International Journal of Economics and Finance; Vol. 11, No. 7; 2019
ISSN 1916-971X E-ISSN 1916-9728
Published by Canadian Center of Science and Education

Investor Sentiment, Innovation Investment and Cash Dividend

Xiaoyang Xu[1], Adubofour Isaac[1], Lizhong Hao[2] & Dandan Wang[1]

[1] School of Finance and Economics, Jiangsu University, Zhenjiang, China

[2] Pamplin School of Business Administration, University of Portland, USA

Correspondence: Adubofour Isaac, School of Finance and Economics, Jiangsu University, Zhenjiang, China. Tel: 86-186-0524-3278. E-mail: adubofourisaac9@gmail.com

Received: May 6, 2019 Accepted: June 3, 2019 Online Published: June 14, 2019

doi:10.5539/ijef.v11n7p97 URL: https://doi.org/10.5539/ijef.v11n7p97

Abstract

Investor sentiment plays a critical role in corporate innovation investment. Firms resort to innovation in their attempts to satisfying the demands of their investors. We argue empirically in our study that investor sentiment has impact on firms' innovation decisions. We also argue that, strong negative sentiment has higher propensity to foster corporate innovation investment. We analyzed a nine- year panel data ranging from 2009-2017, which consisted of 3,558 Chinese listed firms. A verification of the impact of dividend policy on firms' innovation investment was conducted. We found that, favorable dividend policy would trigger corporate innovation investment. We also found a statistically significant relationship between innovation investment and firm performance. Our findings showed a positive association between corporate innovation investment and firm performance. We also conducted a series of robustness checks on our empirical models and then discussed the contribution of our study, theoretically and practically.

Keywords: corporate innovation investment, dividend policy, firm performance, investor optimism, investor sentiment, panel data

1. Introduction

The perception of investors towards an organization is crucial to its success, firms therefore would plan their investment policies carefully so as to maximize the utility of investors by resorting to innovation. Notwithstanding the quest of firms to innovate in order to increase investors' optimism, the returns of these innovative firms still remain uncertain. Innovative investments tend to be costly due to the high level of uncertainty attached to its outcomes (Hall & Lerner, 2010). The intangibility of these innovative outcomes also makes it difficult to access funding for the implementation of innovative ideas. Knight (1921) argued that, innovation consists of a limited knowledge of the probability distributions relevant for the innovation process, investors must decide in this situation whether to invest in a venture that is characterized with uncertainty of success or not. This state of uncertainty by firms is what is described as the "Knightian uncertainty". Innovative firms would still need harmony in operation in order to succeed despite the uncertainty in their outcomes, harmonious relationship among innovative firms triggers innovation waves (Avison et al., 2004). Misalignments in the operations of innovative firms will result in a waste of innovative ideas (Amid et al., 2012). Effective usage of IT by innovative firms has the tendency to increase business performance (Bergeron et al., 2004). IT mutuality and the commitment of CEO's significantly influence the fusion of business and IT strategies (Wu et al., 2015).

The concept of innovation was first proposed by Schumpeter. He believed innovation has the capacity to combine essential productive factors in a new way through the introduction of new product or new product feature. Innovation is indisputably one of the most significant value drivers in modern corporations and a key source of economic growth (Solow, 1957). Innovation represents the core renewal process in any Organization. Investor sentiment promotes corporate innovation investment (Shiller, 2000; Perez, 2002; and Baker & Wurgler, 2007). Investor sentiment can be either positive or negative.

A principle of corporate finance suggests managers should make decisions that lead to maximizing the wealth of investors (Baker, Gary, Powell, & Theodore, 2002). A research by Brown et al. (1995) suggested that, favorable dividend policy has the propensity to increase investor's optimism, thereby leading to high corporate innovation investment. This means that, dividend policy plays significant role in corporate innovation investment. Black

(1976) stated that, ‘‘the harder we look at the dividend picture, the more it seems like a puzzle, with pieces that just don’t fit together’’. Feldstein and Green (1983) added that, ‘‘the nearly universal policy of paying substantial dividends is the primary puzzle in the economics of corporate finance’’. Miller (1986) also asserted that, the observed preference for cash dividends is one of the ‘‘soft spots in the current body of theory’’.

Regardless of the general corporate finance principle stated above and the series of study which argue in favour of the stated principle, other researchers tend to challenge the role of dividend policy in corporate innovation investment. Miller and Modigliani (1961), hereafter called M&M, provided a compelling and widely accepted argument for dividend irrelevance if some well-defined conditions are met. M&M framed their analysis in the context of a perfect capital market with rational investors. They attributed success in firms’ valuation to the productivity of the firm’s assets but not the designed dividend payment policy. This result is consistent with those of other studies (Black & Scholes, 1974; Miller & Scholes, 1978).

Previous researchers acknowledged the importance of corporate innovation investment on firm performance (Belderbos et al., 2004). Innovation is a key part of firms’ ability to compete with rivals and sustain their competitiveness (Morgan & Berthon, 2008). Corporate innovation investment increases firm efficiency and reduces operational cost (Aw et al., 2008; DiMasi et al., 2003). Innovation investment has the tendency to increase the performance of firms (Berchicci, 2013).

The relevance of innovation to an economy cannot be disputed, hence, a better understanding of the factors that have the propensity to cause innovation investment is necessary. Most early study focused on the effect of sentiment on different variables other than innovation, therefore, by adopting both theoretical and empirical approaches, we aim at ascertaining the relationship between investor sentiment, corporate innovation investment and cash dividend. We also aim at advancing our search to examining the impact of corporate innovation investment on firm performance.

2. Review of Literature

Classical finance theory denies the role of sentiment on corporate innovation investment. Previous studies by Morck et al. (1990) and Blanchard et al. (1993) confirm this assertion. However, recent studies tend to challenge this position and acknowledge the role of sentiment on corporate innovation investment. According to David and Paolo (2017), investor sentiment makes corporate innovation investment a strategic complement, which result in innovation waves. They also indicated that, uncertainty hedging by investors produce strategic complementarity in entrepreneurial behavior, producing innovation waves, specifically, when one entrepreneur has a successful first- stage project, equity valuation, entrepreneur utility, and the intensity of innovation increase for other entrepreneurs.

Tri Vi and Zhaoxia (2016) showed that, market-wide sentiment affects firms’ innovation activities. They as well indicated that, financially constrained firms are more likely to issue equity and invest more in R&D than financially unconstrained firms at high market sentiment. Daniel (2016) found statistically significant relationship between sentiment and innovation ideas.

Bruce (2010) developed a model that analyses the relationship between investor sentiment and corporate innovation investment by incorporating the heterogeneous beliefs of investors and the composition of investors in the market. The model indicated that, corporate innovation investment level will increase with an increase in positive investor sentiment. Thus, investor optimism is significantly and positively associated with the level of innovative firms’ investment.

Upon an analysis of five years of panel data for 886 listed firms and their 6.2 million relevant microblogs, Wenping, Lele, Qiqi, and Lei, (2018) concluded that, public opinions expressed via social media influence firm’s strategic decisions pertaining to innovation investment. They also revealed the U-shaped relationship between a firm’s public-opinion valence and its innovation investment and stated that, strongly negative opinions (the left part of the U shape) are the most likely to cause firms to invest more in innovation, as they seek to improve the undesirable status quo and also increase innovation when they receive praises from investors.

Hui, Huguang, and Junzheng (2017) concluded that, there exist a strong correlation between the change in the degree of feature satisfaction and phone improvement after examining Huawei Mate phones. Xiaohan (2018) examined the role of investment specific technology surprise shocks, news shocks and sentiment shocks separately by employing nowcast data and the forecast error variance decomposition method. Results of the empirical analysis revealed that, the sentiment shock accounts for a substantial portion of fluctuations in output and investment in the short run.

A research by Joel, Subramanian, and Ali (2017) indicated that, investor sentiment explains firm’s diversification

discount in their attempt to build on the framework that diversification discount is related to economic activity. Results of the analysis showed that, investor sentiment favours riskier firms when sentiment is high. Junyan, Jianfeng, and Shen (2017) concluded that, high-risk firms earn significantly higher returns than low-risk firms following low-sentiment periods. Thus, during the periods when market participants are more rational, high returns will lead to increased innovation activities in the firm. Mujtaba, Piyush, and Ferdinand (2018) showed that, investor sentiment can influence firm's advertising expenditure. They found that, during periods of low (high) investor sentiment, firms decrease (increase) their advertising expenditure, even though the effectiveness of advertising is greater (lower) during such periods. Using a sentiment exposure model, Yao, Eric, and Ruiyi (2017) found evidence that, fund managers adjust the market exposure of their portfolios to changes in market sentiment. Tanya, Samuel, and Francisco (2018) stated that, sentiment plays an important role in justifying economic actions and are typically presented as being a modern incarnation of expectations that influence financial markets, whether they be of a Keynesian or other type. Wenzhao (2018) applied three approaches to define investors' neutrality and determined high and low sentiment periods. Wang discovered that, investors' perception is more determined by their normal sentiment state, represented by the all-period average sentiment level, rather than the neutrality value set in sentiment surveys.

Having had a critical observation of the above literature, a knowledge gap is been identified which is worth addressing. It is against this backdrop that we aim at examining the relationship between corporate innovation investment, investor sentiment and cash dividend policy. We are not only helping to bridge the gap in knowledge pertaining to our study but will also contribute to the study of the relationship between corporate innovation investment, investor sentiment and cash dividend.

Our main research interest in our quest to bridging the gap in knowledge is to examine whether a change in investors' sentiment towards firms will cause a corresponding change in the level of innovativeness in firms' operations. Another area of interest, is to ascertain if corporate dividend policy affects innovation investment whilst not being oblivious of the so-called "dividend irrelevance" assertion by previous scholars. We also aim at examining the impact of innovation investment on firm performance. Previous literature focused largely on how sentiment affect other financial variables but as a further contribution to the study of corporate finance and in our attempt to bridging the gap in literature with empirical basis, we aim at examining if investor sentiment affects corporate innovation investment and has the potential to foster higher innovation waves in the corporate environment.

3. Empirical Strategy

A study with much emphasis on the sentiment of investors and corporate innovation investment is necessary in current times as far as the study of corporate finance and behavioral economics are concerned. We therefore aim at examining the relationship between these variables empirically, with the assistance of econometric models. This chapter gives a brief description of the data, description of variables used for the study, presentation of our baseline models as well as its analysis.

3.1 Data

Product or service innovation is crucial to achieving the transformation goal of an economy (Kim & Youm, 2017). In order to empirically ascertain the relationship between corporate innovation investment and investor sentiment, data was collected from different sources. We collected data from the Chinese enterprise annual report as well as the 'ifind' database (a Chinese database). The panel data covers the period of 2009-2017, it also consists of both private and state-owned firms. We collected data on 3,558 Chinese listed firms for the study.

3.2 Description of Variables

3.2.1 Key Variables

Firms' Annual Research and Development Investment ($RDIit$) was used as a proxy for innovation investment. This is a widely used proxy for measuring firms' innovation investment (e.g., Tri & Zhaoxia, 2016; Wenping, Lele, Qiqi, & Lei, 2018). We also measured firms' Annual Growth Rate in Total Asset as a proxy for measuring firm performance, in our attempt to empirically ascertain the relationship between firms' innovation investment and their performance. These two variables are considered as dependent variables and denoted as $RDIit$ and $GWRit$ respectively, firms' cumulative monthly stock returns for the previous year was used as an indicator for measuring investor sentiment (Hua, Liu, & Xu, 2011). This is denoted as $SENT_{it}$. Corporate dividend policy may affect corporate innovation in the long run. Firms with favorable dividend policy may have higher chances to attract investor optimism which will result in corporate innovation investment. Firms' cash dividend per share (DPS) was measured from the Chinese enterprise annual report and it is denoted as (DPS_{it}).

3.2.2 Control Variables

Other relevant variables that have the potential to influence corporate innovation investment are included in the model in order to reduce the threat of endogeneity (Wooldridge, 2010).

Operating Income (OPI_{it}): Innovation has the tendency to increase the income levels of firms. Firms would therefore innovate in order to obtain higher incomes. Incomes help firms to stay in business, for this reason, we controlled for each firm's operating income.

Total Assets (TOA_{it}): Firm's asset base determines its strength in business. Firms with larger asset base tend to tolerate innovation than those with small asset base due to the uncertainty in innovation outcomes.

Return on Assets (ROA_{it}): Firm's Return on Assets is a good measure of its business performance. Firms' with higher return on assets have greater propensity to invest in innovation than those with smaller return on assets. We therefore controlled for firm's return on assets in our model as an explanatory variable.

Number of Employees (NOE_{it}): The number of employees in a firm is used to determine its size. Larger firms may have a higher tendency to invest in innovation than smaller firms due to their size. We therefore included firm size as a control variable in the models.

Asset Liability Ratio (ALR_{it}): The ratio of firm's assets and liabilities is crucial to its level of innovativeness. Firms' with higher levels of asset than liabilities in their operations will have greater financial capacity to invest in innovation. We therefore controlled for firms' Asset Liability Ratio in our models.

Cash Flow (CF_{it}): Firms' revenue and expenditure patterns can affect their innovation investment. Firms' with excess revenue over expenditure have higher chances to invest in innovation. The inflow and outflow of cash is essential element for determining corporate innovation investment decisions. We controlled for Cash Flow in our models.

Shareholder's Equity ($SHEQ_{it}$): The proportion of shareholder's equity in main business income can affect corporate innovation investment. Firms' with higher proportion will increase investor optimism towards the entity, this increased optimism will generate innovation waves which will result in corporate innovation investment. We controlled for this variable in our models.

Earnings Per Share (EPS_{it}): This is a measure of firms' profitability levels. EPS is used to gauge a company's net income allotted to each share of its income. Firms' with high profitability levels will have greater propensity to invest in innovation. We therefore included earning per share as a controlled variable.

Average Rate of Return (ARR_{it}): This refers to returns made on investment. Firms' with high returns on their investments would be more likely to invest in innovation than those with low returns. We included firms' average rate of return as a control variable in the models.

Proportion of Research and Development Cost in main business income (PRD_{it}): This determines whether a company desire to invest in innovation or not. Firm's proportion of research and development cost in main business income can determine its level of innovativeness. We therefore controlled for this variable in our model.

Nature of Firm (NAF_i): The nature of business determines firms' degree of innovation investment. Firms' in high-technology domains such as biotechnology, pharmacology and IT are likely to spend more on innovation than other firms are. Therefore, we constructed a categorical variable, NOF_i, to control for variations in innovation investment across industries.

Year dummy ($YEAR_t$): Finally, investor sentiment can change firm's innovation investment over time. We therefore included year dummy variables in our estimation models.

3.3 Statement of Hypotheses

Hypotheses are deduced based on a retrospective view of previous research related to the study. We examined prior studies and critically analyzed the interplay between Investor sentiment and corporate innovation investment as well as taking cognizance notice of the relationship between corporate innovation investment and cash dividend and also examined the impact of innovation investment on firm performance. Primarily, we aim at ascertaining how investor sentiment affects corporate innovation investment, the effect of innovation investment on firm performance and also attempt to comprehend how corporate cash dividend policy affect their innovation investment.

Main hypothesis:

hypothesis 1: *Investor sentiment has an inverse relationship with corporate innovation investment*: This hypothesis is proposed, upon a retrospection of past research works that suggested a decrease in innovation

investment as investor sentiment increases. Negative stimuli tend to elicit stronger and faster reactions than neutral or positive stimuli (Baumeister et al., 2001). Negative sentiment pushes firms to improve their product or service quality through innovation, thereby influencing their decision on innovation investment (Walther et al., 2012). Negative information tends to influence firm's decision than positive information (Yin et al., 2014). Negative sentiment is found to be more liable to trigger arousal and curiosity and to facilitate information diffusion (Kimmel & Kitchen, 2014). In general, negative sentiment tends to have more constructive information for decision making such as, suggestions regarding product quality, strategy or firm's reputation (Derks et al., 2008; Liu et al., 2010; Yin et al., 2014). Low sentiment leads to increased innovation activities (Junyan, Jianfeng, & Shen, 2017). Strongly negative opinions (the left part of the U shape) are the most likely to cause firms to invest more in innovation, as they seek to improve the undesirable status quo and also increase innovation when they receive praises (Lele, Qiqi, & Lei, 2018). These results are inconsistent with the findings of other studies (Aula, 2010; Malthouse et al., 2013).

Other stated hypotheses:

hypothesis 2: *Corporate cash dividend policy has a positive correlation with innovation investment*: This means that favorable dividend policy would trigger innovation investment.

hypothesis 3: *Innovation investment increases firm performance*: Corporate innovation investment increases firm performance/growth. Innovation investment increases operational efficiency (Di Masi et al., 2003; Aw et al., 2008). Innovation investment reduces firm's operational cost (Aw et al., 2011). Innovation investment gives firms comparative advantage over their competitors (Katila & Ahuja, 2002). These conclusions are not consistent with those of other studies (Kelly & Amburgey, 1991; D'aunno & Sutton, 1992; He et al., 2013).

3.4 Empirical Models

Econometric models were employed in an attempt to analyze the data empirically. Firm's research and development investment expense as well as the annual growth rate in assets are set as dependent variables for the empirical analysis. All variables are transformed using logarithms, due to the variations in firm sizes as well as the industrial categorizations of the sample used for the study. We first examined the impact of Investor Sentiment on Innovation Investment, using firm's Cumulative Monthly Stock Returns and firm's Annual Research and Development Investment as proxies for investor sentiment and corporate innovation investment, respectively. We also examined the impact of innovation investment on firm performance, using firm's annual growth rate in asset as an indicator for measuring firm performance. The empirical models are specified as follows:

$$log(RDI_{it}) = \beta_0 + \beta_1 log(SENT_{It-1}) + \beta_2 log(OPI_{it-1}) + \beta_3 log(TOA_{it-1}) + \beta_4 log(ROA_{it-1}) + \beta_5 log(NOE_{it-1}) + \beta_6 log(ALR_{it-1}) + \beta_7 log(DPS_{it-1}) + \beta_8 log(SHEQ_{it-1}) + \beta_9 log(CF_{it-1}) + \beta_{10} log(EPS_{it-1}) + \beta_{11} log(ARR_{it-1}) + \beta_{12} log(PRD_{it-1}) + \beta_{13} NOF_i + \beta_{14} YEAR_t \quad (1)$$

$$log(GWR_{it}) = \lambda_0 + \lambda_1 RDI_{it-1} + \lambda_2 log(OPI_{it-1}) + \lambda_3 log(TOA_{it-1}) + \lambda_4 log(ROA_{it-1}) + \lambda_5 log(NOE_{it-1}) + \lambda_6 log(ALR_{it-1}) + \lambda_7 log(DPS_{it-1}) + \lambda_8 log(SHEQ_{it-1}) + \lambda_9 log(CF_{it-1}) + \lambda_{10} log(EPS_{it-1}) + \lambda_{11} log(ARR_{it-1}) + \lambda_{12} NOF_i + \lambda_{13} YEAR_t + \xi_{it} \quad (2)$$

Subscripts in the above specifications denote measures across firms (i) and years (t). All independent and controlled variables are lagged by one year in order to mitigate the possibility of reverse causality. An extensive set of control variables are included in the models to cater for possible endogeneity. The descriptive statistics as well as the definition of all studied variables are presented in Tables 1 and 2.

4. Results

Tables 1 and 2 summarize the definition of variables and the descriptive statistics respectively. Table 2 indicates that, Investor Sentiment ($SENT_{it}$) has the highest observation, 32,022 among all the variables used for the study. Data on Average Rate of Return (ARR_{it}) has the lowest observation, 13,008. Table 3 reports the correlation between the studied variables. It indicates that, most of the variables have low bivariate correlations. The highest correlation recorded is between Number of Employees (NOE_{it}) and Total Assets (TOA_{it}), 0.798, indicating a strong positive correlation between the two variables. The table presents the correlation between Cash Flow (CF_{it}) and Asset Liability Ratio (ALR_{it}), -0.438 as the weakest. Most of the bivariate correlations are below the 0.70 threshold.

We performed a regression of innovation investment on sentiment, we also included other relevant variables in the models in order to prevent the problem of endogeneity, as suggested by Wooldridge (2010). The results are

shown in Table 4. We applied both fixed and random effect models in our analysis. The results showed a consistent negative coefficient, indicating negative correlations between sentiment and innovation investment for both fixed and random effect models ($b = -0.105$, $p < 0.01$ in model 1; $b = -0.096$, $p < 0.01$ in model 2). The association between sentiment and innovation investment decreases as sentiment increases. These significant results affirm our hypothesis that, negative sentiment expressed by investors has higher propensity to cause innovation investment, as suggested by other researchers (Yin et al., 2014a; Junyan, Jianfeng, & Shen, 2017; Lele, Qiqi, & Lei, 2018). The said relationship means that, corporate innovation investment is high during periods of low sentiment. The result strongly affirm hypothesis 1 (H1).

Results in Table 4 present a significant positive correlation between corporate dividend policy and innovation investment for both fixed and random effects models, models 1 and 2 respectively ($b = 0.027$, $p < 0.01$ in model 1 and $b = 0.032$, $p<0.01$ in model 2). This result provides evidence that, corporate dividend policy has impact on innovation investment. This supports the second hypothesis, (H2). The results also report a positive coefficient for firm's operating income, indicating that firm's high innovation investment is associated with higher operating income, for both fixed and random effects models. This is also true for the relationship between innovation investment and total assets. It also shows a positive correlation between firm's return on assets and its innovation expenditure for both models, indicating that, high innovation investment corresponds with high returns on assets. It also reports a positive coefficient for firm size (number of employees) in both fixed and random effects models, indicating a positive association between the size of firms and their innovation investments. The table also reports a direct association between firm's innovation investment and asset liability ratio for both fixed and random effect models. It also shows a negative relationship between innovation investment and shareholder's equity for the fixed effect model and a positive association for the random effect model. It reports an inverse relationship between innovation investment and cash flow for both fixed and random effect models. The relationship between earnings per share and innovation investment is reported as negative as well as the relationship between innovation investment and average rate of return. It also reports a positive coefficient for the proportion of research and development cost in operating income, indicating that innovation investment increases when the proportion obtained from the operating income increases. This means that, the proportion of innovation investment cost from firm's operating income is a major contributing factor for corporate innovation investment.

We also examined the relationship between firm performance/growth and innovation investment by regressing firms' annual growth rate in asset on innovation investment. The results are presented in Table 5. The estimation results revealed a positive association between innovation investment and firm growth, indicating an increase in firms' growth rate as they increase innovation investment. This is indicated by a positive coefficient for innovation investment in both fixed and random effect models 3 and 4, respectively ($b = 1.482$, $p < 0.01$ in model 3; $b = 0.510$, $p < 0.01$ in model 4). The significant positive results affirm previous research (Aw et al., 2008; Aw et al., 2011) and others who concluded that firms' enjoy high growth and increased efficiency as they invest more into innovation. This result strongly supports hypothesis 3 (H3).

4.1 Robustness Checks

We generated two samples based on firm size from the dataset in our attempt to assess the robustness of the findings. We sampled the top 20% ($1/5^{th}$ above) and bottom 20% ($1/5^{th}$ below) of firms by size (number of employees). We used these two samples to re-estimate our hypotheses in our attempt to verify the robustness of our findings. The estimation results for the top 20% and bottom 20% are presented in Table 6 and Table 7, respectively. The results from the robustness checks showed that, both negative and positive sentiments can trigger innovation investment, as indicated by some previous researchers. The newly generated sample was also used to assess the relationship between innovation investment and firm performance. The results affirmed a positive association between innovation investment and firm performance. These results are also presented in Tables 8 and 9. Results from the robustness checks confirm the statistical significance of our major variables used for the empirical analysis.

Table 1. Definition of variables

Variable	Description
Innovation Investments (RDI_{it})	The innovation investments of a specific firm i in a financial year t, which is measured by the R&D expenses of firms
Proportion of Innovation Investment(PRD_{it})	The proportion of innovation investment cost in operating income, in a specific firm i in a financial year t.
Stock Returns ($SENT_{it}$)	The cumulative monthly stock returns of firm i in a financial year t.
Operating Income (OPI_{it})	The operating income of a specific firm i in financial year t.
Total Assets (TOA_{it})	The total assets of a specific firm i in financial year t.
Return on Assets (ROA_{it})	The return on assets of a specific firm i in financial year t.
Number of Employees (NOE_{it})	The number of employees in a specific firm i a financial year t.
Firms' Growth Rate (GWR_{it})	The growth rate at a specific firm i in a financial year t.
Asset Liability Ratio (ALR_{it})	This is a ratio of a specific firm i's assets and liabilities in a financial year t.
Cash Flow (CF_{it})	This denotes the inflow and outflow of cash at a specific firm i, in a financial year t.
Shareholder's Equity ($SHEQ_{it}$)	The shareholder's equity at a specific firm i in a financial year t.
Earnings Per Share (EPS_{it})	This represent the earnings per share at a specific firm i in a financial year t.
Dividend per Share (DPS_{it})	The dividend per share at a specific firm i in a financial year t.
Average Rate of Return (ARR_{it})	The average rate of return at a specific firm i in a financial year t.
Nature of Firm (NAF_i)	The industrial nature of a specific firm.
Year dummy (YAR_t)	Year dummy variables.

Table 2. Descriptive statistics. The table below describes the summary statistics for the sample (2009-2017)

Variable	Obs.	Median	Mean	Std. Dev.	Min.	25th %	75th %	Max
RDI_{it} (log transformed)	21,443	17.261	17.282	1.540	6.685	16.438	18.164	28.394
PRD_{it} (log transformed)	21,432	1.224	0.856	1.406	-9.210	0.485	1.617	5.132
$SENT_{it}$ (l0g transformed)	32,022	13.306	13.306	0.026	13.305	13.306	13.306	17.910
OPI_{it} (log transformed)	21,096	2.988	2.857	1.213	-5.240	2.279	3.586	10.512
TOA_{it} (log transformed)	29,527	21.494	21.656	1.623	11.348	20.586	22.514	30.892
ROA_{it} (log transformed)	27,175	2.045	1.977	0.879	-9.210	1.463	2.573	7.696
NOE_{it} (log transformed)	28,588	7.330	7.389	1.385	1.099	6.491	8.214	13.223
GWR_{it} (log transformed)	23,707	2.903	2.847	1.340	-5.521	2.134	3.616	13.065
ALR_{it} (log transformed)	29,526	3.781	3.639	0.659	-1.757	3.311	4.099	9.535
CF_{it} (log transformed)	29,258	2.761	2.716	0.839	-5.150	2.249	3.284	4.605
$SHEQ_{it}$ (log transformed)	24,808	3.527	3.479	0.491	-1.238	3.160	3.849	4.605
DPS_{it} (log transformed)	16,556	-2.303	-2.320	1.044	-7.131	-2.996	-1.609	2.398
EPS_{it} (log transformed)	26,979	-0.907	-1.155	1.183	-8.112	-1.761	-0.342	4.357
ARR_{it} (log transformed)	13,008	1.324	1.110	1.154	-2.709	0.588	1.876	4.737
NOF_i		32,022		Category variable. State and Private- owned firms				
$YEAR_t$		32,022		Category variable (2009-2017, 9 years).				

Table 3. Correlation between variables

Variable	RDI_{it}	$SENT_{it}$	OPI_{it}	TOA_{it}	ROA_{it}	NOE_{it}	GWR_{it}	ALR_{it}	CF_{it}	$SHEQ_{it}$	DPS_{it}	EPS_{it}	ARR_{it}	PRD_{it}
RDI_{it}	1.000													
$SENT_{it}$	-0.095	1.000												
OPI_{it}	0.020	0.074	1.000											
TOA_{it}	0.538	-0.321	-0.015	1.000										
ROA_{it}	0.038	0.048	0.173	-0.074	1.000									
NOE_{it}	0.567	0.048	-0.073	0.798	0.002	1.000								
GWR_{it}	0.004	0.106	0.329	-0.019	0.287	-0.077	1.000							
ALR_{it}	0.241	-0.222	0.020	0.534	-0.239	0.477	0.000	1.000						
CF_{it}	-0.045	0.143	0.041	-0.298	0.161	-0.260	0.154	-0.438	1.000					
$SHEQ_{it}$	0.008	-0.053	-0.066	0.144	0.170	0.136	-0.042	0.061	-0.011	1.000				
DPS_{it}	0.135	-0.029	0.014	0.100	0.573	0.144	0.113	-0.203	0.227	0.151	1.000			
EPS_{it}	0.198	0.019	0.149	0.153	0.751	0.157	0.290	-0.123	0.209	0.112	0.761	1.000		
ARR_{it}	-0.057	0.030	0.031	-0.085	0.016	-0.045	0.017	-0.006	0.014	0.025	-0.008	0.029	1.000	
PRD_{it}	0.491	0.245	0.052	-0.383	0.045	-0.259	0.077	-0.348	0.258	-0.178	-0.012	0.018	0.007	1.000

Table 4. Estimation results for the impact of investor sentiment ($SENT_{It-1}$)

Variable	Fixed-effect Model (1)	Random- effect Model (2)
$SENT_{It-1}$	-0.105*** (0.086)	-0.106*** (0.104)
OPI_{it-1}	0.013*** (0.000)	0.007*** (0.001)
TOA_{it-1}	0.706*** (0.000)	0.707*** (0.000)
ROA_{it-1}	0.151*** (0.000)	0.134*** (0.000)
NOE_{it-1}	0.198*** (0.000)	0.260*** (0.000)
ALR_{it-1}	0.114*** (0.000)	0.153 *** (0.000)
DPS_{it-1}	0.027*** (0.001)	0.032 *** (0.000)
$SHEQ_{it-1}$	-0.030 (0.181)	0.025 (0.132)
CF_{it-1}	-0.063*** (0.000)	-0.035*** (0.000)
EPS_{it-1}	-0.053*** (0.000)	-0.040*** (0.000)
ARR_{it-1}	0.003 (0.266)	-0.002 (0.445)
PRD_{it-1}	0.916*** (0.000)	0.900*** (0.000)
NOF_i	Included in the model as category variable	Included in the model as category variable
$YEAR_t$	Financial year of the variable (2009-2017)	Financial year of the variable (2009-2017)
Cons	0.787*** (0.000)	-0.163 (0.893)
R^2: within	0.922	0.920
R^2: Between	0.880	0.893
R^2: Overall	0.886	0.898

Note. *p < 0.1; **p < 0.05; ***p < 0.01. According to the Hausman test, $\chi^2(12)$ =201.52, p(0.000) < 0.001. Hence, the fixed-effect model best fit our model than the random-effect model. Coefficients of variables are presented whilst probability values are placed in brackets.

Table 5. Estimation results for the impact of innovation investment (RDI_{it-1})

Variable	Fixed-effect Model (3)	Random-effect Model (4)
RDI_{it-1}	1.482*** (0.000)	0.510*** (0.000)
OPI_{it-1}	0.165*** (0.000)	0.232*** (0.000)
TOA_{it-1}	1.787*** (0.000)	0.484*** (0.000)
ROA_{it-1}	0.981*** (0.000)	0.426*** (0.000)
NOE_{it-1}	0.088 (0.191)	-0.0381 (0.152)
ALR_{it-1}	0.371*** (0.000)	0.381 (0.000)
DPS_{it-1}	0.024 (0.543)	-0.153*** (0.000)
$SHEQ_{it-1}$	0.132 (0.270)	-0.049 (0.224)
CF_{it-1}	0.339*** (0.000)	-0.049*** (0.000)
EPS_{it-1}	0.007 (0.901)	0.316*** (0.000)
ARR_{it-1}	0.003 (0.842)	-0.009 (0.000)
NOF_i	Included in the model as category variable	Included in the model as category variable
$YEAR_t$	Financial year of the variable (2009-2017)	Financial year of variable (2009-2017)
Cons	-13.014	-2.282
R^2: within	0.288	0.211
R^2: Between	0.103	0.279
R^2: Overall	0.124	0.239

Note. *p < 0.1; **p < 0.05; ***p < 0.01. According to the Hausman test, $\chi^2(12)$ = 454.13, p(0.000) < 0.001. Hence, the fixed-effect model best fit our model than the random-effect model. Coefficients of variables are presented whilst probability values are placed in brackets.

Table 6. Estimation results of the impact of sentiment for top one-fifth largest firms

Variable	Fixed-effect Model (5)	Random-effect Model (6)
$SENT_{It-1}$	20.785***(0.452)	-15.754***(0.516)
OPI_{it-1}	0.011 (0.043)	0.010 (0.068)
TOA_{it-1}	0.781***(0.000)	0.758***(0.000)
ROA_{it-1}	0.146***(0.000)	0.127***(0.000)
NOE_{it-1}	0.173***(0.000)	0.235***(0.000)
ALR_{it-1}	0.079***(0.026)	0.126***(0.000)
DPS_{it-1}	0.015 (0.248)	0.018 (0.806)
$SHEQ_{it-1}$	0.004 (0.913)	0.075***(0.009)
CF_{it-1}	-0.074***(0.000)	-0.052***(0.000)
EPS_{it-1}	-0.006 (0.694)	0.003 (0.843)
ARR_{it-1}	-0.002 (0.659)	-0.002 (0.721)
PRD_{it-1}	0.957***(0.000)	0.961***(0.000)

NOF_i	Included in the model as category variable	Included in the model as category variable
$YEAR_t$	Financial year of the variable (2009-2017)	Financial year of the variable (2009-2017)
Cons	-278.436***(0.449)	207.245***(0.521)
R^2: within	0.947	0.946
R^2: Between	0.891	0.898
R^2: Overall	0.905	0.910

Note. *p < 0.1; **p < 0.05; ***p < 0.01. According to the Hausman test, $\chi^2(12) = 70.82$, p(0.000) < 0.001. Hence, the fixed-effect model best fit our model than the random-effect model. Coefficients of variables are presented whilst probability values are placed in brackets.

Table 7. Estimation results of the impact of sentiment ($SENT_{It-1}$) for the bottom one-fifth (20%) smallest firms

Variable	Fixed-effect Model	Random-effect Model
$SENT_{It-1}$	28.304*** (0.364)	6.385*** (0.810)
OPI_{it-1}	0.049*** (0.000)	0.040*** (0.000)
TOA_{it-1}	0.447*** (0.000)	0.558*** (0.000)
ROA_{it-1}	0.0718*** (0.001)	0.099*** (0.000)
NOE_{it-1}	0.209***(0.003)	0.168*** (0.001)
ALR_{it-1}	0.057*** (0.044)	0.113*** (0.000)
DPS_{it-1}	-0.060***(0.026)	-0.018 (0.420)
$SHEQ_{it-1}$	0.029 (0.683)	0.137*** (0.003)
CF_{it-1}	-0.119***(0.000)	-0.073*** (0.000)
EPS_{it-1}	0.016 (0.900)	-0.047 (0.843)
ARR_{it-1}	0.001 (0.982)	-0.002 (0.721)
PRD_{it-1}	0.822*** (0.000)	0.823*** (0.000)
NOF_i	Included in the model as category variable	Included in the model as category variable
$YEAR_t$	Financial year of the variable (2009-2017)	Financial year of the variable (2009-2017)
Cons	-371.830 *** (0.370)	-82.973*** (0.814)
R^2: within	0.787	0.777
R^2: Between	0.785	0.813
R^2: Overall	0.776	0.800

Note. *p < 0.1; **p < 0.05; ***p < 0.01. According to the Hausman test, $\chi^2(12) = 58.83$, p(0.000) < 0.001. Hence, the fixed-effect model best fit our model than the random-effect model. Coefficients of variables are presented whilst probability values are placed in brackets.

Table 8. Estimation results of the impact of innovation investment ($RDIit-1$) for the top one-fifth (20%) largest firms

Variable	Fixed-effect Model	Random-effect Model
RDI_{it-1}	1.030***(0.000)	0.312***(0.000)
OPI_{it-1}	0.186*** (0.000)	0.232***(0.000)
TOA_{it-1}	0.924*** (0.000)	0.181*** (0.003)
ROA_{it-1}	0.843*** (0.000)	0.430*** (0.000)
NOE_{it-1}	0.246*** (0.110)	0.050 (0.408)
ALR_{it-1}	0.802*** (0.000)	0.706*** (0.000)
DPS_{it-1}	-0.042 (0.576)	-0.158*** (0.000)
$SHEQ_{it-1}$	-0.1338 (0.552)	-0.113*** (0.100)
CF_{it-1}	0.351*** (0.000)	0.328*** (0.000)
EPS_{it-1}	0.004 (0.970)	0.238*** (0.000)
ARR_{it-1}	-0.0285 (0.286)	-0.024 (0.269)
NOF_i	Included in the model as category variable	Included in the model as category variable
$YEAR_t$	Financial year of the variable (2009-2017)	Financial year of the variable (2009-2017)
Cons	5.659*** (0.029)	-1.044*** (0.228)
R^2: within	0.207	0.175
R^2: Between	0.117	0.264
R^2: Overall	0.132	0.240

Note. *p < 0.1; **p < 0.05; ***p < 0.01. According to the Hausman test, $\chi^2(11) = 43.35$, p(0.000) < 0.001. Hence, the fixed-effect model best fit our model than the random-effect model. Coefficients of variables are presented whilst probability values are placed in brackets.

Table 9. Estimation results of the impact of innovation investment (RDIit−1) for the bottom one-fifth (20%) smallest firms

Variable	Fixed-effect Model	Random-effect Model
RDI_{it-1}	1.774*** (0.045)	0.838*** (0.000)
OPI_{it-1}	-0.040 (0.723)	0.067 (0.334)
TOA_{it-1}	2.927*** (0.015)	0.856*** (0.000)
ROA_{it-1}	1.069*** (0.044)	0.653*** (0.002)
NOE_{it-1}	-3.323*** (0.017)	-0.429*** (0.276)
ALR_{it-1}	0.409 (0.511)	0.523*** (0.002)
DPS_{it-1}	1.126*** (0.045)	0.119 (0.501)
$SHEQ_{it-1}$	0.489 (0.759)	0.147*** (0.595)
CF_{it-1}	0.218*** (0.623)	0.153*** (0.311)
EPS_{it-1}	-0.757 (0.212)	0.375*** (0.107)
ARR_{it-1}	-0.223*** (0.133)	-0.116 (0.084)
NOF_i	Included in the model as category variable	Included in the model as category variable
$YEAR_t$	Financial year of the variable (2009-2017)	Financial year of the variable (2009-2017)
Cons	-13.761*** (0.450)	-0.724 (0.871)
R^2: within	0.693	0.536
R^2: Between	0.115	0.356
R^2: Overall	0.155	0.373

Note. *p < 0.1; **p < 0.05; ***p < 0.01. According to the Hausman test, $\chi^2(11) = 29.82$, p(0.002)> 0.001. Hence, the random-effect model is more appropriate model than the fixed-effect model. Coefficients of variables are presented whilst probability values are placed in brackets.

5. Discussion

Results from the study suggest a statistically significant relationship between investor sentiment and corporate innovation investment. Strongly negative sentiment has a higher propensity to foster innovation investment than positive or neutral sentiment. This means that, strong negative sentiments have higher tendency to cause firms to invest in innovation in their quest to satisfying the demands of their investors.

We also found that, corporate dividend policy has a statistically significant relationship with innovation investment. Our study revealed that, there exists a positive correlation between corporate dividend policy and innovation investment, indicating that firms' with favorable dividend policies tend to invest more in innovation.

Our findings provide evidence to support the argument that, corporate innovation investment has impact on firm performance. Our empirical analysis suggested a positive association between innovation investment and firm performance. Firms' eagerly invest in innovation in order to increase their efficiency and gain comparative advantage.

Our findings from the robustness checks indicated a consistent statistically significant relationship between investor sentiment and innovation investment. The robustness checks indicated that, both negative and positive sentiments can generate innovation waves. Fixed effect models best suited our analysis than random effect models.

5.1 Theoretical Contributions of Our Study

Our study adds to the few existing literatures that explore the interplay between investor sentiment and innovation investment (Hui, Huguang, & Junzheng, 2017; Xiaohan, 2018). Our study also examined the association between sentiment and innovation (Liu et al., 2010; Yin et al., 2014). We extended our search to identifying the correlation between sentiment and innovation investment. Our study showed that, negative sentiment causes higher innovation investment whilst most previous research works focused on the statistical significance of sentiment on innovation investment as well as the impact of sentiment on other financial variables (Tri & Zhaoxia, 2016; Daniel, 2016; Mujtaba, Piyush, & Ferdinand, 2018; Tanya, Samuel, & Francisco, 2018). Our findings provide an adequate information for firms' making innovation-investment decisions. Such investments are vital to firms' strategic alignment as they seek to preemptively collect advantages for future business opportunities. Our study admonishes firms to fully regard the sentiment of their customers, most importantly, strongly negative and strongly positive sentiments should be regarded as avenues for innovation investments, since innovation has been shown to have statistically significant relationship with firm growth in asset.

Our study makes an imperative theoretical contribution to the literature that focuses on the impact of dividend policy on corporate innovation investment (Brown et al., Kent, Gary, & Theodore, 2002). Our study provides an empirical evidence on the impact of favourable dividend policy on innovation investment. Our study also

attempts to increase the knowledge in literature pertaining to the impact of innovation on firm growth (Di Masi et al., 2003; Aw et al., 2008; Berchicci, 2013). Our study revealed that innovation investment is a necessary tool for increasing firm growth. We identified in our study that firms' enjoy high growth as they invest more into innovation, as suggested by some previous researchers.

5.2 Limitations and Future Research

Despite our attempt to empirically ascertain the impact of sentiment on innovation investment by including a rich set of control variables in our models, the unavailability of data on some variables is a limitation to our study. We therefore suggest that, future research should examine the full dataset if available, without missing values.

Although, innovation investment is an important variable to cause high growth in firms, other external factors such asgovernment policy decisions or macroeconomic shocks may also have significant impact on firm growth. Future research should consider other controlled covariates such as economic shocks and policy effects.

Our data consisted of a combination of private and state-owned firms, future research can assess the impact of sentiment on innovation by considering private and public firms separately.

Our research revealed that, corporate innovation investment reduces as investor sentiment increases, indicating a negative correlation, using the cumulative stock returns as proxy for measuring sentiment. Future research should consider using other variable as proxy for measuring sentiment to examine the impact of sentiment on innovation investment as well as their correlation.

Acknowledgements

We would like to acknowledge the funding and support from the Foundation of Humanities and Social Sciences of Chinese Ministry of Education "Investor Sentiment in the Perspective of Social Media: Generation Mechanism, Contagion Mechanism and Stock Market Crisis Warning" (17YJA630117). We also would like to thank Mr. Jeremiah Osei-Kwakye for his useful inputs on the article.

References

Amid, A., Moalagh, M., & Zare, R. A. (2012). Identification and classification of ERP critical failure factors in Iranian industries. *Inf. Syst., 37*(3), 227-237. https://doi.org/10.1016/j.is.2011.10.010

Aula, P. (2010). Social media, reputation risk and ambient publicity management. *Strategy Leadership, 38*(6), 43-49. https://doi.org/10.1108/10878571011088069

Avison, D., Jones, J., Powell, P., & Wilson, D. (2004). Using and validating the strategic alignment model. *J. Strategic Inf. Syst., 13*(3), 223-246. https://doi.org/10.1016/j.jsis.2004.08.002

Aw, B. Y., Roberts, M. J., & Xu, D. Y. (2008). R&D Investments, Exporting, the evolution of firm productivity. *Am. Econ. Rev., 98*(2), 451-456. https://doi.org/10.1257/aer.98.2.451

Aw, B. Y., Roberts, M. J., & Xu, D. Y. (2011). R&D investment, exporting, and productivity dynamics. *Am. Econ. Rev., 101*(4), 1312-1344. https://doi.org/10.1257/aer.101.4.1312

Baker, H. K., Powell, G. E., & Veit, E. T. (2002). Why companies use open-market repurchases: A managerial perspective. *Quarterly Review of Economics and Finance*, (in press). https://doi.org/10.1016/S1062-9769(02)00151-5

Baker, M., & Wurgler, J. (2007). Investor Sentiment in the Stock Market. *Journal of Economic Perspectives, 21*, 129-151. https://doi.org/10.1257/jep.21.2.129

Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad Is stronger than good. *Rev. Gen. Psychol., 5*(4), 323-370. https://doi.org/10.1037/1089-2680.5.4.323

Belderbos, R., Carree, M., & Lokshin, B. (2004). Cooperative R&D and firm performance. *Res. Policy, 33*(10), 1477-1492. https://doi.org/10.1016/j.respol.2004.07.003

Berchicci, L. (2013). Towards an open R&D system: Internal R&D investment, external knowledge acquisition and innovative performance. *Res. Policy, 42*(1), 117-127. https://doi.org/10.1016/j.respol.2012.04.017

Bergeron, F., Raymond, L., & Rivard, S. (2004). Ideal patterns of strategic alignment and business performance. *Inf. Manage., 41*(8), 1003-1020. https://doi.org/10.1016/j.im.2003.10.004

Bessant, J. et al. (2005). Enabling continuous and discontinuous innovations: Some reflections from a private sector perspective. *Public Money and Management, 25*(1).

Black, F. (1976). The dividend puzzle. *Journal of Portfolio Management, 2*, 5-8.

https://doi.org/10.3905/jpm.1976.408558

Black, F., & Scholes, M. (1974). The effects of dividend yield and dividend policy on common stock prices and returns. *Journal of Financial Economics.* https://doi.org/10.1016/0304-405X(74)90006-3

Blanchard, O. C. R., & Summers, L. (1993). The stock market, profit, and investment. *Quarterly Journal of Economics, 108,* 115-136. https://doi.org/10.2307/2118497

Brown, S. W. G., & Ross, S. (1995). Survival. *Journal of Finance, 50,* 853-873. https://doi.org/10.1111/j.1540-6261.1995.tb04039.x

Bruce, D. G. H. L. (2010). Investor sentiment, executive compensation, and corporate investment. *Els. Journal of Banking and Finance.* https://doi.org/10.1016/j.jbankfin.2010.03.020

D'aunno, T., & Sutton, R. I. (1992). The responses of drug abuse treatment organizations to financial adversity: A partial test of the threat-rigidity thesis. *J. Manage., 18*(1), 117-131. https://doi.org/10.1177/014920639201800108

Daniel, E. O'Leary. (2016). On the relationship between number of votes and sentiment in crowdsourcing ideas and comments for innovation: A case study of Canada's digital compass. *Els. Journal of Decision Support.* https://doi.org/10.1016/j.dss.2016.05.006

David, D., & Paolo, F. (2017). Innovation waves, investor sentiment, and mergers. *Annual Corporate Finance Review* (in press).

Derks, D., Fischer, A. H., & Bos, A. E. R. (2008). The role of emotion in computer-mediated communication: A review. *Comput. Hum. Behav., 24*(3), 766-785. https://doi.org/10.1016/j.chb.2007.04.004

DiMasi, J. A., Hansen, R. W., & Grabowski, H. G. (2003). The price of innovation: new estimates of drug development costs. *J. Health Econ., 22*(2). https://doi.org/10.1016/S0167-6296(02)00126-1

Feldstein, M., & Green, J. (1983). Why do companies pay dividends? *American Economic Review, 73,* 7-30.

Hall, B. H., & Lerner, J. (2010). The Financing of R&D and Innovation. In B. H. Hall, & N. Rosenber (Eds.), *Handbook of Economics and Innovation*. Elsevier-North Holland. https://doi.org/10.1016/S0169-7218(10)01014-2

He, W., Zha, S., & Li, L. (2013). Social media competitive analysis and text mining: A case study in the pizza industry. *Int. J. Inf. Manage., 33*(3), 464-472. https://doi.org/10.1016/j.ijinfomgt.2013.01.001

Hua, G. R., Liu, Z. Y., & Xu, Q. (2011). Investor Sentiment, Managerial Optimism and Corporate Investment. *Journal of Financial Research, 9,* 178-191.

Hui, Z., Hu, G. R., & Junzheng, F. (2017). Product innovation based on online review data mining: A case study of Huawei phones. https://doi.org/10.1007/s10660-017-9279-2

Joel, T. H., Subramanian, R. I., & Ali, N. (2017). Diversification Discount and investor sentiment. *North American Journal of Economics and Finance,* (42), 218-236. https://doi.org/10.1016/j.najef.2017.07.011

Junyan, S., Jianfeng, Y., & Shen, Z. (2017). Investor sentiment and economic forces. *Journal of Monetary Economics*. https://doi.org/10.1016/j.jmoneco.2017.01.001

Katila, R., & Ahuja, G. (2002). Something old, something new: A longitudinal study of search behavior and new product introduction. *Acad. Manag. J., 45*(6), 1183-1194. https://doi.org/10.2307/3069433

Kelly, D., & Amburgey, T. L. (1991). Organizational inertia and momentum: a dynamic model of strategic change. *Acad. Manag. J., 34*(3), 591-612. https://doi.org/10.5465/256407

Kim, E. H., & Youm, Y. N. (2017). How do social media affect analyst stock recommendations? Evidence from S&P 500 electric power companies' Twitter accounts. *Strateg. Manag. J., 38*(13), 2599-2622. https://doi.org/10.1002/smj.2678

Kimmel, A. J., & Kitchen, P. J. (2014). WOM and social media: presaging future directions for research and practice. *J. Market. Commun., 20*(1-2), 5-20. https://doi.org/10.1080/13527266.2013.797730

Knight, F. (1921). *Risk, Uncertainty, and Profit.* Boston: Houghton Mifflin.

Liu, Y., Chen, Y., Lusch, R., Chen, H., Zimbra, D., & Zeng, S. (2010). User-generated content on social media: predicting market success with online word-of-mouth. *IEEE Intell Syst., 25*(1), 75-78.

Malthouse, E. C., Haenlein, M., Skiera, B., Wege, E., & Zhang, M. (2013). Managing customer relationships in the social media era: introducing the Social CRM House. *J. Interact. Market, 27*(4), 270-280.

https://doi.org/10.1016/j.intmar.2013.09.008

Miller, M. H., & Shiller, R. J. (1986). Behavioral rationality in finance: The case of dividends. *Journal of Business, 59*, S451-S468. https://doi.org/10.1086/296380

Miller, M., & Modigliani, F. (1961). Dividend policy, growth, and the valuation of shares. *Journal of Business, 34*, 411-433. https://doi.org/10.1086/294442

Miller, M., & Scholes, M. (1978). Dividends & taxes. *Journal of Financial Economics, 6*, 333-364. https://doi.org/10.1016/0304-405X(78)90009-0

Morck, R. A. S., & Vishny, R. (1990). The stock market and investment: is the market a sideshow? *Brookings Papers on Economic Activity,* 157-202. https://doi.org/10.2307/2534506

Morgan, R. E., & Berthon, P. (2008). Market orientation, generative learning, innovation strategy and business performance inter-relationships in bioscience firms. *J. Manage. Stud., 45*(8), 1329-1353. https://doi.org/10.1111/j.1467-6486.2008.00778.x

Mujtaba, G. M., Piyush, S., & Ferdinand, A. G. (2018). Investor sentiment and advertising expenditure. *International Journal of Research In Marketing*. https://doi.org/10.1016/j.ijresmar.2018.08.005

Perez, C. (2002). *Technological Revolutions and Financial Capital.* Edward Elgar. https://doi.org/10.4337/9781781005323

Shiller, B. (2000). *Irrational Exuberance*. Princeton, NJ: Princeton University Press.

Solow, R. (1957). Technical Change and the Aggregate Production Function. *Review of Economics and Statistics, 39*, 312-320. https://doi.org/10.2307/1926047

Tanya, A., Samuel, E., & Francisco, L. (2018). Do sentiments influence market dynamics? A reconstruction of the Brazilian stock market and its mood. https://doi.org/10.1016/j.physa.2018.04.045

Tri, V. D., & Zhaoxia, X. (2016). *Market sentiment and innovation activities*. Tsinghua University press.

Walther, J. B., Liang, Y., Ganster, T., Wohn, D. Y., & Emington, J. (2012). Online reviews, helpfulness ratings, and consumer attitudes: An extension of congruity theory to multiple sources in Web 2.0. *J. Comput.-Med. Commun., 18*(1), 97-112. https://doi.org/10.1111/j.1083-6101.2012.01595.x

Wenping, Z., Lele, K., Qiqi, J., & Lei, P. (2018). From buzz to bucks: The impact of social media opinions on the locus of innovation. *Journal of Electronic Commence and Applications,* (30), 125-137. https://doi.org/10.1016/j.elerap.2018.04.004

Wenzhao, W. (2018). Investor sentiment and the mean-variance relationship: European evidence. *Research in International Business and Finance*. https://doi.org/10.1016/j.ribaf.2018.02.006

Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data.* Cambridge, MA: MIT Press.

Wu, S. P. J., Straub, D. W., & Liang, T. P. (2015). How information technology governance mechanisms and strategic alignment influence organizational performance: insights from a matched survey of business and its managers. *MIS Quarter, 39*(2), 497-518. https://doi.org/10.25300/MISQ/2015/39.2.10

Xiaohan, M. (2018). Investment specific technology, news, sentiment, and fluctuations: Evidence from nowcast data. *Journal of Macroeconomics*. https://doi.org/10.1016/j.jmacro.2018.05.006

Yao, Z., Eric, O., & Ruiyi, Z. (2017). Sentiment hedging: How hedge funds adjust their exposure to market Sentiment. *Journal of Banking and Finance*. https://doi.org/10.1016/j.jbankfin.2017.11.016

Yin, D., Bond, S. D., & Zhang, H. (2014). Anxious or Angry? Effects of discrete emotions on the perceived helpfulness of online reviews. *MIS Quarter, 38*(2), 539. https://doi.org/10.25300/MISQ/2014/38.2.10