348**	0.273	-0.386				0.072
	(2.841)	(-2.264)	(1.432)	(-1.331)				
*SUR*4-*SUR*1	2.432**	-1.859	0.045	-0.194				0.025
	(2.468)	(-1.334)	(0.301)	(-0.846)				
Panel B-4: Fama-French with Sentiment								
*SUR*1(Big Neg.)	1.341	-2.497	0.223	-0.199	0.037	0.018		0.048
	(1.203)	(-1.375)	(1.646)	(-0.966)	(0.227)	(0.138)		
SUR2	2.758**	-4.392**	0.076	-0.209	0.049	-0.191		0.073
	(2.263)	(-2.185)	(0.414)	(-0.724)	(0.223)	(-1.495)		
*SUR*3	2.221**	-2.840*	0.216	-0.094	0.073	-0.192		0.085
	(2.193)	(-1.780)	(1.645)	(-0.433)	(0.519)	(-1.574)		
*SUR*4(Big Pos.)	3.674***	-3.939**	0.307	-0.322	0.029	-0.197		0.091
	(2.728)	(-2.018)	(1.559)	(-1.161)	(0.138)	(-1.269)		
*SUR*4-*SUR*1	2.357**	-1.447	0.082	-0.122	-0.006	-0.215**		0.076
	(2.445)	(-1.093)	(0.540)	(-0.577)	(-0.040)	(-2.006)		
Panel B-5: Cahart with Sentiment								
*SUR*1(Big Neg.)	1.395	-2.266	0.085	-0.011	0.075	0.013	-0.070	0.061
	(1.245)	(-1.242)	(0.802)	(-1.386)	(0.387)	(0.101)	(-0.430)	
SUR2	2.666**	-4.117**	-0.024	-0.018	0.222	-0.175	0.244	0.108
	(2.161)	(-2.052)	(-0.201)	(-1.515)	(0.892)	(-1.337)	(1.363)	
*SUR*3	2.218**	-2.646	0.160	-0.007	0.121	-0.207*	-0.007	0.100
	(2.133)	(-1.645)	(1.625)	(-0.701)	(0.776)	(-1.673)	(-0.047)	
*SUR*4(Big Pos.)	3.619***	-3.679*	0.153	-0.013	-0.022	-0.220	-0.043	0.112
	(2.690)	(-1.877)	(1.149)	(-1.059)	(-0.108)	(-1.454)	(-0.247)	
*SUR*4-*SUR*1	2.248**	-1.416	0.065	-0.002	-0.095	-0.233**	0.027	0.090
	(2.388)	(-1.064)	(0.681)	(-0.235)	(-0.795)	(-2.214)	(0.247)	

Second, D'Avolio (2002) suggested that the demand for short-sales increases with the extent of discrepancy of opinions across investors. Consequently, we used earnings forecast dispersion as a second proxy measure for short-sale constraints. To estimate this proxy, at the end of each month $t - 1$, we divided the standard deviation of earnings forecasts for the current fiscal year by the absolute value of the mean forecast (Antoniou et al., 2013).

Because of the limited number of observations, we reduced the partition of SUR_t portfolios from four to three subgroups with common breakpoints of 30%, 40%, and 30%, resultant subgroups of SUR1, SUR2, and SUR3. In addition, the sample period for the dispersion of earnings forecasts is shorter and began in 2007. We used each of the two measures to construct three-tiered portfolios sequentially from the two-tiered portfolios previously mentioned.

The results for SUR1 in Panel A-5 of Table 6 show that stocks with two periods of conflicting bad revenue news yield more negative future returns in optimism than in pessimism for both high and low occupied quota portfolios. More importantly, the sentiment-driven differential returns are higher for high-occupied quota portfolios than low-occupied quota portfolios with an incremental return of −1.448% (*t*-stat. of -1.986), consistent with prior US evidence of the role of short-sale constraints in hindering arbitrage activities. On the other hand, the incremental return for dispersion of earnings forecast is in a weak wrong direction. However, findings of occupied quotas are more plausible than those of dispersion of earnings forecast because the former is a direct measure of short-sale constraints whereas the latter is an indirect one.

Turning to stocks with announcements of two periods of good revenue news, Hypothesis 4 marginally holds for stocks with high-occupied quotas (i.e., the sentiment-based return difference is −3.481% with a *t*-stat. of −1.839, see SUR3 in Panel B-5) but not for low-occupied quota stocks. Consequently, the performance differential between stocks with different levels of occupied quotas is significant. The possible explanation for the significant difference lies in the fact that, in pessimism, stocks with higher occupied quotas generate a stronger positive return after good revenue news, with the incremental returns of 0.93% (see SUR3 in Panel B-4).

Table 6 Short-Sale Constraint Tests

This table reports portfolio returns controlled for variables relative to short-sale constraints. At the end of each month t, standardized unexpected revenue surprise (*SUR*) is computed based on equation (1). Stocks are partitioned into three portfolios indicating poor (*SUR*1), medium (*SUR*2), and good (*SUR*3) revenue surprises, with breakpoints of 30%, 40%, and 30%. Within each SUR_t portfolio, component stocks are further categorized into negative and positive SUR_{t-1} portfolios, which consist of the half of component stocks in the SUR_t portfolios with relatively low and high revenue surprises, respectively, at month t–1. Within each two-tier portfolios, we partition stocks in terms of occupied lending quotas and earnings forecast dispersion. All portfolios are computed at the end of month t–1. The sample is composed of qualifying common stocks on TWSE from January 1998 to July 2012, with the exception of beginning in 2007 for earnings forecast dispersion. Return in percentage is the average of time-series of value-weighted portfolio monthly returns with holding period of one month. We partition sample months into optimistic, neutral, and pessimistic periods based on sentiment measures of prior three months. The t-statistics for portfolio returns following optimistic, neutral, and pessimistic periods are computed by regressing all portfolio returns on three dummy variables with no intercept, each of the dummy thereby denoting one sentiment state. As for the differential returns between the optimistic and pessimistic states, we obtain t-statistics via regressing returns of portfolios on three dummy variables (without intercept) denoting non-neutral, neutral, and optimistic states. The regression coefficient for the dummy variable of optimistic state is the incremental returns for optimistic periods over pessimistic periods. Data in parentheses are Newey-West t values with correction for heteroskedasticity and autocorrelation.

SUR_t	Panel A: Negative SUR_{t-1}					
	Occupied Lending Quotas$_{t-1}$			Earnings Forecast Dispersion$_{t-1}$		
	Low	High	High - Low	Low	High	High - Low
Panel A-1: All Periods						
*SUR*1	0.327	-0.882	-1.208	0.523	-1.789	-2.312
	(0.704)	(-1.515)	(-3.306)	(0.499)	(-2.066)	(-2.945)
*SUR*2	0.638	-0.011	-0.649	-0.136	-0.152	-0.016
	(0.880)	(-0.006)	(-0.897)	(-0.120)	(-0.147)	(-0.018)
*SUR*3	1.472	1.173	-0.299	1.405	0.298	-1.107
	(2.099)	(1.332)	(-0.523)	(1.027)	(0.317)	(-1.075)
*SUR*3-*SUR*1	1.146	2.055	0.909	0.882	2.087	1.205
	(2.199)	(4.627)	(1.881)	(0.581)	(3.195)	(0.722)
Panel A-2: Optimistic Periods						
*SUR*1	-0.981	-3.156	-2.175	-1.122	-3.616	-2.494
	(-1.115)	(-3.214)	(-3.066)	(-0.661)	(-2.462)	(-2.581)
*SUR*2	-0.686	-1.489	-0.803	-1.228	-0.962	0.265
	(-0.877)	(-1.288)	(-0.929)	(-0.744)	(-1.044)	(0.201)
*SUR*3	0.549	-0.105	-0.654	-0.269	-1.509	-1.240
	(0.539)	(-0.079)	(-0.590)	(-0.192)	(-1.440)	(-0.763)
*SUR*3-*SUR*1	1.531	3.051	1.521	0.853	2.107	1.254
	(1.558)	(4.825)	(1.306)	(0.393)	(1.696)	(0.519)
Panel A-3: Neutral Periods						
*SUR*1	0.852	-0.147	-0.999	1.280	-0.009	-1.288
	(1.107)	(-0.154)	(-1.658)	(0.990)	(-0.005)	(-1.143)
*SUR*2	0.517	-0.260	-0.776	-2.282	0.304	2.586
	(0.365)	(-0.254)	(-0.645)	(-1.000)	(0.134)	(2.766)
*SUR*3	1.701	1.600	-0.101	0.743	0.771	0.027
	(1.279)	(1.249)	(-0.110)	(0.343)	(0.415)	(0.014)
*SUR*3-*SUR*1	0.849	1.747	0.898	-0.537	0.779	1.316
	(1.014)	(1.820)	(0.896)	(-0.263)	(0.379)	(0.488)
Panel A-4: Pessimistic Periods						
*SUR*1	1.509	0.782	-0.727	2.365	-0.464	-2.829
	(1.599)	(0.604)	(-0.713)	(1.314)	(-0.267)	(-2.238)
*SUR*2	2.210	1.896	-0.314	3.113	0.895	-2.218
	(2.276)	(1.306)	(-0.312)	(2.086)	(0.385)	(-1.319)
*SUR*3	2.247	2.092	-0.154	4.373	2.595	-1.779
	(1.725)	(1.862)	(-0.122)	(1.841)	(1.313)	(-1.689)
*SUR*3-*SUR*1	0.738	1.311	0.573	2.009	3.059	1.050
	(0.845)	(2.079)	(0.491)	(1.797)	(2.916)	(0.934)
Panel A-5: Opt. - Pes.						
*SUR*1	-2.490	-3.938	-1.448	-3.487	-3.152	0.335
	(-2.056)	(-2.772)	(-1.986)	(-1.652)	(-1.394)	(0.196)
*SUR*2	-2.896	-3.386	-0.490	-4.341	-1.858	2.483
	(-2.911)	(-2.013)	(-0.384)	(-1.874)	(-0.723)	(1.276)
*SUR*3	-1.697	-2.197	-0.500	-4.642	-4.104	0.539
	(-1.066)	(-1.689)	(-0.280)	(-2.116)	(-2.170)	(0.241)
*SUR*3-*SUR*1	0.793	1.741	0.948	-1.155	-0.952	0.204
	(0.537)	(2.297)	(0.577)	(-0.580)	(-0.605)	(0.080)

SUR_t	Panel B: Positive SUR_{t-1}					
	Occupied Lending Quotas$_{t-1}$			Earnings Forecast Dispersion$_{t-1}$		
	Low	High	High - Low	Low	High	High - Low
Panel B-1: All Periods						
*SUR*1	0.205	-0.619	-0.823	0.633	-0.936	-1.569
	(0.507)	(-0.837)	(-1.801)	(0.794)	(-0.957)	(-2.021)
*SUR*2	1.350	0.114	-1.236	0.196	-0.306	-0.503
	(2.195)	(0.156)	(-2.017)	(0.194)	(-0.303)	(-0.467)
*SUR*3	1.651	1.560	-0.091	1.146	1.117	-0.029
	(2.529)	(1.825)	(-0.223)	(0.825)	(0.735)	(-0.035)
*SUR*3-*SUR*1	1.446	2.179	0.732	0.513	2.053	1.540
	(2.945)	(4.558)	(1.427)	(0.472)	(1.778)	(1.861)
Panel B-2: Optimistic Periods						
*SUR*1	-0.074	-1.528	-1.455	-0.619	-1.763	-1.145
	(-0.078)	(-1.567)	(-1.836)	(-0.441)	(-1.215)	(-1.019)
*SUR*2	-0.698	-1.278	-0.579	-0.069	-0.650	-0.581
	(-0.743)	(-1.053)	(-0.616)	(-0.047)	(-0.469)	(-0.757)
*SUR*3	1.029	-0.054	-1.083	0.513	0.777	0.264
	(0.941)	(-0.040)	(-1.871)	(0.310)	(0.539)	(0.254)
*SUR*3-*SUR*1	1.102	1.475	0.372	1.132	2.540	1.408
	(1.243)	(2.295)	(0.451)	(0.899)	(2.264)	(1.109)
Panel B-3: Neutral Periods						
*SUR*1	0.366	0.054	-0.312	4.999	0.679	-4.320
	(0.439)	(0.058)	(-0.386)	(1.407)	(0.231)	(-2.367)
*SUR*2	1.085	0.030	-1.055	3.529	0.779	-2.750
	(0.897)	(0.027)	(-0.904)	(2.625)	(0.342)	(-1.116)
*SUR*3	1.491	1.508	0.018	2.339	2.204	-0.136
	(2.002)	(1.869)	(0.034)	(1.339)	(1.075)	(-0.125)
*SUR*3-*SUR*1	1.124	1.454	0.330	-2.660	1.525	4.184
	(1.577)	(1.664)	(0.324)	(-1.242)	(1.044)	(2.383)
Panel B-4: Pessimistic Periods						
*SUR*1	0.499	-0.328	-0.826	-0.292	-0.275	0.017
	(0.583)	(-0.220)	(-0.740)	(-1.592)	(-0.255)	(0.018)
*SUR*2	3.706	1.775	-1.932	-1.837	-0.469	1.367
	(2.700)	(1.210)	(-1.805)	(-1.046)	(-0.298)	(0.606)
*SUR*3	2.497	3.427	0.930	1.691	0.965	-0.726
	(1.965)	(1.952)	(1.357)	(0.529)	(0.259)	(-0.394)
*SUR*3-*SUR*1	1.999	3.755	1.756	1.984	1.240	-0.743
	(2.306)	(2.887)	(1.419)	(0.618)	(0.335)	(-0.336)
Panel B-5: Opt. - Pes.						
*SUR*1	-0.572	-1.201	-0.629	-0.326	-1.488	-1.162
	(-0.411)	(-0.645)	(-0.402)	(-0.226)	(-0.862)	(-0.753)
*SUR*2	-4.405	-3.052	1.352	1.768	-0.180	-1.948
	(-2.944)	(-1.628)	(0.895)	(0.831)	(-0.087)	(-0.820)
*SUR*3	-1.469	-3.481	-2.012	-1.178	-0.188	0.990
	(-1.013)	(-1.839)	(-2.664)	(-0.391)	(-0.061)	(0.519)
*SUR*3-*SUR*1	-0.896	-2.280	-1.384	-0.852	1.300	2.151
	(-0.740)	(-1.528)	(-0.899)	(-0.259)	(0.367)	(0.765)

Recall that occupied lending quotas are estimated at the end of month $t-1$, i.e., prior to the revenue announcement in month t. Therefore, when the arrival of contrary good revenue news in month t in pessimism, stocks with high-occupied quotas encounter stronger purchasing force, owing to stronger demands from closing larger volumes of short positions than stocks with low-occupied quotas. Accordingly, the resultant future positive returns in pessimism are stronger for

stocks with high-occupied quotas than for those with low-occupied quotas.[17] With respect to dispersion of earnings forecasts, the sentiment-driven return difference does not vary in correct direction with the extent of dispersion of earnings forecasts. Again, these results are not plausible because the dispersion is an indirect measure for short-sale constraints.

4.6 Control Variables

Previous research shows that naïve investors are responsible for varieties of psychological biases (Odean, 1999; Bartov et al., 2000). However, some evidence suggests that institutional investors are also prone to behavioral biases (Puetz & Ruenzi, 2011). This section addresses the question of whether sentiment-driven return difference is stronger among stocks with low institutional ownership. As noted by Kumar & Lee (2006), stocks with higher holdings of retail investors are often characterized by small size, low price, and high book-to-market ratio. Accordingly, control variables selected include institutional holdings, stock prices, book-to-market ratios, and firm sizes (the latter two variables are estimated as in Fama & French (1993, 1996)). At the end of each month $t - 1$, we sequentially constructed three-tiered portfolios from two-tiered portfolios with one of the four control variables serving as the third-ranking variable. High institutional holding portfolios pick up stocks in which institutional investors own 50% or more of outstanding shares; therefore, stocks with an institutional ownership of less than 50% constitute low institutional holding portfolios.[18] Each of the other three

[17] Panel B-2 exhibited that, in optimism, high-occupied quota stocks produce lower positive returns after good revenue news than low-occupied quota stocks do, in contrast to the situation in pessimism. The possible interpretation for the differential performance between stocks in optimism may be that investors heavily hold short position in optimism are due to reasons other than speculation. Therefore, high-occupied quota stocks encounter less purchasing pressure from closing short position after good revenue news than low-occupied quota stocks, which may be held by investors who are more inclined to a speculative purpose.

[18] In the Taiwanese stock market, retail investors dominate ownership of many stocks. As a result, we did not select the median value as the breakpoint for institutional holding portfolios to avoid institutional holdings being low (i.e., below 50%) in both high-and low-holding portfolios.

control variables uses the median value to construct low (small) versus high (big) portfolios.

The first row of Panel A-3 in Table 7 shows that the effect of Hypothesis 3 is not different across stocks with different levels of concentration of retail investors. Similarly, an indifferent conclusion holds for Hypothesis 4, as observed by the results tabulated in Panel B-3. Accordingly, the sentiment effect is not confined to retail investors.

4.7 Robustness Check

We also conducted several robustness checks for the sentiment-driven return dynamics of the two-period revenue surprises reported in Table 3. These unreported findings introduce no material changes to the results.[19] First, we bootstrapped standard errors to correct for the limited number of sample months for sentiment states.[20] Second, our previous analysis did not exclude outliers so as to reserve as many firms as possible. In this section, as in Jegadeesh & Livnat (2006b), we dropped 0.5% of the outliers in the bottom/top of holding-period returns in each month. Third, to reserve the maximum number of stocks, we did not follow the practice of some previous researchers in excluding financial stocks for their distinct operation (Jegadeesh & Livnat, 2006a). In the robustness check, we excluded financial firms and duplicated the results. Fourth, Chordia & Shivakumar (2006) found that returns relative to earnings news are significantly associated with future macroeconomic factors. Therefore, we calculated a new residual sentiment by regressing the original investment opportunity index on the macroeconomic factors of not only the concurrent month but also one month ahead (or one quarter ahead) to remove the influence of both the concurrent and future one-period macroeconomic status.

[19] The results of the robustness checks are available on request.
[20] The total number of monthly observations is 139.

Table 7 Control Variable Analysis

This table reports one-month holding period portfolio returns controlled for a variety of variables. At the end of each month *t*, standardized unexpected revenue surprise (*SUR*) is computed based on equation (1). Stocks are partitioned into portfolios with big negative (*SUR*1), small negative (*SUR*2), small positive (*SUR*3), and big positive (*SUR*4) revenue surprises. *SUR*1 (*SUR*3) and *SUR*2 (*SUR*4) portfolios are composed of stocks with negative (positive) revenue surprises. We assign an equal number of stocks into *SUR*1 (*SUR*3) and *SUR*2 (*SUR*4) portfolios. Within each SUR_t portfolio, component stocks are further categorized into negative and positive SUR_{t-1} portfolios, which consist of the half of component stocks in the SURt portfolios with relatively low and high revenue surprises, respectively, at month *t*–1. Within each two-tier portfolios, stocks are discriminated as low (small) or high (big) categories at the end of month *t*–1 in terms of institutional holdings, size, stock price, and book-to-market ratio, where size and book-to-market ratio follows definition in Fama & French (1993, 1996). The sample is composed of qualifying common stocks on TWSE from January 1998 to July 2012. Return in percentage is the average of time-series of value-weighted portfolio monthly returns with holding period of one month. We partition sample months into optimistic, neutral, and pessimistic periods based on residual sentiment of prior three months. The *t*-statistics for portfolio returns following optimistic, neutral, and pessimistic periods are computed by regressing all portfolio returns on three dummy variables with no intercept, each of the dummy denoting one sentiment state. As for the differential returns between the optimistic and pessimistic states, we obtain *t*-statistics by regressing returns of portfolios on three dummy variables (without intercept) denoting non-neutral, neutral, and optimistic states. As such, regression coefficient for the dummy variable of optimistic state is the incremental returns for optimistic periods over pessimistic periods. Data in parentheses are Newey-West *t* values with correction for heteroskedasticity and autocorrelation.

SUR_t	Panel A: Negative SUR_{t-1}											
	Institutional Holdings$_{t-1}$			Size$_{t-1}$			Stock Price$_{t-1}$			BM$_{t-1}$		
	Low	High	L - H	Small	Big	S - B	Low	High	L - H	Low	High	H - L
Panel A-1: Optimistic Periods												
*SUR*1(Big Neg.)	-2.530	-3.097	0.567	-2.997	-2.827	-0.170	-2.373	-3.288	0.915	-3.456	-1.782	1.675
	(-2.287)	(-3.140)	(0.848)	(-2.821)	(-2.715)	(-0.292)	(-1.893)	(-3.282)	(0.905)	(-3.336)	(-1.462)	(1.574)
*SUR*2	-1.304	-1.953	0.649	-1.685	-2.139	0.454	-1.184	-2.222	1.038	-1.988	-1.365	0.623
	(-1.148)	(-1.811)	(0.654)	(-1.393)	(-2.028)	(0.465)	(-0.944)	(-2.109)	(0.989)	(-1.894)	(-1.153)	(0.647)
*SUR*3	-1.278	0.388	-1.667	-1.764	-0.184	-1.580	-0.456	0.261	-0.717	0.461	-0.163	-0.624
	(-1.100)	(0.309)	(-1.589)	(-1.672)	(-0.154)	(-1.578)	(-0.360)	(0.213)	(-0.612)	(0.366)	(-0.146)	(-0.650)
*SUR*4(Big Pos.)	-0.978	0.624	-1.602	-1.376	0.365	-1.740	0.064	0.039	0.025	-0.026	0.750	0.777
	(-0.811)	(0.570)	(-1.788)	(-1.213)	(0.348)	(-1.975)	(0.043)	(0.038)	(0.021)	(-0.025)	(0.519)	(0.714)
*SUR*4-*SUR*1	1.552	3.721	-2.169	1.622	3.192	-1.570	2.437	3.327	-0.890	3.430	2.532	-0.898
	(2.057)	(4.697)	(-1.915)	(3.545)	(3.907)	(-1.726)	(2.356)	(4.264)	(-0.691)	(4.285)	(2.316)	(-0.674)
Panel A-2: Pessimistic Periods												
*SUR*1(Big Neg.)	1.764	1.043	0.722	1.698	1.456	0.242	0.973	1.586	-0.613	1.250	1.197	-0.053
	(1.275)	(0.706)	(0.782)	(1.250)	(1.117)	(0.312)	(0.684)	(1.214)	(-0.764)	(0.873)	(0.731)	(-0.046)
*SUR*2	2.493	2.167	0.326	2.128	2.160	-0.032	2.857	2.138	0.719	2.039	2.906	0.867
	(1.708)	(1.483)	(0.324)	(1.566)	(1.661)	(-0.037)	(1.692)	(1.737)	(0.700)	(1.525)	(1.610)	(0.880)
*SUR*3	1.637	2.234	-0.597	2.818	1.964	0.854	2.247	2.275	-0.028	2.217	1.917	-0.299
	(1.040)	(1.777)	(-0.566)	(2.111)	(1.656)	(0.812)	(1.360)	(1.999)	(-0.026)	(1.832)	(1.080)	(-0.276)
*SUR*4(Big Pos.)	2.950	3.211	-0.261	3.476	3.125	0.351	2.900	3.223	-0.324	3.159	2.494	-0.665
	(1.890)	(1.848)	(-0.198)	(2.540)	(2.136)	(0.301)	(1.571)	(2.120)	(-0.218)	(1.861)	(1.281)	(-0.410)
*SUR*4-*SUR*1	1.186	2.169	-0.983	1.778	1.669	0.109	1.927	1.637	0.290	1.909	1.296	-0.612
	(1.284)	(1.763)	(-0.738)	(1.917)	(1.235)	(0.076)	(1.655)	(1.559)	(0.193)	(1.552)	(1.273)	(-0.358)
Panel A-3: Opt. - Pes.												
*SUR*1(Big Neg.)	-4.295	-4.140	-0.155	-4.695	-4.283	-0.412	-3.346	-4.874	1.528	-4.707	-2.979	1.728
	(-2.424)	(-2.331)	(-0.136)	(-2.723)	(-2.567)	(-0.425)	(-1.765)	(-2.960)	(1.184)	(-2.662)	(-1.459)	(1.101)
*SUR*2	-3.797	-4.120	0.323	-3.813	-4.299	0.485	-4.041	-4.359	0.318	-4.027	-4.271	-0.244
	(-2.053)	(-2.268)	(0.229)	(-2.096)	(-2.568)	(0.372)	(-1.921)	(-2.691)	(0.217)	(-2.370)	(-1.978)	(-0.177)
*SUR*3	-2.915	-1.846	-1.069	-4.582	-2.148	-2.434	-2.704	-2.014	-0.689	-1.756	-2.081	-0.324
	(-1.490)	(-1.038)	(-0.719)	(-2.693)	(-1.278)	(-1.676)	(-1.298)	(-1.205)	(-0.433)	(-1.006)	(-0.991)	(-0.224)
*SUR*4(Big Pos.)	-3.928	-2.587	-1.341	-4.851	-2.760	-2.091	-2.836	-3.184	0.349	-3.185	-1.743	1.442
	(-1.992)	(-1.259)	(-0.841)	(-2.729)	(-1.533)	(-1.431)	(-1.196)	(-1.738)	(0.184)	(-1.596)	(-0.719)	(0.738)
*SUR*4-*SUR*1	0.367	1.553	-1.186	-0.156	1.522	-1.679	0.510	1.690	-1.180	1.521	1.236	-0.286
	(0.307)	(1.061)	(-0.678)	(-0.151)	(0.964)	(-0.991)	(0.327)	(1.291)	(-0.597)	(1.037)	(0.827)	(-0.132)

SUR_t	Panel B: Positive SUR_{t-1}											
	Institutional Holdings$_{t-1}$			Size$_{t-1}$			Stock Price$_{t-1}$			BM$_{t-1}$		
	Low	High	L - H	Small	Big	S - B	Low	High	L - H	Low	High	H - L
Panel B-1: Optimistic Periods												
*SUR*1(Big Neg.)	-0.401	-0.800	0.400	-0.317	-1.182	0.866	0.462	-1.124	1.587	-1.071	0.159	1.230
	(-0.286)	(-0.713)	(0.349)	(-0.271)	(-1.064)	(0.947)	(0.380)	(-0.998)	(1.726)	(-0.914)	(0.139)	(1.331)
*SUR*2	-0.415	-0.627	0.212	-0.021	-1.040	1.018	-0.042	-0.866	0.824	-0.774	0.323	1.097
	(-0.318)	(-0.463)	(0.222)	(-0.016)	(-0.791)	(0.954)	(-0.033)	(-0.608)	(0.723)	(-0.529)	(0.264)	(0.923)
*SUR*3	-1.123	-0.256	-0.868	-0.452	-0.351	-0.101	-0.433	-0.400	-0.033	-0.440	-0.179	0.261
	(-0.995)	(-0.256)	(-1.507)	(-0.404)	(-0.360)	(-0.152)	(-0.405)	(-0.410)	(-0.052)	(-0.445)	(-0.159)	(0.357)
*SUR*4(Big Pos.)	0.383	0.648	-0.266	0.053	0.603	-0.550	0.684	0.333	0.351	0.213	1.291	1.078
	(0.353)	(0.583)	(-0.335)	(0.048)	(0.586)	(-0.860)	(0.592)	(0.322)	(0.460)	(0.197)	(1.141)	(1.287)
*SUR*4-*SUR*1	0.783	1.449	-0.665	0.369	1.785	-1.416	0.221	1.457	-1.235	1.284	1.132	-0.153
	(0.715)	(1.861)	(-0.480)	(0.682)	(2.506)	(-1.640)	(0.359)	(1.800)	(-1.187)	(1.563)	(1.952)	(-0.169)
Panel B-2: Pessimistic Periods												
*SUR*1(Big Neg.)	1.640	1.006	0.634	2.029	1.161	0.868	2.254	1.001	1.254	1.050	2.045	0.995
	(1.108)	(0.808)	(0.620)	(1.672)	(1.006)	(0.921)	(1.673)	(0.842)	(1.171)	(0.790)	(1.385)	(0.955)
*SUR*2	2.559	1.731	0.828	2.578	2.352	0.170	2.230	2.253	-0.023	1.658	2.789	1.131
	(1.611)	(1.222)	(0.871)	(1.859)	(1.775)	(0.164)	(1.379)	(1.723)	(-0.020)	(1.263)	(1.565)	(1.062)
*SUR*3	2.666	1.732	0.934	3.017	2.034	0.983	1.873	2.167	-0.294	1.664	2.702	1.038
	(1.785)	(1.359)	(1.014)	(2.175)	(1.745)	(1.131)	(1.380)	(1.868)	(-0.331)	(1.300)	(1.891)	(1.067)
*SUR*4(Big Pos.)	3.935	3.826	0.109	4.209	3.560	0.649	3.936	3.684	0.252	3.717	3.024	-0.693
	(2.580)	(2.197)	(0.087)	(3.068)	(2.314)	(0.675)	(2.698)	(2.367)	(0.214)	(2.140)	(2.010)	(-0.502)
*SUR*4-*SUR*1	2.295	2.820	-0.525	2.180	2.399	-0.219	1.682	2.684	-1.002	2.667	0.980	-1.688
	(2.905)	(1.942)	(-0.323)	(3.374)	(1.894)	(-0.166)	(1.830)	(1.960)	(-0.612)	(1.741)	(0.982)	(-0.946)
Panel B-3: Opt. - Pes.												
*SUR*1(Big Neg.)	-2.040	-1.806	-0.234	-2.346	-2.344	-0.002	-1.792	-2.124	0.333	-2.121	-1.886	0.235
	(-1.002)	(-1.077)	(-0.153)	(-1.394)	(-1.463)	(-0.012)	(-0.987)	(-1.298)	(0.236)	(-1.197)	(-1.010)	(0.169)
*SUR*2	-2.974	-2.358	-0.615	-2.599	-3.392	0.848	-2.272	-3.119	0.847	-2.432	-2.467	-0.035
	(-1.447)	(-1.203)	(-0.456)	(-1.340)	(-1.817)	(0.570)	(-1.100)	(-1.612)	(0.529)	(-1.237)	(-1.142)	(-0.022)
*SUR*3	-3.789	-1.988	-1.802	-3.470	-2.385	-1.084	-2.306	-2.567	0.261	-2.104	-2.881	-0.777
	(-2.024)	(-1.227)	(-1.659)	(-1.947)	(-1.569)	(-0.991)	(-1.334)	(-1.694)	(0.239)	(-1.300)	(-1.584)	(-0.639)
*SUR*4(Big Pos.)	-3.552	-3.177	-0.374	-4.157	-2.958	-1.199	-3.252	-3.351	0.099	-3.504	-1.734	1.770
	(-1.897)	(-1.538)	(-0.252)	(-2.361)	(-1.599)	(-1.038)	(-1.748)	(-1.794)	(0.071)	(-1.712)	(-0.921)	(1.096)
*SUR*4-*SUR*1	-1.512	-1.371	-0.140	-1.811	-0.614	-1.197	-1.460	-1.227	-0.233	-1.383	0.152	1.535
	(-1.120)	(-0.832)	(-0.066)	(-2.148)	(-0.423)	(-0.761)	(-1.320)	(-0.771)	(-0.120)	(-0.796)	(0.132)	(0.768)

5. Conclusions

Contrary to quarterly announcements of sale revenues in the US, revenue news in the Taiwanese stock market is released on a monthly basis. By partitioning sample months into extreme optimism and extreme pessimism (and designating other months as neutral), we found significantly lower future negative returns over *adjustment* periods in optimism than in pessimism for stocks with two consecutive

months of extreme negative revenues. Conversely, the significant return difference does not occur in *event* periods, albeit which are more close (than adjustment periods) to the very momentum when the market receives revenue news. The asymmetry evidence is consistent with predictions of cognitive dissonance theory. The interpretation is that investors stick to their existing optimistic beliefs, shaped by optimism in prior periods, and thereby react sluggishly to the arrival of new, contradictory negative revenue news. Therefore, an initial optimism-driven overpricing occurs in event periods and is followed by a delayed negative correction in subsequent adjustment periods. In contrast, the results are less significant for good revenue news following pessimism, implying a lesser extent of initial underpricing. The less significant underpricing is reminiscent of the argument of Miller (1977) that underpricing is less frequent than overpricing because stockholders show a tendency toward optimism and short-sale constraints hinder the holding of short positions.

Furthermore, a two-period analysis exhibits a larger delayed reaction than a normal one-period analysis in situations of negative revenue surprises during times of optimism. The evidence confirms our expectation that investors are more likely to accept the same-sign signal revealed by two months of news in rows (albeit their conflicting with market sentiment) than the signal revealed by only one month of news adverse to sentiment. In addition, the results are less significant for good revenue news following pessimism, implying a lesser extent of initial underpricing. The less significant underpricing is reminiscent of the argument of Miller (1977) that underpricing is less frequent than overpricing because stockholders show a tendency toward optimism and short-sale constraints hinder the holding of short positions.

Moreover, the sentiment-driven return difference extends approximately three months for the situation of bad revenue news in optimism and six months for the situation of good revenue news in pessimism, confirming the persistence of the delayed reaction predicted by cognitive dissonance theory. The results are robust to the common risk tests, yet they are stronger among stocks with higher extent of short-sale constraints. Moreover, the evidence remains consistent across stocks with various levels of institutional holdings, prices, book-to-market ratios, and

sizes, which the literature suggests may be related to the concentration of retail investors. Therefore, the findings indicate that the effect of sentiment is not restricted to retail investors.

Most sentiment-based anomaly evidence centers on the US stock markets. Therefore, this study contributes to the limited non-US markets research, which still warrants further research.

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About the Author

Hsiao-Peng Fu

Hsiao-Peng Fu is an assistant professor in Department of Finance at Providence University, Taiwan. Her research interests are mainly on behavior finance, market anomalies, and investment strategies. She has presented her research at several international conferences on finance and published on international journals such as Applied Economics Letters.

E-mail: hspefu@pu.edu.tw

Sheng-Hung Chen

Sheng-Hung Chen is an associate professor in Department of Finance and Institute of Financial Management at Nanhua University in Taiwan. His research focus is on bank performance and risk in global banking, behavior finance, and applied health economics. He has presented his research at several international conferences on banking and finance and has published in journals such as Journal of Banking and Finance.

E-mail: shenghong@mail.nhu.edu.tw