

The customer knows best: the investment value of consumer opinions

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1.Introduction

Background

- Consumers can possess information about product quality and value, which can have direct implications for the company's future sales and profitability.
- Yet little evidence exists on the information content of consumer opinions for firms' future cashflows and stock returns.
- Consumer opinions may fail to provide new information beyond what has been incorporated in the stock price for some reasons, but there are several reasons to posit that the aggregated opinions of consumers contain information for the financial markets.

1.Introduction

Background



Fig. 1. Intuit Inc. This figure plots the stock price of Intuit Inc., the maker of tax-preparation software TurboTax, from October 2002 to February 2003. The dates when the firm released TurboTax 2002 on Amazon.com and when the first review for the product appeared on Amazon.com are indicated.

1.Introduction

Questions

- Whether consumer opinions convey value-relevant information to financial markets? Yes
- Whether the return predictability of abnormal customer ratings continues to hold after controlling for firm characteristics ? Yes
- Whether abnormal customer ratings also positively predict revenue surprises and earnings surprises? Yes
- Whether hedge funds make use of the information contained in consumer reviews in their trading decisions ? Yes

1.Introduction

Research contents

- We measure consumer opinions to find abnormal customer ratings are positively associated with future stock
- We use Fama–MacBeth regressions to test the return predictability of abnormal customer ratings by controlling for accounting variables and other known predictors in the cross section of stock returns.
- The return predictability of abnormal customer ratings did not reverse subsequently as consumer opinions contain relevant information about firms' fundamentals,
- Sophisticated investors exploit value-relevant information contained in consumer opinions in their trading decisions.

1.Introduction

Related researches

- Da et.al.(2011b) show that Internet search volume for firms' products can serve as a leading indicator of a firm' s earnings and stock prices.
- Tirunillai and Tellis (2012) examine the lead-lag relation between product reviews and stock market variables but find mixed results.
- Fornell et al. (2016) find that an investment strategy based on customer satisfaction scores delivers an abnormal return of 90 basis points per month.
- Da et al (2011a),Kelley and Tetlock (2013),Chen et al.(2014),and Lee et al.(2015) find evidence that the collective actions of large groups of financial market participants convey information about future stock returns and cash flows

1.Introduction

Contribution

- This study is among the first to test the information content of consumer opinions by distinguishing between an information story and an attention story .
- We construct a comprehensive sample of stocks with customer reviews on Amazon.com, which is much larger than those used by previous studies that examine on line customer reviews.
- We provide suggestive evidence that customer reviews in aggregate provide new information, which can not be inferred from traditional sources such as accounting statements.
- This paper illuminates the sources of the stock return predictability of consumer opinions.

1. Introduction

Framework

Sort sample stocks into tercile portfolios based on abnormal customer rating and compute it's alpha.



Test whether consumer opinions contain relevant information about firms' fundamentals,.



Test whether this information is new information by Fama-MacBeth regressions.



Test whether abnormal customer ratings and cash flow surprise have relationship.



Test whether abnormal customer ratings influent trading decision of sophisticated investors.

2.Data

- Data source: More than 14.5 million reviews are posted on 269,957 products manufactured by the sample firms on Amazon.com.
- Stock return and volume data from CRSP , financial statement data from Standard and Poor's (S&P) Compustat.
- analysts' earnings forecasts from the Institutional Brokers' Estimate System (I/B/E/S).
- period: July 2004 through December 2015.
- Frequencies : monthly
- Sample: 20,562 firm-months. On average , each month has 150 stocks.

2.Data

More details

- Retrieve the list of brands from Amazon.com
- Identify firms that use Amazon.com to sell their products by searching for the term “Amazon” in 10-K filings of all publicly traded firms in the US.
- Products of rivals of the companies identified in the above two approaches.
- remove duplicate reviews posted by the same reviewer account ID on the same day for the same product.

2.Data

Summary statistic

Table 1

Summary statistics on Amazon.com reviews for public firms.

This table reports the summary statistics for the sample of Amazon.com customer reviews for products of public firms from July 2004 through December 2015. To be included in the sample, a firm has to be publicly traded on finance NYSE, AMEX, or Nasdaq, have financial and stock returns data from Compustat and CRSP, and have at least ten customer reviews in a month. I report the number of reviews, products, brands, and public firms for the full sample as well as by Fama and French 12 industries. Firms in the sample come from nine out of 12 Fama and French industries. The industries that do not have firms with Amazon.com reviews are energy, utilities, and financial industries.

	Number of reviews	Number of products	Number of brands	Number of firms
<i>Full sample</i>	14,555,765	269,957	1931	346
<i>By Fama and French 12 industries</i>				
Consumer non-durables	2,583,822	66,008	798	80
Consumer durables	1,886,991	29,444	94	24
Manufacturing	2,036,257	48,719	170	46
Chemicals	1,248,339	29,779	384	21
Business equipment	4,652,443	47,571	176	68
Telecommunication	787,979	14,823	14	11
Shops	518,004	12,764	112	51
Healthcare	385,722	11,368	153	38
Others	456,208	9,481	30	7

2.Data

Abnormal customer rating

- average customer ratings in the prior 12 months as benchmarks for consumers' expectations of product quality and value.
- Then measure abnormal customer ratings as the difference between the average customer rating in a month and that in the prior 12 months.

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2.Data

SURGE (standard unexpected revenue growth estimator)

$$SURGE_{i,q} = \frac{REV_{i,q} - E(REV_{i,q})}{\sigma_{i,q}},$$

- $REV_{i,q}$ is the quarterly revenue per share for firm i in quarter q
- $\sigma_{i,q}$ is the standard deviation of quarterly revenue growth.
- $E(REV_{i,q}) = REV_{i,q-4} + 1/8 \sum_{j=1}^8 (REV_{i,q-j} - REV_{i,q-j-4})$.

2.Data

SUE: (standard unexpected earnings)

- Difference between reported quarterly earnings per share and the median of the most recent EPS forecasts of all analysts issued during the 90-day period prior to the earnings announcement date scaled by the stock price.

2.Data

$\text{NetBuy}_{i,q}^{HF}$: a measure for earnings surprises

$$\text{NetBuy}_{i,q}^{HF} = \frac{\text{ShrOwn}_{i,q}^{HF}}{\text{ShrOut}_{i,q}} - \frac{\text{ShrOwn}_{i,q-1}^{HF}}{\text{ShrOut}_{i,q-1}},$$

- $\text{ShrOwn}_{i,q}^{HF}$, ($\text{ShrOwn}_{i,q-1}^{HF}$) is the number of shares of firm i held by hedge funds in quarter q ($q-1$) and ShrOut_q (ShrOut_{q-1}) is firm i 's number of shares outstanding in quarter q ($q-1$).

2.Data

- Summary statistics of these firm characteristics in sample.

<i>Panel A: Summary statistics</i>						
Variable	N	Mean	Standard Deviation	25th percentile	Median	75th percentile
Customer reviews						
Average customer ratings	20,562	4.096	0.444	3.893	4.167	4.377
Abnormal customer ratings	20,562	0.014	0.309	−0.104	0.024	0.153
# of customer reviews	20,562	700.077	2048.420	33.000	109.000	449.000
Firm-level characteristics						
Market cap (millions of dollars)	20,562	25,723.300	56,088.990	997.479	5,533.220	21,868.000
Book-to-market	20,562	0.418	0.588	0.213	0.358	0.589
Stock return $m-12, m-1$	20,562	0.170	1.034	−0.086	0.123	0.335
Advertising	20,562	0.040	0.053	0.004	0.022	0.054
R&D	20,562	0.009	0.015	0.000	0.000	0.014
Gross profitability	20,562	0.113	0.074	0.070	0.100	0.140
F-score	20,562	5.326	1.892	4.000	5.000	7.000
Dollar volume (millions of dollars)	20,562	3,701.090	11,572.960	117.757	944.920	3,228.530
CV of dollar volume	20,562	0.367	0.240	0.225	0.298	0.425
Book leverage	20,562	0.529	0.254	0.366	0.512	0.659
Asset tangibility	20,562	0.169	0.133	0.080	0.135	0.222
# of analysts	20,562	16.419	13.286	6.000	14.000	24.000
Institutional ownership	20,562	0.627	0.287	0.516	0.689	0.816
Analyst revisions (percent)	9,916	−0.108	2.157	−0.124	0.000	0.104
Cash flow surprises and institutional trades						
Revenue surprise (SURGE)	7,283	0.525	1.742	−0.215	0.292	1.095
Earnings surprise (SUE) (percent)	5,503	0.077	0.632	0.000	0.060	0.197
Net buying by HFs (percent)	7,886	0.009	2.140	−0.616	0.000	0.634
Net buying by non-HFs (percent)	7,886	0.056	4.407	−1.512	0.035	1.644

2.Data

Panel B: Regression of one-month-ahead abnormal customer ratings on firm characteristics

	Dependent variable: One-month-ahead abnormal customer ratings			
	(1)	(2)	(3)	(4)
Advertising		-0.043 (0.40)	-0.037 (0.34)	0.302 (1.36)
R&D		0.023 (0.09)	0.031 (0.11)	0.145 (0.26)
Gross profitability		-0.112 (1.34)	-0.115 (1.37)	-0.035 (0.42)
F-score		0.000 (0.10)	0.000 (0.11)	-0.000 (0.05)
Log(Dollar volume)			0.005 (1.28)	0.009 (0.92)
Log(CV of dollar volume)			0.005 (0.66)	0.018 (1.84)*
Log(Market cap)	0.005 (0.77)	0.005 (0.84)	0.002 (0.23)	0.002 (0.19)
Book-to-market	0.002 (0.26)	0.001 (0.14)	0.001 (0.17)	0.003 (0.14)
Stock return $m-12, m-1$	0.000 (0.05)	0.000 (0.22)	0.000 (0.03)	-0.006 (0.64)
Book leverage	-0.022 (0.85)	-0.016 (0.57)	-0.017 (0.62)	0.008 (0.18)
Asset tangibility	-0.020 (0.22)	-0.013 (0.14)	-0.007 (0.07)	-0.096 (0.69)
Log(1+# of analysts)	-0.011 (1.45)	-0.011 (1.45)	-0.013 (1.51)	-0.021 (1.43)
Institutional ownership	0.016 (1.04)	0.014 (0.93)	0.007 (0.41)	0.025 (0.91)
Net buying by HFs				0.000 (0.16)
Analyst revision				-0.177 (1.02)
Number of observations	19,603	19,554	19,554	9,900
Adjusted R-squared	0.07	0.07	0.07	0.07

3.1 Empirical result

Calendar-time portfolio tests

Table 3

Calendar-time portfolio returns.

This table reports calendar-time portfolio regression results. For each month from July 2004 through December 2015, I sort sample stocks into tercile portfolios based on the abnormal customer rating, defined as the average customer rating in the month minus that in the prior 12 months. I then track the performance of the three portfolios over the following month. I employ two weighting schemes, weighting by the number of reviews and equal weighting across stocks. I use the Fama–French–Carhart four-factor model to adjust returns. The alpha estimates and factor loadings reported below are obtained by regressing monthly portfolio excess returns on the monthly returns from the risk factors. “Long/short” is a spread portfolio that buys the top tercile portfolio and sells the bottom tercile portfolio. Numbers in parentheses are *t*-statistics. Significance at the 10% (*), 5% (**), or 1% level (***) is indicated.

		Market	SMB	HML	UMD
<i>Panel A: Review weighting</i>					
T1 (low abnormal rating)	−0.198% (0.74)	1.124 (15.69)***	0.482 (3.83)***	0.132 (1.11)	−0.308 (4.91)***
T2	−0.014% (0.06)	1.245 (19.90)***	0.246 (2.24)**	0.022 (0.21)	−0.188 (3.43)***
T3 (high abnormal rating)	0.532% (1.98)**	1.051 (14.50)***	0.179 (1.41)	0.165 (1.37)	−0.134 (2.11)**
Long/Short (high - low)	0.730% (2.17)**	−0.073 (0.81)	−0.303 (1.90)*	−0.033 (0.22)	0.174 (2.19)**
<i>Panel B: Equal weighting</i>					
T1 (low abnormal rating)	−0.024% (0.15)	1.006 (22.19)***	0.513 (6.44)***	0.003 (0.04)	−0.239 (6.01)***
T2	0.264% (1.52)	1.081 (23.09)***	0.385 (4.68)***	0.152 (1.96)*	−0.090 (2.19)**
T3 (high abnormal rating)	0.533% (2.52)**	0.956 (16.74)***	0.636 (6.34)***	−0.115 (1.21)	−0.361 (7.20)***
Long/short (high - low)	0.557% (2.66)***	−0.050 (0.88)	0.123 (1.24)	−0.118 (1.26)	−0.121 (2.45)**

3.1 Empirical result

Calendar-time portfolio tests: subsample analyses

	Review weighting	Equal weighting
<i>Panel A: By idiosyncratic volatility</i>		
High idiosyncratic volatility	1.366% (2.12)**	1.030% (2.50)**
Low idiosyncratic volatility	-0.015% (0.05)	0.131% (0.63)
Long/short (high - low)	1.380% (1.81)*	0.899% (1.86)*
<i>Panel B: By analyst coverage</i>		
Low analyst coverage	1.480% (2.38)**	0.734% (2.11)**
High analyst coverage	0.190% (0.53)	0.393% (1.57)
Long/short (low - high)	1.291% (1.73)*	0.341% (0.78)
<i>Panel C: By market capitalization</i>		
Small firms	1.162% (2.42)**	1.181% (2.75)***
Large firms	0.597% (2.11)**	0.412% (1.72)*
Long/short (small - large)	0.565% (0.97)	0.768% (1.52)

3.1 Empirical result

The robustness of the main results

Table 5

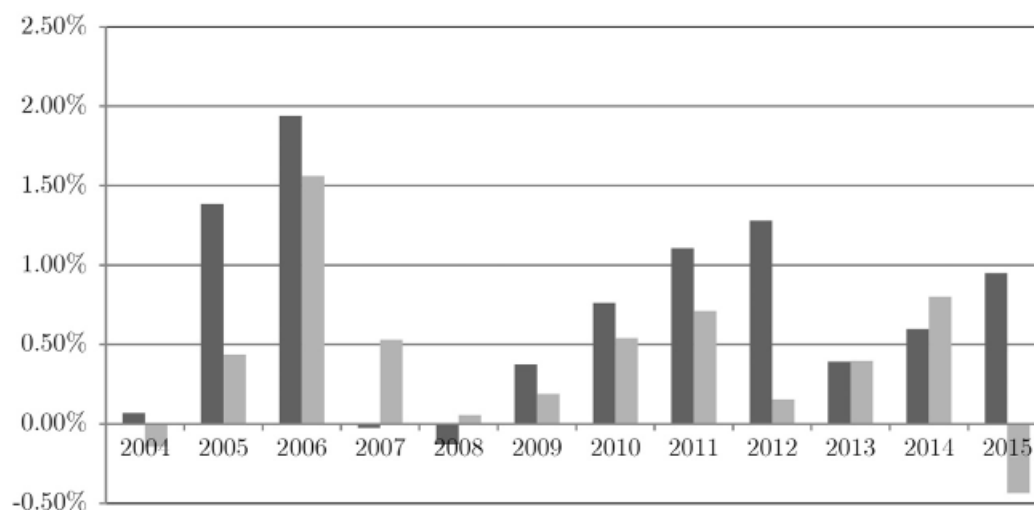
Robustness checks.

This table reports robustness checks of calendar-time portfolio tests. Panel A uses alternative risk benchmarks to adjust returns: the Fama and French (1993) three-factor model, the Fama and French (2015) five-factor model, a liquidity-augmented Fama–French–Carhart model, and industry-adjusted stock returns (following Moskowitz and Grinblatt (1999)). Panel B constructs an alternative measure for abnormal ratings using a six-month window to define the benchmark period. For each specification, I report the alphas on a monthly calendar-time spread portfolio that buys the top tercile stocks and sells the bottom tercile stocks in abnormal customer ratings. Numbers in parentheses are *t*-statistics. Significance at the 10% (*), 5% (**), or 1% level (***) is indicated.

	Review weighting	Equal weighting
<i>Panel A: Alternative risk adjustments</i>		
Using the Fama and French three-factor model	0.787% (2.31)**	0.517% (2.43)**
Using the Fama and French five-factor model	0.789% (2.24)**	0.513% (2.32)**
Using a liquidity-augmented Fama–French–Carhart model	0.771% (2.26)**	0.602% (2.85)***
Using industry-adjusted abnormal returns	0.678% (1.98)*	0.476% (2.32)**
<i>Panel B: Alternative measures for abnormal ratings</i>		
Prior six months as benchmark	0.592% (2.01)**	0.573% (2.03)**

3.1 Empirical result

Long-run stock return



Holding period	Review weighting	Equal weighting
Months [2, 4]	0.122% (0.56)	0.143% (0.97)
Months [2, 7]	0.132% (0.74)	0.084% (0.75)
Months [2, 10]	0.093% (0.61)	0.095% (0.91)
Months [2, 13]	0.009% (0.07)	0.110% (1.18)

3.1 Empirical result

Fama-MacBeth regressions

$$\text{ExcessRet}_{i,t+1} = \alpha + \beta_1 \text{AbnRating}_{i,t} + \gamma x_{i,t} + \varepsilon_{i,t}$$

- $\text{ExcessRet}_{i,t+1}$ means excess return: raw return in excess of the one-month T-bill rate, of stock i in month $t+1$
- $\text{AbnRating}_{i,t}$ is the abnormal customer rating of stock i during month t
- $x_{i,t}$ is a vector of common firm characteristics of firm i in month t

3.1 Empirical result

Table 7

Fama–MacBeth regressions.

This table reports the coefficient estimates obtained from Fama–MacBeth regressions of one-month-ahead excess stock returns on abnormal customer ratings and other cross-sectional predictors of stock returns described in Eq. (3). For each specification in each month, I run a cross-sectional regression with the monthly excess return (in percent) as the dependent variable. I report the time series averages of the cross-sectional regression coefficients. All variables are defined in Table 2. Numbers in parentheses are Fama–MacBeth *t*-statistics calculated using Newey–West standard errors with four lags. Significance at the 10% (*), 5% (**), or 1% level (***) is indicated.

	Dependent variable: One-month-ahead excess stock returns (percent)					
	(1)	(2)	(3)	(4)	(5)	(6)
Abnormal customer ratings	1.718 (2.44)**	1.681 (2.34)**	1.525 (2.27)**	1.426 (2.23)**	1.580 (2.18)**	1.323 (2.08)**
Gross profitability			4.125 (2.22)**	3.360 (1.65)		3.295 (1.57)
F-score			0.396 (5.02)***	0.412 (4.65)***		0.391 (4.26)***
Advertising				1.122 (0.31)		0.456 (0.13)
R&D				−3.672 (0.37)		−3.882 (0.43)
Log(Dollar volume)					−0.204 (2.06)**	−0.175 (1.70)*
Log(CV of dollar volume)					−0.868 (2.76)***	−0.747 (2.40)**
Log(Market cap)		−0.056 (0.49)	−0.087 (0.78)	−0.115 (1.01)	0.054 (0.44)	−0.017 (0.13)
Book-to-market		0.342 (0.69)	0.829 (1.53)	0.644 (1.08)	0.309 (0.61)	0.561 (0.88)
Stock return $m-12, m-1$		0.035 (0.05)	−0.331 (0.47)	−0.297 (0.40)	0.303 (0.42)	−0.061 (0.08)
Number of observations	20,562	20,562	20,562	20,562	20,562	20,562
Average <i>R</i> -squared	0.01	0.07	0.10	0.13	0.11	0.17

3.2 Empirical result

- Abnormal customer ratings and cash flow surprises

$$\begin{aligned} & \text{SURPRISE}_{i,q} \\ &= \alpha + \tau_q + \beta_1 \text{AbnRating}_{i,t} + \beta_2 \text{AbnRating}_{i,t-1} + \gamma x_{i,q-1} + \varepsilon_{i,q} \end{aligned}$$

3.2 Empirical result

Abnormal customer ratings and revenue surprises.

	Dependent variable: Revenue surprise (SURGE)				
	(1)	(2)	(3)	(4)	(5)
Abnormal customer ratings	0.443 (2.16)**	0.440 (2.26)**	0.340 (2.17)**	0.359 (2.16)**	0.360 (2.25)**
Lagged dependent variable			1.248 (26.63)***		
Log(Market cap)		-0.020 (0.50)	-0.026 (1.14)		0.174 (1.45)
Book-to-market		-0.100 (1.23)	-0.027 (0.50)		-0.072 (0.75)
Advertising		-1.873 (2.59)**	0.115 (0.29)		-0.133 (0.07)
R&D		0.479 (0.17)	1.273 (0.75)		-3.817 (1.47)
Gross profitability		0.067 (3.70)***	-0.012 (0.80)		0.016 (0.98)
F-score		0.875 (1.36)	-0.569 (1.47)		2.507 (3.11)***
Log(Dollar volume)		0.084 (3.00)***	0.029 (1.66)*		0.061 (1.00)
Log(CV of dollar volume)		-0.125 (1.39)	-0.076 (1.22)		-0.133 (1.51)
Stock return $_{t-30,t-3}$		0.528 (5.27)***	0.121 (1.92)*		0.404 (4.12)***
Stock return $_{t-365,t-31}$		0.924 (4.02)***	0.677 (3.89)***		0.942 (5.29)***
Time fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	Yes	Yes
Number of observations	7,283	7,283	7,283	7,283	7,283
Adjusted R-squared	0.07	0.12	0.41	0.29	0.31

3.2 Empirical result

Abnormal customer ratings and earnings surprises.

	Dependent variable: Earnings surprise (SUE)				
	(1)	(2)	(3)	(4)	(5)
Abnormal customer ratings	0.077 (2.33)**	0.080 (2.40)**	0.076 (2.26)**	0.074 (2.07)**	0.073 (1.92)*
Lagged dependent variable			0.096 (2.64)***		
Forecast dispersion		-3.087 (0.90)	-3.387 (1.15)		-2.963 (1.26)
Log(Market cap)		-0.033 (1.88)*	-0.031 (1.77)*		-0.078 (1.47)
Book-to-market		0.053 (0.56)	0.039 (0.44)		-0.178 (1.23)
Advertising		-0.163 (0.54)	-0.112 (0.40)		1.370 (2.28)**
R&D		2.558 (2.83)***	2.284 (2.81)***		0.341 (0.16)
Gross profitability		0.009 (1.35)	0.006 (0.90)		0.002 (0.34)
F-score		0.057 (0.25)	-0.036 (0.16)		0.336 (0.80)
Log(Dollar volume)		0.044 (2.30)**	0.041 (2.11)**		0.027 (0.88)
Log(CV of dollar volume)		0.013 (0.48)	0.011 (0.45)		0.034 (1.08)
Stock return $t-30, t-3$		0.193 (3.99)***	0.161 (3.61)***		0.150 (2.57)**
Stock return $t-365, t-31$		0.660 (3.34)***	0.647 (3.32)***		0.632 (3.33)***
Time fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	Yes	Yes
Number of observations	5,503	5,503	5,503	5,503	5,503
Adjusted R-squared	0.02	0.04	0.06	0.11	0.13

3.3 Empirical result

Whether abnormal customer ratings predict hedge fund trades?

$$\begin{aligned} \text{NetBuy}_{i,q} &= \alpha + \beta_1 \text{AbnRating}_{i,q-1} + \beta_2 \text{Ret}_{i,q} + \beta_3 \text{Ret}_{i,q-1} + \beta_4 \text{Ret}_{i,[q-5,q-2]} \\ &+ \gamma x_{i,q-1} + \varepsilon_{i,q} \end{aligned}$$

- $\text{NetBuy}_{i,q}$ is net purchases either by hedge funds or by non-hedge fund institutions in quarter q ;
- $\text{Ret}_{i,q}$ are the stock returns in quarter q , quarter $q-1$, and quarters $q-5$ through $q-2$;

3.3 Empirical result

- I partition hedge funds into two groups based on the median of the trading weight in stocks with Amazon.com reviews. Hedge funds with more trading in stocks that have consumer reviews are specialized hedge funds .Then repeat the regressions for net purchases.

3.3 Empirical result

	Net buying by HFs (1)	Net buying by non-HFs (2)	Net buying by specialized HFs (3)	Net buying by less specialized HFs (4)
Abnormal customer ratings	0.227 (2.39)**	-0.047 (0.29)	0.183 (2.74)***	0.058 (1.07)
Log(Market cap)	-0.017 (0.41)	-0.093 (1.09)	0.036 (0.88)	-0.040 (3.09)***
Book-to-market	0.151 (1.66)	-0.412 (2.46)**	0.114 (2.24)**	-0.008 (0.13)
Advertising	-0.338 (0.55)	-1.850 (1.47)	0.035 (0.08)	-0.332 (0.85)
R&D	-1.469 (0.58)	-13.454 (2.16)**	1.712 (0.96)	-1.296 (0.91)
Gross profitability	0.086 (0.15)	-0.045 (0.04)	-0.241 (0.51)	0.042 (0.15)
F-score	-0.005 (0.30)	0.021 (0.51)	-0.012 (1.25)	0.000 (0.04)
Log(Dollar volume)	0.007 (0.19)	0.058 (0.88)	-0.040 (1.06)	0.032 (2.83)***
Log(CV of dollar volume)	-0.009 (0.10)	-0.035 (0.23)	0.031 (0.58)	-0.053 (1.42)
Stock return _q	0.141 (0.52)	2.687 (4.65)***	-0.135 (0.49)	0.254 (1.26)
Stock return _{q-1}	0.029 (0.10)	-0.023 (0.03)	-0.183 (0.64)	0.011 (0.05)
Stock return _[q-5,q-2]	0.010 (0.09)	0.108 (0.49)	0.049 (0.58)	-0.042 (0.81)
Number of observations	7,886	7,886	7,886	7,886
Average R-squared	0.13	0.12	0.12	0.12

4. Conclusion

- Abnormal customer ratings positively predict subsequent stock returns.
- Fama–MacBeth regressions show that the return predictability of customer ratings continues to hold after controlling for firm characteristics.
- Abnormal customer ratings positively predict revenue and earnings surprises and the return predictability does not reverse in the long run.
- Sophisticated investors exploit the information contained in consumer opinions.
- Aggregated opinions of consumer crowds contain valuable information about cash flows and stock pricing.