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**Herding by mutual fund managers in
the Athens Stock Exchange**

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ABSTRACT

Behavioural finance is a paradigm receiving great attention in the last decades and shaking the foundations of modern finance. A broadly discussed behavioural bias is herding, i.e. the tendency of investors to imitate each others' decisions. Herding is a phenomenon with far-reaching implications for financial markets, but its importance becomes even larger if it is exhibited by institutional investors. The present study attempts to investigate whether mutual fund managers in Greece herd when investing in the Athens Stock Exchange in the period 2001 – 2006. For this purpose, semi-annual portfolio holdings of 31 mutual funds are analyzed using the methodology proposed by Lakonishok *et al.* (1992). The study concludes that mutual fund managers undoubtedly herd, with the extent of herding being irrelevant of the price movements observed in the market. Managers herd primarily when they trade in large capitalization stocks or stocks that belong to the most “famous” indices.

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TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION	6
<hr/>	
CHAPTER 2: LITERATURE REVIEW	8
2.1 The evolution of Behavioural Finance	8
2.2 Empirical evidence about the validity of BF	10
2.3 Criticism and evaluation of the BF approach	15
2.4 Herding in financial markets	17
<i>2.4.1 Herding by financial institutions</i>	19
<i>2.4.2 Empirical evidence about the presence and effect of herding</i>	20
<hr/>	
CHAPTER 3: RESEARCH METHODOLOGY	30
3.1 The purpose of the study	30
3.2 The sample	31
3.3 Measured variables	34
3.4 Limitations of the study	35
<hr/>	
CHAPTER 4: STATISTICAL ANALYSIS – RESULTS	37
<hr/>	
CHAPTER 5: CONCLUSIONS	45
<hr/>	
REFERENCES	46
<hr/>	

LIST OF TABLES AND FIGURES

TABLE 1	<i>Overview of the Mutual Fund Management Companies (MFMC) active in Greece, their market shares (September 30th 2005) and their response to the request for data</i>	32
TABLE 2	<i>Mutual Funds forming the sample for the present study</i>	33
TABLE 3	<i>Results of the data analysis for the market as a whole</i>	37
GRAPH 1	<i>Comparison of LSV measure with price movements in the ASE</i>	38
TABLE 4	<i>Comparison of herding measures for large capitalization companies, small and medium capitalization companies and the market</i>	39
GRAPH 2	<i>Comparison of LSV measure for large capitalization companies with the market's measure</i>	40
GRAPH 3	<i>Comparison of LSV measure for the General Index with the market's measure</i>	41
GRAPH 4	<i>Comparison of LSV measure for the FTSE 20 index with the market's measure</i>	42
TABLE 5	<i>Industry sectors identified by the ASE, the number of companies in each sector</i>	43
GRAPH 5	<i>Herding measures for the industries with the highest number of firms (statistically non-significant values are not displayed)</i>	44

CHAPTER 1

INTRODUCTION

Finance has traditionally been based on a specific set of assumptions regarding human behaviour. These assumptions, known as the VM (Von Neumann and Morgenstern) axioms, are highly questionable as a mode of behaviour, because they imply that investors are totally keen, penetrating and rational in calculating the numbers that are required for making investment decisions (Frankfurter and McGoun, 2001). Nevertheless, due to their simplicity and suitability for advanced mathematical models, these assumptions have formed a foundation that had not been questioned for several decades. This approach is termed “traditional finance” and its cornerstones are the Expected Utility (EU), the Efficient Market Hypothesis (EMH) and the Capital Asset Pricing Model (CAPM) paradigms. Today, this point of view is less widespread and it has become less plausible. The reasons are the extraordinary events of the last two decades of the twentieth century and primarily the emergence of a new approach (De Bondt, 2004).

The new approach attempts to reconsider the concept of the “homo economicus” altogether. The supporters of this point of view state that finance needs to be redefined so that it reliably represents the actions of real people. According to Frankfurter *et al.* (2004), the limitations of the traditional model have become too obvious to be ignored. This line of thought has been called “Behavioural Finance” by its supporters and draws many of its concepts from psychological findings regarding human behaviour. Limits to the exercise of arbitrage that have been documented (Barberis and Thaler, 2002) further question the validity of the main argument of the traditional approach, namely that deviations from the model’s prescriptions will quickly disappear. Although heavily disputed and still controversial (opponents of the theory call it “the anomalies literature”) Behavioural Finance (or BF) is an idea that has shaken the very foundations of the traditional finance theory. BF does not refer to a single mode of human behaviour in order to explain phenomena, but rather on different human responses to various circumstances. Therefore, many different modes of behaviour that deviate from the prescriptions of traditional finance have been formed into categories explained by specific psychological traits. One interesting

phenomenon is termed “herding” and refers to the tendency of people to imitate each other for various (rational or irrational) reasons when making decisions (Lemieux, 2003, 2004).

Herding becomes more important if such behaviour is exhibited by finance professionals and experts, since they are purported to be the most “rational” and “efficient” persons according to the traditional approach. Should these individuals not verify the traditional approach with their behaviour, the paradigm cannot hold at all. Several studies have been conducted to investigate the presence of herding by institutional investors and other professionals and the results might be considered controversial.

The present study attempts to investigate whether institutional herding can be established for mutual fund managers active in the Athens Stock Exchange (or ASE). For this purpose, the semi-annual holdings of 31 mutual funds trading in the ASE between 2001 and 2006 have been gathered from the mutual fund management companies and the data have been analyzed according to the methodology proposed by Lakonishok *et al.* (1992). The analysis confirms the existence of mutual fund managers’ herding in the ASE throughout the period under examination. Furthermore, herding behaviour is documented primarily for large capitalization and more renowned shares, leading to a set of questions regarding the quality and maturity of the market.

The remainder of this paper is structured in the following manner. Chapter 2 reviews theoretical concepts and empirical findings regarding Behavioural Finance and especially herding. Chapter 3 presents the purpose, the sample and the methodology of the research conducted. Chapter 4 provides the empirical results and Chapter 5 concludes.

CHAPTER 2

LITERATURE REVIEW

2.1 The evolution of Behavioural Finance

Behavioural finance is one of the products of a larger trend in the discipline of economics; this trend demands a reassessment of many core principles in this field, claiming that the standard economic model of human behaviour includes (at least) three unrealistic traits that need to be modified: unlimited rationality, unlimited willpower, and unlimited selfishness (Mullainathan and Thaler, 2000). This line of thought has been labelled “Behavioural Economics” and has influenced many areas of the field, like corporate finance and management. For example, it has led to a better understanding of financing and investment decision patterns exhibited by managers, as a result of their interaction with investors (Baker *et al.* 2004). It is argued that the value creation process of a firm is undermined not only by the fact that managers make errors based on cognitive imperfections and emotional influences themselves, but also by the behavioural errors of analysts and investors that lead to mispricing. Since managers are aware of the errors made by analysts and investors, they take them into consideration, often with an amplifying effect on the mispricing (Shefrin, 2001). Another issue of interest has been the effect of behavioural biases on the efficient allocation of resources in the economy. It has been suggested that the mispricing observed leads to substantial misallocation of the available resources, thereby harming the economy as a whole, and measures have been proposed to mitigate this phenomenon (Kent *et al.* 2002). Behavioural economics has influenced other disciplines as well, like corporate and securities law, showing thereby that it is more than a fleeting trend of the last decade (Bainbridge, 2000).

As far as BF in particular is concerned, Barberis and Thaler (2002) identify two main reasons for its existence: the first is the recognition of psychological factors affecting the process of decision-making and the second are the limits to the exercise of arbitrage by rational investors in their effort to exploit the misallocations observed. Often the arbitrageur may privately benefit more (in the short term) from trading that helps push prices in the wrong direction than from trading that pushes prices in the right direction. Furthermore, arbitrage is an inherently risky activity and consequently

the supply of arbitrage will be inherently limited. Fundamental risks, noise trader risks and implementation costs are also involved with the implementation of arbitrage. Moreover, in practice most arbitrageurs are judged periodically since they manage other people's money and therefore they are forced to take on short horizons (Mullainathan and Thaler, 2000).

The concerns with the rationality assumption discussed above have led to an extended literature on bounded rationality, learning and heterogeneity (Kirman and Tuinstra, 2005). Many different modes of behaviour and thinking that deviate from the prescriptions of the traditional approach have been proposed. Stracca (2004) groups the "anomalies" observed that are purported to be systematic and influential on the aggregate market level into five main categories: decision heuristics, emotions and visceral factors, choice bracketing, stochastic and context-dependent preferences and reference dependent models; this categorization is presented in the following paragraphs. Until now, no BF model takes all factors into consideration comprehensively.

According to Stracca (2004), decision heuristics take account of the fact that economic agents use mental shortcuts and "rules of thumb" when facing complex and far-reaching problems due to deliberation costs and limited information processing capabilities (bounded rationality). Decision heuristics that have been documented are, among others, the misperception of the laws of probability, the representativeness bias and anchoring effects, limited attention and saliency, credulity and ambiguity aversion. Most of these modes of behaviour can sufficiently be explained according to the entropy theory of psychology, which positively correlates the cost of obtaining some information with the value of that information (Chen, 2004).

Stracca (2004) also states that the decision-making process is affected by emotional factors, especially in a condition involving risk and uncertainty – which is the norm in financial decision-making. One commonly cited "anomaly" that falls into this category and refers to the natural reluctance to acknowledge losses suffered is the disposition effect. Other such phenomena are the belief perseverance and the confirmatory bias, which is the search for evidence confirming one's initial hypotheses and overconfidence to one's own abilities, which has been credited the excessive trading of investors in financial markets. Finally, the weighing of (objective) probabilities seems to be dependent on emotional factors, with the general tendency to overvalue small and undervalue large probabilities.

According to Stracca (2004), economic agents are influenced in their decisions by the way a problem is presented, an attribute called choice bracketing; thus, they may make local choices that seem correct but lead to a sub-optimal overall outcome. Framing, for instance, can assume many different forms and particularly narrow framing, the evaluation of a problem with an irrationally short horizon in mind, has been documented for several cases. This main form of narrow framing is called procrastination and some implications of this phenomenon are undersaving and investment choices leading to irrational financial portfolio composition.

Stracca (2004) also defines that with stochastic and context-dependent preferences the focus is on preference reversals in the decision-making process that have been shown to appear when some alternatives are presented in a different manner. This category also involves the case of agents making wrong estimations of the utility they can expect from a certain decision, because they are influenced by the past, because they are reluctant to alter the present condition or because a person's expected utilities change over time.

Finally, according to Stracca (2004), reference dependence is an incorporation of many ideas expressed previously and is also closely related to the prospect theory, which is the main contender of expected utility as a framework of analysis of human behaviour under risk. Prospect theory is based on psychological traits that lead to a two-stage process of decision-making which is quite different to that of the traditional approach. This theory, in the way it has evolved, can be modelled and tested, though not as easily as the expected utility function.

2.2 Empirical evidence about the validity of BF

Numerous studies have attempted to provide evidence supporting the BF paradigm by identifying inefficiencies of the traditional approach that can be explained with the new one. There are also studies defending the rational expectations model, either by casting doubt on contradictory research or by validating the older paradigm directly. In order to keep the length of the paper within the proposed limits, only few of the more recent studies will be mentioned. For the same reason, mathematical models that theoretically attempt to behaviourally document observed phenomena (like bubbles and crashes) are also left out.

Goetzmann *et al.* (2000) investigate the correlation matrix of the net daily flows to a set of US mutual funds and prove that flows and returns are affected by behavioural factors and primarily market sentiment, or, alternatively, they are both correlated to an unknown additional factor in the economy, beyond all factors that are accepted by the traditional paradigm (according to the Fama – MacBeth approach).

Shefrin (2001) refutes the argument of the traditional paradigm that size, book-to-market equity and past returns offer additional explanatory power concerning why different securities have different expected returns (because these characteristics are claimed to proxy for unobserved risk). Instead, she claims that book-to-market equity, size, past returns and past sales growth are negatively related to expected returns. The relationship between expected returns and each of these characteristics has the opposite sign from the relationship between realized returns and that characteristic and a sound explanation is the occurrence of the representativeness heuristic.

Shapira and Venezia (2001) consider the presence of the disposition effect for independent and professional investors and claim that both groups are subject to this bias, although it is significantly weaker for professionals. They also find out that professionally managed accounts trade more and perform better than those handled independently. Individual's investments are less diversified and more correlated with the market. Overall, they suggest that the different patterns of behaviour of the two groups prohibit the inference of behaviour for the one group by examining the other.

Frankfurter and McGoun (2002) provide evidence supporting the overreaction hypothesis: all six predictions of this hypothesis are confirmed with statistical significance for data concerning firms listed in the NYSE and the AMEX. These predictions are that for long periods “best” stocks under-perform while “worst” stocks out-perform the market, that positive surprises boost “worst” stock prices significantly more than they do for “best” stocks, that negative surprises depress “best” stock prices much more than they do for “worst” stocks, that there are two distinct categories of surprises: event triggers (positive surprises on “worst” stocks, and negative surprises on “best” stocks), and reinforcing events (negative surprises on “worst” stocks and positive surprises on “best”), with event triggers resulting in much larger price movements than do reinforcing events, that the differences will be significant only in the extreme quintiles, with a minimal impact on the 60 percent of stocks in the middle, and that overreaction occurs before the announcement of earnings or other surprises. A correction of the previous over-reaction occurs after the surprise. “Best”

stocks move lower relative to the market, while “worst” stocks move higher, for a relatively long time following a surprise.

Basu (2002) examines the persistence of financial market contagion by viewing the spillover of shocks after the bond market developments in Hong Kong SAR in 1997 and proposes that this contagion was a consequence of adverse sentiment shifts that arose from investor learning, at least for a few countries, and was not merely a consequence of changes in the fundamentals. He suggests that these random and provisional patterns convey a herding psychology in these markets that might be associated with unreasonable changes of mood of investors. Furthermore, these patterns apparently disappear over longer time horizons.

Galai and Sade (2003) document that in Israel government T-bills provide a higher Yield to Maturity than an equally risky illiquid asset (bank deposits), a phenomenon that can only be explained by the behavioural finance paradigm, especially since the difference of the yield is higher in periods of greater uncertainty.

Fellner and Maciejovsky (2003) focus on the fact that investors hold an unreasonably small proportion of their financial portfolios in foreign equity although the potential gains from international diversification are large. This discrepancy between actual and optimal international equity portfolios they call equity home bias. They claim to provide important evidence that if the focus remains on institutional explanations the equity home bias is captured insufficiently; social forces, like the identification with one’s national companies, familiarity, optimism toward the domestic equity market and asymmetric expectations because of individual probability judgments might play an equally important role.

Goetzmann and Massa (2003) find evidence that trade volume as well as volatility of a company’s stock may generally depend upon the composition of the market, and more specifically on the proportion of disposition-prone investors; they associate the aggregate percentage of disposition investors in the economy with lower ex post returns.

Shively (2003) evaluates the nonlinear dynamics of stock prices using a three-regime, non-linear threshold random-walk model and daily international data from the CAC 40, DAX 30, FTSE 100, Nikkei 225, S&P 500 and TSE 300 stock-price indexes. He concludes that all six stock-price indexes are highly consistent with threshold non-linearity and that all six stock-price indexes are consistent with a random walk in all three regimes. The non-linear, regime-reverting process of this

three-regime, threshold random-walk model implies that stock prices have a deterministic or predictable element, which implies a violation of the EMH that is consistent with the “reversal effect”.

Charness and Gneezy (2003) experimentally investigate the persistence of three well-known behavioural biases, illusion of control, ambiguity aversion and myopic loss aversion, when there are clear financial disincentives. They find that, when it becomes costly, illusion of control disappears, while the other two biases remain. Yet, only the myopic loss aversion leads to different investment choices, but not with an expectable or invariable mode.

Vissing-Jorgensen (2003) analyzes data from UBS/Gallup on investor expectations and stockholdings for 1998–2002 and suggests that expected returns were still high at the peak of the market, even for wealthy investors. Many investors realized that the market was overvalued but believed it would not correct quickly. Investors’ beliefs are based upon their investment experience (a version of the law of small numbers), the dependence of beliefs on the past performance of one’s portfolio is asymmetric, which is consistent with theories of biased self-attribution, and furthermore investors’ beliefs do affect their stockholdings, suggesting that understanding beliefs is actually useful for understanding prices.

As far as the investor sentiment and its relation to the near-term stock market returns are concerned, Brown and Cliff (2004) find strong evidence of co-movement with the market for all of the aggregate sentiment measures but they find little evidence of predictability in returns on the short term (using a variety of methods). Therefore, it does not appear to be profitable to utilize the limited predictability of sentiment as a trading strategy. It is notable that the strongest relations exist between the measures for institutional sentiment and large stocks. This has consequences for existing research, because it is usually assumed that “noise” traders are individuals who affect small shares.

Coval and Shumway (2005) examine the trading behaviour of a group of market makers and test both for biases in their behaviour and for the implication of these biases for prices. They conclude that the traders are loss averse to a significant degree, at least at the microstructure level under investigation. Yet, due to the speed of reversion of the price effects of the loss-averse traders, the existing limits to arbitrage do not appear to delay the elimination of behaviourally induced mispricing in the setting.

Dittrich *et al.* (2005) experimentally induce risk aversion to examine the prevalence of the overconfidence bias, comparing the evaluation of actual investment choices with alternative decisions. They reached the following results. Overconfidence is positively related with the degree of deviation between actual and optimal investments as well as with task complexity. Overconfidence decreases when the perceived uncertainty is high. Participants who believe that their life is largely controlled by external factors are less often classified as overconfident, males are less prone to overconfidence than females and age is positively correlated with overconfidence. However, they point out that only the first three correlations are proven beyond doubt.

Zhou and Sornette (2005) detect the presence of an “antibubble”, as they call it, in the relaxation of the US S&P 500 index since August 2000 with high statistical significance, in the form of strong log-periodic components.

Finally, Chuang and Lee (2006) provide extensive evidence of the presence of the overconfidence bias in financial markets and reveal trading manners which they attribute to specific behavioural biases.

However, there is also research refuting the influence of behavioural biases in financial markets. Lewellen (1999) observes that the Book-to-Market (B/M) ratio is able to explain significant cross-sectional variation in average returns. This finding implies that, the ratio conveys information about the firm's expected return relative to other stocks. The conclusion is reached that the EMH paradigm can better explain this occurrence than BF, pointing out the existence of unknown underlying risks represented by the differences in the ratio. Yet, the explanation is not quite satisfactory, because statistically the model proposed is not robust and the risks are not at all identified.

Chan *et al.* (2003) examine the existence of the representativeness heuristic and conclude that the sequence of past accounting performance is not related to future returns, and therefore it is unlikely to bias investors' consensus expectations, who rely on accounting performance. Nevertheless, evidence is found of multi-month return momentum after accounting performance. This momentum is substantially reduced after control for earnings surprise effects. Overall, these conclusions cast doubt on the representativeness heuristic-based theories of behavioural finance; however, the predictability of returns documented in the literature remains an interesting and problematic phenomenon potentially at odds with market efficiency.

Kothari *et al.* (2003) provide evidence that the BF theories explaining post-earnings announcement drift in returns do not seem to describe aggregate price behaviour. The results suggest that the models are incomplete, if not wrong, and do not facilitate the understanding of why firm and aggregate price behaviour should differ. Therefore, behavioural models that provide a general description of price behaviour are still to be found.

Demirer and Lien (2005) investigate the firm-level volatility and the correlations among stock returns in the Chinese stock market during great upward and downward movements of the market and, among other findings, state that the CAPM's predictions for such a situation are generally consistent with their observations.

2.3 Criticism and evaluation of the BF approach

The behavioural finance theory has faced a lot of criticism by the supporters of the rational expectations model, and some of it is not unjustified. Fama (1998) claims that the evidence does not suggest that market efficiency should be abandoned. Consistent with the market efficiency hypothesis that the anomalies are results of random variation, the overreaction of stock prices to information observed is about as common as the underreaction. Furthermore, post-event continuation of pre-event abnormal returns is about as frequent as post-event reversal. Most important, Fama claims, the long-term return "anomalies" are fragile. They tend to disappear with reasonable changes in the way they are measured. These arguments have been confuted by Shiller (2003), who states that Fama's first criticism reflects an incorrect view of the psychological underpinnings of behavioural finance, because since there is no fundamental psychological principle stating that people will always act the same way, it is profound that research on financial anomalies does not reveal such a principle either. Moreover, his second criticism is also weak: in scholarly research, it is most common in all disciplines to refute initial claims of important discoveries after research advances. The most basic anomaly discovered, which is the excess volatility observed, has hardly been knocked down; it has in fact been reinforced by the experience of the past few years in the international stock markets.

Another major argument proposed by the advocates of the traditional approach is the fact that very few mutual funds manage to outperform the market – and only temporarily. Since mutual fund managers are professionals, it is claimed that their

inability to outperform the market means that the markets are highly efficient (Stangle, 2005). However, there is a reasonable explanation for this too, as those who raise the argument themselves acknowledge. Mutual fund managers have a short (usually annual) evaluation period; they have to follow the market, otherwise they may be quickly dismissed. Furthermore, their knowledge of a particular company is generally not as detailed as that of company insiders. Since information asymmetry is difficult to overcome, it is expected from the information theory that most professional investors could not earn higher returns over the market average (Chen, 2002).

Behavioural finance represents an alternative way of looking at financial markets, proposing a different layout for research that accommodates deviating behaviour and differs from the standard finance approach on several dimensions. Some of these are the fact that most behavioural studies include an empirical component, that they emphasize the descriptive value without claiming normative significance, that models often show a high predictive value, but the criticism faced is that they lack robustness, that often the method of reasoning is inductive in nature and that the focus is not only on the outcomes but also on the generating process (Van der Sar, 2004).

While the list of anomalies discovered is indeed impressive, there is still no convincing, bullet-proof evidence that the market is not rational and therefore expected utility is a flawed analytical framework for studying the behaviour of agents in a (financial) market context. Many hints that the market may not be rational in other reasonable senses have been provided, so the key challenge for behavioural finance is to study, in more detail, the market implications of the widely documented biases (Stracca, 2004).

Behavioural finance enriches our understanding of the economy by incorporating our knowledge about human nature into financial models (Barber and Odean, 1999). Behavioural finance may in fact be offering the salvation of neoclassical finance, because by putting the traditional model into its correct perspective it can be applied much more constructively. The “passionate” adherence to one model contains the risk of losing sight of when the model is appropriately applied and when not (Shiller, 2006). Most financial economists seem to share moderate and mixed opinions about the necessity of a “paradigm shift”, since they agree that behavioural theories can be a good supplement or even revision for the traditional theories, without necessarily a dramatic “paradigm shift”. Instead of contending with each other, the two rival camps

can arrive at a peaceful state of consensus; behavioural finance need not fully replace the neoclassical paradigm, but modifications are necessary to improve the interpretative power of the latter (Du, 2004).

2.4 Herding in financial markets

A main accusation of the traditional paradigm proposed by the supporters of BF is the lack of testability and predictive power of the traditional models, due to the unrealistic assumptions. These features are considered the cornerstones of a modern science. On the other hand, their opponents typically claim that behavioural models are based on ambiguous assumptions of irrationality that can not be disciplined by rigorous mathematics, leading to models that lack testable predictions of market behaviour (Brav *et al.* 2004). They also declare that, since the psychological biases that can be used to build behavioural models are numerous, it is difficult to distinguish data mining from genuine patterns (Chen, 2004).

There are, nevertheless, behavioural biases that have been documented and acknowledged by both sides. In this case, the emphasis lies on whether these biases are persistent and moreover on whether they affect the market structures and prices. Should these modes of behaviour be unable to cause stable deviations from the predictions of the traditional paradigm, there is no need for further examination, since the EMH does allow for short-term divergences that are corrected (and exploited) by the “rational” investors in the market. However, should long-term deviations appear, the expected utility model is at peril.

One of the biases that claim to lead to persistent mispricing is called herding. Herding refers to the human tendency to imitate the behaviour of others, which leads to a group of people acting in a similar way. Herding can be a temporary “irrational” mode of behaviour by an individual, without further implications for the market, but it is often a very “rational” choice on the individual level, although it establishes a distinct deviation from the rational expectations paradigm. For example, herding behaviour exhibited by market participants has been proposed as the reason for the heavy tails observed in the distribution of stock market returns (Cont and Bouchaud, 2000). Several reasons for rational herding have been proposed. These can be categorized into imperfect information, reputational concerns and compensation structures, although these categories are interdependent factors of herding

(Bikhchandani and Sharma, 2000). The first type of herding can be assumed to apply primarily for individual investors, while the other broad category is usually linked to institutional investors.

The most usual phenomenon based on imperfect information is cascading, i.e. the situation where an investor is influenced by others acting before him and decides to undervalue or even ignore his own (private) information and estimation (Hirshleifer and Teoh, 2003). In this case the investor assumes that the actions of the previous investors convey information that he may not know. Acting quite rationally, he chooses to imitate the “herd”, despite the absence of any actual documentation of the correctness of the actions of the previous investors. In the extreme case, one investor making a certain investment decision can lead to the creation of fragile and idiosyncratic herd behaviour, since the others will simply imitate his choice. It is likely that a point is reached at which one investor decides rationally to ignore his own information and thereby to inflict an externality on all subsequent investors, so that they all do what everyone else is doing (Blackburn and Bose, 2003).

This phenomenon is common and does not require a specific set of conditions to occur; such cascades require only the existence of both well-informed and poorly informed investors and are based on the assumption that each investor does not know the proportion of each group in the total population or which group is currently trading. Herding behaviour may also appear when the risk aversion of market makers is different to that of individual investors, which is the usual situation (Decamps and Lovo, 2002), and leads to bubbles and crashes in the market. Nevertheless, the effect can be mitigated by the presence of derivative securities, and it must be noticed that bubbles seem to arise from a confluence of factors. For example, the lack of an objective valuation methodology for new technology ventures helps to facilitate bubbles in this industry (Miller, 2002).

There are, on the other hand, models claiming that in a market aware of the possibility of herding, if the information collection process is costly and is considered an endogenous factor, herding is unlikely to appear (Swank and Visser, 2003). Furthermore, other models state that the observance of other investors' behaviour is a form of learning leading to more accurate market prices. The improvement in price accuracy from learning increases when more traders receive private information and when the aggregated private information is more accurate or more diverse; yet, it is acknowledged that more diversity in private information reduces the ability of

reactive learning to decrease the volatility of prices and returns and sometimes this can exacerbate the prevalence of bubbles (Chakrabarti and Roll, 1999).

It should be stressed that herding does not appear only in the investment process, but also in other financial decisions. It is argued that herding occurs in foreign investment activities, concerning not only the decision to invest in a market (Besancenot *et al.* 2001) but also contagion effects regarding risk estimations and evaluation of fundamentals (Bayoumi *et al.* 2003), and in firms' voluntary disclosure practices (Brown *et al.* 2006). Herd behaviour has also been documented in the credit policies of banks, especially towards emerging industries (Nakagawa and Uchida, 2003). Herding has been an area of research as far as security analysts' forecasts are concerned as well. In this field, the importance of career concerns has been highlighted, leading to different behaviours by analysts depending on how "safe" their job is considered (Hong *et al.* 2000). Established, reputable analysts may even systematically issue biased anti-herding forecasts, biasing their forecasts away from the extant consensus forecast (Bernhardt *et al.* 2006). Herding is also common when informative private signals are positively correlated across analysts (Graham, 1999) and depends on the financial analysts' prior relative performance (Clarke and Subramanian, 2006). Nevertheless, other studies claim that financial analysts do not herd, at least in financial crises (Ang and Ma, 2001) and that is a main reason why great differences in performance occur (Zitzewitz, 2001).

2.4.1 Herding by financial institutions

Herding becomes a very interesting phenomenon if it can be traced in the behaviour of institutional investors, because this type of investors makes up for a large proportion of the trading volume and their behaviour affects market prices. Furthermore, professionals, who are purported to be extremely rational, knowledgeable and keen according to the criteria of the "rational investor" referred to by the EMH paradigm, manage the funds. Should these investors exhibit behavioural biases, there is hardly any person left to prove that the models proposed by the traditional school of thought are realistic (Keim and Madhavan, 1995). For these reasons, institutional herding is considered and evaluated separately as a matter for discussion.

Institutional investors may herd not so much because of imperfect information, although this might happen as well, but primarily (and for the long term) due to reputational concerns and compensation structures. As far as these factors are concerned, it is important to remember that an investment manager will probably not face personal professional damage if he fails when the others have failed as well, but is very likely to lose his job if he significantly underperforms the market (Hirshleifer and Teoh, 2003). This means that, firstly, there is no linear relationship between investment success and professional success, and, secondly, this relationship is not direct; the direct relationship to be considered is that between comparative investment success (with reference to other managers) and professional success. This fact could be considered a persistent agency problem. It has been claimed that this feature leads to permanent behavioural biases for the investment managers, since a risk-averse manager has a large incentive to follow the market consensus to avoid professional implications.

This effect is exacerbated by the means utilized to compensate managers. Strongly correlated behaviour and incentive provisions in fund manager contracts may be related problems. Relative-performance contracts provide the correct incentives to managers at the least cost for fund owners if the behaviour of other funds' managers is not taken into consideration. If, nevertheless, managers make investment decisions in a correlated manner, this form of contracts provides an incentive for all managers as a group to herd (Eichberger *et al.* 1999). This effect can be mitigated with sophisticated compensation schemes, like the provision that a manager is offered a relative performance contract only if the other funds retain a non-relative performance contract. In any case, if managers are risk-averse, then communication increases the cost of preventing herding or makes it very difficult to achieve (Kargin, 2003).

2.4.2 Empirical evidence about the presence and effect of herding

There are many studies concerning the presence of herding in different markets and its potential impact on asset prices, which do not always reach the same conclusions. Kaminsky *et al.* (1999) concern themselves with the Asian Crisis of 1997 and state that some of the largest swings cannot be explained by any apparent substantial news, but seem to be driven by herd behaviour. Their results also indicate that “noise” affects foreign markets as strongly as it affects domestic financial markets, suggesting

the presence of important contagion effects. Moreover, as the crisis deepens, the reactions in days without any relevant news become more pronounced, which may indicate an increase in uncertainty and asymmetries in information, that can magnify the contagion effect. It is interesting that there is also evidence that investors generally react instantaneously more strongly to bad news compared to their reactions to good news.

Chevalier and Ellison (1999) find that the loss of their job is more performance-sensitive for younger managers, which gives younger managers a stronger incentive to avoid unsystematic risk and to herd into more popular stocks. Therefore, it is shown that such managers tend to hold more conventional portfolios. These results justify the need to examine the agency relationship between fund company and managers as a relevant factor affecting herding behaviour.

Nofsinger and Sias (1999) document strong positive correlation between changes in the portfolio holdings of institutional investors and returns measured over the same period. Their results suggest that institutional investors positive-feedback trade more than individual investors and that their herding behaviour has a larger impact on stock prices than that of individual investors. On the other hand, they do not find evidence of return mean-reversion in the period after large changes in the portfolio holdings of institutional investors, because stocks institutional investors purchase subsequently outperform those they sell. Moreover, herding by institutions is positively correlated with lag returns and appears to be associated with stock return momentum.

Wermers (1999) analyzes the trading activity of mutual funds to determine whether funds herd when they invest in shares and to investigate the impact of herding on share prices. Although mutual funds do not seem to herd substantially in the average share, since little such evidence is found, the levels of herding are much higher in trades of small shares and in trading by growth-oriented funds. Growth-oriented funds also exhibit positive-feedback trading strategies. Shares that herds buy outperform shares they sell by four percent during the semi-annual period after the trade, with this difference being much more substantial among small shares. These results are consistent with the proposition that herding by mutual funds speeds the price-adjustment process. Another conclusion reached is that herding by mutual funds appears to be profitable before expenses, but perhaps this effect is reversed after expenses.

Oehler and Chao (2000) analyze herding by institutions in the German bond market and their results resemble the conclusions of studies in the stock market, i.e. that there is only weak evidence of herding in individual bonds, while market-wide herding appears to be a relevant phenomenon. However, the degree of herding is generally lower than in the stock market, which can probably be attributed to the big variety of bonds. The nominal interest rate is the most important bond characteristic to mutual funds when making investment choices, with type of quality and time to maturity also playing a role in the bond selection process, but only to a lesser extent.

Iihara *et al.* (2001) use long-term data to examine the presence and effect of herding in the Tokyo Stock Exchange and conclude that both herding by institutions and herding by foreign investors affect stock prices. They further state that this behaviour leads to a destabilization of the market, while they distinguish the herding by domestic institutions as feedback trading and the herding of foreign investors as informational herding. Finally, their results show that both institutional and foreign investors appear to be able to forecast short-term stock returns.

Hwang and Salmon (2001) use a linear factor model based on the cross-sectional standard deviation of the factor loadings of the individual assets. Their model is used to examine the US, UK, and South Korean stock markets and find that herding toward the market returns is heavily affected by the Asian and Russian Crises in 1997 and 1998, respectively. Contrary to the common belief that claims that herding is significant when the market is in stress, they find that herding can be more prevalent before a crisis when the market is relatively quiet. Once a crisis appears, herding toward the market returns seems to become much weaker. Their study also suggests that advanced markets such as the US and UK are subject to smaller degrees of herding than emerging markets such as the South Korea, which is explained by a larger degree of information asymmetry between investors in emerging markets than in advanced markets.

Lobão and Serra (2002) concern themselves with the level of herding in the trades of Portuguese mutual funds. The overall level of herding observed in the market is very significant. The level of herding remains fairly constant over time or when a minimum number of funds to trade a given stock is imposed and it is significant in both sides of the market, purchases and sales. The average level of herding for Portuguese mutual funds is much higher than that for the US and the UK mutual funds found in previous studies, which suggests that herding is higher on more volatile

markets. Furthermore, the overall level of herding is much higher than that observed within different subgroups of funds, which means that herds seem to include funds of different size, different portfolio holdings and different trading strategies. The low and high cap subgroups of funds appear to herd less and funds with fewer stocks appear to herd more often. Finally, the levels of herding when the market is doing well and when the market is more volatile are lower. Altogether, the results are consistent with the implications of information-based models.

Kyröläinen and Perttunen (2003) examine momentum trading and herding of both active and passive investors during the information technology (IT) stock bubble period of 1997-2000 in Finland. They find that primarily large active investors engage in momentum trading. Active investors in general also tend to herd when taking their trading decisions, with their tendency to herd increasing monotonically every year. Passive investors and small active investors exhibit contrarian trading styles and the passive investors' herding appears to be very strong over the sample period. Overall, neither trading of active investors nor trading of passive investors seem able to predict the returns observed. These results are consistent with the proposition that large active investors are contributors to the price bubble, so active trading probably does not have solely positive effects on the efficiency of asset markets.

Kübler and Weizsäcker (2004) experimentally investigate the appearance of herding in a laboratory setting and discover that while not all of the subjects acting as first "players" choose to acquire private information, information acquisitions in later stages are excessive, such that overall far too many "signals" are bought. Subjects tend to imitate the majority of preceding choices, but only if this majority is strong enough. The results suggest that players attribute an error rate to their opponents that is higher than the one they attribute to themselves. This bias leads them to depend too little on their predecessors, and hence to acquire too many signals themselves. Players also seem to ignore what their predecessors thought about their respective predecessors. Thus, they do not comprehend that some of the decisions they observe may have been herding decisions, not based on any private information.

Hwang and Salmon (2004) propose an approach for the detection and the measurement of herding based on the cross-sectional dispersion of the factor sensitivity of assets. This method enables them to examine the presence of herding towards particular sectors in the market, including the market index itself. Furthermore, they claim to be able to critically separate such herding from common

movements in asset returns caused by changes in the fundamentals. They find that herding towards the market shows significant movements for the US and South Korean stock markets and appears to be persistent independently from any given market conditions. There is also evidence of herding towards the market portfolio both when the market is rising and when it is falling. Periods of market crisis or stress seem to help markets return to equilibrium, thereby implying that efficient pricing may be facilitated by market stress – they have found cases where herding behaviour turned before the market itself turned.

Bowe and Domuta (2004) investigate the behaviour of investors in the Jakarta Stock Exchange and suggest that foreign investors always herd more than local investors, while the difference in herding measures increases from 7 to 18 percent over the pre- to the post-crisis period. Foreign investors tend to herd more following the onset of the Asian crisis with herding percentages ranging from 17 to 20 percent. The measure of herding for local investors remains relatively constant from before until after the crisis, although following the crisis their tendency to trade as a group is reduced.

Fong *et al.* (2004) utilize a database of daily trades and monthly portfolio holdings of active Australian equity managers to examine herding by institutional investors. The data suggest that active managers herd more when selling stocks, when trading in small stocks, and when moving between industries. They show that brokers facilitate information transfer between managers, a phenomenon resulting in a substantially higher level of herding, and also indicate that these brokers pass their best, most timely private information to their largest clients first, and later disseminate that information to their smaller clients, so that this information generates higher returns for those managers who are sufficiently active to be considered as the broker's best client. They also find some evidence of leader-follower relationships; in particular, managers tend to follow those managers with higher past performance.

Sias (2004) finds that institutional investors appear to be momentum traders. Only little of their herding behaviour, however, can be considered a result of momentum trading. Moreover, demand by institutions is more strongly related to lag demand by the institutions than lag returns. Institutional herding declines with time and seems to differ across capitalizations and types of investors. The results are most consistent with the hypothesis that institutional investors herd because they infer information from each other's trades. This point of view they justify by directly examining the

cross-sectional temporal dependence in institutional demand over subsequent quarters. However, no evidence is found that institutional herding drives prices away from their fundamental values, but rather that demand by institutions is weakly, but positively, related to returns over the following year suggesting that institutional herding reflects the manner in which information is impounded into prices. Herding also seems to decline over time (in large stocks) and to differ across investor types.

Cai and Zheng (2004) investigate the dynamic relation between the aggregate trading activity of institutions and the equity prices observed and conclude that trading by institutions is strongly related to contemporaneous returns. It is suggested that institutions buy more popular stocks following market rises, while stock returns appear to be negatively related to institutional trading of the previous quarter; there is an increase (decrease) in returns before and during the major buying (selling) activity by institutions, but any “excess” returns seem to disappear soon after the peak in their trading activity. While institutions indulge in positive feedback trading based on information about the market as a whole, the fact that institutions are more likely to follow positive feedback trading in buys than in sales eases the concern that institutions could exacerbate the price decline by selling stocks after a market downturn.

Massa and Simonov (2005) show that the impact of interaction between former fellow college students is statistically and economically significant, since investors tend to invest in the same stocks in which their former classmates do and moreover skew their portfolios towards growth stocks if their former classmates do the same. College-based interaction is the strongest form of interaction (stronger than professional and geographical interaction) and ranks third as the single most important factor affecting portfolio choice.

Chang and Dong (2005) use Japanese data and offer evidence at both portfolio and firm level that variations in firm idiosyncratic volatility are related to behavioural as well as fundamental factors. They find strong evidence that shares of firms subject to institutional herding have high idiosyncratic volatility and that the relationship between herding by institutions, firm earnings and idiosyncratic volatility remains significant in a joint regression. In addition, the hypothesis that the contemporaneous relationship between institutional herding and firm idiosyncratic volatility is due to the tendency of investors to herd toward stocks with high idiosyncratic volatility and systematic risk is rejected, which highlights the causality effect of institutional

behaviour on the pattern of market aggregate idiosyncratic volatility. The results appear to be robust to control variables such as firm size, trading volume, leverage effect, and measures of firm idiosyncratic volatility with respect to the market model and the Fama-French three-factor model.

Massa and Patgiri (2005) test the theory of managerial herding based on reputational and career concerns by focusing on the mutual fund industry and studying how incentives included in managers' contracts affect the magnitude of risks taken by managers and their herding. After considering two types of herding, namely category herding (which is the choice to operate in a herding conducive category, in which other funds are already operating) and stock herding (which is adopting a trading strategy similar to the one of the competitors) they argue that reputation and career concerns induce managers to herd and that compensation seems to contrast this tendency. A compensation structure with greater incentives might induce managers to enter categories with less effective herding and to adopt trading strategies different from their peers, thereby taking more risk. Family affiliation appears to reduce the incentive to herd and increase the one to take risk.

Voronkova and Bohl (2005) investigate the degree of herding by pension fund investors and whether they engage in feedback trading behaviour as well as their effects on prices in the developing stock market of Poland, where such investors face limitations in their investment activity. The values of herding and positive feedback trading for Polish pension funds found are considerably higher than the corresponding values reported for mature markets; these findings are attributed to the local regulatory framework that includes relative performance evaluation and penalties and the high concentration in the Polish pension fund industry. The results provide evidence of significant herding by Polish pension fund managers, primarily in small size stocks and stocks of certain industries, like computer services, banking and metal production. Herding is detected in both past winners and past extreme losers; however, they do not find a significant effect on the prices of Polish stocks due to herding and positive feedback trading by the institutions.

Dass *et al.* (2005) study the relation between the incentives contained in the advisory contracts of mutual fund and the funds' investments in bubble stocks and show that for mutual funds in the US there is a negative relationship between the incentives, and the investment in bubble stocks. Moreover, they show that the difference in performance between funds with high and low incentives is strongly

related to the difference in their portfolio holdings of bubble stocks. These findings provide evidence that high-incentive contracts, far from exacerbating the presence of a bubble, help to rein them in. In this industry, they argue, managers are more cautious not to score at the bottom than interested in ranking top. This induces them to herd by investing in the same stocks in which other funds are also investing. The incentives contained in the advisory contracts facilitate the reduction of this tendency. This has significant implications when financial market bubbles occur, a fact with both positive and normative importance.

Sharma *et al.* (2006) examine the behaviour of institutional investors during the internet bubble and crash of 1998-2001 in the US and its impact on stock prices. They find that all types of institutions displayed herding behaviour into internet stocks during the bubble with a high intensity. In addition, they show that herding by institutions was much greater than what could be expected if they had exhibited momentum trading and that institutions in general continued to herd by acquiring internet stocks for two quarters past the market peak in the first quarter of 2000 and for three quarters past the peak in individual stock prices, which means that institutions were unable to identify the price peaks. Most importantly, they find positive excess returns contemporaneous with institutional buy herding and negative abnormal returns (reversals) at the cease of the herding. This finding suggests that institutions' herding behaviour created temporary price pressures, thereby probably contributing to the bubble.

On the other hand, there are also studies denying the existence or influence of herding. For instance, Chang *et al.* (2000) use a non-linear regression model to examine the relation between equity return dispersions and the overall market return for the US, Hong Kong, South Korea and Taiwan. They document that during periods of extreme price movements, equity return dispersions for the US and Hong Kong continue to increase in a linear fashion, hence providing evidence against the presence of herd behaviour. Nevertheless, for South Korea and Taiwan, which are still considered emerging markets, they find a significant non-linear relation between equity return dispersions and the underlying market price movement, which is evidence of herding according to the methodology chosen, but they argue that in these countries systematic risk accounts for a relatively large proportion of overall security risk.

Henker *et al.* (2003) use a high frequency intraday dataset from the Australian stock market and find little evidence for market-wide or industry sector herding, even in extreme market conditions. It should be noted that the approach used to detect herding in this study looks for evidence of a particular form of herding (herding towards the market portfolio) and considers herding behaviour only in the asset-specific component of returns. The approach, therefore, does not consider herding that may occur in the common component of returns, for example in the situation where prices of all assets in a class (or market) move towards the same direction.

Gleason *et al.* (2004) assume that during up markets, when news is positive, investors would probably be evaluating a relatively large set of investment opportunities vis-à-vis the positive news. Therefore, their actions may be distributed over a longer time period, leading to a lack of herding. On the other hand, during down markets, investors face the simpler task of evaluating the effects of news their portfolios, i.e. on a smaller set of stocks. They can act quickly by following the aggregate market in adjusting their portfolio holdings, thereby creating the possibility of herding. Using two different measures of dispersion, and two different methods for identifying herding, they show that when up and down markets are analysed in aggregate, no evidence of herding behaviour is found. Nevertheless, there is evidence that investors may be more inclined to herd when the market is falling and their results provide weak support for the hypothesis of the myopic loss aversion bias.

Feng and Seasholes (2004) show that individual investors engage in correlated trading behaviour and furthermore claim they are able to rule out herding behaviour as the predominant force driving investment decisions. Their results support the view that public (or market-wide) information is a major determinant of trading decisions and that the decision to buy or sell depends to a large degree on location (observed as a positive or negative loading on the factor). They claim that what has traditionally been called “herding” in the relevant literature is in fact trade between asymmetrically informed agents.

Lipson and Puckett (2005) investigate the trading behaviour of pension plan sponsors on days when markets experience large increases or decreases in value and find significant evidence that pension plan sponsors as a group sell on days when the market experiences large increases and buy on days when the market experiences large decreases. Furthermore, both mean and median trading imbalance measures are negative and significantly different from pre-event levels used for comparison,

suggesting that aggregate pension fund trading is different on these days. Exploring the reason for the change in aggregate trading on these days, they find that pension funds continue the trading patterns they had already established even on large market movement days, and that large market moves provide an opportunity for institutions to complete investment decisions that were made previously and are being executed over a longer time horizon. These results suggest that institutional investors have a long-term horizon and trade quite rationally to accomplish these goals.

Demirer and Kutan (2006) examine whether herds are formed in Chinese stock markets based on the assumption that investors would be more likely to ignore their private information and imitate the market consensus during periods of market stress. They find no evidence of herd formation, using both firm- and sector-level data, from both the Shanghai and the Shenzhen Stock Exchanges, which suggests that market participants in Chinese stock markets make investment choices rationally. Furthermore, they claim that their results show a smooth transition of information between markets. They nevertheless acknowledge that the results may be sensitive to different approaches for testing for herd formation.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 The purpose of the study

The present study aims to investigate the presence of herding in the trading behaviour of institutional investors in the Athens Stock Exchange. More specifically, the focus is on herding by managers of mutual funds available to Greek private investors. The importance of herding by this subgroup of “traders” has been documented previously. Another major reason why this issue is of interest lies in the fact that similar studies in different countries have led to contradicting results; there appears to be a tendency of higher levels of herding in less mature financial markets. Furthermore, no such study has yet been conducted for Greece (to the knowledge of the writer).

Empirical research distinguishes between two types of herding in stock markets (Oehler, 1998): stock-picking herding, which refers to the tendency of managers to buy or sell a particular stock at the same time, and market-wide herding, which is the tendency to be on the same side of the market in general (buying or selling) without focusing on each stock separately. The second type of herding is a broader definition which can be disputed by opponents of the behavioural finance theory; the fact that open-end mutual funds have to invest the capital entrusted every time there is an inflow may lead to a buying position that does not constitute herd behaviour (and the opposite). In this study, only stock-picking herding is considered, so the hypothesis tested can be stated in the following way:

H₀: No stock-picking herding occurs in the behaviour of mutual funds in the ASE.

H₁: Stock-picking herding occurs in the behaviour of mutual funds in the ASE.

This hypothesis is tested initially for the market as a whole (for all stocks), but it is considered informative to further examine the presence and magnitude of herding in particular sub-groups of the market. These sub-groups are the large capitalization shares (the way they are defined by the ASE), the small and medium capitalization shares, the shares that constitute two well-known indices of the market, i.e. the General Index and the FTSE 20 index, and the shares in each of the seventeen

industries identified by the governing body of the ASE. The results are then evaluated in comparison with the results for the market.

3.2 The sample

The list of mutual fund management companies (henceforth, MFMC) provided by the “Association of Greek Investment Companies and Mutual Fund Management Companies” or, as it is usually abbreviated, “Association of Greek Institutional Investors” (henceforth, AGII) and containing twenty five firms (at September 30th 2005) was utilized as the starting point for the data collection process. All open-end MFMC legally operating in Greece are members of the AGII. To reduce the amount of work necessary for the purpose of this dissertation, firms with a market share of less than 0.30 percent of the total volume of funds managed at both January 1st 2005 and September 30th 2005 were excluded from the sample, leaving seventeen firms and 98.71 percent of the market to be considered. One of the MFMC (namely, Social Security Organizations MFMC) is responsible for managing the funds of the public insurance and pension funds and institutions and therefore does not resemble the other firms. Out of the remaining sixteen companies, seven responded to the request for data of their mutual funds (45.41 percent of the funds managed and 47.33 percent of the funds to be considered). The other nine firms chose either not to respond to the request or to allege the absence of a database of the data requested. Table 1 provides a list of the twenty five firms, their relevant market shares and the availability of data concerning the mutual funds they manage. Since the study focuses on herding in shares, only mutual funds investing a significant proportion (over 10 percent) of their resources in shares were considered.

Table 1: Overview of the Mutual Fund Management Companies (MFMC) active in Greece, their market shares (September 30th 2005) and their response to the request for data

Name	Number of Funds	Market Share (%)	Provision of Data
Alico AIG MFMC	16	1.76	New company without sufficient data
Allianz MFMC	10	1.18	Data available
Alpha Asset Management MFMC	25	17.28	Data available
Alpha Trust MFMC	12	1.20	Data available
Aspis International MFMC	10	0.78	New company without sufficient data
ATE MFMC	10	2.50	No response to request
Attica MFMC	6	0.29	New company without sufficient data
Diethniki MFMC	21	23.21	Data available
EFG MFMC	35	33.02	No response to request
Egnatia MFMC	8	0.44	New company without sufficient data
European Reliance MFMC	8	0.23	Market share less than 0.30%
Greek Postal Savings Bank & Hellenic Post MFMC	3	0.22	Market share less than 0.30%
Hellenic Trust MFMC	8	0.44	New company without sufficient data
Hermes MFMC	11	8.05	Data available
HSBC (Hellas) MFMC	10	2.20	Data available
ING Piraeus MFMC	12	2.23	No data – absence of database
International MFMC	7	0.34	Data available
Kyprou MFMC	5	0.81	No response to request
Laiki MFMC	4	0.16	Market share less than 0.30%
Marfin MFMC	10	0.09	Market share less than 0.30%
Omega MFMC	7	0.15	Market share less than 0.30%
P&K MFMC	12	0.50	No response to request
Social Security Organizations MFMC	2	2.77	Funds not traded publicly
Profund MFMC	3	0.09	Market share less than 0.30%
Proton MFMC	3	0.05	Market share less than 0.30%

The Greek legislation demands that these companies publish every six months (at June 30th and December 31st) a detailed report of their portfolio holdings resembling a balance sheet. These data are the only publicly available reports of the investment decisions made by the funds' managers. Attempts to attain further data – data referring to direct investment decisions or to shorter intervals – addressed to some companies were rejected with the explanation that it would create much work and harm the companies' interests. The study utilized data concerning portfolio holdings from June 30th 2001 to June 30th 2006, because holdings of earlier periods were not accessible for many of the firms in the sample and furthermore because the crash in 1999 and 2000 in the Athens Stock Exchange might lead to unreliable results

regarding the herding behaviour exhibited. The mutual funds whose portfolio holdings formed the database for the study appear in Table 2.

Table 2: *Mutual Funds forming the sample for the present study*

MFMC	Mutual Fund
Allianz MFMC	Aggressive Strategy Domestic Equity Fund Domestic Balanced Fund (Unit Linked) Domestic Balanced Fund Domestic Equity Fund
Alpha Asset Management MFMC	Athens Index Domestic Equities Fund Domestic Equities Fund Domestic Balanced Fund
Alpha Trust MFMC	Selected Value Domestic Equity Fund Growth Domestic Fund New Enterprises Domestic Equity Fund Eurostar Domestic Balanced Fund
Diethniki MFMC	Blue Chips Fund Financial Domestic Equity Top-30 Domestic Equity Information & Technology (Hi-Tech) Domestic Equity Infrastructure & Construction Domestic Equity Fund Small Cap Domestic Equity Fund European Fund Balanced Fund "Syllogiko" Domestic Balanced
Hermes MFMC	Dynamic Domestic Equity Protoporos Domestic Equity Balanced Domestic
HSBC (Hellas) MFMC	Greek Equity Fund TOP 20 Greek Equity Fund Pan-European International Equity Fund Emerging Markets International Equity Fund
International MFMC	Equity Fund Domestic Domestic Balanced Fund Equities Selection Equity Domestic Fund Balanced Foreign Fund

Furthermore, data concerning the fluctuation of the General Index of the ASE, the composition of certain indices and the classification of shares into groups and industries by the Stock Exchange where necessary. These data were obtained from the ASE directly. Since the composition of the indices and the classification of shares are not constant throughout the period examined, those stocks that changed categories at

some point in the period where not taken into consideration when the focus was on specific groups.

3.3 Measured variables

For the estimation of herding this study has utilized the measure proposed by Lakonishok, Schleifer and Vishny (1992), henceforth LSV. This measure determines initially those mutual funds that have been buyers and sellers of a share in a given period; the herding of the managers in a share i in the period t is then calculated as

$$H(i) = \left| \frac{B(i)}{B(i) + S(i)} - p(t) \right| - \left(\frac{n}{np(t)} \right) p(t)^{np(t)} (1 - p(t))^{n(1-p(t))} \quad (1),$$

where $H(i)$ is the herding in stock i in period t , $B(i)$ is the number of mutual funds buying the stock in the period, $S(i)$ is the number of mutual funds selling the stock, $p(t)$ is the average change that an active fund is a buyer for all stocks in the period, i.e.

$$p(t) = E\left(\frac{B(i)}{B(i) + S(i)} \right), \text{ and } n \text{ is the number of funds trading the stock in the period,}$$

i.e. $n = B(i) + S(i)$. This function measures the herding in a particular stock (stock-picking herding), rather than the general tendency of the traders to be sellers or buyers in a certain period. The same measure has been utilized by a series of studies concerning herding for different markets and countries, sometimes with slight variations (e.g. Oehler, 1998, Wermers, 1999, Oehler and Chao, 2000, Lobão and Serra, 2002, and Voronkova and Bohl, 2005).

The function used for calculating herding may obviously lead to disputable results if certain considerations are not made. For example, a company going public or issuing new shares would probably appear to have more buyers than sellers, although this can not be considered herding behaviour. The opposite would be the case for a firm that is acquired or undergoes a merger or even goes bankrupt. To mitigate the effect of such incidents, function (1) is not calculated for a share whenever such an incidence occurs, except for the case of a new issue of an already listed firm (because it was impossible to determine the effect of each such case). The same treatment occurs whenever only one fund is trading in a stock ($n=1$), because the calculation would overestimate herding.

3.4 Limitations of the study

The present study is subject to certain limitations and shortcomings, which are partially related with the layout of the study per se and partially with the measure utilized. As far as the study is concerned, it should be noticed that the sample does not cover a large proportion of the market, leaving the quality of the results under some dispute. As far as the measure is concerned, although it has been used widely due to its simplicity and conceptual clarity, it carries certain drawbacks. First of all, the LSV measure cannot identify the reason managers are lead to similar decisions (Voronkova and Bohl, 2005). A severe change in the fundamentals of a firm or in the information available to traders would lead to a value similar to the one observed when great herding occurs. Although such large movements due to rational decision-making are not very likely to appear, nevertheless the values observed must be treated with caution.

Since the measure only captivates the change between two given reference points, it cannot trace strategies that occur inside a period (in this case, in the semi-annual period) and are reversed in the same period (Oehler and Chao, 2000). This drawback cannot be overcome unless actual trading data become available. Furthermore, it does not measure the effect of the herding behaviour on the stock prices, which is a very important aspect of this issue. In order to estimate this effect, it would be necessary to consider the volume of the buy and sell trades and not only the number of active managers (Wermers, 1999). Also, it must be noticed that managers of funds managed by the same MFMC often share the same information; although this constitutes a form of herding, it is nevertheless often mentioned as a reason why the LSV measure might overestimate actual deliberate herding behaviour (Lobão and Serra, 2002).

Finally, the measure overestimates herding when short-selling is prohibited, because the binomial distribution used as the basis for the calculations is not an absolutely realistic assumption (Oehler and Chao, 2000) and may underestimate herding for low activity stocks, because the expression $\binom{n}{np(t)} p(t)^{np(t)} (1-p(t))^{n(1-p(t))}$ (used in the formula to take into account random variations in the trading behaviour) may take large values (Lobão and Serra, 2002).

It should be noticed that more sophisticated measures have been proposed for measuring herding, which focus primarily on share return dispersions, but they also face certain drawbacks and conceptual ambiguities (e.g. Hwang and Salmon, 2001, Hwang and Salmon, 2004, and Demirer and Kutan, 2006).

CHAPTER 4

STATISTICAL ANALYSIS - RESULTS

The results of the analysis provide evidence of herding in the ASE as a whole, consistent with findings of other studies for developing markets. The H_0 hypothesis is clearly rejected for all periods. The herding measures calculated are provided in the following table.

Table 3: Results of the data analysis for the market as a whole

Semi-annual Period	Number of Shares Traded ^a	LSV Measure	Significance (Two-Tailed)
01.07.01 – 31.12.01	148	0.0934	0.000 ^b
01.01.02 – 30.06.02	155	0.1010	0.000 ^b
01.07.02 – 31.12.02	153	0.1197	0.000 ^b
01.01.03 – 30.06.03	147	0.0544	0.005 ^b
01.07.03 – 31.12.03	137	0.2194	0.000 ^b
01.01.04 – 30.06.04	135	0.0941	0.000 ^b
01.07.04 – 31.12.04	113	0.0541	0.018 ^c
01.01.05 – 30.06.05	102	0.0623	0.007 ^b
01.07.05 – 31.12.05	101	0.1624	0.000 ^b
01.01.06 – 30.06.06	109	0.1029	0.000 ^b

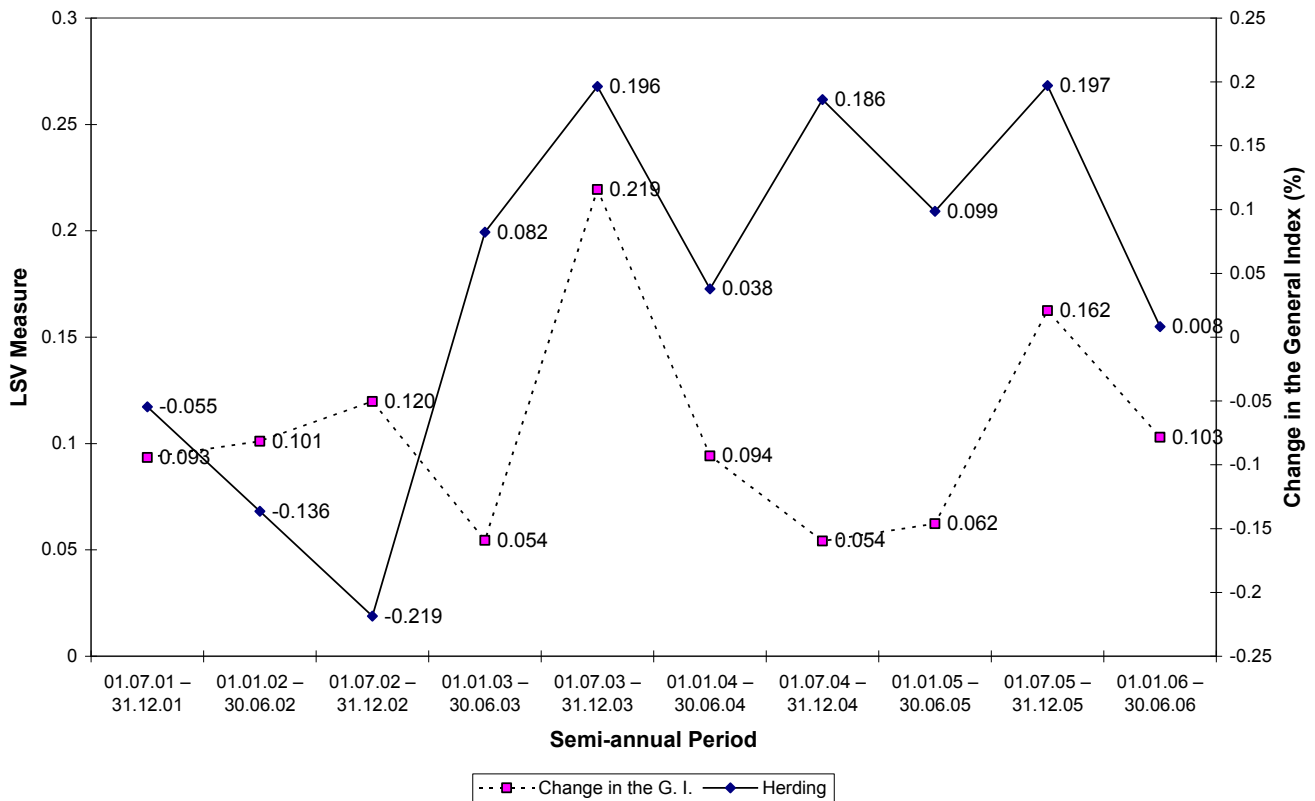
^aThe number of shares traded is the total number of all shares in which at least two mutual funds were active.

^bLSV measure significant at the 99 percent significance level.

^cLSV measure significant at the 95 percent significance level.

It should be noticed that, although stock-picking herding appears to be relatively weak, nevertheless it remains statistically significant at a 99 percent significance level for nine out of ten periods and at a 95 percent significance level for the other period. Therefore, the presence of herding in the ASE as measured with the LSV function cannot be disputed. The following graph demonstrates how the extent of herding changes from period to period and also presents the changes in the price levels observed in the ASE.

Graph 1: Comparison of LSV measure with price movements in the ASE



The above graph 1 reveals large fluctuations of herding with time. These fluctuations, contrary to other studies, cannot be (statistically) associated with the price movements in the market.

Further analyses attempt to identify the nature of the herding behaviour observed in the market. It can reasonably be assumed that managerial herding in shares of companies with little market capitalization or in shares of firms that appear less in the financial news will occur primarily due to imperfect information and not due to reputational concerns. On the other hand, the opposite will probably be the case for shares with large market capitalization or for shares that are more “famous” among financial investors, because information for these shares is plentiful. Therefore, shares are divided into large capitalization shares and small and medium capitalization shares and the herding measures are calculated for each group independently. The categorization of the shares utilized is the one conducted by the Stock Exchange authorities. The following table displays the measures computed for each period compared with the market’s measures.

Table 4: Comparison of herding measures for large capitalization companies, small and medium capitalization companies and the market

Period	Large Capitalization	Small & Medium Capitalization	Market
01.07.01 – 31.12.01	0.1667 (0.000 ^a)	0.0168 (0.662 ^c)	0.0934 (0.000 ^a)
01.01.02 – 30.06.02	0.1520 (0.000 ^a)	0.0609 (0.062 ^c)	0.1010 (0.000 ^a)
01.07.02 – 31.12.02	0.1460 (0.000 ^a)	0.0538 (0.075 ^c)	0.1197 (0.000 ^a)
01.01.03 – 30.06.03	0.1251 (0.000 ^a)	-0.0225 (0.541 ^c)	0.0544 (0.005 ^a)
01.07.03 – 31.12.03	0.2073 (0.000 ^a)	0.2722 (0.000 ^a)	0.2194 (0.000 ^a)
01.01.04 – 30.06.04	0.1400 (0.000 ^a)	-0.0092 (0.812 ^c)	0.0941 (0.000 ^a)
01.07.04 – 31.12.04	0.0615 (0.017 ^b)	0.0200 (0.718 ^c)	0.0541 (0.018 ^b)
01.01.05 – 30.06.05	0.1053 (0.000 ^a)	-0.2726 (0.003 ^a)	0.0623 (0.007 ^a)
01.07.05 – 31.12.05	0.1907 (0.000 ^a)	-0.1773 (0.014 ^b)	0.1624 (0.000 ^a)
01.01.06 – 30.06.06	0.1433 (0.000 ^a)	-0.0026 (0.955 ^c)	0.1029 (0.000 ^a)

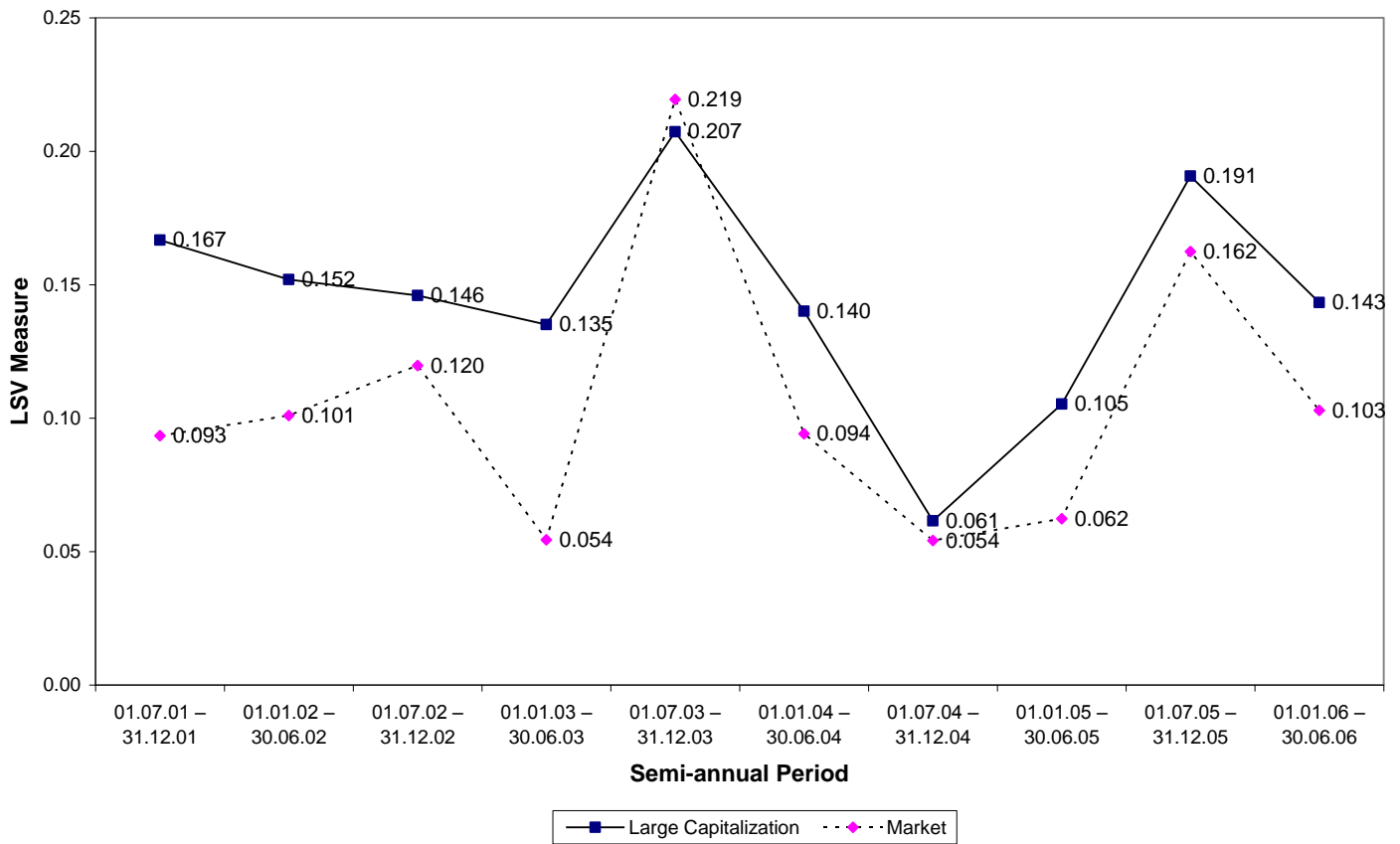
^a LSV measure significant at the 99 percent significance level.

^b LSV measure significant at the 95 percent significance level.

^c LSV measure not significant at an acceptable level.

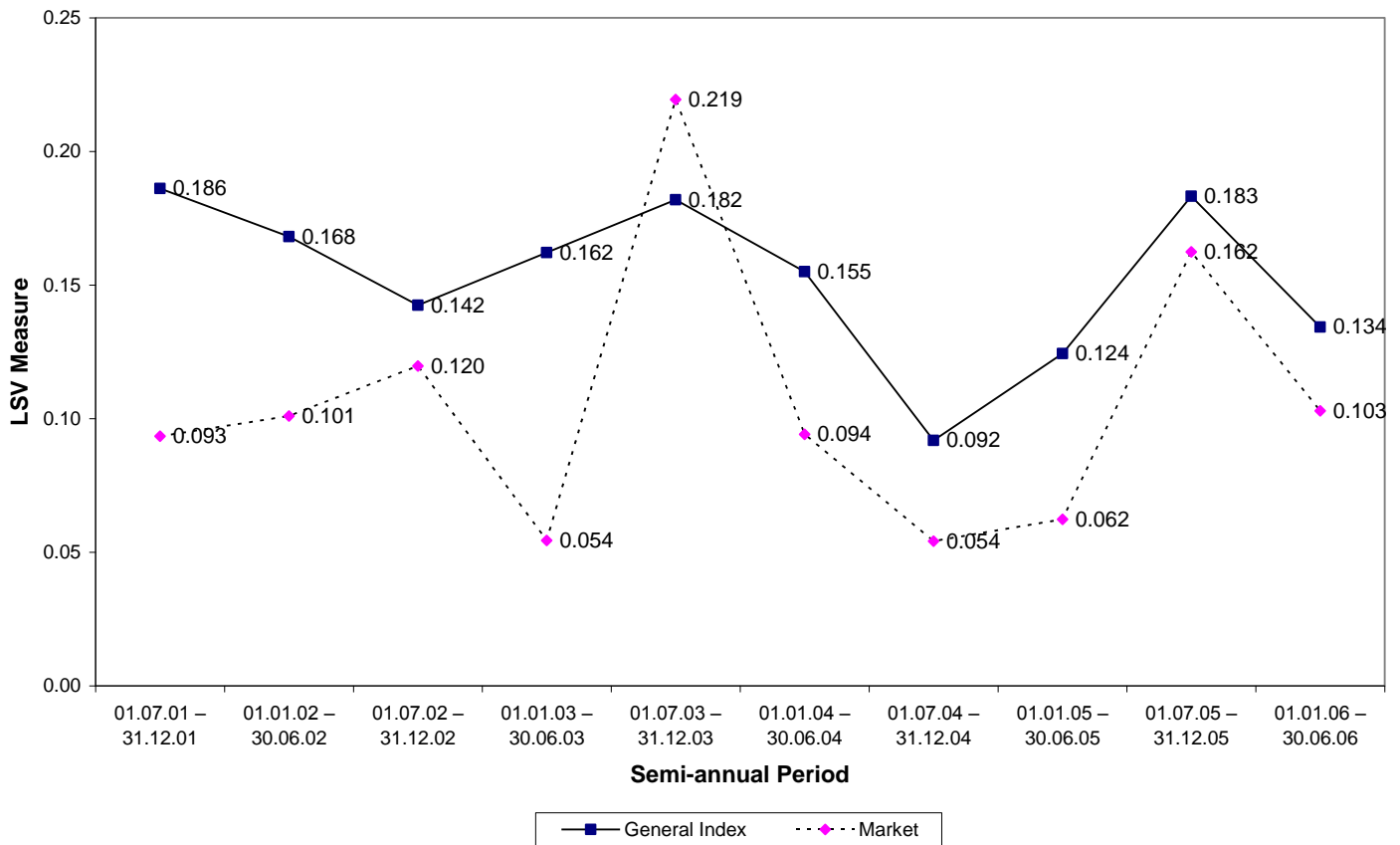
From the above table it becomes obvious that the herding behaviour observed in the ASE can be attributed to the investment decisions regarding large capitalization stocks. Small and medium capitalization shares do not appear to be subject to herding, since only in one period the LSV measure can be conceptually explained and is statistically significant. The two other statistically significant values have no explanatory power, because they are negative. They are considered a result of the drawbacks of the LSV measure that have been identified previously. On the contrary, the herding measures for the large capitalization firms are statistically significant in all periods and usually larger than those of the market. This is presented in the following graph 2 as well.

Graph 2: Comparison of LSV measure for large capitalization companies with the market's measure



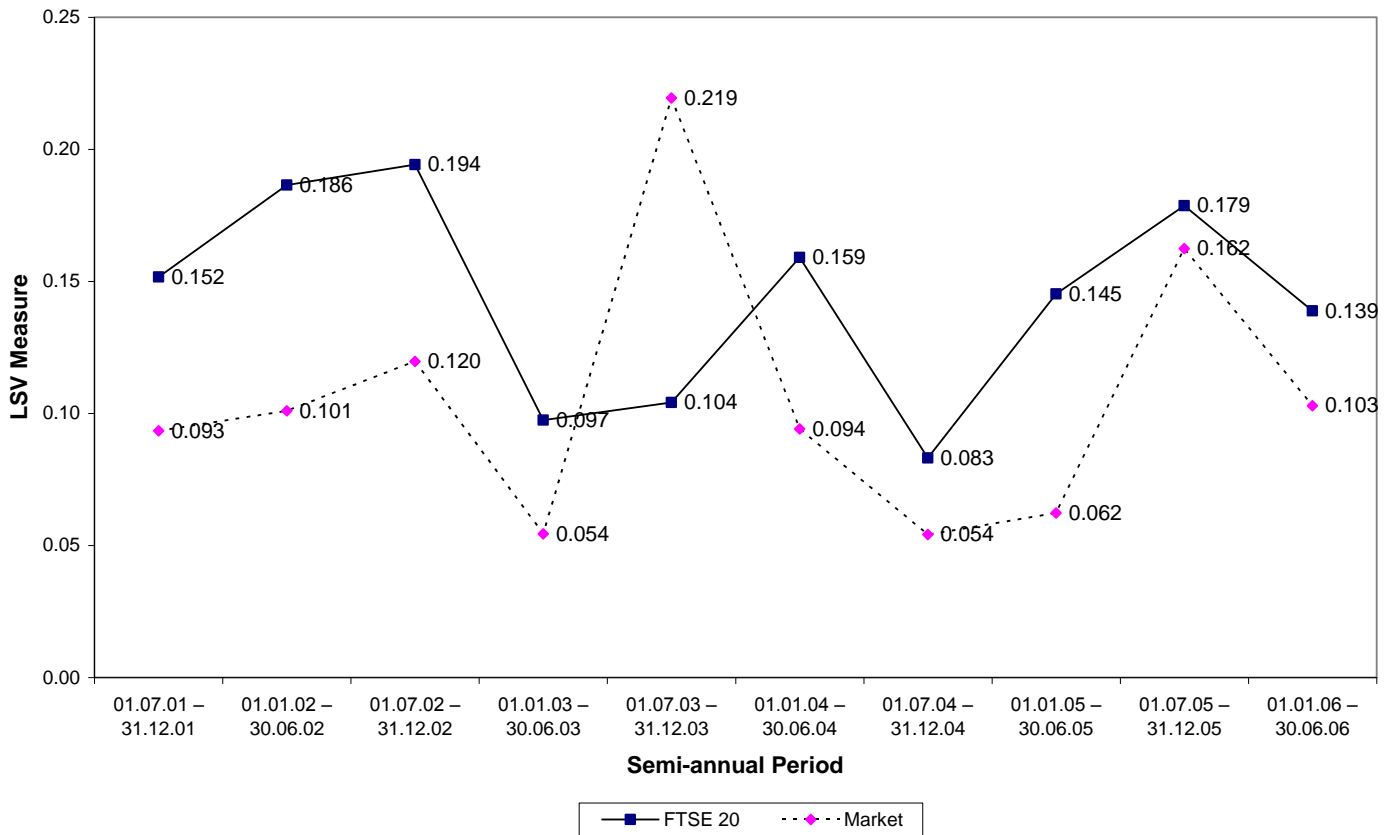
A further analysis conducted in order to identify the reasons for mutual fund herding in the ASE focuses on the trading behaviour concerning the shares comprising the two most renowned indices, the General Index and the FTSE 20 index. Although both indices primarily include large capitalization shares, and the effect of the “size” of a firm has already been shown previously, the shares comprising the indices represent the “fame” of a share as a reason for better herding behaviour and provide additional information about the trading patterns of managers. The results of the analysis for the General Index are shown in Graph 3.

Graph 3: Comparison of LSV measure for the General Index with the market's measure



From the above graph 3 it can be concluded that herding in the General Index stocks is by far greater than that for the market as a whole. The measures calculated for the General Index are statistically significant at the 99 percent level for all periods. This graph displays that herding is greater for more popular shares, a finding strengthening the conclusion reached after comparing the herding measures for large capitalization and small and medium capitalization shares. In the following graph 4, the same analysis is presented for the FTSE 20 index.

Graph 4: Comparison of LSV measure for the FTSE 20 index with the market's measure



We notice here that the results are also similar with those discussed previously for the General Index (graph 3). All measures are statistically significant at the 99 percent level, except for the LSV measures for period 5, which is significant at the 95 percent level, and for period 7, which is significant at the 90 percent level. This may nevertheless be attributed to the small number of shares comprising the index. However, it is noticeable that herding in the FTSE 20 index appears to be slightly less intense than in the General Index; the General Index is older and more “famous” than the FTSE 20 index.

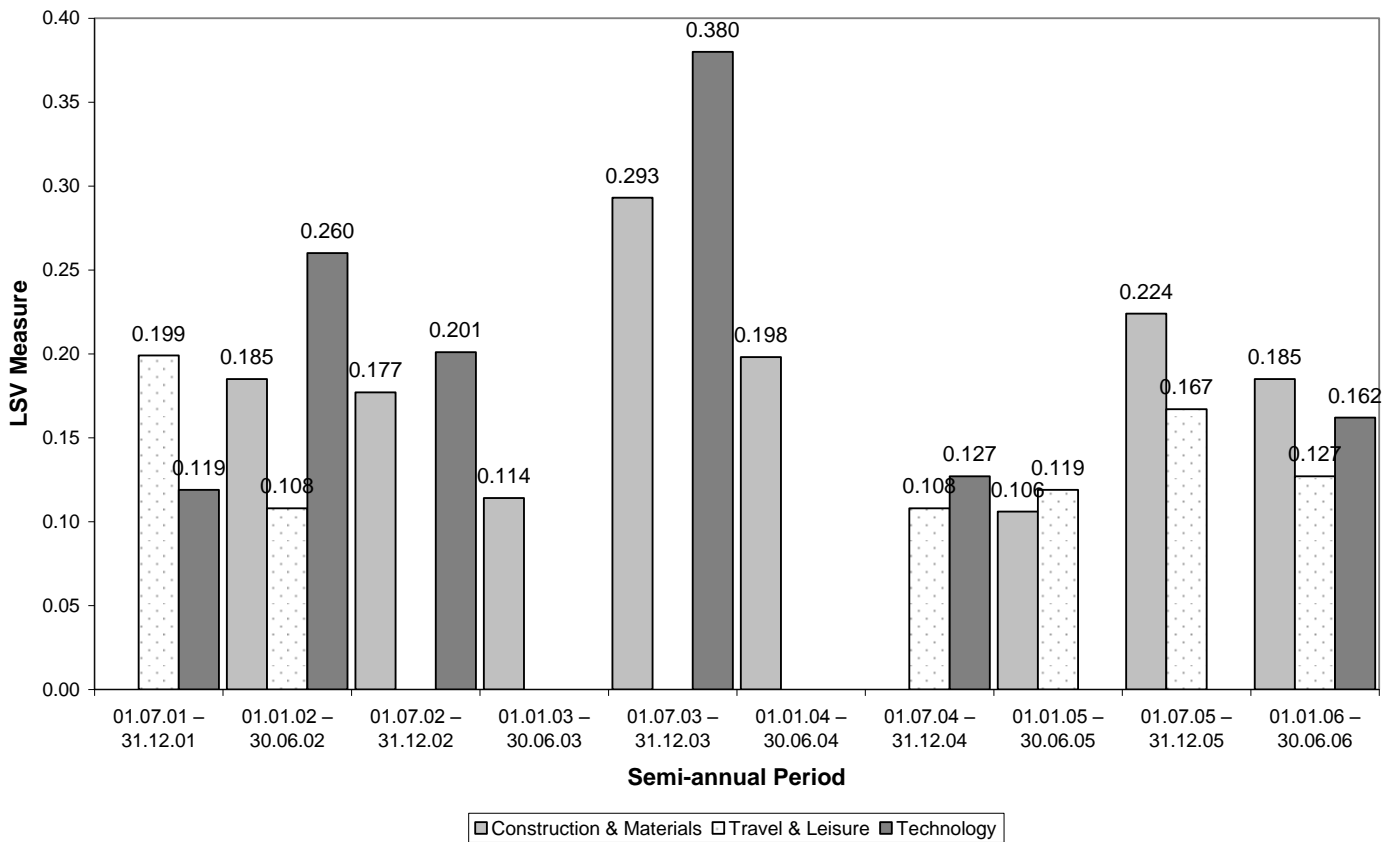
Finally, the attempt to examine the presence of herding in each sector, according to the categorization of the firms performed by the governing body of the ASE, did not yield significant results, because the small number of shares in most industries did not permit any meaningful statistical analysis. The following table 5 presents the number of firms in each sector (only the firms whose category has not changed in the period under investigation are included). For the three industries with more than ten active

shares the LSV measures were nevertheless calculated and are shown in Graph 5. Besides the fact that herding does not seem to differ significantly between the three sectors, no other conclusions can be drawn due to the small number of the firms.

Table 5: *Industry sectors identified by the ASE and the number of companies in each sector*

Sector	Average Number of Firms
Oil & gas	2
Chemicals	3
Basic Resources	9
Construction & Materials	14
Industrial Goods & Services	10
Food & Beverage	10
Personal & Household Goods	10
Health Care	2
Retail	3
Media	5
Travel & Leisure	11
Telecommunications	2
Utilities	4
Banks	10
Insurance	1
Financial Services	7
Technology	11

Graph 5: Herding measures for the industries with the highest number of firms (statistically non-significant values are not displayed)



CHAPTER 5

CONCLUSIONS

The present study can be classified as part of the research concerning the existence and effect of herding. This research has led to a large volume of studies throughout the world that often reach contradicting conclusions. Herding is a bias identified by the proponents of the Behavioural Finance paradigm that has received a lot of attention internationally and has been documented for several markets. It has been claimed that the emergence of herding behaviour by investors can lead to a destabilization of the market, creating bubbles and crashes. Herding becomes an even more important phenomenon if it is exhibited by institutional investors, as has been explained previously.

The main goal of this study has been to identify whether the presence of herding by mutual fund managers active in the Athens Stock Exchange in the period from January 2001 to June 2006 can be established. To accomplish this goal, the herding measure devised by Lakonishok *et al.* (1992) has been utilized. The research conducted led to the conclusion that overall managers herd in all semi-annual periods examined, with the measures calculated being similar to those observed by other studies for developing markets (Lobão and Serra, 2002). The measures are statistically significant throughout the period 2001 – 2006; therefore, although certain limitations of the methodology and the sample are acknowledged, the existence of a herding behaviour is sufficiently documented. It has not been possible to associate the variation in the value of the LSV measure with the price movements of the General Index in the ASE (this index is purported by the ASE authorities to represent the market as a whole).

Further analyzes were conducted in an attempt to identify the reasons for herding by managers. The shares traded in the ASE were grouped into categories based on criteria set by the Stock Exchange itself. Using the market capitalization as a criterion, shares were divided into large capitalization shares and small and medium capitalization shares. It was found that herding for large capitalization shares is significantly higher than for the market in all periods, while herding for small and medium capitalization shares could not even be documented at all (except for one period only). In addition, the shares comprising the most popular index of the ASE,

the General Index, were also formed into a group. The same procedure was followed for the shares comprising the FTSE 20 index, which includes large firms with high reputation. The firms included in these indices can reasonably be considered “famous” and information for these firms is plentiful in the financial news. The measures for the General Index shares were overall significantly greater than those for the market. The same conclusion was drawn for the FTSE 20 index, although due to the small number of shares comprising the sample the measure was not statistically significant at the desired level for one period.

The usefulness of the above analyzes, apart from describing the herding behaviour observed more precisely, lies in the inferences that can be attempted about the reasons of managerial herding. Two main reasons for herding have been proposed: imperfect information and reputational concerns and compensation structures (Bikhchandani and Sharma, 2000). Imperfect information as a reason for herding assumes the presence of information asymmetries or at least perceived information asymmetries. Such asymmetries are more likely to occur for shares with smaller market capitalization or for less popular shares. On the other hand, the reputation of managers can be damaged more severely if wrong investments are made in shares with larger market capitalization or in more popular shares, because their performance can more closely be monitored. From the above, the main argument extracted is that imperfect information as a reason for herding should lead to greater LSV measures for small and medium capitalization shares, compared to the large capitalization shares, and that index shares should be subject to smaller degrees of herding. The opposite should be the case for herding due to reputational concerns and compensation structures. Taking into consideration the measures actually calculated, the conclusion reached is that herding by mutual fund managers in the ASE most probably occurs primarily due to reputational concerns.

Finally, the shares were grouped into categories based on the sector of the economy each firm is placed into by the governing body of the Stock Exchange. The ASE identifies seventeen industries and it was attempted to investigate differences in the intensity of herding between them. Unfortunately, the small number of firms in each sector did not allow comparisons, since the measures calculated lack statistical significance in most cases.

This study follows a pattern devised to conduct an initial examination of the herding behaviour in a market. In a sense, the measure calculated merely scratches the

surface of this issue. It is possible only to infer the reasons of herding and the effect of this herding behaviour on the stock prices can not be appreciated. Furthermore, it is impossible to distinguish genuine herding behaviour from decisions based on changes in the fundamentals. Nevertheless, since mature markets do not usually exhibit stock-picking herding, an important implication of this study is the fact that the ASE is still a developing market with important inefficiencies. Moreover, it is necessary to examine the investing strategies adopted by managers and to closer review their decisions. Perhaps it is the duty of the controlling body of the Stock Exchange to control market makers more closely, in order to prevent large market swings, bubbles and crashes due to herding.

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