

## EMPIRICAL SOCIAL ASSET PRICING

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I review the empirical literature on word of mouth (WOM) among investors. I begin with an outline of the empirical challenges that WOM research faces and possible strategies to overcome those challenges. I then discuss recent studies on WOM among retail and institutional investors. The research to date provides compelling evidence that WOM importantly determines investment decisions. On balance, the information transmitted through WOM does *not* appear to help investors make better investment decisions. I explore possible reasons. I also discuss potential asset pricing implications, the emergence of social technologies, and possible avenues for future research.

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## 1. Introduction

The history of financial markets is filled with anecdotes in which social interactions supposedly created bubbles and subsequent crashes. One of the first stock market bubbles, the South Sea Bubble, reportedly started in London's coffeehouses (Dale, 2014). More recent illustrations include the social-media-driven frenzies in cryptocurrencies and "meme stocks" in the US (Pedersen, 2022).

One rapidly growing strand of research has begun to systematically evaluate the impact of social interactions on asset prices.<sup>1</sup> This literature, which I will hereafter refer to as "social asset pricing," aims to address three questions:

- (1) whether investors frequently act on investment ideas they hear from/discuss with other investors, and, if so, in what manner,
- (2) what the consequences of "word of mouth" ("WOM") are on the quality of investors' decisions, and
- (3) what the consequences of WOM are for asset prices and market efficiency.

This article reviews the empirical literature regarding the above three questions. Section 2 outlines the empirical challenges that the social asset pricing literature faces and possible strategies to overcome them. Sections 3 and 4 review the evidence regarding questions (1) and (2), respectively. In essence, the evidence suggests that investors strongly lean on each other for news and opinions and that the information transmitted through WOM importantly determines their investment decisions. The evidence so far indicates that – on balance – the information transmitted through WOM does *not* help investors make better investment decisions. I discuss possible reasons.

There is yet very little evidence regarding question (3). Given the evidence that WOM does not help investors make better investment decisions yet importantly determines their decisions, there is reason to believe that WOM can generate mispricing in the stock market. Section 4 outlines two specific channels through which mispricing may arise.

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<sup>1</sup> This article follows much of the literature and defines social interaction as a private transmission of information from one person to another, also known as "word of mouth."

With the advent of modern information technologies, an increasing portion of our interactions occurs virtually. Section 5 discusses implications of this change on the social asset pricing literature and possible avenues for future research. I conclude in Section 6 with final considerations for future research.

## **2. Empirical Challenges in WOM Research and Possible Solutions**

### *2.1 The Empirical Challenges with Detecting WOM and Describing its Effect*

Empirical work trying to establish the presence of WOM or examining the effects of WOM faces a “self-selection”- and a “common-shock problem.” To illustrate by example, consider the question of whether investors share investment ideas with one another and, as a result, place similar trades. We could try to infer the presence of WOM among investors by correlating the trading patterns of investors residing in the same locale. However, even if we observed a positive correlation, how can we be sure that the investors actually communicated with one another rather than followed the same local news regarding particular companies (“common-shock problem”)? Moreover, investors likely choose to live in certain areas because of specific tastes and preferences. These shared tastes and preferences can, in turn, trigger common investment decisions without investors directly communicating with one another (“self-selection problem”).

There are at least five approaches to address the self-selection- and common-shock problem. To help evaluate current research on WOM among investors and, more importantly, to help guide future research on this topic, I provide examples for each of the five approaches in the following subsections.

For many approaches, I am not aware of studies that have used the corresponding method to study WOM among investors. Many examples thus represent studies that examine WOM broadly construed. However, in principle, all five strategies are deployable to study WOM among investors.<sup>2</sup>

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<sup>2</sup> In my descriptions, I emphasize the key feature that allows the authors to draw their inferences. The feature by itself often does not fully address the self-selection- and common-shock problem. The authors of the studies are aware of this possibility. Most of them combine their empirical strategy with other techniques to further alleviate self-selection- and common-shock concerns.

## *2.2 Possible Solutions*

### *2.2.1 Experiments*

Some of the cleanest evidence regarding WOM comes from experiments. Experiments utilize plausibly exogenous variation in social interactions to provide causal evidence for the presence and consequences of WOM. Sometimes, the variation is induced by “natural events” that are not under the researchers’ control (“natural experiment”). Other times, the variation is generated by the researchers (“field and laboratory experiment”).

#### *2.2.1.1 Natural Experiments*

Despite its name, the plausibly exogenous variation induced by natural events does not have to come from nature per se. Natural events can represent corporate events. They can also represent education-related events.

To provide an example of the former, Dimmock, Gerken, and Graham (2018) examine whether financial misconduct spreads among coworkers. The authors consider US financial advisors and compile data regarding which geographically distinct branch a particular financial advisor works in and which branches have a history of financial misconduct. The authors then utilize plausibly exogenous changes to coworker groups due to branch reorganizations caused by the M&As of financial advisory firms.

Dimmock et al. find that financial advisors are 37% more likely to commit misconduct if their new coworkers have a history of misconduct.

To provide two examples utilizing education-related events, both Lerner and Malmendier (2013) and Shue (2013) take advantage of the feature that Harvard Business School (HBS) assigns all entering MBA students to sections of roughly ninety students. The section assignment is random conditional on observable student characteristics. Section members take the first year of coursework together. They are also grouped during school-related social activities and reunions after graduation. Section members thus frequently interact with one another and likely form strong social bonds.

Lerner and Malmendier (2013) combine historical student section assignments with pre- and post-graduation data. The authors find that when students are grouped with students who have prior entrepreneurial experience, they less frequently become entrepreneurs post-graduation. One possible explanation is that through their interactions, students learn about the challenges of being an entrepreneur.

Shue (2013) considers students who later become top executives at publicly traded firms in the US. The author combines her section assignments with data on compensation levels and acquisition attempts. She finds that the level of acquisition attempts and the changes in compensation levels are substantially more similar within section members than across section members. The within- to across-section similarities increase sharply following HBS alumni reunions, which occur every five years after an executive's graduation year. Together, the patterns strongly suggest that corporate managers engage in WOM and that WOM impacts corporate finance decisions.

HBS students frequently join investment companies, including mutual funds, hedge funds, and private equity funds. Future research could utilize HBS section assignments and reunions to provide relatively clean evidence regarding the effects of WOM among institutional investors.

#### *2.2.1.2 Field and Laboratory Experiments*

To provide an example of a field experiment, Banerjee, Chandrasekhar, Duflo, and Jackson (2019) seed information on a raffle in three randomly chosen subsets of rural villages in India: in the first subset, the information is seeded with randomly selected individuals; in the second subset, the information is seeded with village elders; in the third subset, the information is seeded with individuals nominated by villagers as the best gossipers. Banerjee et al. then analyze which setting generates the highest information diffusion rate by counting how many villagers enter the raffle.

Unfortunately, field experiments are expensive and often impractical to conduct. Laboratory experiments offer an alternative. Laboratory experiments on WOM have been primarily conducted in social psychology and marketing but, in the future, could also play a role in finance. To provide an example of a study conducting a laboratory experiment, Berger and Milkman (2012) examine what types of stories more

frequently become viral. In the first part of their paper, the authors examine which features of a *New York Times* article increase the likelihood that the article appears in the *New York Times*' most-emailed list. Berger and Milkman find that one of the strongest predictors is whether an article evokes anger. Articles that evoke anger may differ along other dimensions, which, in turn, could encourage sharing. The authors conduct a laboratory experiment to examine whether it is truly the anger-evoking content that helped propel the article on the most-emailed list. The authors randomly assign participants either a high- or a low-anger version of an article. The authors then ask participants whether they would share the article. Similar to the results based on *New York Times* articles, the authors find that participants were significantly more likely to share the high-anger version.

Future research could adopt a similar strategy to study what types of information more easily propagate among investors. This has become increasingly feasible with the advent of online platforms, such as Prolific (<https://www.prolific.co>), which allow researchers to easily recruit prescreened participants for online experiments.

### 2.2.2 Instrumental Variable

A strategy that has been used in the past and that is likely to remain helpful in the future is the instrumental variable approach. To provide an example, Brown, Ivković, Smith, and Weisbenner (2008) examine whether neighbors encourage each other to invest in the stock market. As discussed at the beginning of this section, common stock ownership among neighbors, by itself, does not establish the presence of WOM. To address self-selection- and common-shock concerns, Brown et al. assume that our decision to invest in stocks is at least partially driven by our upbringing and the norms and values of the region in which we were born. The authors build on this assumption and instrument the average stock ownership of an individual's neighborhood with the lagged average stock ownership of the states in which the individual's *nonnative neighbors* were born. Using this empirical strategy, the authors estimate that a 10-percentage-points increase in the average neighborhood stock ownership increases the likelihood that an individual purchases stocks by four percentage points.

### *2.2.3 Regression Discontinuity*

Sometimes, we can conduct a regression discontinuity analysis to provide evidence of WOM effects. To give an example, Anderson and Magruder (2012) estimate how much WOM in the form of customer ratings incrementally affects businesses' sales. The authors turn to Yelp, which publishes crowdsourced reviews about businesses. Yelp users assign a rating from one to five stars, with five stars representing the most positive assessment. Yelp computes the average rating and rounds off to the nearest half-star. Yelp thus assigns a business with an average rating of 3.74, a 3.5-star rating, and a business with an average rating of 3.76, a 4-star rating. In the authors' study, Yelp was the 12<sup>th</sup> most trafficked website. The authors combine their Yelp data with restaurant availability data from a large online restaurant reservation website. The authors find that a half-star increase in a restaurant's rating significantly increases the odds that the restaurant is fully booked. Businesses with an average rating of 3.74 and 3.76 are likely of the same quality. Coupled with Yelp's popularity, we may thus causally tie the observed differences in restaurant sales to WOM transmitted through Yelp.

As mentioned in the introduction and further discussed in Section 5, investors obtain an increasing portion of their financial news and opinions through social technologies. Regression discontinuity may provide a particularly useful strategy to examine how investment recommendations transmitted through social technologies affect investors' decisions and asset prices.

### *2.2.4 Survey*

Another empirical strategy to gauge investors' reliance on WOM is simply asking them. One of the earliest studies on WOM did precisely that. Shiller and Pound (1989) survey retail and institutional investors. In their survey, 53% of institutional investors report that a fellow investment professional triggered their interest in a subsequently purchased stock. Another 10% report that a person who is not an investment professional triggered their interest. In other words, a stunning 63% of institutional investors report that social interactions triggered their trades. In comparison, only 30% report that an investment advisory newsletter or brokerage house recommendation triggered their interest in a stock they ended up buying.

Among retail investors, 33% report “yes” to the question, “*Was another person you spoke to, besides a stockbroker (for example, a friend or business associate), influential in getting you to buy stock in the COMPANY?*” The survey results in Shiller and Pound suggest that investors frequently draw from each other as they decide which stocks to invest in.

### *2.2.5 Detailed Data*

Finally, there are numerous cases of researchers using unique and detailed data to study WOM. These data contain records of investors’ interactions. Sometimes, the data even include the content that investors share with one another. Since these data contain “proof” that two investors communicated with one another, they help mitigate the self-selection- and common-shock problem.

To list two recent examples, Rantala (2019) obtains detailed data regarding investors’ social networks from a police investigation of a large Ponzi scheme. The investment firm delivered its early investors large positive returns, which it said derived from sports betting and currency trading. Individuals could only invest if a current investor invited them. Rantala uses the police documents to assemble the complete inviter-invitee social network. He then uses his data to analyze the structure of investors’ social networks.

In another paper, Lane, Lim, and Uzzi (2021) obtain data on instant messages exchanged between professional traders on an investment firm’s trading platform and the trades these traders executed. The authors find that professional traders are significantly more likely to message about stocks they had gains on than stocks they had losses on.

The detailed data approach is likely to remain important in the WOM literature particularly with the advent of modern information technologies. As our search for information and conversations shift online, we can increasingly listen in on peoples’ thoughts and conversations through the digital footprints they leave behind. Researchers will eventually obtain access to some of these digital footprints and use them to study WOM effects among investors.



All in all, the WOM literature faces strong empirical challenges. But the challenges are not insurmountable. There are at least five approaches to address the self-selection- and common-shock problem: experiments, instrumental variables, regression discontinuity, surveys, and detailed data. All of these strategies can be used, either in isolation or in combination, to study WOM among investors.

### **3. The Presence of WOM among Investors**

Recall that social asset pricing aims to address three questions:

- (1) whether investors frequently act on investment ideas they hear from/discuss with other investors, and, if so, in what manner,
- (2) what the consequences of WOM are on the quality of their investment decisions, and
- (3) what the effects are on asset prices and market efficiency.

In this section, I discuss the evidence regarding question (1). The first subsection discusses the evidence for retail investors. The second subsection covers the evidence for institutional investors.<sup>3</sup>

#### *3.1 Retail Investor Behavior*

Kaustia and Knüpfer (2012) obtain detailed data from an official registry that includes every stock market transaction of every stock market participant in the Finnish stock market. The authors use the data to construct the average monthly return across all stocks held by investors who live in a particular zip code (“neighborhood return”). The authors find that positive neighborhood returns increase the odds that investors in the corresponding zip code subsequently purchase stocks for the first time. The authors find little effect for negative neighborhood returns. These results suggest that investors are keen to share their investment successes, which, in turn, causes their neighbors to invest in the stock market. Investors are reluctant to share their investment failures. Investment failures thus do not enter investors’ conversations and do not cause neighbors to withdraw from the market.

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<sup>3</sup> I do not discuss again the studies touched on in the previous empirical methods section (Shiller and Pound, 1989; Brown, Ivković, Smith, and Weisbenner, 2008; Rantala, 2019; Lane, Lim, and Uzzi, 2021).

Relatedly, Hvide and Östberg (2015) use detailed data that includes all stock trades of every Norwegian resident. The authors also have records of the residents' workplaces. The authors find that an individual is significantly more likely to purchase (sell) a stock in a particular month if a high fraction of her coworkers is also buying (selling) a stock during that month. The results are substantially stronger for stock purchases than for stock sales. The authors find that more coworkers purchasing a specific stock increases the likelihood that an individual purchases the same stock. Consistent with the presence of WOM, the authors find that the effect is stronger in smaller workplaces and among coworkers with a similar socioeconomic background.

The effects that Kaustia and Knüpfer (2012) and Hvide and Östberg (2015) observe are large in magnitude. Kaustia and Knüpfer find that a one standard deviation rise in the monthly neighborhood return increases the fraction of first-time stock purchases by 9-13%. Hvide and Östberg find that a one standard deviation rise in the fraction of coworkers making a stock purchase increases the likelihood that an individual makes a stock purchase by 41%.

Huang, Hwang, and Lou (2021) adopt a natural-experiment-style approach to study the presence of WOM among retail investors. The authors consider US retail investors who are directly or indirectly affected by a cross-industry stock-financed M&A. At the completion of a cross-industry stock financed M&A, investors in the target firm receive shares of the acquirer firm. The authors conjecture that the endowment of shares from the acquirer industry leads some of the affected retail investors to form opinions about the acquirer industry and start trading firms in the acquirer industry (aside from the acquirer firm itself).

Suppose these retail investors communicate their newly gained industry perspectives to other retail investors in their neighborhood. In that case, we may observe abnormal trading activity in the acquirer industry not only by the initially affected target investors but also by their neighbors and their neighbors' neighbors. Dynamically tracking the contagion of abnormal trading activity in the acquirer industry then enables the authors to estimate the degree to which investors spread and act on information transmitted through WOM ("communication rate"). The seeding of industry attention through cross-industry M&As is

plausibly exogenous to retail investors' backgrounds, tastes, and preferences. Moreover, the variation between the time the M&A is announced and the time the acquirer shares are eventually endowed helps rule out common shocks, such as local media coverage.

The authors find that abnormal trading activity in the acquirer industry, indeed, strongly percolates from the initially affected target investors to their neighbors and their neighbors' neighbors. Investors tend to trade in the same direction: if a target investor is buying in the acquirer industry, so are her neighbors and neighbors' neighbors. Most abnormal trading activity comes from stock purchases.

Differences in age, gender, and income generally lower the communication rate. But there are strong asymmetries. The communication rate from older, high-income investors to younger, low-income investors is substantially higher than the communication rate in the reverse direction. One possible explanation for this asymmetry is that investors perceive information conveyed by older, wealthier investors as more credible and, thus, are more likely to act on any views transmitted by such investors.

The strongest determinants of the communication rate are the sender's and receiver's recent portfolio performances. Investors more frequently transmit financial information when they have had recent investment successes. Investors are also more open to *receiving* financial information when they have had recent investment successes. Together, these findings suggest that WOM effects are stronger during bull markets when senders are more likely to transmit investment ideas and receivers are more likely to listen to investment ideas.<sup>4</sup>

Individuals invest not only in stocks but also in housing. Bailey, Cao, Kuchler, and Stroebel (2018) combine a 2015 snapshot of all US Facebook users with a 2010 and a 2012 snapshot of US housing records and county-level house price indices from Zillow. The Facebook data contain information about all the Facebook users that a user is connected to and their counties of residency. The housing records contain information about a person's homeownership status and, for current homeowners, information about their current house. Bailey et al. conjecture that people discuss the housing market with their friends and that

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<sup>4</sup> Relatedly, the authors find that WOM effects are stronger when investor sentiment is high.

these discussions impact their decision to buy a house. To test this conjecture, the authors consider Facebook users in Los Angeles and compute for each user the average house price change of the counties in which their geographically distant friends reside. Some users have strong ties to the Midwest, while others have strong ties to the Northeast. The average house price experience across Facebook users' friends varies accordingly. To illustrate the magnitude of the variation, while house prices declined substantially from 2008 to 2010, the 5<sup>th</sup> and 95<sup>th</sup> percentiles of friends' house price experiences are -16.3% and -5.2%, respectively.

In their first test, the authors consider Los Angeles-based renters in 2010 and examine whether their likelihood of becoming a homeowner by 2012 is affected by their friends' house price experiences from 2008 to 2010. The authors find a strong positive relation. The authors also find that the house price experiences of friends positively predict the size and price paid for the house. Together, these results suggest that WOM affects peoples' decision to invest in housing. To further bolster this interpretation, the authors conduct a survey among Los Angeles-based Facebook users. In the survey, more than half report that they regularly discuss investing in the housing market with their friends. Moreover, positive house price experiences by friends increase the odds that a survey participant believes investing in the local housing market is a good idea.

In another study, Bayer, Mangum, and Roberts (2021) obtain detailed data on housing transactions in the Los Angeles area. The authors consider a household's primary residence and examine whether other households whose primary residences are within 0.1 miles of the focal household (around 160 meters) recently purchased another property for investment purposes. The authors also consider whether properties within 0.1 miles of the focal household have recently been "flipped," that is, sold within two years of purchase. The authors find that a household is more likely to purchase another property for investment purposes when her neighbors recently invested in another property or when a nearby property was recently flipped. The evidence in Bayer et al. suggests that WOM affects our decision to invest in properties held for investment purposes without any consumption component.

### *3.2 Institutional Investor Behavior*

There is less work on WOM among institutional investors, even though the evidence in Shiller and Pound (1989) suggests that institutional investors rely on WOM to a greater degree than retail investors.

Pool, Stoffman, and Yonker (2015) use detailed data regarding US mutual fund managers' residential addresses and their holdings and trades. The authors construct normalized distance measures, which measure how far two fund managers reside from each other while accounting for the population density of the areas in which the fund managers reside. The authors classify two managers residing on the Upper East Side of New York City as living in the same neighborhood if they live within 161 feet (49 meters) from each other; for New Canaan, a town of 21,000 people located a one-hour train ride from New York City, the authors consider two managers as living in the same neighborhood if they live within 7.8 miles (12.6 kilometers) from each other. Pool et al. find that managers in the same neighborhood have more similar holdings and trades. As with retail investors, the similarity in trades is substantially stronger for stock purchases than for stock sales. The similarity is particularly pronounced among managers with the same ethnic background. The finding of Pool et al. corroborates the earlier observation by Hong, Kubik, and Stein (2005) that, in any quarter, mutual fund managers residing in the same city more frequently buy (or sell) the same stocks.

Overall, the literature provides compelling evidence that retail investors discuss the stock- and housing market with other retail investors. There are fewer studies on the presence of WOM among institutional investors. But the evidence so far suggests that WOM also impacts the decisions of institutional investors. By and large, WOM causes investors to buy stocks (rather than sell stocks).<sup>5</sup>

The above literature examines not only whether investors lean on each other but also how much. The literature finds that the WOM effects are substantial unconditionally. The literature has also begun to spell out the conditions under which WOM effects are particularly strong: (a) when the sender has had recent

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<sup>5</sup> Part of this asymmetry may be driven by the fact that many investors do not short.

investment successes, (b) when the receiver has had recent investment successes, (c) when the source of information is seen as more credible, and (d) when senders and receivers share similar ethnic or socioeconomic backgrounds.

#### **4. The Consequences of WOM among Investors**

Given the evidence that investors frequently lean on each other for ideas and opinions, it is natural to inquire whether WOM causes investors to make better or worse decisions. The first subsection discusses the corresponding evidence. The second subsection offers possible explanations for the evidence. The final subsection outlines potential asset pricing implications.

##### *4.1 Does WOM Lead to Better or Worse Investment Decisions? The Evidence*

###### *4.1.1 Retail Investors*

Recall that Hvide and Östberg (2015) find that more coworkers purchasing a particular stock significantly increases the odds that an individual purchases the same stock. In additional tests, Hvide and Östberg consider the stocks that coworkers purchase more aggressively (than non-coworkers) and track their subsequent performance. The authors find that the stocks that coworkers are more enthusiastic about are *not* followed by higher returns. Coworkers also appear to encourage individuals to purchase within-industry stocks, which, from a diversification perspective, is not a sound financial decision. Overall, the evidence leads Hvide and Östberg to conclude that “*individual investors follow the advice of their coworkers even though the advice does not contain value-pertinent information*” (page 644).

Recall that Huang, Hwang, and Lou (2021) find evidence that WOM among retail investors leads to the percolation of abnormal trading activity in the acquirer industry. Similar to Hvide and Östberg (2015), the authors find that the stocks that retail investors purchase in the corresponding industries do not earn higher returns than the stocks that they sell. The abnormal trading activity in the acquirer industry thus does not improve investors’ performances.

Chen and Hwang (2022) obtain server-log data from Seeking Alpha, one of the largest investment-related websites in the US. For each article published on the website, the authors have data on the number of times a reader scrolled to the bottom of each article and the number of times an article was shared through e-mail. The authors measure an article's accuracy by whether a positive (negative) article is followed by positive (negative) abnormal returns. The authors find that while Seeking-Alpha articles are generally accurate, particularly the ones that users more frequently read to the end, the articles that users choose to share with others are not. Relatedly, stocks receiving a high number of article shares over article reads earn unusually low returns in the long run, as do stocks receiving a high number of retweets over tweets. In general, the authors observe a striking disparity between the types of articles that investors read to the end and the types of articles that they share with their peers.

All in all, the evidence suggests that pre-transaction costs, WOM does not improve or even lowers the quality of households' stock picks. Once accounting for transaction costs, WOM appears to mostly hurt retail investors' performances. This conclusion carries over to the housing market. Bailey, Cao, Kuchler, and Stroebel (2018) find that the degree to which an individual invests in the Los Angeles housing market based on her friends' house price experiences does not depend on how well her friends' house price experiences predict the house price growth in Los Angeles. Bayer, Mangum, and Roberts (2021) find that individuals who purchase homes for investment purposes (after seeing their close neighbors invest in housing or after observing flipped houses in their neighborhood) subsequently earn unusually low returns on their purchased homes and more frequently default.

On the surface, the evidence regarding retail investors' investment decisions contradicts some of the evidence regarding households' other financial decisions. Haliassos, Jansson, and Karabulut (2020) use the allocation of refugees to apartments in Sweden to examine the effects of exposure to financially literate neighbors. The authors find that refugees exposed to financially literate neighbors subsequently hold more stocks for retirement.

To provide another "positive" piece of evidence, Maturana and Nickerson (2019) compile records of US school teachers to observe which teachers at a particular school share an off-period. Teachers spend

their off-periods in common workrooms or lounges to rest, prepare classes, and grade. Maturana and Nickerson assume that teachers sharing an off-period are more likely to interact with one another. The authors combine teachers' off-period records with teachers' mortgage refinancing activities. The authors find that when off-period peers engage in more refinancing, "treated" teachers are substantially more likely to refinance their mortgages themselves and, as a result, realize considerable savings.

I offer a possible explanation for the seeming contradiction between WOM's negative effects on investment decisions and WOM's positive effects on other financial decisions in Subsection 4.2.

#### *4.1.2 Institutional Investors*

Recall that Pool, Stoffman, and Yonker (2015) find that managers in the same neighborhood have more similar holdings and trades. In an additional test, Pool et al. compare the subsequent performance of stocks that both a fund manager and her neighbors hold with that of stocks that a fund manager holds but that her neighbors do not. If fund managers transmit unique value-relevant information through WOM, we may expect the former to outperform the latter. The authors find no such outperformance.

In another test, the authors compare the subsequent performance of stocks that both a fund manager and her neighbors recently bought (sold) with that of stocks that a fund manager bought (sold) but that her neighbors did not. That is, rather than condition on managers' holdings, the authors condition on their trades. The authors find that the difference in future performance between the recently bought and the recently sold stocks is more positive when fund managers and their neighbors trade together. While the difference is economically meaningful, it is only marginally statistically significant.

All in all, while the evidence suggests that WOM does not help retail investors make better investment decisions, WOM appears to be more beneficial to institutional investors.

#### *4.2 Possible Explanations*

What could explain the evidence? I suggest that at least three concepts could play a role, "homophily," "impression management," and "emotion regulation."



#### *4.2.1 Homophily*

Investing in a stock or an alternative asset requires us to project the asset's future cash flows and compute the corresponding present value. I believe the “wisdom of the crowd effect” can provide a helpful framework to lay out the conditions under which WOM can help us (or hurt us) in this task.

The wisdom of the crowd effect was first chronicled by Galton (1907) and popularized by Surowiecki (2005). Suppose that (1) there is a diversity of opinions, (2) there is no systematic bias in the outlook, and (3) opinions are appropriately aggregated (e.g., we consider the average or median opinion rather than the most extreme opinion). Galton notes that under these conditions, we can take advantage of the fact that we all know a little something and that individual errors wash out in the aggregate. The consensus opinion thus becomes remarkably accurate even if individuals, in isolation, do not know more than others.

Jame, Johnston, Markov, and Wolfe (2016) find evidence of the wisdom of the crowd effect in financial markets. The authors study Estimize, a website that allows any interested user to provide a forecast for a company's upcoming earnings. As of February 2022, the website has more than 115,000 contributors. Jame et al. find that the consensus forecasts across Estimize users are very close to the actual reported earnings.

Applying the wisdom of the crowd principle to WOM suggests that WOM can help people be more informed (1) if they interact with a large, diverse group of people, (2) if their peers are not systematically biased in their outlook, and (3) if they consider the average or median opinion rather than the most extreme opinion or the opinion of the person closest to them.

Alas, our social networks are not constructed in this manner most of the time. The circle of peers with whom we feel comfortable discussing an issue may be small. The noise in individual opinions only washes out when we aggregate across many opinions. Suppose we solicit views from a limited number of nonexperts who, in turn, are unlikely to have discussed the issue with their peers (or are unlikely to discuss the matter with their peers going forward and report back to us). In that case, the consensus view primarily reflects noise. If investors nevertheless condition their decisions on the consensus view, WOM does not lead to better investment decisions.

One possible explanation for why Pool, Stoffman, and Yonker (2015) find some indication that WOM leads to better investment decisions among institutional investors, while other studies find no such evidence for retail investors, is that while retail investors may condition on noisy consensus views (“Do my friends think I should buy Netflix stocks?”), institutional investors likely use social interactions more as a means to uncover nuggets of perspectives that they have not considered yet. In addition, given the importance and relevance of the topic to professional investors, institutional investors likely discuss the issue with their own set of peers, which, through iterations and feedback loops, effectively increases the number of viewpoints and, hence, decreases the noise in the consensus view.

Perhaps more important than the small number problem is that people prefer interacting with people of similar backgrounds, preferences, and belief systems (Lazarsfeld and Merton, 1954; McPherson, Smith-Lovin, and Cook, 2001). In the literature, this principle is known as homophily. Homophily in social networks lowers the diversity of opinions. Homophily also introduces a systematic bias in the outlook. Finally, even if there are differing viewpoints, homophily can cause people to not properly aggregate viewpoints and overweigh the views of the people closest to them.

To provide an example, US survey evidence suggests that peoples’ economic outlook is strongly determined by their political affiliation and which political party currently holds the presidency: if their favored party holds the presidency, their economic outlook is optimistic; if their non-favored party holds the presidency, their economic outlook is pessimistic (Survey of Consumers - University of Michigan, 2021). Homophily implies that Democrats prefer interacting with Democratic-leaning people while Republicans prefer interacting with Republican-leaning people. When the Democratic Party holds the US presidency, Democrats thus mostly hear about the upsides of the economy, whereas Republicans mostly hear about the downsides. These one-sided, skewed “discussions” in “echo chambers” can cause people to form biased expectations about future cash flows and make suboptimal investment decisions as a result.<sup>6</sup>

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<sup>6</sup> Echo chambers can be broadly defined as “environments in which the opinion, political leaning, or belief of users about a topic gets reinforced due to repeated interactions with peers or sources having similar tendencies and attitudes” (Cinelli et al., 2021).

Homophily also implies that investors prefer interacting with investors who hold a similar view about the stock market. For instance, an investor who is bullish on Tesla may like interacting with peers who are also bullish on Tesla. Cookson, Engelberg, and Mullins (2022) find evidence for this possibility. The authors compile data from Stocktwits, a social media platform on which investors post messages and express their sentiments regarding publicly traded companies. Stocktwits user  $i$  can choose to follow Stocktwits user  $j$ . The messages that user  $j$  subsequently posts then appear on user  $i$ 's newsfeed. The authors classify a user as "bullish" about a stock if more than 90% of the user's messages regarding the stock are toggled as "bullish." The authors find that bullishness is highly persistent at the user-stock level. Moreover, a bullish user is significantly more likely to follow another user who is also bullish on the corresponding stock. As a result, the user's newsfeed becomes populated with mostly bullish messages, resulting again in a very one-sided, skewed "discussion."

Homophily has the most prominent effects when the topic is nuanced and subject to interpretation. Homophily has smaller effects on disseminating hard information, such as the possibility of refinancing one's mortgage (Jackson, Robers, and Zenou, 2017). This key difference may explain why WOM appears valuable in certain situations (e.g., Maturana and Nickerson, 2019) and less helpful in picking stocks or houses.

Examining in what other ways homophily affects investors' beliefs and decision-making should be an interesting avenue for future research.

#### *4.2.2 Impression Management*

Impression management is another concept that could explain why WOM does not appear to help retail investors. An extensive literature in social psychology notes that we regularly use our conversations to enhance our social standing and create impressions of likeability and competence (e.g., Goffman, 1978; Baumeister, 1982; Lakin and Chartrand, 2003; Berger and Milkman, 2012; Berger, 2014; Gilovich, Keltner, Chen, and Nisbett, 2019; Baek, Scholz, and Falk, 2020).

The origins of impression management can be traced to our evolution:<sup>7</sup> Over time, nature favored and prodded the human species into improving our ability to harmonize with others and live within large groups (Dunbar and Shultz, 2007). Our ability to cooperate and live within large groups paid off handsomely, at least to the human species, as these skills dramatically improved our capacity to extract foods, avoid predators and care for our young (Dunbar, 1993; Hill and Dunbar, 1998).

One unfortunate byproduct of living within large groups is increased competition for resources and mating partners. Our well-being thus becomes strongly tied to how others perceive us. Research in neuroscience shows that our brain is wired accordingly. For instance, Eisenberger, Lieberman, and Williams (2003) find that physical pain and social pain induced by social exclusion activate the same brain regions. Our brain thus appears to treat threats to our social well-being in the same manner as threats to our physical well-being. DeWall et al. (2010) find that medication that helps treat physical pain (Tylenol) also helps alleviate social pain.

What are the consequences of impression management for investors' conversations? The above alluded literature shows that impression-management considerations can cause people to share select, non-representative information or experiences. For instance, impression-management considerations can lead people to share only their positive, successful experiences.

Impression-management considerations can also alter *how* we talk about things. Humans have developed a large arsenal of strategies ranging from simple exaggeration, which we believe allows us to appear fun and interesting, to more subtle techniques such as "humblebragging," which we think allows us to project competence without appearing self-aggrandizing ("*I'm so busy with review requests these days. The JF just sent me another one... I think one of the authors is Thaler.*"). When Marsh and Tversky (2004) ask participants to share stories from their lives, they find that 61% of the stories are distorted, containing exaggerations, omissions, minimizations, and additions.

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<sup>7</sup> My discussion of this theory is necessarily brief. For a deeper understanding of the arguments and the corresponding evidence, I refer the reader to Lieberman (2013).

Even though impression-management considerations are wired into our brains, evidence suggests that receivers are unable to fully account for these considerations (Enke, 2020). The transmission of non-representative, distorted signals coupled with our inability to fully account for these biased transmissions lead to misconstrued realities and poor decision-making.

To illustrate how impression management can cause WOM to negatively affect investors, suppose that investors in actively-managed mutual funds discuss their investment only after experiencing unusually positive returns. Receivers, therefore, only hear the investment successes and not the investment failures. Han, Hirshleifer, and Walden (2022) note that such one-sided conversations can give receivers the (wrong) impression that actively-managed mutual funds generally outperform their benchmark and cause receivers to flock to active investment strategies.

To provide another example, the suitability of a content for impression management and its value-relevance are often uncorrelated or even negatively correlated with one another. Impression management can therefore lead to the propagation of noise. For instance, Chen and Hwang (2022) find that Seeking-Alpha users prefer sharing stock opinion articles that are technical and quantitative, presumably in an attempt to appear intelligent and sophisticated. Unfortunately, Chen and Hwang find that quantitative articles are also *less* accurate than their qualitative counterparts, as Seeking-Alpha authors' comparative advantage lies in the evaluation of the softer aspects of a firm. In an attempt to appear intelligent and sophisticated, Seeking-Alpha users thus inadvertently end up sharing the less accurate stock opinion articles.

The above are just a couple of examples of how impression-management considerations can cause WOM to lead investors astray even when there is no conscious attempt to mislead them. I anticipate future research to uncover many more.

#### *4.2.3 Emotion Regulation*

Another important reason people engage in social interactions is to make themselves feel better. People share negative experiences that they believe were not their fault to vent and seek comfort. When feeling

uncertain about a decision they have made, people seek out conversations to (hopefully) confirm that they have made the right decision. People also engage in conversations to relive past positive emotional experiences (Berger, 2014).

Investors' desire to confirm that they have made the right investment decision can cause them to seek out echo chambers. As discussed in Subsection 4.2.1, echo chambers can lead to distorted beliefs and suboptimal decision-making.

Relatedly, investors' desire to relive positive emotional experiences can cause them to only share their investment successes and not their investment failures. As discussed in Subsection 4.2.2, such select, non-representative transmission can cause WOM to create distorted perceptions and poor investment decisions.

As with homophily and impression management, the above are just a couple of examples of how emotion regulation can lead investors astray. I anticipate future research to uncover many more.

### *4.3 Potential Asset Pricing Implications*

If homophily, impression management, and emotion regulation can cause WOM to negatively impact investors, it is conceivable that these concepts also generate mispricing in the stock market. Empirical research assessing this possibility is only getting started.

#### *4.3.1 Echo Chambers*

Suppose that homophily and emotion regulation induce investors to enter echo chambers. Suppose further that there are short-sale constraints. Both assumptions are reasonable and supported by evidence (Diether, Malloy, and Scherbina, 2002; Nagel, 2005; Cookson, Engelberg, and Mullins, 2022). If positive echo chambers are strong enough, increasing "self-radicalization" in echo chambers can lead to continuously building overpricing and unusually low returns in the long run. Note that such overpricing can emerge even if the positive echo chambers are met with equally prominent negative echo chambers. The reason is that

in the presence of short-sale constraints, only the views of the optimists become reflected in market prices (Miller, 1977).

Cookson, Engelberg, and Mullins (2022) find evidence consistent with the above possibility. The authors show that when a user declares herself as bullish about stock  $s$  within a positive echo chamber on Stocktwits, stock  $s$  earns unusually low returns over the ensuing weeks.

Further examining whether echo chambers exist in financial markets and whether they can be strong enough to determine asset prices appears to be an interesting avenue for future research.

#### *4.3.2 Self-Enhancing Transmission Biases*

Impression management and emotion regulation cause investors to transmit non-representative or distorted signals in their conversations. The theory paper of Han, Hirshleifer, and Walden (2022) provides the conceptual backbone for how these “self-enhancing transmission biases” can affect asset prices.

Suppose that investors exhibit a systematic preference for discussing stocks with specific features because of common impression-management- or emotion-regulation considerations. I will specify some possible features in the ensuing paragraphs. Further, suppose that investors tend to purchase stocks that enter their radar (Barber and Odean, 2008) and that there are short-sale constraints. Under these conditions, people will flock to the same types of stocks. Investors’ synchronous purchase of these stocks will generate overpricing among the affected stocks and unusually low returns in the long run.

As Han, Hirshleifer, and Walden (2022) note, the above mechanism offers an alternative interpretation of some basic stock market patterns. For instance, one peculiarity of the stock market is that stocks with high return volatility earn unusually low future returns both in the US (Ang, Hodrick, Xing, and Zhang, 2006) and internationally (Ang, Hodrick, Xing, and Zhang, 2009). One possible behavioral explanation is that investors exhibit prospect theory preferences. Stocks with high volatility may have high skewness in their subsequent returns, for which prospect-theory investors are willing to pay a high price and accept a low average return (Barberis, 2018).

An alternative social explanation is that investors prefer discussing stocks with extreme returns because they make for more interesting conversations. High-volatility stocks thus more frequently enter investors' conversations than low-volatility stocks, which, coupled with the above assumptions, can help explain why high-volatility stocks become overpriced and earn such unusually low returns in the long run.

The above line of argument can be extended to other cross-sectional determinants of average returns. Can systematic sharing preferences help explain why stocks with aggressive investment subsequently earn unusually low returns (Fama and French, 2015)? Can systematic sharing preferences help explain why growth stocks generally earn lower returns in the long run (Fama and French, 1992; 2015)?

Testing whether social interactions can explain these basic facts about the stock market is the natural next step for social asset pricing. These empirical assessments should yield insight into how seriously we should consider social interactions in our asset-pricing models going forward.

## **5. How Could Social Technologies Alter the Effects of WOM among Investors?**

Before concluding, I discuss how the advent of modern communication technologies is changing WOM among investors and what the implications are for future research in social asset pricing.

An increasing portion of our social interactions occurs virtually. In principle, the effects could be positive or negative. Recall that WOM can help people be more informed (1) if they interact with a large, diverse group of people, (2) if their peers are not systematically biased in their outlook, and (3) if they consider the average or median opinion rather than the most extreme opinion or the opinion of the person closest to them.

Thanks to the creation of virtual platforms, such as Stocktwits and SA, investment-related conversations are no longer constrained to real-world acquaintances. They can involve many more people who are likely more interested in and possibly more informed about financial markets than our real-world social circle. By facilitating access to a much larger number of possibly more informed opinions, virtual platforms offer a possible solution to the small number problem.



In addition, some platforms, such as Stocktwits and SA, allow users to observe all recent opinions regarding a stock, irrespective of whether the sentiment is bullish, bearish, or unspecified. These platforms also prominently display the consensus sentiment for each stock. In principle, virtual platforms thus facilitate the proper aggregation across many diverse opinions and could therefore trigger more informed investment decisions.

Finally, suppose that investors are indifferent toward how anonymous users perceive them. In that case, virtual platforms also solve the impression-management problem.

The following observations represent possible counterarguments: On most virtual platforms, users can choose to follow other users. The followed users' opinions then appear on the following user's newsfeed. Since people prefer hearing an opinion that confirms their prior (e.g., Nickerson, 1998), people generally follow users who hold a similar view. Users' newsfeeds can thus become severely biased (e.g., Garrett, 2009; Cookson, Engelberg, and Mullins, 2022). In fact, Bakshy, Messing, and Adamic (2015) suggest that on certain platforms, such as Twitter (which bears a resemblance to Stocktwits), users become significantly *less* exposed to *opposing* viewpoints than in real-world interactions.<sup>8</sup>

Another concern is that social media networks are less egalitarian than real-world social networks in the sense that social media networks often have an "influencer" at the center of the network who is connected to many people. We know from social network analysis that in a centralized network, even a small bias in an influencer's viewpoint can become amplified and severely bias the views of the overall network (Centola, 2021). Centralized networks also facilitate coordinated "attacks" on certain stocks, such as GameStop, for either strategic or ideological reasons.

Finally, research suggests that users do care about how others perceive them in the virtual world (Cunningham, 2013). In fact, recent evidence from psychology suggests that impression-management considerations are more pronounced when interacting with weak ties than with strong, close ties (Dubois,

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<sup>8</sup> On the other hand, Flaxman, Goel, and Rao (2016) suggest that people who use social media are more exposed to opposing viewpoints than people who do not use social media.

Bonezzi, and De Angelis, 2016). We thus have reason to believe that virtual platforms exacerbate biased information transmission due to impression-management considerations.

All in all, it appears crucial that future research examines whether the recent changes in how investors interact with one another have improved or worsened the quality of investors' conversations and investors' decision-making.

It also appears crucial that in examining the effects of WOM on asset prices, future research considers our increasing reliance on virtual platforms. Any such research should consider that not all platforms are the same. For instance, Cinelli et al. (2021) note that the algorithms determining how feeds are displayed to users and the degree to which users can customize the algorithm vary significantly across platforms. Cinelli et al. find evidence that these differences help explain variation in the prevalence and strength of echo chambers across platforms.

## **6. Conclusion**

In this article, I surveyed empirical work in social asset pricing. Social asset pricing tries to understand (1) whether investors obtain much of their investment ideas through WOM and, if so, in what manner, (2) what the consequences of WOM are on the quality of their investment decisions, and (3) what the effects are on asset prices and market efficiency.

Most empirical research in social asset pricing has been on question (1). Of the three questions, the first is perhaps the least controversial. To some, it may also be the least interesting. This is not a criticism of the literature. It is reasonable to begin with question (1) as questions (2) and (3) become relevant only if the answer to the first question is a "yes." Also, there is value in systematically documenting and, more importantly, quantifying and qualifying the relevance of WOM among investors.

Still, I speculate that most future research will turn to question (2) and to question (3) in particular.<sup>9</sup> I outlined possible directions in Sections 4 and 5. Here, I offer one final tentative suggestion:

Section 4 notes that social asset pricing can offer an alternative to current behavioral explanations of empirical phenomena, such as why high-volatility stocks earn unusually low future returns. Future research should gauge this possibility. At the same time, I believe it is important to realize that behavioral finance and social asset pricing need not be in competition and can complement each other.

Barberis (2018) concludes his review of behavioral finance with some open questions: “*While extrapolative beliefs and gain-loss utility are both helpful for understanding the data, they both also raise fundamental questions that have not been fully answered: Why do people extrapolate, and how do they extrapolate? [...] And if, when making investment decisions, people think about the gains and losses that could result, how do they define these potential gains and losses*” (page 79).

Regarding why people extrapolate, the non-randomness in how people enter echo chambers, coupled with the increasing self-radicalization in echo chambers, offer one natural explanation. Regarding how people define potential gains and losses, it appears plausible that they consider the gains and losses reported by their peers. Transmission biases in how peers report gains and losses can lead to distorted definitions. Accounting for these distortions could enhance prospect theory’s ability to explain investor behavior and asset prices. Examining these and related possibilities should be an interesting and promising avenue for both behavioral finance and social asset pricing.

Social asset pricing is part of a much larger “social finance” literature. Social finance is a term coined by Hirshleifer (2015) and describes research “*which studies the structure of social interactions, how financial ideas spread and evolve, and how social processes affect financial outcomes*” (page 133). Readers interested in social finance should consider David Hirshleifer’s AFA Presidential Address on social finance (2020), Robert Shiller’s AEA Presidential Address on narrative economics (2017), Kuchler and Stroebel’s

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<sup>9</sup> One caveat to this statement is that I think it would be helpful to have more evidence on the prevalence of WOM among institutional investors. This research could be archival, for instance, utilizing HBS section assignments. This research could also update the survey evidence in Shiller and Pound (1989).

review of social finance (2021), and Jackson, Robers, and Zenou's (2017) review of social network analysis in economics.

Social finance is a rapidly growing field. To help interested researchers navigate the literature, Hailiang Chen and I have created a website that serves as a repository of research in social finance: <http://socialfinance.site>. We invite everyone to visit and contribute to this website. More broadly, we invite everyone to push forward on the social-asset-pricing- and the social-finance research agendas.

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