Journal of Economics and Business 94 (2017) 32–42

Contents lists available at ScienceDirect

Journal of Economics and Business

Industry herd behaviour in financing decision making

Omar Camara

Department of Accounting and Finance, College of Business Administration (COBA), Prince Mohammad Bin Fahd University, Saudi Arabia

ARTICLE INFO

Article history:
Received 2 February 2017
Received in revised form 11 July 2017
Accepted 13 August 2017
Available online 1 September 2017

JEL Codes:
G02
G14
G31

Keywords:
Capital structure
Behavioral finance
Herd behavior
Cross-sectional absolute dispersion

ABSTRACT

Utilizing a panel data, I examined herd behavior in capital structure of firms for four major US industries (Manufacturing, Construction, Wholesale and Services), specifically regarding their propensity to exhibit herd behavior around industry median capital structure and industry-leader capital structure respectively. I followed existing methodology in the extant literature by using cross-sectional absolute dispersion (CSAD) to detect industry-wide herding and industry leader-follower herding, as well as the herding behavior during economic expansion and contraction during the sample period 1996–2015. Using industry median capital structure measurement, statistically significant evidence of herding in Services industry is found in the bear market, whilst statistically significant evidence of herding in the bull market is found in Manufacturing industry when industry-leader capital structure measurement is used. Given the relatively high procyclical nature of services industry, it is not all surprising that corporate financial managers may herd around industry median capital structure during economic contraction for reasons such as indemnity against sub-optimal performance and reputational costs. On the other hand, in a bull market coupled with information asymmetry, firms may engage in free-riding and this might explain herd behavior exhibited by manufacturing industry. Regarding inter-industry herd behavior, all three industries are found to herd around the Wholesale industry; two are found to herd around manufacturing and construction industries. With the exception of manufacturing industry, none of the other three industries exhibit within-industry herding behavior using both industry median and industry leader capital structure measurements.

1. Introduction

Recently there has been much interest in behavioral finance, particularly in the area of herd behavior. Herd behavior whether spurious or true is the decision to disregard one's private information to follow the behavior of others (Bikhchandani & Sharma, 2001; Hirshleifer & Teoh, 2003). In his seminal paper, Banerjee (1992, pg.798) defines herding as "everyone doing what everyone else is doing, even when their private information suggests doing something quite different." This generalized form of herding can be applied to various situations including corporate financing decision making. In adopting the definition of Hwang and Salmon (2004, pg, 1) that "Herding arises when investors decide to imitate the observed decisions of others or movements in the market rather than follow their own beliefs and information", this paper extend such definition of herding to the environment of corporate financing decision making.

Akin to individuals in non-economic settings, corporate financial managers are known to be influenced by peers in their decision making process, particularly in conforming to industry expectations and norms. In an effort not to be perceived

E-mail address: ocamara@pmu.edu.sa

http://dx.doi.org/10.1016/j.jeconbus.2017.08.001
0148-6195/

as an outsider, firms within the same industry may exhibit homogeneity regarding essential financial metrics in order to avoid added scrutiny by financial market participants (MacKay & Phillips, 2005). This phenomenon is generally referred to as herd behavior, and it may arise as a result of informational cascade or exuberance devoid of sufficient rational deliberation. Several capital structure studies have implied a positive value proposition of optimal financing mix; therefore it is necessary to understand the influence of industry on financing decision making process particularly with respect to herding. Capital structure mutation maybe susceptible to herd behavior especially during changing periods of macroeconomic conditions in which the cost of debt and equity issuance may vary.

Pioneers of theoretical research on herd behavior may be attributed to researchers such as Bikhchandani, Hirshleifer, and Welch, (1992), Welch (1992) and Banerjee (1992). These papers examined herd behavior in which a decision by finite number of agents with private information influenced their counterparty agents to disregard their own private information and follow the decision of the former. As observed in other academic literatures, there are two tracks of research regarding herd behavior; the theoretical and empirical. Although theoretical literature of herd behavior is significant for identification of mechanisms leading to herd behavior, nevertheless, distinguishing between spurious and true herd behavior is an empirical question (Bikhchandani & Sharma, 2001; Hirshleifer & Teoh, 2003), for example, due to publicly announced information, firms are likely to take similar actions. However, through empirical testing, the significance of the presence and stability of herding can be estimated cross-sectionally and over time. Herd behavior among corporate financing decision makers may be divided into intentional herding and spurious herding. The former is the result of the intent by financing decision makers to replicate the decisions of other's. This type of herding may lead to inefficient market outcomes (Bikhchandani et al., 1992) and it also suggests irrationality. Spurious herding on the other hand is a situation where financing decision makers are confronted with similar sets of information and decision problems. In a theoretically efficient market, one would expect financing decision makers to have equal access to similar information set, but in practice, this is rarely realized, which therefore minimizes the plausibility of spurious herding. Another problem for theoretical literature in distinguishing spurious from intentional herding is that, several previous papers found the influence of asset structure and other firm specific factors on financing decision making (Margaritis & Psillaki, 2007; Margaritis & Psillaki, 2010; Ozkan, 2001; Titman & Wessels, 1988), all of which implicitly suggest herding behavior effectively constitutes sub-optimal decision and has a potential to create underinvestment and asset substitution.

Identifying the causes of herding is outside the scope of this paper, thus, by keeping the theoretical underpinnings of herding in mind, I followed the methodology of Chiang and Zheng (2010) by analyzing the presence of herd behavior in industry capital structure through empirical and statistical analysis of clustering in financing decision making process using panel data. In the past, Shiller (2003), Khan, Hassairi, and Viviani (2011), and Cipriani and Guarino (2005) have employed similar empirical investigation of herd behavior in financial markets, however their results are rather mixed. The essence of studying herd behavior in corporate financing decision making may as well reside in the very foundation and efficiency of financial markets. In terms of relevance, corporate financing decision account for a large portion of all financing and investment decisions within the US economy, thus herding in corporate financing decisions is expected to have a significant impact on cost of debt and equity, thereby shifting prices from intrinsic values, generating excess volatility and inefficiency in the financial market.

The primary objective of this paper is to address the fundamental questions: Do firm's capital structure herd around and across industry median capital structure, and do firms capital

structure exhibit industry leader −follower path, and how does the macroeconomic conditions influence capital structure herding behavior. As such, my paper differs from previous studies in that prior studies mainly focused on investor herd behavior. To my knowledge, prior papers have not directly tests herd behavior of financing decision making both within and across the four major industries, by simultaneously testing herd behavior under different economic conditions over the last twenty years using CSAD methodology. The sample period 1996–2015 is particularly interesting because it includes some of the major bubbles and burst in history of US financial.

2. Literature review

The impression from the literature is such that, behavioral finance in a general form is characterized as a conflation or an overlap of psychological factors and rational financial considerations used by decision makers in understanding the dynamics of decision making process. This phenomenon maybe observed with individuals such as investors, or with corporations. Findings from prior research highlighted convincing evidences that decision makers often diverge from rational evaluations for many reasons and these reasons cannot be explained by traditional financial theories which are based on the theory of market efficiency, rational behavior, and capital asset pricing model (Olsen, 1998; Shefrin, 2001).

In their studies in the field of experimental psychology, influenced by prospect theory, Kahneman and Tversky (1979) found that individuals tend to avoid distress and regret which likely occur as a result of a wrong decision. Their finding contradicts rationality-based model of risk-return relationship. They showed that decision makers tend to avoid regret because the cost of regret is stronger than the utility of winning. Thus the detection of this behavioral tendency may influence individuals to engage in herd behavior. It is perceived that such herd behavior may have a dilutive effect on the cost of regret been shared by the herd. The corollary is that, market-driven punitive reactions will be indiscriminate and therefore no single individual or firm may be individually-blameworthy. In this paper, herd behavior in industry capital structure is defined as an act of firms within the industry following the industry median capital structure or the capital structure of industry leader.

Patel, Zeckhauser, and Hendricks (1991) described three reasons which may lead to herd behavior. The first possible reason is free-riding in the acquisition of information. Due to information asymmetry, those with lesser information or lesser resources to acquire relevant information follow the decisions of those who are believed to have more relevant information. The second possible reason is that proximity to the group may provide protection against the costs of deviation from the herd, such as the costs of risk perceptions of the debt and equity investors. The third possible reason may emerge from a circumstance where basic preference level regarding group norms in the level of regret is greater when the decision outcome of a firm deviating from the herd turns out to be negative, i.e. the deviating firm experienced below industry average financial ratios. Their (Patel et al., 1991) studies, shows that high coefficient but statistically meaningful herd behavior was found in seven of ten sectors and low coefficient but statistically meaningful herd behavior was found in three of ten sectors. Similarly, using the approach of Patel et al. (1991), Filbeck, Gorman, and Preece (1996) found evidence for follower-leader herd behavior in capital structure, but found no evidence of herd behavior in following the industry averages. The follower-leader narrative is prevalent in social psychology literature, often suggesting that some individuals tend to follow those who are more dominant than others (Marsat, 2007). In extending this behavioral tendency to corporate financing decision making, I presume the possibility that firms within and across industry mimic the capital structure of the leader-firm of the respective industry. In another words, when the leader-firm makes structural adjustment to its capital structure, the follower- firms may likewise make changes to their capital structure.

Also, in a rather similar strand of literature, Kim and Nofsinger (2005) revealed an interesting finding, suggesting that institutional herding may depend on the economic condition and the regulatory environment. Indeed, their finding attributed herd behavior to macroeconomic issues, rather than industry or firm characteristics. My paper extends the suggestive findings of Kim and Nofsinger (2005) to capital structure by examining herd behavior under both expansive and regressive US economic conditions during the sample period.

Besides the reasons for herding (Patel et al., 1991), other theoretical foundations for why institutional herding may exist are not lacking. In the case of investigative herding, herd behavior results when investors follow the same or similar signals of the firm's value (Froot, Scharfstein, & Stein, 1992; Hirshleifer, Subrahmanyam, & Titman, 1994). It is not implausible to imagine investigative herding in the context of competitive corporate financing decision making

environment. For example, prior studies signaled the presence of high information asymmetry in the US capital markets, suggesting that firms may herd on firm or industry characteristics they perceive are correlated with firm value (Banerjee 1992; Bihkchandani et al., 1992; DeLong, Shleifer, Summers, & Waldmann, 1990; Gompers & Metrick 2001). On the other hand, Bikhchandani and Sharma (2001) attempted to distinguish between "spurious herding" where investors take similar decisions because they face similar information sets and react to the same changes in fundamental factors, and "intentional herding" where investors copy each other's actions with intent; e.g. in informational cascades or in order to preserve reputation and protect remuneration. Scharfstein and Stein (1990) also argue that reputation concerns in labor markets with no perfect information and a need to share the blame when things go bad may lead managers to follow each other's actions, therefore herding may be viewed as insurance against manager underperformance (Rajan, 2006). With regard to informational cascade, herd behavior take place when it is optimal for individuals to follow the observable actions or position of individuals before them, disregarding their own information (Bikhchandani et al., 1992). From this, it may be argued that informational cascades may have an influence over rational economic agents and more profoundly, it may lead to the creation of bubbles and distortions in the financing market. Obviously, this may have serious implications for corporate financial managers in their effort to create value through optimal financing mix. In a related work, within an experimental research context, Avery and Zemsky (1998) find that herding in the form of an informational cascade is not possible, if simple information structures and a price mechanism are assumed, but possible in case of complicated information structures. In addition, Cipriani and Guarino (2005) studied herding in financial markets and found similar results found by Avery and Zemsky (1998). Many studies of herd behavior are also found in the area of stock markets (Baker, Wurgler, & Yuan, 2012; Ben-Rephael, Kandel, & Wohl, 2012; Blasco, Corredor, & Ferreruela, 2012; Boyson, 2010; Boyer & Zheng, 2004; Forbes & Rigobon, 2002). Christie and Huang (1995) investigate the US stock market and suggest that herding among investors is more likely during periods of market stress. Chang, Cheng, and Khorana (2000) suggest a similar but less stringent method to detect herding in the stock market. Evidence of herding is also found for institutional investors (Barberis & Shleifer, 2003; Frazzini & Lamont, 2008). This strand of literature found that institutional investors may herd because they face a reputational cost from acting different from the herd, i.e., it is more costly to be alone and wrong than to be with the herd and wrong (see Dasgupta, Prat, & Verardo, 2007; Scharfstein & Stein, 1990; Trueman, 1994; Zwiebel, 1995). Further eviden ce of herding in this area is documented by Dass, Massa, and Patgiri (2008); they found empirical evidence of reputational herding by mutual funds around the technology bubble. The aforedmentioned studies have important implications for the cost component of debt and equity and are therefore relevant for the overall capital structure framework. In terms of research focus, my paper is relatively closer to Hong, Ngo and, McGowan (2015) in which they examined the peer effect in firm leveraging decisions and MacKay and Phillips (2005) in which intra-industry variation and firm financial decisions are examined. In this paper, I intend to modestly extend the literature on capital structure by implementing a CSAD methodology in detecting herd behavior to a panel of firms within the industry and across different economic conditions. Thus the purpose of this paper is not to distinguish between spurious and intentional herding or to attach any particular theoretical arguments of herding, but rather to seek an empirical evidence of herd behavior over the sample period.

3. Data and methodology

All firm level data are from Annual Compustat database from 1996 to 2015, and the annual gross domestic product (GDP) data was extracted from World Bank database. All financial services firms (SIC codes 6000–6999), regulated utilities (SIC codes 4900–4999) and firms with less than ten (10) years of continuous data were excluded. Firms with ten (10) years of continuous data enhances the reliability of the estimated values as it excludes young firms whose infant-stage capital structure may significantly diverge from the average industry capital structure. Variables used to compute capital structure are trimmed at the upper and lower 1%. To compute cross-sectional absolute dispersion (CSAD), two primary central tendencies are used; the industry median capital structure for each year and the mean capital structure of the industry leader for each year. The industry leader is identified on average based on size and continuity. To be selected as an industry leader, a firm must mutually-exclusively satisfy the conditions of having both the largest total assets and revenue for more that 50% of the entire sample period and for the last five years of the sample period. This selection criteria is motivated by the reasoning that if a firm is truly an industry leader, then it should be reflected in total asset size

or through the revenue generating process, and simultaneously maintaining that position over an extended period of time, particularly for the past fews years (2011–2015). The rationale for

the past five years is to substantiate the industry leader's strength for survival as a true leader just after coming out of a major global financial crisis of 2007–2008. Therefore based on the above criteria of industry leader-selection process, if a firm dominates in total assets and revenue for more than 50% of the sample period and maintain its dominance for the last five years, then is reasonable to consider that firm as the industry leader. For capital structure, this paper used the market-oriented measurement defined as the ratio of the sum of long-term debt due in 1 year and long-term debt divided by the sum of long-term debt due in 1 year (i.e. debt reclassified from long-term debt to short term liabilities), long-term debt and the market value of equity. The limitation of this paper to four industries (Manufacturing, Construction, Wholesale and Services) is due to unavailability of sufficient panel data. This paper used linear panel data estimator to estimate herd behavior within and across industries, and during economic expansion and contraction. The paper starts the CSAD model with a market-oriented measure of capital structure as follows:

$$CS_t = D_{it} / \sum (D_{it}, E_{it}) \tag{1}$$

Where CS is annual capital structure, D is debt and E is market equity capitalization. Cross-sectional absolute dispersion (CSAD) is measured as:

$$CSAD_t = \frac{1}{N} \sum_{i=1}^{N} |CS_{i,t} - CS_{IndMed,t}| \tag{2}$$

$$CSAD_t = \frac{1}{N} \sum_{i=1}^{N} |CS_{i,t} - CS_{IndLead,t}| \tag{3}$$

Where N is the number of firms in the industry for the sample, $CS_{i,t}$ is the observed capital structure of firm i at time t, $CS_{IndMed,t}$ is the industry median capital structure of N firms in the industry at time t, and $CS_{IndLead,t}$ is the capital structure of industry leader at time t.

To detect industry-wide herding, the following regressions are estimated for each industry.

$$CSAD_t = \lambda_0 + \lambda_1 CS_{IndMed,t} + \lambda_2 {CS_{IndMed,t}}^2 + \varepsilon_t \tag{4}$$

$$CSAD_t = \lambda_0 + \lambda_1 CS_{IndLead,t} + \lambda_2 {CS_{IndLead,t}}^2 + \varepsilon_t \tag{5}$$

Where $CS_{IndMed,t}$ is the industry median capital structure of N firms in the industry at time t, $CS_{IndLead,t}$ is the capital structure of the industry leader at time t. $CSAD_t$ is the measure of capital structure dispersion. An additional $CS_{IndMed,t}$ and $CS_{IndLead,t}$ on the right-hand side of Eqs. (4) and (5) respectively are to account for asymmetric firm behavior during different financing conditions. Herd behavior is assumed to be more responsive to varying financing conditions, implying a non-linear relationship between CSAD and industry median capital structure as well as industry leader's capital structure, thus a non-linear term ${CS_{IndMed,t}}^2$ is included in model 4, and in model 5 the non-linear term ${CS_{IndLead,t}}^2$ is included to account for the superior position of an industry leader in accessing relatively favorable financing opportunities. A negative and statistically significant coefficient of the non-linear term in Eqs. (4) and (5) suggest herding behavior.

Firms financing environment is influence by the overall economy, thus herding behavior is expected to be asymmetrical between a growing and regressing economy. To capture this differential effect, the following empirical specification is estimated for each industry and their respective industry leader.

$$CSAD_t = \lambda_0 + \lambda_1(1-E)CS_{IndMed,t} + \lambda_2 ECS_{IndMed,t} + \lambda_3(1-E){CS_{IndMed,t}}^2 + \lambda_4 E{CS_{IndMed,t}}^2 + \varepsilon_t \tag{6}$$

$$CSAD_t = \lambda_0 + \lambda_1(1-E)CS_{IndLead,t} + \lambda_2 ECS_{IndLead,t} + \lambda_3(1-E){CS_{IndLead,t}}^2 + \lambda_4 E{CS_{IndLead,t}}^2 + \varepsilon_t \tag{7}$$

E = A dummy variable that equals one when the economy deteriorates and zero otherwise. A negative and statistically significant λ_3 indicates herding during the bull market, and a negative and statistically significant λ_4 indicates herding during the bear market.

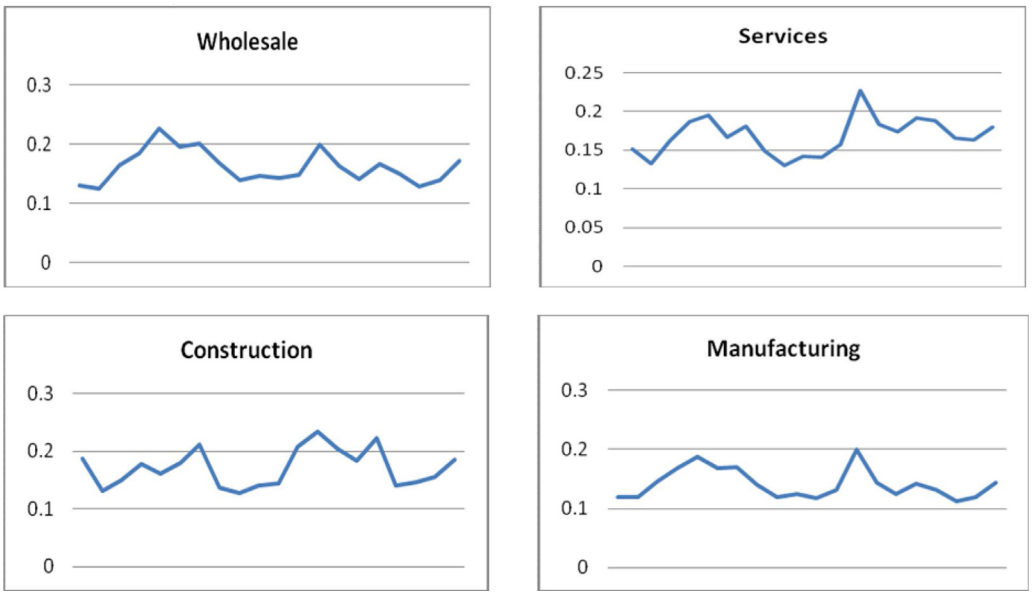


Fig. 1. Historical Industry CSAD Trajectory.
These figures present the historical Industry CSAD trajectory of the four industries in this study during the time period 1996–2015.

Furthermore, to test whether industries and industry leaders herd around each other, Eqs. (8)–(15) are used to estimate for each industry and industry leader.

$$CSAD_t = \lambda_0 + \lambda_1 CS_{IndMed,t} + \lambda_2 CS_{IndMed,t}{}^2 + \lambda_3 CSAD_{M,t} + \lambda_4 CS_{M,t}{}^2 + \varepsilon_t \quad (8)$$

$$CSAD_t = \lambda_0 + \lambda_1 CS_{IndMed,t} + \lambda_2 CS_{IndMed,t}{}^2 + \lambda_3 CSAD_{C,t} + \lambda_4 CS_{C,t}{}^2 + \varepsilon_t \quad (9)$$

$$CSAD_t = \lambda_0 + \lambda_1 CS_{IndMed,t} + \lambda_2 CS_{IndMed,t}{}^2 + \lambda_3 CSAD_{S,t} + \lambda_4 CS_{S,t}{}^2 + \varepsilon_t \quad (10)$$

$$CSAD_t = \lambda_0 + \lambda_1 CS_{IndMed,t} + \lambda_2 CS_{IndMed,t}{}^2 + \lambda_3 CSAD_{W,t} + \lambda_4 CS_{W,t}{}^2 + \varepsilon_t \quad (11)$$

$$CSAD_t = \lambda_0 + \lambda_1 CS_{IndLead,t} + \lambda_2 CS_{IndLead,t}{}^2 + \lambda_3 CSAD_{LM,t} + \lambda_4 CS_{LM,t}{}^2 + \varepsilon_t \quad (12)$$

$$CSAD_t = \lambda_0 + \lambda_1 CS_{IndLead,t} + \lambda_2 CS_{IndLead,t}{}^2 + \lambda_3 CSAD_{LC,t} + \lambda_4 CS_{LC,t}{}^2 + \varepsilon_t \quad (13)$$

$$CSAD_t = \lambda_0 + \lambda_1 CS_{IndLead,t} + \lambda_2 CS_{IndLead,t}{}^2 + \lambda_3 CSAD_{LS,t} + \lambda_4 CS_{LS,t}{}^2 + \varepsilon_t \quad (14)$$

$$CSAD_t = \lambda_0 + \lambda_1 CS_{IndLead,t} + \lambda_2 CS_{IndLead,t}{}^2 + \lambda_3 CSAD_{LW,t} + \lambda_4 CS_{LW,t}{}^2 + \varepsilon_t \quad (15)$$

Where $CS_{IndMed,t}$ is the industry median capital structure of N firms in the industry at time t, $CS_{IndLead,t}$ is the capital structure of the industry leader at time t. $CSAD_t$ is the measure of capital structure dispersion, and $CSAD_{M,C,S,W,t}$ and $CSAD_{LM,LC,LS,LW,t}$ are the industry's and industry leader's CSAD and $CS_{M,C,S,W,t}{}^2$ and $CS_{LM,LC,LS,LW,t}{}^2$ are the squared capital structure for industries and industry leaders. A negative and statistically significant λ_2 indicates industry-wide and industry-wide leader herd behavior. Similarly, a negative and statistically significant λ_4 suggest that the industry and leaders herd around other industries and leaders. Finally, a positive and statistically significant λ_3 indicates individual industries and industry leaders CSAD have important influence on the industry capital structure dispersion (Figs. 1 and 2).

Measurement of herd behavior in this paper postulates that industry-wide and industry-leader herding will be indicated by a non-linear relationship between the individual firms capital structure dispersions and the industry-wide median capital structure, as well as a non-linear relationship between individual firms capital structure and industry leader's capital structure. Meaning, the CSADs are expected to decline or increase but at a relatively decreasing rate with industry-median capital structure or with the industry-leader's capital structure. It can be easily observed from Figs. 3 and 4 that the relation between CSAD and industry-median and between CSAD and industry-leader varies. In Fig. 3, the relation for all four industries appears to be linear suggesting that the dispersions are an increasing function of industry median capital structure. This means that the firms within the industry do not exhibit herd behavior. Hence the

relationship appears to be linear. Similarly, in Fig. 4, with the exception of manufacturing, the relationship appears to be linear, suggesting non-herd behavior. Although, Figs. 3 and 4 suggest absence of herd behavior it doesn't provide convincing evidence to conclude whether industry financing decision making clustering is present or not. Therefore, an empirical testing is necessary and the results are presented in the next section (Tables 1a and 1b).

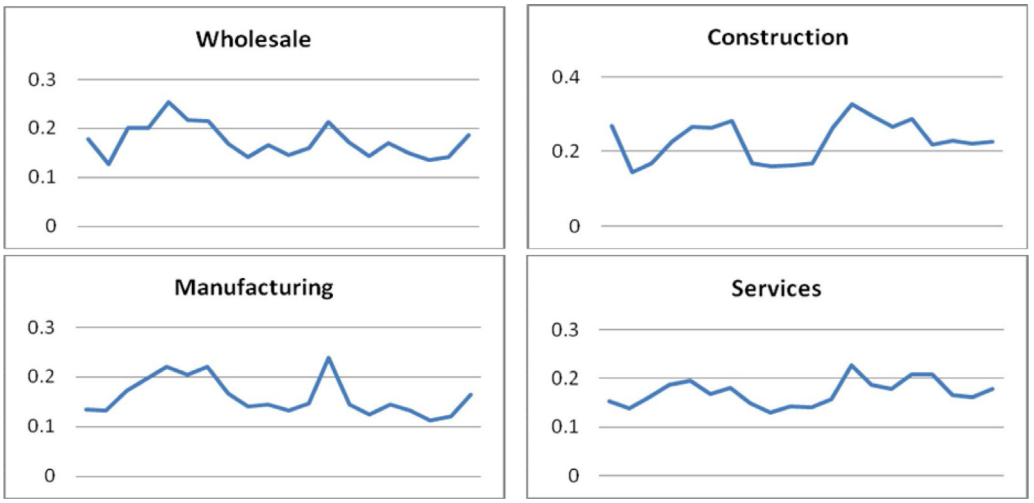
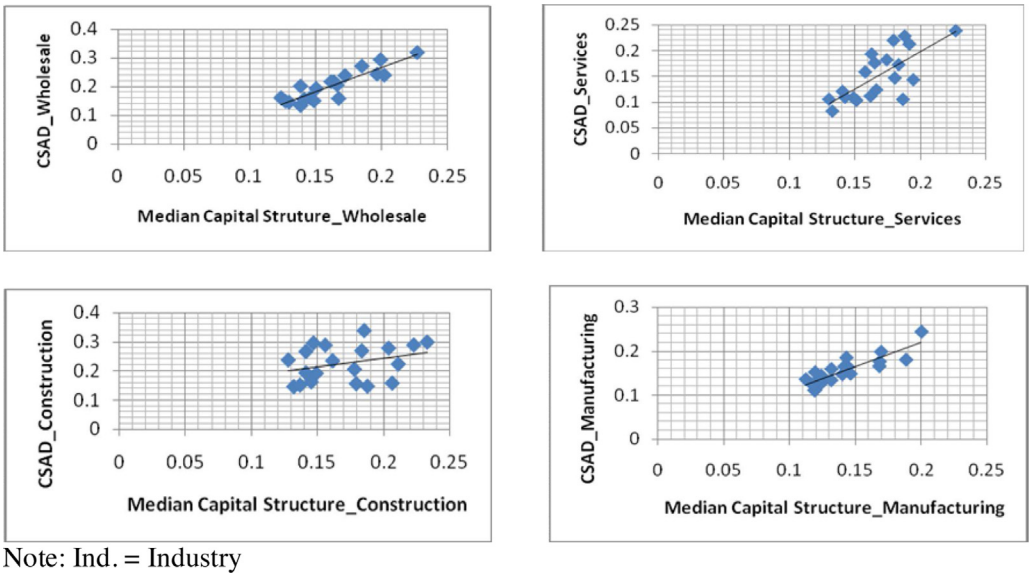


Fig. 2. Historical Industry Leader CSAD Trajectory.
These figures present the historical Industry Leader CSAD trajectory of the four industry leaders in this study during the time period 1996–2015.



Note: Ind. = Industry

Fig. 3. The Relationship between Ind. CSAD and Ind. Median Capital Structure.
Relationship between annual cross-sectional absolute dispersion (CSAD), and Industry median capital structure in this study during the time period 1996–2015.
Note: Ind. = Industry.

Table 1a
Descriptive statistics of Industry CSAD.

Statistics	Construction_CSAD	Manufacturing_CSAD	Wholesale_CSAD	Services_CSAD
Mean	0.174	0.142	0.161	0.169
Maximum	0.233	0.200	0.227	0.226
Minimum	0.128	0.112	0.124	0.130
Std. Dev	0.032	0.025	0.027	0.024
Skewness	0.311	0.916	0.745	0.406
Kurtosis	1.808	2.789	2.700	3.015
Prob._JB test	0.000	0.000	0.000	0.000
Prob. SW test	0.000	0.000	0.000	0.000
Prob. SF test	0.000	0.000	0.000	0.000
# of Obs	481	14536	1296	4292

This table presents descriptive statistics of annual cross-sectional absolute dispersions (CSAD) for four industries. The table also presents three normality tests: Jarque-Bera (JB), Shapiro-Wilk (SW), and Shapiro-Francia (SF). The market-oriented capital structure dispersion is defined as $CSAD_t = \frac{1}{N}\sum_{i=1}^{N}|CS_{i,t} - CS_{IndMed,t}|$. The data range from 1996 to 2015.

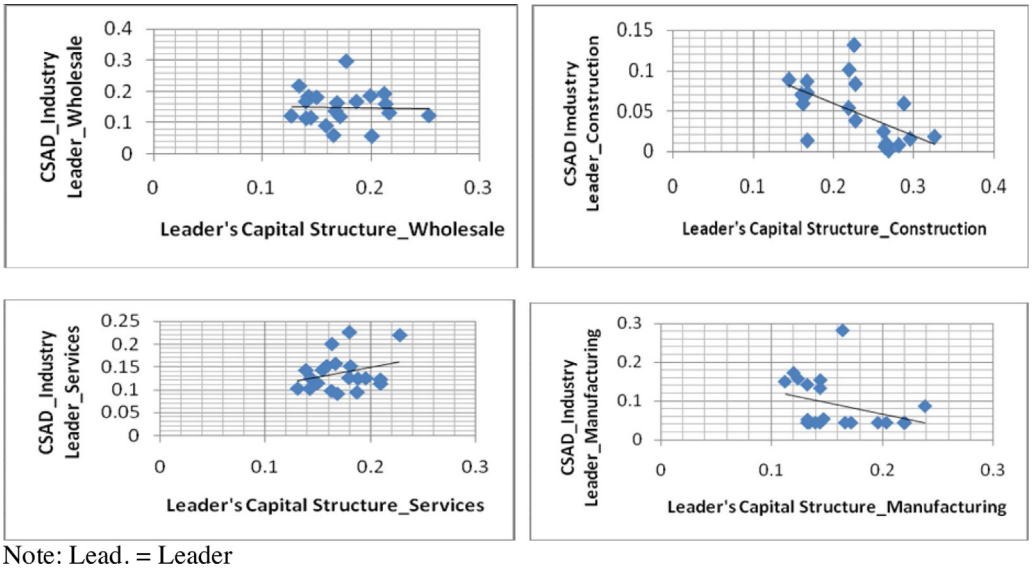


Fig. 4. The Relationship between Lead. CSAD and Lead. Capital Structure.
Relationship between annual industry leader's cross-sectional absolute dispersion (CSAD) and the Industry leader's Capital Structure in this study during the time period 1996–2015.
Note: Lead. = Leader.

Table 1b
Descriptive statistics of Industry Leader's CSAD.

Statistics	Construction_CSAD	Manufacturing_CSAD	Wholesale_CSAD	Services_CSAD
Mean	0.234	0.160	0.173	0.172
Maximum	0.326	0.238	0.254	0.227
Minimum	0.144	0.112	0.127	0.130
Std. Dev	0.052	0.036	0.032	0.026
Skewness	−0.127	0.808	0.700	0.374
Kurtosis	1.952	2.374	2.726	2.385
Prob._JB test	0.000	0.000	0.000	0.000
Prob. SW test	0.000	0.000	0.000	0.000
Prob. SF test	0.000	0.000	0.000	0.000
# of Obs	481	14536	1296	4292

This table presents descriptive statistics of annual cross-sectional absolute dispersions (CSAD) for four industries. The table also presents three normality tests: Jarque-Bera (JB), Shapiro-Wilk (SW), and Shapiro-Francia (SF). The industry leader's market-oriented capital structure dispersion is defined as $CSAD_t = \frac{1}{N}\sum_{i=1}^{N}|CS_{i,t} - CS_{IndLead,t}|$. The data range from 1996 to 2015.

Table 2a
Estimation of capital structure industry-wide herding. This table reports the regression results of CSAD based on Eq. (4).

Industry_Median	λ_0	λ_1	λ_2	F-stats	R^2
Construction	0.204 (0.007)*	−0.472 (.061)*	1.36 (0.131)*	426 (0.000)*	0.11
Manufacturing	0.033 (0.001)*	.700 (.014)*	−0.015 (0.038)*	45,3442 (0.000)*	0.76
Wholesale	0.109 (0.002)*	.070 (.017)*	0.901 (0.035)*	24,223 (0.000)*	0.80
Services	0.127 (0.002)*	0.146 (0.022)*	0.726 (0.069)*	7029 (0.000)*	0.54

The data range from 1996 to 2015. The explanatory power is the adjusted. The numbers in the parenthesis are the robust standard errors.
*Statistical significance at the 1% level.
**Statistical significance at the 5% level.
***Statistical significance at the 10% level.

4. Empirical results

In Tables 2a and 2b, Eqs. (4) and (5) are estimated for four industries (Manufacturing, Construction, Wholesale and Services) to investigate herd behavior. Both tables' shows that λ_2 are highly statistically significant for all industries, however, only manufacturing industry on average over the sample period indicates herd behavior. As mentioned in previous sections, a negative and statistically significant coefficient of λ_2 suggests industry herd behavior. A negative and statistically significant coefficient value of λ_2 indicates that during the sample period, the capital structure of firms within the manufacturing

Table 2b
Estimation of capital structure industry-leader herding. This table reports the regression results of CSAD based on Eq. (5).

Industry_Leader	λ_0	λ_1	λ_2	F-stats	R^2
Construction	0.294 (0.001)*	−2.15 (.061)*	11.94 (.321)*	1298 (0.000)*	0.38
Manufacturing	0.200 (0.000)*	−0.712 (.006)*	1.97 (.017)*	10636 (0.000)*	0.19
Wholesale	0.177 (0.002)*	−0.035 (.022)	.037 (.059)*	9.86 (0.000)*	0.01
Services	0.198 (0.002)*	−0.533 (0.024)*	2.317 (0.076)*	1197 (0.000)*	0.11

The data range from 1996 to 2015. The explanatory power is the adjusted. The numbers in the parenthesis are the robust standard errors.
*Statistical significance at the 1% level.
**Statistical significance at the 5% level.
***Statistical significance at the 10% level.

Table 3a
Industry-wide herding during up and down economy. This table reports the regression results of CSAD based on Eq. (6).

Industry_Median	λ_0	λ_1	λ_2	λ_3	λ_4	F-stats	R^2
Construction	0.278 (0.008)*	−1.429 (0.057)*	−0.546 (0.073)*	4.952 (0.099)*	1.331 (0.151)*	575 (0.000)*	0.32
Manufacturing	0.092 (0.002)*	0.063 (0.019)*	−0.114 (0.024)*	1.563 (0.047)*	2.732 (0.075)*	587 (0.000)*	0.77
Wholesale	0.111 (0.002)*	0.051 (0.018)*	0.038 (0.022)*	0.851 (0.035)*	1.030 (0.048)*	118 (0.000)*	0.81
Services	0.084 (0.001)*	0.524 (0.016)*	0.802 (0.023)*	0.340 (0.039)*	−1.598 (0.075)*	278 (0.000)*	0.65

The data range from 1996 to 2015. The explanatory power is the adjusted. The numbers in the parenthesis are the robust standard errors.
*Statistical significance at the 1% level.
**Statistical significance at the 5% level.
***Statistical significance at the 10% level.

Table 3b
Industry-leader herding during up and down economy. This table reports the regression results of CSAD based on Eq. (7).

Industry_Leader	λ_0	λ_1	λ_2	λ_3	λ_4	F-stats	R^2
Construction	0.275 (0.001)*	−7.679 (0.190)*	−1.848 (0.037)*	569.9 (0.099)*	1.331 (7.081)*	106 (0.000)*	0.54
Manufacturing	0.207 (0.000)*	1.363 (0.006)*	−0.998 (0.004)*	−11.531 (0.026)*	3.013 (0.000)*	1.39 (0.000)*	0.52
Wholesale	0.186 (0.002)*	−0.508 (0.027)*	−0.157 (0.023)*	3.384 (0.091)*	0.287 (0.065)*	960 (0.000)*	0.10
Services	0.167 (0.002)*	0.023 (0.022)	−0.012 (0.024)	1.153 (0.066)*	0.152 (0.074)**	954 (0.000)*	0.30

The data range from 1996 to 2015. The explanatory power is the adjusted. The numbers in the parenthesis are the robust standard errors.
*Statistical significance at the 1% level.
**Statistical significance at the 5% level.
***Statistical significance at the 10% level.

industry on average herd around the industry median capital structure. Consistent with the results of Tables 2a and 2b, industries in Tables 3a and 3b shows no evidence of herd behavior during the bull market $\lambda_3$and the bear market λ_4, except for manufacturing during the bull market and services during the bear market. However, herd behavior appears to be more consistent for manufacturing industry (i.e. herding in both Tables 2a, 2b and 3a, 3b) than services industry. Although Chiang and Zheng (2010) analyzed herd behavior in stock markets, their findings of no evidence of herd behavior in US stock market is strikingly consistent with the results of industry capital structure herd behavior during bull and bear US stock market in this paper. Only manufacturing industry appears to show a consistent industry-wide herding behavior in Tables 2a and 3b. Tables 2a, 2b and 3a, 3b revealed a rather interesting observation in regards to herd behavior within the manufacturing and services industry. On average over the sample period, firm's capital structure within the manufacturing industry herd around the industry median capital structure, and not around the industry leader's capital structure, but in a bull market, firms appeared to herd around the industry leader's capital structure and therefore seems to abandon the industry median capital structure. For services industry, there is no evidence of herd behavior on average over the sample period, but during the bear market, firms appeared to herd around the industry median capital structure.

A possible reason for the switching in herding behavior of manufacturing firms may be attributed to the firms' long-term capital structure strategy of maintaining an industry average capital structure, while at the same time implementing the short-term strategy of following the industry leader in good economic environment due to perceived lower market risk. On the contrary, the herd behavior of services industry during bear market seems to suggest that services firms attach more value to industry median capital structure during an economic downturn in order to insure against reputational cost and against differential cost of capital which tend to be severe during a bear market. In Tables 4a and 4b, Eqs. (8)–(15) were estimated to investigate if industries and industry leaders herd around each other. In these equations, a negative and statistically significant λ_2 indicates within-industry herding, a positive and statistically significant $\lambda_3$indicates that an industry median capital structure or industry leader's capital structure has influenced on the capital structure dispersion of the counterpart industry, and a negative and statistically significant λ_4 suggests the industries herd around another industry. In panel A of Table 4a, consistent with Tables 3a and 3b, none of the industries exhibit within industry herd behavior λ_2 using both industry median and industry leader's capital structure measurement. All four industries with the exception of construction

Table 4a
Estimation of herding around other industries. This table reports the regression results of CSAD based on Eqs. (8)–(11).

Industry	λ_2	λ_3	λ_4	Adj. R^2
Panel A: Herding around Construction Industry				
Manuf.	1.340 (.122)*	0.307 (.094)*	1.152 (.212)*	0.42
Whole.	1.876 (.136)*	0.892 (.054)*	−0.380 (.053)*	0.34
Serv.	2.302 (.117)*	1.195 (.034)*	−0.137 (.075)*	0.55
Panel B: Herding around Manufacturing Industry				
Constr.	−1.051 (.012)*	−0.007 (.001)*	−0.396 (.001)*	0.90
Whole.	3.08 (.012)*	0.605 (.002)*	0.217 (.002)*	0.97
Serv.	0.692 (.005)*	0.583 (.001)*	−1.06 (.002)*	0.95
Panel C: Herding around Wholesale Industry				
Constr.	0.735 (0.018)*	0.108 (0.018)*	−0.219 (0.006)*	0.85
Manuf.	−0.533 (0.030)*	1.15 (0.011)*	−0.643 (0.029)*	0.92
Serv.	0.433 (0.023)*	0.301 (0.009)*	−0.515 (0.018)*	0.83
Panel D: Herding around Services Industry				
Constr.	1.65 (.060)*	0.354 (0.003)*	.084 (0.006)*	0.70
Manuf.	0.163 (.029)*	0.864 (0.004)*	−0.789 (0.009)*	0.92
Whole.	0.299 (.017)*	0.129 (0.004)*	0.486 (0.005)*	0.89

The data range from 1996 to 2015. The explanatory power is the adjusted R^2. The numbers in the parenthesis are the robust standard errors.
*Statistical significance at the 1% level.
**Statistical significance at the 5% level.
***Statistical significance at the 10% level.

Table 4b
Estimation of herding around other industry leaders. This table reports the regression results of CSAD based on Eqs. (12)–(15).

Industry	λ_2	λ_3	λ_4	Adj. R^2
Panel A: Herding around Construction Leader				
Manuf.	−14.33 (0.973)*	0.730 (0.023)*	2.45 (0.075)*	0.66
Whole.	4.29 (0.312)*	0.544 (0.026)*	0.957 (0.074)*	0.49
Serv.	5.60 (0.193)*	1.16 (0.016)*	0.737 (0.019)*	0.80
Panel B: Herding around Manufacturing Leader				
Constr.	2.98 (.016)*	0.575 (0.002)*	2.04 (0.022)*	0.64
Whole.	−0.016 (0.008)**	0.975 (0.002)*	−0.086 (0.005)*	0.84
Serv.	3.86 (0.010)*	1.23 (.003)*	0.638 (0.006)*	0.85
Panel C: Herding around Wholesale Leader				
Constr.	0.983 (0.062)*	0.433 (0.007)*	0.702 (0.079)*	0.32
Manuf.	1.82 (0.033)*	0.884 (0.009)*	0.324 (0.007)*	0.88
Serv.	1.92 (0.062)*	0.877 (0.017)*	−0.006 (0.048)	0.34
Panel D: Herding around Services Leader				
Constr.	2.48 (.077)*	0.410 (0.001)*	0.678 (.028)*	0.63
Manuf.	−4.13 (.074)*	0.502 (0.004)*	0.744 (.013)*	0.40
Whole.	0.264 (.062)*	0.389 (0.004)*	0.397 (.021)*	0.37

The data range from 1996 to 2015. The explanatory power is the adjusted R^2. The numbers in the parenthesis are the robust standard errors.
*Statistical significance at the 1% level.
**Statistical significance at the 5% level.
***Statistical significance at the 10% level.
1To be an industry leader, a firm must mutually-exclusively satisfy the conditions of having both the largest total assets and revenue for more that 50% of the entire sample period and for the last five years of the sample period.

shows a highly positive and statistically significant coefficient value for λ_3 in both Tables 4a and 4b, indicating that an industry median capital structure or industry leader's capital structure has influenced on the capital structure dispersion of the counterpart industry. This phenomenon may be explained by the overall credit rationing scheme in the economy and the effect of macro-economic factors. In panel A of Table 4a, wholesale and services industries herd around construction industry, whereas construction and services herd around manufacturing in Panel B of Table 4a. All the three industries are found to herd around wholesale in Panel C of Table 4a, whilst only manufacturing herd around services in Panel D of Table 4a. Strikingly different evidence is found when industry leader's capital structure is used in Table 4b. There is no evidence of herding around construction and services, and only wholesale appears to herd around manufacturing in Panel B, and only services herd around wholesale in Panel C. A possible reason for herd behavior (i.e. λ_4) in 4a and 4b is that activities of construction and manufacturing industry are often used as major economic indicators, thus other industries may attempt to herd around certain financial indicators of these two industries.

5. Conclusion

This paper examined the herd behavior of financing decision making of four major US industries (Manufacturing, Construction, Wholesale and Services) over twenty years period using cross-sectional absolute dispersion (CSAD) methodology. This methodology was adopted from Chiang & Zheng (2010) to detect capital structure herding behavior within and across industries. The methodology is generally based on the assumption of a non-linear relationship between two variables. For this paper, Industry median capital structure and the capital structure of industry leader are used to compute cross-sectional absolute dispersion. That means if herd behavior exists, the cross sectional absolute dispersion (CSAD) will decrease or at least increase at a decreasing rate or less-than-proportional rate with the industry median or industry leader's capital structure. Prior empirical literature on herd behavior suggests that there is asymmetry between changing market and economic conditions (Chiang & Zheng, 2010), thus herd behavior during economic expansion and contraction is also analyzed in this paper. Using industry median, the paper find a significant evidence of herding in Services industry during bear market, and significant evidence of herding for Manufacturing industry during the bull market when industry leader criteria is used. All three industries are found to herd around the Wholesale industry; two are found to herd around manufacturing and construction industries. With the exception of manufacturing industry, none of the other three industries exhibit within-industry herd behavior using both industry median and industry leader criteria. This paper been focused on a single market (i.e. US market) may be considered as a limitation. As a result, further exploration of industry herd behavior in an international context by comparing industry herd behavior of different countries or regions are likely to engender many more predictions, and therefore propound new ways of analyzing the already existing empirical facts in the extant literature.

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