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Herd behaviour: A survey

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Abstract

This paper presents a survey of the extant research on herding, from both a theoretical and an empirical perspective. Theoretical research provides valuable insights into the key motives underlying investors' tendencies to herd, while empirical evidence confirms the presence of herding – to varying degrees – internationally, both at the market level and for specific investor types. In future research there should be a greater focus on empirically testing herding intent, herding dynamics at high frequencies and other (non-equity) asset classes, who follows whom in the stock market, and whether herding can be profitably exploited.

Keywords:
Herding, Informational cascades, Institutional herding, Behavioural finance.

JEL classification:
G02, G10.

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El comportamiento gregario **a examen**

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Resumen

En este artículo se presenta un estudio de la investigación existente sobre el comportamiento gregario, tanto desde una perspectiva teórica como desde un punto de vista empírico. En general, la investigación teórica ha proporcionado información muy valiosa sobre los principales motivos que subyacen a la tendencia de los inversores hacia este tipo de comportamiento, mientras que la evidencia empírica confirma dicho comportamiento –en distinto grado– a escala internacional, tanto a nivel de mercado como para tipos de inversores específicos. La investigación futura debe centrarse más en la contrastación empírica de la intención de comportamiento gregario a altas frecuencias y en otras clases de activos (no accionariales), quién sigue a quién en el mercado de valores, y si el comportamiento gregario puede ser explotado de manera rentable.

Palabras clave:

Comportamiento rebaño, cascadas de información, comportamiento rebaño institucional, finanzas conductuales.

1. Introduction

Herding as a behavioural trait of investors in capital markets has been persistently identified throughout the centuries, and was first documented during the early stages of the world's first stock exchanges. Indeed, the earliest known direct reference to herding can be traced back to 1688, when Joseph de la Vega published his work "*Confusión de Confusiones*"[1] based on anecdotal evidence from the 17th century Amsterdam stock exchange, shortly after the collapse of the Tulip bubble that had shaken the Netherlands in the late 1630s. The 18th century was marked by some of the world's most famous bubbles to be blamed on herd instinct, this time in the London (South Sea Bubble) and Paris (Mississippi Bubble) stock exchanges, while the wider launch of stock markets internationally from the 19th century onwards saw the advent of herd behaviour across a number of them during various financial episodes (Galbraith, 1994). Although herding as a topic has primarily been a concern for popular finance literature over the years, a wave of academic research into its underlying causes began to emerge from the 1990s onwards. The demand for such research was principally driven by the remarkably frequent financial crises (1997 Asian crisis; Dot Com bubble-crash; 2008 global credit crisis) stemming from the accelerated process of globalization that improved links between financial markets internationally post-1990.

The tremendous wealth of research on herding to date, both at an analytical and an empirical level, has provided novel insights into this behavioural pattern. Evidence from analytical studies, for example, has yielded useful insights into the theoretical factors driving the propensity to herd among economic agents with varying degrees of rationality operating in hypothetical market settings characterized by various institutional features (see the excellent review by Hirshleifer and Teoh, 2003). Empirical research, based on the methodologies proposed during the 1992-2004 period has produced a wide cross section of evidence pertaining to various market classifications (developed, emerging, frontier) and investor types (retail, institutional). On a more practical note, herding has been found to exhibit regular patterns, include size and industry effects, as well as asymmetric properties conditional on differential market states (e.g. rising/declining market returns/volatility/volume etc.), while there is evidence to suggest it is not entirely unrelated to the momentum trading of institutional investors.

Our survey provides the reader with an integrated picture of the key issues surrounding herding research to date. Section 2 discusses the main factors driving the propensity of individuals to mimic their peers in stock markets, while section 3 analyses the key empirical patterns that herding has been shown to entail in the extant research. Sec-

[1] "Merchant: In this chaos of opinions, which one is the most prudent? Shareholder: To go in the direction of the waves and not fight against the powerful currents" (Joseph de la Vega. "Confusión de Confusiones", adapted from Corzo *et al.*, 2014).

tion 4 concludes the paper with a discussion on research questions that have yet to be answered and offers an overview of the likely future of herding research.

2. Herd behaviour: Theoretical perspectives

Herding involves imitation following interactive observation of actions or outcomes of those actions (Hirshleifer and Teoh, 2003). As a result, when herding occurs in the stock market, individuals copy the trades of others, regardless of whether their information dictated an alternative course of action or whether they had no information from the outset. The issue, therefore, is not whether individuals herd but rather, why. Research to date (Bikhchandani and Sharma, 2000; Holmes *et al*., 2013; Gavriilidis *et al*., 2013; Economou *et al*., 2015b; Galariotis *et al*., 2015) has attempted to answer this question by proposing a dichotomous typology of herding, distinguishing between "intentional" and "spurious" herding.

Intentional herding primarily involves imitation motivated by the expectation of some benefit accruing from it and is normally found in situations where some kind of asymmetry exists, be it actual or perceived. In other words, investors mimic their peers in anticipation of a payoff they could not themselves realize in the absence of imitation (i.e. based on their own merit or information). Research has identified two distinct types of payoffs capable of driving intentional herding: informational and professional.

Informational payoffs motivate herding when investors believe themselves to be at an informational disadvantage vis-à-vis their peers, and hence opt to copy the latter's trades in order to free-ride on their informational content (Devenow and Welch, 1996). The source of this disadvantage stems from either the low quality of investors' information or their lack of information-processing skills compared to their counterparts whom they perceive as better informed. From the moment investors choose to sideline their private signals in favour of imitating the actions of others, this can give rise to temporary blockages of information, whereby investors trade in a given direction simply because their predecessors did so (irrespective of whether these predecessors traded based on information or not). This is clearly detrimental to a market's informational efficiency; indeed, if one assumes an efficient market to be one in which prices reflect all available information at any point in time over time (Fama, 1991), herding obviously deters (or, at best, delays) the incorporation of information into prices, thus leading to the creation of a backlog of "hidden" information and degrading the pool of public information (Lee, 1998). If enough investors opt for such behaviour, it can lead to trading trends being set in motion on the basis of very little information, thus triggering the emergence of informational cascades (Banerjee, 1992; Bikhchandani *et al*., 1992). These cascades tend to be characterized by path-dependence, since the actions of the first few movers can shape the trajectory of the followers' trades; however, this also renders them very fragile, since the arrival of little new information in the market can dislodge the (equally scarce) information on which they were founded in the first place (Lee, 1998; Moscarini *et al*., 1998). Cascades are facilitated by the presence of options that are discrete (Vives, 1993) and limited, as both features make it more likely that investors will eventually converge towards one of them. Occasionally, cascading is a function of information-collection incentives. The higher the cost of information, the more likely it is that investors will choose to infer the information from the trades of those they consider informed, rather than pay to acquire it. If observing the trades of others is not possible, observational learning can rely on statistical summary gauges; historical prices are a good example here, as they provide investors with a (noisy) summary indicator of past aggregate market activity. Vives (1993) and Cao and Hirshleifer (1997) have demonstrated how the sequence of historical prices provides investors with an indirect inference of their peers' trades at the aggregate level, thus removing the necessity – and the concomitant cost – of having to observe their peers' actions directly. Joining a cascade is also a response to the limits of human cognition, in particular, limits to attention and processing (Hirshleifer *et al*., 2001), since environments rich in information signals can make the observation and deciphering of information arduous for the average investor. Such investors may deem it easier to focus on the trades of others as a means of dealing with the complexity of the informational environment.

Professional payoffs are a key driver of the herding documented among investment professionals, such as fund managers and financial analysts. The crux of the argument here is that investment professionals' performance is assessed in relative terms (i.e. versus the performance of their peers), leading them to monitor their peers' actions closely in order to avoid falling behind the industry average, since any underperformance can negatively affect their professional prospects (Scharfstein and Stein, 1990). A low-skilled ("bad") fund manager, for instance, would prefer to mimic the trades of a highly skilled ("good") fund manager to give his assessors the impression that he is highly skilled as well. The actions of the "bad" manager in this case stem from three factors: a subjective uncertainty regarding each manager's skills (his assessors do not have perfect knowledge about his skills); an objective asymmetry (the "bad" manager knows he lacks the skills of his "good" counterparts); and an equally objective risk aversion (his relative underperformance can be readily verified, thus compromising his professional future). Taken together, these factors fuel his herding intent. This behaviour is particularly important during periods of market downturns, where the likelihood of losses is greater, since a "bad" manager can then claim that he made the same trades as his "good" peers (in effect claiming that he is of equally high ability) and blame his losses on the overall adverse state of the market. Such imitative intent can, however, also occur during rising markets, since underperforming during bullish periods can help reveal a "bad" manager's shortcomings. Research to date has identified two types of professional payoffs as motivating factors underlying intentional herding: reputation and compensation schemes. Highly reputed professionals will choose to imitate their peers in order to protect their reputation when having to make a decision (Graham, 1999); this is because, if the decision proves to be wrong, the damage to their reputation will exceed any reputational benefits they would enjoy should the decision turn out to be correct. However, investment professionals of poor repute are also susceptible to herding, since by doing so they can free-ride on the (presumably better) skills of their well-reputed peers (Trueman, 1994; Welch, 2000; Clement and Tse, 2005). Compensation schemes have also been shown (Chevallier and Ellison, 1999; Graham, 1999) to be important in determining whether investment professionals opt for herding or choose to utilize their private signals.

Turning now to *spurious* herding, this occurs when investors exhibit similar reactions to commonly observed signals. In this case, investors' trades exhibit correlation although this does not stem from investors actually observing each other (i.e. herding does not actually take place); rather it is the presence of an (endogenous or exogenous) factor to which they are all commonly exposed that leads to similar trades. There are two main sources of spurious herding, *relative homogeneity* and *characteristic trading*. Relative homogeneity refers to the presence of features that increase commonality among investment professionals and which prompt them to generate similar responses (De Bondt and Teh, 1997). Fund managers, for example, tend to share similar educational backgrounds and professional qualifications and also tend to investigate similar indicators (macroeconomic, financial, etc.), which they also tend to interpret in a similar fashion (Froot *et al*., 1992; Hirshleifer *et al*., 1994)[2]. Another factor that has been found to promote homogeneity in the trades of investment professionals is the regulatory framework to which they are subject. Evidence, for example, from emerging markets[3]' pension funds (Voronkova and Bohl, 2005; Olivares, 2008) has indicated that their institutional framework imposes strict minimum performance requirements, which, coupled with profiling restrictions on the stocks in which they are allowed to invest, leads them to hold very similar portfolios. In addition, British pension funds reveal a strong indication of herding behaviour in groups when buying/selling stocks and bonds as well as alternative asset classes, which is in line with the notion of reputational herding (Blake *et al*., 2015), a finding further confirmed by Broeders *et al*. (2016). According to Jame (2011) pension funds find it difficult and risky to deviate from what other pension funds are buying and selling, thus resulting in automatic rebalancing and herding.

Spurious herding can also be the product of the similar investment strategies employed by professional investors. Fund managers have been found to be very prone

[2] The case where investors trade similarly because their information sets are positively correlated (i.e. they are employing similar signals) is also known as "investigative herding" (see Sias, 2004).

[3] The references mentioned here pertain to the well-researched cases of pension funds investment behaviour in Chile and Poland.

to utilizing characteristic trading (Bennett *et al*., 2003). The term "characteristic trading", also known as "style investing", refers to strategies of opting for stocks with specific characteristics. Examples of such characteristics include past performance (momentum and contrarian strategies), fundamental pricing (value and growth strategies), industry classification (sector strategies), capitalization (size strategies) and religious or ethical principles (ethical investing and Sharia-compliant strategies). If several institutional investors pursue a specific strategy, then their trades will exhibit correlation without any interactive observation having occurred; the mere fact that they all adhere to the same style of investment is enough to create the impression of herding, without herding actually being at work. In particular, evidence from a variety of studies (Grinblatt *et al*., 1995; Choe *et al*., 1999; Nofsinger and Sias, 1999; Wermers, 1999; Sias, 2004; Choi and Sias, 2009) shows that fund managers are attracted to momentum trading ("trend-chasing") while also herding at the same time. The relationship, however, between herding and momentum trading has not been consistently found to exhibit significance. It is reasonable to expect that the wide popularity of momentum trading among institutional investors would suggest that they would tend to buy (sell) similar winners (losers) over time, thus giving the impression of herding. However, as mentioned above, herding presupposes interactive observation, and this is largely unnecessary among investors using the same strategy; any similarity in their trades may well be merely the result of their common use of the particular strategy they employ.

Less-than-perfectly rational factors have been found to be relevant to herding, either in conjunction with the abovementioned intentional/spurious ones or in isolation. A typical example here relates to behavioural forces, including the availability heuristic and home bias. Investors, for example, have been found to be partial to investing in stocks whose companies' headquarters are in close proximity to their home, with the portfolios of most investors showing a heavy bias towards their home market's stocks (home bias). Such a tendency has been found (see e.g. Seasholes and Zhu, 2010) to amplify the correlation in trades among "home biased" investors. Kuran and Sunstein (1999) have linked home bias to informational reasons related to within-community dynamics. The issue here is that a community (social or professional) encourages preference towards home-stocks (being "home", they are better-known), thus causing the community's pool of information to be dominated by news regarding these stocks only. This availability bias then tacitly prompts investors to participate in an availability cascade of preferences towards home-stocks (Andrikopoulos *et al*., 2014). Home-bias can be further reinforced by other psychological vehicles, including familiarity bias (investors choosing stocks that appear more familiar – see Huberman, 2001), recognition heuristic (investors choosing stocks with higher recognisability – see Boyd, 2001) and conformity (a community can increase the tendency among its members to conform to the norm – see Hirshleifer, 2001).

The discussion so far has shown that although herding *per se* may appear to be a straightforward activity, it may have a range of roots and causes. Motivated by these theoretical considerations – and by the greater incidence of financial crises over the past two decades – a series of studies have been devoted to the empirical research of herding, in order to confirm its existence, its patterns and the effect it has on capital markets. The next section therefore presents a more detailed overview of the extant empirical evidence from the herding literature.

3. Herd behaviour: Empirical evidence

Herding is perhaps one of the most widely empirically researched areas of behavioural finance, with herding studies normally relying on one of two types of data, namely *aggregate data* (such as prices and volume) and *microdata* (proprietary data on investors' accounts, portfolios and transactions). Empirical research on herding has grown since the 1990s, following the establishment of the herding measures by Lakonishok *et al*. (1992) and Christie and Huang (1995). The Lakonishok *et al*. (1992) model hinged on measuring the herding of market participants at the micro level (the authors used US funds portfolio data as input) and provided a picture of herding within a period based on the cross-sectional fraction of buyers (i.e. funds increasing their position in stocks within a particular period). Sias (2004) improved on that measure, testing directly for the inter-temporal (period-on-period) dependence of the cross-sectional institutional demand; he then decomposed the cross-sectional correlation of this demand into two parts, one pertaining to habit investing (funds following their past trades) and one reflecting herding (funds following the trades of other funds). At the macro (aggregate) level, Christie and Huang (1995) proposed a model based on the relationship between the cross-sectional dispersion of returns and extreme market returns; regressing the former on the latter, their aim was to test whether herding could be reflected in a negative relationship between the two. The explanation for such a relationship is that herding in the market would lead individual equity returns to cluster more closely around the market average, hence leading to a reduction in their cross-sectional deviation. However, their model used a linear regression design and was thus unable to capture potential non-linearities in that relationship, despite wide evidence linking herding with non-linear dynamics in capital markets (e.g. Lux, 1995).[4] Chang *et al*. (2000) incorporated this into their model, which tested simultaneously for both the linear and the non-linear relationship between the cross-sectional return dispersion and market returns. An additional advantage of their model was that, unlike Christie and Huang (1995), they tested for herding on the premise

[4] It is interesting to note here that herding studies employing the Christie and Huang (1995) model have almost never produced evidence in support of herding, Christie and Huang (1995) included.

of the entire market return distribution and not only during extreme return periods. The latest fundamental evolution of Chang *et al*. (2000)'s model came from Hwang and Salmon (2004), who tested for herding based on the cross section of securities' factor sensitivities, by a Kalman filter to extract herding from the cross section of a market's stock-betas. Although the methodological design they proposed was econometrically more complex, it offered the key advantage that, for the first time, it enabled a graphical visualization of herding.

Empirical research on herding has allowed us to establish certain stylized facts regarding herding properties internationally. To begin with, herding appears more significant in emerging markets than in developed markets, confirmed by results at both the aggregate and the micro level. Fund managers, for example, tend to herd more in markets such as Poland (Voronkova and Bohl, 2005), Portugal (Holmes *et al*., 2013), South Korea (Choe *et al*., 1999) and Taiwan (Demirer *et al*., 2010; Hung *et al*., 2010; Lu *et al*., 2012), rather than the US (Lakonishok *et al*., 1992; Grinblatt *et al*., 1995; Wermers, 1999)[5] or the UK (Wylie, 2005). At the macro level, Chang *et al*. (2000) found significant herding for the emerging, but not the developed markets of their sample, while further evidence of emerging market herding was reported by Chiang *et al*. (2010), Chiang and Zheng (2010) and Tan *et al*. (2008). As Gelos and Wei (2005) argued, this should be attributed to the relatively lower transparency of emerging markets which renders the quality of public information ambiguous, thus prompting institutional investors to mimic each other when trading there.[6]

Specifically, with respect to institutional herding, mutual funds buy and sell stocks and closely track the herd of hedge funds, with mutual funds having a positive effect on the earlier quarter's hedge fund herding (Jiao and Ye, 2014). However, Jiao and Ye further argued that hedge funds do not follow mutual funds and that hedge funds do not disrupt stock prices, with the top 30% of the most actively traded mutual funds closely following hedge funds, thereby forcing stock price reversals. A notable study by Brunnermeier and Nagel (2004) highlights that during the Nasdaq bubble, hedge funds did not apply downward pressure on stock prices but were fully invested in tech stocks and due to their short selling strategies were able to unwind their leveraged positions by minimizing losses and circumventing further declines.[7] Using 13F position reports, Zykaj *et al*. (2014) claimed that there is some herding and crowding in hedge

[5] A very interesting issue with regards to the US market is that US fund managers appear to herd more when the Sias (2004) framework is employed, compared to the one by Lakonishok et al. (1992), thus suggesting that different models may capture different types of herding; alternatively, since the Sias (2004) model has been used on data covering more recent periods, this may be due to the growing share of unskilled fund managers in the US market over the past decades, who, due to their lack of skill would be more likely to consider herding (for more on this, see Barras *et al.*, 2010).

[6] Economou *et al.* (2015b) recently produced evidence of herding among fund managers in the category of frontier markets, by investigating institutional herding in Bulgaria and Montenegro.

[7] The Nasdaq Composite Index and Nasdaq 100 Index dropped –67.18% and –73.45% respectively from January 2000 to December 2002, while during the same period the Hedge Fund Research (HFR) Hedge Fund Weighted Composite Index appreciated 8.24%.

funds, but it is less than that encountered among other institutional investors, with hedge funds rarely participating in momentum trading strategies due to both their short selling and the fact that they have different styles from mutual funds. It should be understood that hedge fund data is monthly and, due to the high frequency of their trading, said data only provides insight into a fraction of their trades. This situation is exacerbated by the fact that the SEC does not require short trades to be disclosed. In addition, hedge funds are known for their performance fee structure, which means they have significantly higher disclosure standards in order to guard their superior stock selection abilities, investment ideas and marketing-timing skills and thus take advantage of inefficiencies in global markets. However, Zykaj *et al*. (2014) found that hedge fund herding is not linked to extreme market events or market pressure. On the other hand, Ben-David *et al*. (2011) discovered that hedge funds did herd in the 2008 crisis but 18% less than mutual funds, which is contrary to what the media suggested at the time, namely that hedge funds tended to destabilize markets. In addition, hedge funds are not seen as destabilizing global stock markets but rather hedge fund herding is based on profitable opportunities with herding being more prominent in small cap stocks (Mattes, 2014). Likewise, Mattes (2014, p.39) found some "weak evidence" to suggest that trading with the herd helps to generate superior returns, stating that the "...selling of past losers is still pronounced but the strongest herding is in buying and selling past winners". Furthermore, Gray (2009) finds that hedge fund herding is not related to money flows, whereas Mattes (2014) discovers that money flows appear to be robust in stocks displaying a large degree of herding but hedge fund inflows and outflows display low correlation with herding. By examining age, Boyson (2010) finds that older (senior) hedge fund managers that diverge away from the herd have a higher likelihood of failure and her findings illustrate that hedge fund managers with more experience herd more than managers with less experience.

Another interesting finding regarding herding internationally is that it manifests itself with a size effect. Many studies on herding (Lakonishok *et al*., 1992; Wermers, 1999; Chang *et al*., 2000; Sias, 2004; Wylie, 2005; Hung *et al*., 2010) have reported strong herding among small capitalization stocks; this has been ascribed to these stocks' greater information risk[8], which thus prompts investors to copy their peers' trades in order to tackle their informational predicament. There is also evidence (Wylie, 2005; Kremer and Nautz, 2013), however, of fund managers herding significantly towards the largest stocks in international markets. This is a very interesting finding, considering that large cap stocks do not suffer from the dearth of information that affects small cap ones. One possible explanation for this is that institutional investors' per-

[8] Information risk in small stocks (due to their lack of wider coverage by analysts) leads to less attention/interest on the part of investors and, hence, lower volumes. This, in turn, gives rise to higher liquidity risk for small stocks, which can further encourage herding; investors wishing to enter/exit positions in/from illiquid stocks will likely trade as soon as their volume picks up, i.e. when they see other investors trading those stocks.

formance is often benchmarked against a blue chip index and this prompts them to track that index which means they end up holding a portfolio whose composition mirrors the index one.[9] Apart from the size effect, herding internationally presents us with industry effects as well, with its significance manifesting itself across various sectors for different markets (Voronkova and Bohl, 2005; Choi and Sias, 2009; Zhou and Lai, 2009; Demirer *et al.*, 2010; Gavriilidis *et al.*, 2013; Gebka and Wohar, 2013).

Another interesting issue is that herding is affected by the outbreak of financial crises, be they local or global. Hwang and Salmon (2004) showed that market-wide herding declined in the US and South Korea following the onset of the Asian crisis (1997-1998), while Choe *et al.* (1999) found that foreign funds showed less herding behaviour in South Korea following the outbreak of that crisis. However, other studies (Kim and Wei, 2002; Chiang and Zheng, 2010; Mobarek *et al.*, 2014) report a rise in herding following the outbreak of various crises, while Economou *et al.* (2015b) find mixed evidence on the effect of the 2008 global crisis on institutional herding in Balkan markets. The effect of financial crises on herding might be explained by the fact that crises lead to the unveiling of novel fundamentals, which can both collapse the pre-crisis consensus on which investors herded (which would explain why there is less herding post crises) and give rise to a new consensus on which investors can herd (which would explain why there is more herding post crises)[10].

Herding has also been found to be induced internationally by US market returns, as recent evidence by Chiang and Zheng (2010) and Economou *et al.* (2015a) indicates, while the CBOE VIX index[11] (also known as the "fear index") has also been found to motivate herding both within and outside the US (Chiang *et al.*, 2013; Philippas *et al.*, 2013). Such an effect is perhaps to be expected, considering the pivotal role of US stock markets in the global financial system.

Perhaps the most persistent finding in the herding literature is that herding is asymmetric in equity markets, with its significance varying across different states of the market. A wealth of studies have conditioned herding on variables such as market returns, market volatility and market volume, with results overwhelmingly confirming that herding varies with market conditions. This variation is by no means uniform across capital markets; herding has been found to be significant during periods of negative market returns (Goodfellow *et al.*, 2009; Zhou and Lai, 2009; Demirer *et al.*, 2010; Economou *et al.*, 2011; Holmes *et al.*, 2013; Gavriilidis *et al.*, 2013), positive market returns (Economou *et al.*, 2015a; Economou *et al.*, 2015b), low or decreasing

[9] Walter and Weber (2006) called this "benchmark" herding.

[10] For more on this, see Borio (2008).

[11] The CBOE VIX, which was launched in 1993, is an implied volatility index calculated based on the expected volatility of the S&P500 index constituents' options over the following 30 days.

volatility (Economou *et al.*, 2011; Holmes *et al.*, 2013; Economou *et al.*, 2015b), high volatility (Blasco *et al.*, 2012; Economou *et al.*, 2015b), high or rising volume (Gavriilidis *et al.*, 2013; Economou *et al.*, 2015b) and low volume (Tan *et al.*, 2008; Economou *et al.*, 2011). Other studies have produced evidence against the presence of asymmetric herding (Chang *et al.*, 2000; Caparelli *et al.*, 2004) and others (Chiang and Zheng, 2010; Chiang *et al.*, 2010; Chiang *et al.*, 2013) have produced mixed evidence in that respect.

Aside from the extant evidence on institutional investors' herding, retail investors' behaviour has also been studied, with evidence to date (Kumar and Lee 2006; Dorn *et al.* 2008; Kaniel *et al.*, 2008; Kumar 2009; Barber *et al.*, 2009a; 2009b) suggesting the presence of pronounced herding in that segment. This is a very promising area of research, since individual investors' herding can be examined using both empirical as well as experimental approaches (through experiments in controlled environments, something which is very hard to do in the case of institutional investors). Perhaps the biggest obstacle faced by those researching retail herding is data-availability; whereas institutional holdings' databases are occasionally available due to disclosure requirements, retail trades/portfolios are much harder to attain as they are considered private data and are thus less likely to be shared by their proprietors (e.g. banks, brokers etc.).

Finally, a promising area of research is the one attempting to determine whether herding is intentional or spurious. Evidence on this mainly stems from microdata studies at the market (Holmes *et al.*, 2013; Economou *et al.*, 2015b) and industry level (Gavriilidis *et al.*, 2013); basing the detection of herding intent on the interaction between herding and market/sector conditions, the above studies have noted that fund managers herd intentionally in various markets. The seminal attempt to address this issue at the market level was made by Galariotis *et al.* (2015), who identified herding intent by extracting the fundamentals-driven component from the cross-sectional dispersion of returns in the Chang *et al.* (2000) model. The advantage of these studies is that they push the frontier of research beyond testing whether herding exists or not towards identifying what motivates herding.

4. Conclusion

A huge amount of research on herding has been carried out since the early 1990s and has provided numerous insights into what motivates herding theoretically, as well as about whether investors herd internationally. This section focuses on what remains to be established by future herding research. First of all, although we know much about why investors herd in theory, the corresponding empirical evidence is rather scarce, aside from the few studies mentioned above on intentional versus spurious herding. Whether institutional herding, for example, is the product of intent or the outcome of fund managers' spuriously synchronized trades is important, both for regulators (herding can potentially destabilize stock markets) and investors in mutual funds (herding constitutes an undeclared passive investment strategy that may lead to sub-optimal portfolio structures for these funds' investors; Economou *et al*., 2015b). Second, it is worth noting that we still lack a model that enables us to identify exactly who follows whom in capital markets; although herding reflects the concept of people following each other, the models currently at hand do not enable us to determine in what order this following occurs. Third, the advent of algorithmic/high frequency trading during the past decade or two, poses interesting questions concerning herding dynamics at high and ultra-high frequencies, an issue that has received very little attention to date[12]. Fourth, although most evidence on herding emanates from equity markets, relatively little is known about herding in other asset classes, such as bonds, exchange-traded funds, derivatives and currencies[13]; it would be interesting to see more research on those instruments, given their differences in structure and clientele (institutional investors predominate almost overwhelmingly) compared to equities. Finally, it would be very interesting to assess whether herding could be exploited profitably, especially given earlier research (De Long *et al*., 1990) on rational speculators profiting at the expense of noise traders. Admittedly, the issue here is to come up with a herding measure that allows us to identify herding as a discrete or continuous variable for forecasting purposes; the Hwang and Salmon (2004) model goes some way towards satisfying this condition (it allows herding to be extracted as a time series and portrayed graphically), yet at low (monthly) frequencies, which do not appeal to professional investors, whose trades are conducted at higher frequencies. Many of the above issues are likely to be addressed in the near future, if both new empirical designs and – most importantly – more sophisticated databases (allowing greater identification of who is trading at the tick level) are developed.

[12] Gleason *et al.* (2004) and Henker *et al*. (2006) reported no intra-day herding for US sector ETFs and the Australian equity market, respectively; on the other hand, Zhou and Lai (2009) showed that investors herded significantly intra-daily in Hong Kong equities, particularly towards a) small capitalization stocks, b) the sell-side and c) when the market slumped, while significant intra-day herding was also reported by Blasco *et al*. (2011; 2012) for the Spanish equity market.

[13] Bond herding has been investigated by Oehler and Chao (2000), Cai *et al.* (2012) and Galariotis *et al.* (forthcoming), herding in the futures market has been investigated by Kodres and Pritsker (1997), Gleason *et al.* (2003) and Weiner (2006), herding in ETFs has been tested for the first time by Chen *et al.* (2012) and herding in the currency market has been investigated by Carpenter and Wang (2006) and Sherman (2011).

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