



UNIVERSITY OF CAPE TOWN

# Herding behaviour by South African unit trusts in the consumer services sector

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The other part of the requirement for this qualification was the completion of a programme of courses. I hereby declare that I have read and understood the regulations governing the submission of Master of Commerce dissertations, including those relating to length and plagiarism, as contained in the rules of the University, and that this dissertation conforms to those regulations.

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# Abstract

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This study examines whether there is herding by general equity unit trusts as investors in the consumer services sector in South Africa. It also investigates whether herding was more prevalent during the financial crisis period in South Africa between 2008 and 2010, than during a non-crisis period. Using a herding measure developed by Lakonishok, Shleifer and Vishny (1992) (LSV), it was found that there was indeed herding behaviour by general equity unit trusts in the consumer services sector. A herding rate (i.e. the proportion of trades by general equity unit trusts in the consumer services sector in excess of the expected random and independent proportion) of 7.75% is calculated. Possible reasons for herding in the consumer services sector include; consumer services companies being profitable investments and a small number of investment analysts in South Africa. It was also observed that herding behaviour was not more prevalent during the financial crisis period (12.14%) than the non-crisis period (6.36%), as these two periods were not statistically different from one another, even though the average herding rates differed.

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# 1. Introduction

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Herding behaviour occurs when market participants trade in the same direction during the same time period, as a result of being influenced by the actions of other investors (Sias, 2003; Spyrou, 2013; Nofsinger & Sias, 1999). These market participants could be individuals or institutions, and foreign or domestic investors.

Studies of herding behaviour have been undertaken in a number of countries. The majority of these studies have confirmed the existence of herding behaviour in the stock markets. Choi and Sias (2009) were the first to investigate and show herding behaviour by institutional investors at an industry level, and provide a number of justifications for focusing on herding at that level. Choi and Sias (2009) explain that information that is not available for specific equities might be inferred from information about the industry as a whole.

Celiker, Chowdhury and Sonaer (2015) examine whether mutual funds (known as unit trusts or collective investment schemes in South Africa) herd by industry in the United States of America (U.S.). The study by Celiker, Chowdhury and Sonaer (2015) is similar to the study carried out by Choi and Sias (2009), but it focuses on herding by mutual funds, as opposed to all institutional investors (which would include the likes of pension and other retirement funds). The study finds that mutual funds follow behavioural patterns, such as copying of trades of other mutual funds (especially those with a good performance), trading based on reputation or career concerns, and trading based on the same information sources available to other mutual funds. Some elements of the Celiker, Chowdhury and Sonaer (2015) study have been replicated in this study.

The most widely used method to measure herding behaviour in the studies covered in the literature review is Lakonishok, Shleifer and Vishny (1992) (commonly referred to as LSV). The LSV measure quantifies the imbalance between the number of buyers and sellers from a particular investor group in a specific industry, during a given quarter (Spyrou, 2013). LSV is used as the actual measure for the herding rate calculation in this study.

This study examines whether general equity unit trusts herd in the consumer services sector in South Africa. The study also examines whether herding behaviour was more prevalent during the financial crisis period between 2008 and 2010 in South Africa than the non-crisis period. The period studied is from 30 June 2008 to 30 September 2015. Twenty-one South African general equity unit trusts (referred to as unit trusts in this study) are included in the sample. The consumer services sector was selected for this study as 93.5% of its shares were traded by the twenty-one unit trusts, and 45 shares could be selected from this sector for the study. Data was obtained from FundsData Online and INET BFA.

This study contributes to the literature as the first study to examine industry herding by unit trusts in South Africa. It complements the existing literature on herding by unit trusts by providing evidence of herding at an industry level in South Africa.

The remainder of this paper is organised into the following sections: Section 2 provides a literature review. Section 3 explains the methodology and research process. Section 4 provides the results and analysis of the results. Section 5 includes a conclusion, recommendations, and suggestions for future research.

## 2. Literature Review

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### 2.1. Introduction to herding behaviour

Herding behaviour refers to similarities in trading by a group of market participants (Celiker, Chowdhury & Sonaer, 2015). Herding behaviour is the process where market participants are imitating each other's actions or base their decisions on those of other market participants. This results in market participants decisions of other market participants to make their own decisions in the following period. Herding behaviour allows the decisions by "early movers" to provide information to "later movers", incentivising those "later movers" to imitate the "early movers" even if private information indicates a different decision (Khanna & Matthews, 2011). Such behaviour can be seen in stock markets, where there is trading in a specific direction amongst certain stocks, sectors, and in other areas over time (Spyrou, 2013).

The dominance of institutional investors in stock markets in South Africa and worldwide highlights the importance of analysing the impact of trading patterns. There is popular belief that institutional investors herd into and out of stocks without fundamental justification for their decisions (Walter & Weber, 2006). Owing to the high volume of institutional trades, herding behaviour by institutional investors can result in the dilution the information quality of stock prices, exacerbate stock price volatility, and destabilise capital markets by driving prices away from their fundamental value (Scharfstein & Stein, 1990).

The tendency of traders to follow a consensus or a trend has been observed for a number of years in equity markets around the world (Hirshleifer, 2001). Herding behaviour has been cited as one of the main reasons for bubbles and crashes observed in financial markets over time (Lux, 1995).

A large volume of literature exists on herding behaviour by institutional investors. Institutional investors include; pension funds, endowment funds, insurance companies, commercial banks, hedge funds and unit trusts (Barber, Odean & Zhu, 2009). Research on these institutional

investors has been undertaken in different markets, in both developed and emerging markets, from as early as 1992.

The literature review examines the reasons for herding behaviour and finds that studies commonly cite five main reasons for herding: first, protection of reputation and remuneration; second, informational cascades; third, short term investing; fourth, social conformation; and fifth, inexperienced investors and a lack of information.

The studies viewed in the literature consider the methods used to quantify herding behaviour. Herding was commonly measured using one or more of three methods: LSV (Lakonishok, Shleifer & Vishny, 1992), Sias (Sias, 2003) and Christie and Huang (1995). This section provides a brief overview of those methods.

Similar studies the instant one are examined for evidence of the presence of herding behaviour in both developed and emerging stock markets. The studies are discussed in the literature review and the herding rates shown in of a number of these studies are presented in section 4.1, and are compared to the results of this study.

Industry-level herding behaviour is explored in order to determine whether institutional investors herd in certain industries. A number of studies have been considered in order to provide context to this research (which specifically examines herding behaviour at an industry level).

The literature review also discusses the effect of market conditions on herding behaviour. It specifically examines herding during crisis and non-crisis periods, and during bullish and bearish market periods.

## **2.2. Rational explanations for herding behaviour**

The existing body of literature posits a number of reasons for herding behaviour. Such behaviour could be to protect an investor's reputation or remuneration, or could be due to investor irrationality (Spyrou, 2013). Other reasons for herding behaviour include; social conformation, the short-time period available to make decisions and to invest, inexperience in decision making and informational cascades (Dasgupta, Prat & Verardo, 2011; Sias, 2003; Choi & Sias, 2009). Herding behaviour is often a result of emotions having a strong presence in economic decision making, and also because stories and patterns are fundamental to the way people think (Akerlof & Shiller, 2009). Keynes (1936) finds that such decisions are a result of "animal spirit" and irrationality. It is suggested that trading noise in financial markets stems from investor irrationality and increases as more investors trade without any information (De Long *et al*, 1990).

According Bikhchandani and Sharma (2000) there are two types of herding behaviour. The first type is "spurious" (unintentional) herding, where investors obtain similar information and therefore make similar decisions. Hirshleifer (2001) concludes that unintentional herding is a result of institutional investors using the same information sources to make the same decision independently. The second type of herding is "intentional", where investors copy the behaviour of other market participants. The former may lead to efficient outcomes, while the latter may cause fragile markets (including bubbles and crashes), and excess volatility (Bikhchandani & Sharma, 2000).

Five of the most common explanations for herding behaviour are discussed below. These are protection of reputation and remuneration, informational cascades, short-term investing, social conformation, and investor inexperience with an associated lack of information.

### **2.2.1. Protection of reputation and remuneration**

Reputation concerns in the labour market often result in intentional herding. This is because there is no perfect information in the market and fund managers desire to share the responsibility when their decisions cause unfavourable outcomes. In order to share the responsibility, fund managers copy each other's trades in a rational but socially inefficient manner (Scharfstein &

Stein, 1990). This often leads to fund managers ignoring significant private information in order to follow the decisions of other fund managers (Scharfstein & Stein, 1990). Herding, for many fund managers, has become an insurance against their underperformance (Rajan, 2006).

Graham (1999) developed a model that shows investors being more likely to herd if they have a good reputation but do not believe in their ability to select winning shares. Hong, Kubik and Solomon (2000) find that on average, inexperienced analysts whose forecasts deviate from consensus are more likely to be terminated than experienced analysts. Chevalier and Ellison (1999) also find that younger inexperienced analysts have an incentive to herd.

Popescu and Xu (2014) and Hong, Kubik and Solomon (2000) investigate whether reputation contributes to institutional herding and observe that the stronger the investor's career concerns, the greater the chances are that such investor will herd. Herding was found to occur 40% more in a bearish market than in a bullish market (Popescu & Xu, 2014). During a bearish period, the cost of deviating from consensus would result in a decrease in compensation or, in some cases, result in job termination if the losses are large enough (Kempf, Ruenzi & Thiele, 2009). It could also result in the destruction of a fund manager's reputation and even the possibility of a manager not being able to find a job in the industry again. 226 brokers were investigated in the U.S. and the study finds that the influence of consensus on recommendations of analysts is stronger in bullish periods (Welch, 2000). Walter and Weber (2006) find that there is significantly higher herding during a bull market than a bear market, opposing studies done by Popescu and Xu (2014) and Kempf, Ruenzi and Thiele (2009).

Holmes, Kallinterakis and Ferreira (2013) find the reasons for herding to be more intentional than spurious by analysing herding under different conditions. The study is based on the hypothesis that if herding is unintentional, then the extent of such behaviour should be unaffected by market returns, volatility and the regulatory environment (transparency and efficiency of the information in the market). If herding is intentional, there will be a relationship between these three variables. The results find strong evidence of intentional herding where funds are following the trades of other funds, especially in times of low market returns. The cause for such behaviour is driven by reputational concerns. This is consistent with the study

undertaken by Cote and Sanders (1997) that reveal that credibility and reputational concerns lead to herding behaviour amongst investors.

### **2.2.2. Informational cascades**

According to Bikhchandani and Sharma (2000), an informational cascade occurs when it is optimal for individuals to follow the observable actions of other investors and disregard their own information. This generally occurs when there is no direct verbal communication between individuals. Each new market participant adds a small amount of new information to the cascade as they enter a trade but after a point in time, there is very little new information and individuals merely follow other market participants based on the premise that such a large number of market participants cannot be wrong (Jain, 2015). Mutual imitations among investors may temporarily drive asset prices away from their fundamental values and thereby make the market inefficient as many investors make decisions without a reasonable and diligent basis (Banerjee, 1992).

Financial investment advice published in newspapers from 1980 to 1992 is examined to determine the influence on investors and finds that there was herding towards the advice presented in newspapers (Graham, 1999).

A decision model was analysed in which it was rational for investors to look at the decisions made by other investors because such other investors appear to be in possession of important information (Banerjee, 1992). The decision model finds that the decision rules chosen by investors leads them to mimic trades of other investors and ignore their own information (Banerjee, 1992).

Khanna and Mathews (2011) argue that the collection of private information is done at a cost. The more time and money spent on collecting information, the more reliable the information should be. They find that most of the existing models of herding behaviour assume that analysts either are given free quality information or purchase a fixed quantity at a fee, which is an inappropriate assumption. Mimicking trades of investors who have paid for information could

result in herding behaviour, as investors believe that information that is paid for is superior, but resist paying for it themselves (Khanna and Mathews, 2011).

Respected investors feel the need to protect their reputation. They often follow public information even if it differs from the private information they hold. This is a finding by Scharfstein and Stein (1990) and Trueman (1994), who show that investors with career concerns or those who have a good reputation to maintain, will herd towards consensus choices and under-value private information.

Cipriani and Guarino (2005) study herding in financial markets in a laboratory experience. The results show low levels of herding when investors are trading based on information in a frictionless market. Evidence was found that when investors followed other investors, they chose to ignore their own private information (Cipriani & Guarino, 2005).

In an internet experiment that tests informational cascades in financial markets, Drehmann, Oechsler and Raider (2005) reveal that there is no herding when information access is equal, as the market price of a share reflects all known information. Lakonishok, Shleifer and Vishny (1992) find that an effective share price may be the result of investors having common information, as all information should be included in the share price. Lobao and Serra (2007) find that the higher uncertainty in emerging markets results in less accurate and reliable information, and this may result in informational cascades.

The clustering of analysts' recommendations and forecasts may not imply that herding is taking place (Bernhardt, Campello & Kutsoati, 2006). Rather, this could be due to investors using the same information sources, even though those investors may believe the information to be private. Bernhardt, Campello and Kutsoati (2006) considers that analysts' recommendation clustering could also be due to unexpected extreme events that happen in the market which change forecasts. Boyd *et al* (2016) find that herding in financial markets could be the result of common information signals, common trading strategies, or investors replicating other market participants' decisions.

Simonsohn and Ariely (2008) show that judgments can be biased in a sequential choice framework model. They find that when investors make decisions based on estimates of previous trades, they often ignore private information and factors they consider to be irrelevant. This could lead to poor decisions if the factors they ignore are pertinent to the investment decision.

### **2.2.3. Short-term investing**

In a study that examines whether herding by investors is related to the time period in which they are investing, Froot, Scharfstein and Stein (1992) find that herding could be rational when an investor does not have a long investment horizon. When investing over shorter periods, investors often obtain more information from other investors, who are believed to be informed investors, and this results in herding behaviour. This may also have the effect of violating information efficiency, owing to an investor concentrating on one information source (such as other investors) rather than a diverse set of information sources. This is due to investors not wanting to spend limited time in the short period they have available to invest, researching different investment options.

Spyrou (2013) finds the copying of other investor's trades has also caused investors to enter the market at a later stage and ignore any private information that they may possess. These late-entry investors believe that the investors they are following have based their decisions on superior private information. This leads to information cascades (discussed above) which often cause bubbles and crashes, as they influence perfectly rational investors to act less than rationally (Spyrou, 2013).

There is evidence to suggest that the more difficult the task of analysing a company, the more herding amongst investors occur in these companies (Kim & Pantzalis, 2003). This is especially true when a company is diversified and a large amount of time is needed to analyse its value (Kim & Pantzalis, 2003). Kim and Pantzalis (2003) also find that the market value of diversified companies is generally lower than that of undiversified companies.

#### 2.2.4. Social conformation

Jegadeesh and Kim (2010) suggest a model to distinguish between an investor who is herding because of imitation and an investor who is using information of other investors to herd. The model finds that imitation destabilised share prices, while investors who used information of other investors to herd had no effect on the share price. Jegadeesh and Kim (2010) claim that the market can determine when an analyst is herding. In order to test their model, they use sell-side recommendations of analysts between 1993 and 2005, and find strong evidence of herding. Herding behaviour was found to be significant in analysts from large broker firms, analysts who cover a share that does not get many recommendations and analysts who do not often update their recommendations (Jegadeesh & Kim, 2010).

The same study shows that the market's reaction to an analysts revised recommendation is stronger when the revised recommendation moves away from consensus than towards the consensus, and that revised recommendations are partly driven by analysts' tendencies to herd. (Jegadeesh & Kim, 2010). Simonsohn and Ariely (2008) show how rational agents can manipulate the environment of early decision makers by indirectly influencing the decision of observers. They demonstrate this using bid data for DVD auctions from eBay, which show herd behaviour.

Some investors herd as a consequence of psychological influences, and the restraints of social convention Baddeley (2010). Psychological influences are behaviour-based factors that affect a market participant's decision making process. These influencing factors result in a tendency towards a certain asset (such as stocks in a specific sector). Influencing factors include perception, personality and lifestyle (Bakar & Chui Yi, 2016). Social conventions are arbitrary rules and norms governing the countless behaviours engaged in every day without necessarily thinking about them (Marmor, 2014). Market participants may make decisions without thinking about the decision because others are making the same decisions, which leads to herding behaviour. Baddeley (2010) argues that investors are influenced by social conventions and groups that may cause them to mimic the trading of other investors.

Baddeley (2010) shows that herding behaviour can be based on information scarcity, information asymmetry, and a number of other influencing heuristics. Heuristics are mental shortcuts that reduce the burden of making a decision by offering the market participant the ability to scrutinize only a few alternatives in decision making (Shah & Oppenheimer, 2008). According to Redelmeier (2005), market participants are inclined to retrieve information that is most readily available in making a decision - this could result in market participants using the same information and cause them to herd unintentionally.

### **2.2.5. Inexperienced investors and a lack of information**

Boyson (2010) and Graham (1999) find that senior hedge fund managers are more likely to herd in their investment decisions than inexperienced fund managers. Boyson (2010) finds that senior managers that deviate from consensus had a higher probability of failure than their less senior counterparts. This incentivises senior managers to increase the amount of herding as their careers progressed.

Analysts who produce earnings forecasts were examined by Hong, Kubik and Solomon (2000) to determine if their forecasting is influenced by career concerns. They find that, on average, young, inexperienced analysts whose forecasts deviated from consensus choices, were more likely to lose their jobs. This leads them to become more conservative in their forecasts and herding behaviour was shown to be the outcome. This indicates that inexperienced investors with career concerns may herd more than investors who are more secure in their employment. However, studies by Boyson (2010) and Graham (1999) reveal that both inexperienced and experienced investors could exhibit herding behaviour. A study carried out in Japan with macroeconomic forecasters showed that inexperienced investors exhibited herding tendencies when investing, irrespective of age (Ashiya & Doi, 2001).

Uncertainty in information can also result in herding behaviour. While Lakonishok, Shleifer and Vishny (1992) and Wermers (1999) concludes that there is little evidence of herding, they did find herding in small capitalisation shares. Market participants reacted to the lack of information about these small capitalisation shares by paying attention to the choices of other market participants (institutions) who were also trading these shares. Choi and Sias (2009) finds herding

at an institutional industry level occurred in smaller and more volatile industries, often due to a lack of market information.

### **2.3. Measuring herding**

Past studies of herding behaviour use different methodologies to determine whether herding takes place. The majority of empirical tests for herding behaviour involve statistical analysis to determine whether decisions cluster in markets, irrespective of the underlying reasons for such behaviour (Bikhchandani & Sharma, 2000). However, studies often lack a unified approach for testing herding behaviour, making empirical comparisons difficult. LSV (1992), Sias (2003) and Christie and Huang (1995) are most commonly used to measure herding behaviour, but the use of the LSV measure appears the most prevalent.

The LSV herding measure provides the simplest method to determine if herding is taking place in a stock market. It is easy to calculate, easy to understand and is therefore widely used as a herding measure. This measure quantifies the imbalance between the number of buyers and sellers from a particular investor group (e.g. unit trusts) during a given quarter, and can be applied to determine if specific industries are exhibiting herding, as done by Celiker, Chowdhury and Sonaer (2015). Sias (2003) requires a calculation of the cross-sectional correlation using unobservable inputs that make it difficult to calculate or to obtain the required data. Christie and Huang (1995) also require a complex calculation of the cross-sectional standard deviation and ignore that industry herding is a relative measure against the market as a whole. As LSV does not require any complex calculation or use unobservable inputs, and it provides a relative measure of industry herding, it is the most appropriate method to use in this study.

The methodology for calculating the LSV herding measure will be discussed in the methodology chapter (section 3.2). The methodology for calculating Sias (2003) and Christie and Huang (1995) and limitations to using LSV (1992), Sias (2003) and Christie and Huang (1995) are provided in Appendix 1.

## **2.4. Herding effects from around the world**

There is a large volume of literature on herding behaviour in equity markets around the world. For the purposes of this review, the literature will be categorized into studies in developed markets (specifically considering the U.S., United Kingdom (U.K.), Japan, and Germany) and, emerging markets (specifically examining Asia, Europe, and South America).

### **2.4.1. Studies from developed markets**

The earliest studies into herding behaviour were undertaken in the U.S. Lakonishok, Shleifer and Vishny (1992) were the first to examine the phenomenon, using 769 tax-exempt pension funds, followed by Grinblatt, Titman and Wermers (1995) and Wermers (1999), who examined unit trusts as investors. These studies focussed on institutional level herding behaviour using the LSV herding measure, and found little evidence of herding behaviour in the U.S. Sias (2003) finds some evidence of herding by institutional investors in the U.S. by analysing quarterly data between March 1983 and December 1997, using the Sias herding measure that he developed in the study. Wylie (2005) analysed 268 U.K. equity unit trusts for the period January 1986 to December 1993, to test for the presence of herding in the U.K. equity market. Using the LSV herding measure, Wylie (2005) found little evidence of herding amongst U.K. equity fund managers, where a herding rate of 3.4% was calculated.

Kim and Nofsinger (2005) find some evidence of institutional herding in Japan. They find that the level of herding depended on economic conditions and the regulatory environment in Japan. When interest rates are low (or negative), as they have been in the recent period, institutional investors prefer to buy equities (as opposed to debt instruments). This leads to more herding in the equity market, as institutional investors buy the same shares to follow the consensus decision as to asset allocation.

The German unit trust industry was analysed by Walter and Weber (2006) between 1998 and 2002, and some evidence of herding was found. The sample included managers of 60 unit trusts trading shares in the German equity market. The LSV herding measure was used, and an overall herding rate of 5.59% was calculated, which is somewhat higher than the studies in which no

evidence of herding was concluded. The herding behaviour was found by Walter and Weber (2006) to be unintentional, and due to changes in the benchmark index composition.

A study by Kremer and Nautz (2013) shows the effect of using daily, monthly and quarterly data to study the German equity market. The sample included data from transactions made by financial institutions for the period July 2006 to March 2009. The study finds that herding was more prevalent using a daily basis than other frequencies of data. The study also finds that herding was more noticeable in times of market stress when quarterly data was used as opposed to daily data.

One of the earliest studies of herding behaviour at an industry level in the U.S was done by Choi and Sias (2009). They find evidence of industry level herding by institutional investors, using the herding measure developed by Sias (2003). Celiker, Chowdhury and Sonaer (2015) present evidence of herding behaviour in investments by unit trusts at an industry level, also in the U.S., using both the Sias and LSV herding measures. The Sias herding measure (along with the Christie and Huang method) are discussed in appendix 1, while the LSV herding measure is discussed in the methodology section 3.2.

#### **2.4.2. Studies from emerging markets**

There are a number of emerging markets where studies of herding behaviour have been conducted. These include Hong Kong, South Korea, India, China, Indonesia, Poland, Portugal, Spain and Chile.

One of the first studies that examines herding by fund managers in more than one country in the same study was done by Chang, Cheng and Khorana (2000). The countries included; Hong Kong, South Korea, Taiwan, U.S., and Japan. Evidence of herding was found in South Korea and Taiwan, both of which have been defined as emerging markets in the Morgan Stanley Capital International (MSCI) emerging market classification.

Voronkova and Bohl (2005) examine trading of pension fund managers in the Polish equity market. They find more herding amongst Polish pension fund managers (where a herding rate of

11.5% was calculated using the LSV herding measure) than pension fund managers in more developed and mature markets such as the U.S. and U.K.

There is evidence of herding in monthly institutional holdings data in Portugal, using the Sias (2003) methodology (Holmes, Kallinterakis & Ferreira, 2013). They find that herding behaviour is more prevalent in a concentrated market (often an emerging market), due to its small size and investors (mainly institutional) being aware of the decisions made by other market participants.

Using data between 2002 and 2009, Lavin and Magner (2014) found that when specific shares in the Chilean stock market became popular, often due to unit trust managers being aware of other market participants trading these shares, there was evidence of herding behaviour. Lavin and Magner (2014) focussed on 50 shares from the Chilean stock exchange traded by eighteen unit trusts and find a herding rate of 2.8% using the LSV herding measure.

The Korean equity market were investigated by Kim and Wei (2002) to determine the extent of herding behaviour by individual and institutional investors. They find that institutional investors herd significantly less frequently than individual investors. Chang, Chen and Jiang (2012) investigate portfolio performance of both institutional and individual investors. They use the LSV herding measure to determine the presence of herding in the Taiwanese equity market. The study concludes that herding behaviour occurs within both investor groups. They find, further, that the strategically gained profits of herding were greater for individual investors than institutional investors, which could result in greater herding by individual investors.

Agudo, Sarto and Vicente (2008) used data from Spanish equity fund trading, and finds that many market participants invested large amounts of money into the Spanish equity market through unit trusts. Unit trusts had grown by 25% in the past 15 years, as these were considered profitable investments. This resulted in herding behaviour in the Spanish equities market as unit trusts mimicked each other in shares bought and sold.

Individual investors trading in the Indian equity market were examined by Batra (2003) and evidence of herding behaviour was found consistent with the study done by Kim and Wei (2002)

and Chang, Chen and Jiang (2012), where individual investors are found to exhibit higher levels of herding behaviour, although there are different levels of herding among domestic and foreign individual investors. Kim and Wei (2002) find that domestic individual investors herd significantly less often than foreign individual investors.

Herding behaviour by foreign and domestic investors was examined by Agarwal *et al* (2011). The study finds that foreign investors herd more than domestic investors in the Indonesian stock market, possibly due to foreign investors not fully understanding the equity market in which they are investing. Chang (2010) examines qualified foreign institutional investors in emerging markets and finds that when qualified foreign institutional investors change their holdings in a market sector, other market participants (such as margin traders and unit trusts) often follow their decisions, either in the same quarter, or in a subsequent quarter, often due to a lack of information.

Hou, McKnight and Weir (2014) analyse the impact of share characteristics and regulatory change on herding of investments in unit trusts in Taiwan, over the period 1996 to 2008. They reveal that elimination of qualified foreign institutional investors from the Taiwanese stock exchange reduced directionless and sell-side herding, presenting evidence that foreign investors have significant influence in the equity market. However, opposing Hou, McKnight and Weir (2014), Ashirsh and Kiran (2014) find that foreign investors may also cause the market to become more rational due to the large international presence in markets such as the Indian equity market.

Evidence of herding was found by unit trusts and foreign institutional investors in the Indian stock market (Lakshman, Basu and Vaidyanathan ,2011). Ashirsh and Kiran (2014) characterise the Indian stock exchange before 2014 as an inefficient market, because of inconsistent and insufficient laws, poor law enforcement, cultural differences, and a scarcity of investor education. These factors could influence the herding behaviour in markets that exhibit the same characteristics. Chiang and Zheng (2010) find that herding behaviour is more prevalent in emerging markets.

### **2.4.3. Conclusion as to herding investment behaviour in developed and emerging markets**

From the above literature, it is evident that herding behaviour is more prevalent in certain markets, amongst different types of investors and by foreign and domestic investors.

The first noticeable observation from the literature is the presence of herding behaviour in emerging markets and lack of evidence in developed markets. The U.S., Japan and Germany showed some evidence of herding behaviour, but this generally occurred within a certain time period (more recently in the U.S. and with a certain frequency of data - *viz* daily - in Germany) or in certain market conditions (in Japan with negative interest rates). Almost all of the emerging markets in which studies have been conducted (including Chile, China, Hong Kong, India, Indonesia, Poland, Portugal, South Korea and Spain) have shown evidence of herding behaviour, using one or more of the LSV, Sias or Christie and Chang methods. This is pertinent to this study, as the South African equity market will be examined, which is also an emerging market and hence herding levels similar to other emerging markets is expected.

Holmes, Kallinterakis and Ferreira (2013) finds that herding behaviour is more prevalent in concentrated markets. This is also of particular interest to this study, as the South African equity market is concentrated, having only approximately 400 shares in 10 broad industry classifications listed on the Johannesburg Stock Exchange (JSE). The Lavin and Magner (2014) study is useful for comparison because it includes data drawn from a market of similar size: The sample comprised of eighteen unit trusts and they focus on 50 shares; the sample size in this study is twenty-one unit trusts and the focus is on 45 shares.

It is also seen that herding by individual investors is more prevalent than institutional investors in studies done by Agudo, Sarto and Vicente (2008) and Kim and Wei (2002). Agudo, Sarto and Vicente (2008) find that investors herd towards a particular type of investment if they can see growth and profit. This study focuses on institutional investors (unit trusts) and therefore expect the herding rate to be lower than if individual investors were examined.

Another noticeable observation from the above literature is that foreign investors seem to exhibit higher levels of herding behaviour than individual investors, often due to a lack of information or

understanding about the equity market in which they are investing. This is of interest to this study as there is a large presence of international investors on the JSE. According to Bank of America Merrill Lynch (Merrill Lynch, 2015), foreign investors own approximately 46% of the free-float on the All Share Index on JSE. This could result in higher levels of herding if these investors lack information or understanding; however, according to Ashirsh and Kiran (2014), a large international presence could result in lower levels of herding behaviour.

## **2.5. Industry level herding behaviour**

Few studies have examined herding at an industry level. Three such studies are discussed in this section. The first is a study by Jame and Tong (2009) which examines individual investor herding by industry. The second study, by Brunnermeier and Nagel (2004), investigates herding in investment in technology shares on the NASDAQ. The third study is by Celiker, Chowdhury and Sonaer (2015), and examines herding by unit trusts at an industry level in the U.S.

Jame and Tong (2009) investigate whether individual investors group their shares by industry, as this may lead to herding behaviour at an industry level. This may in turn cause industry-wide price shocks, as all investors buy or sell a particular share grouping. The researchers collected data for the period 1983 to 2000 on share transactions from the Trade and Quotes database of the New York Stock Exchange (NYSE) and from the Institute for the Study of Security Markets. They used this data to calculate the percentage of trades in which individual investors bought or sold shares per industry. They used the LSV and Sias herding measures to determine whether herding took place by industry (Jame & Tong, 2009).

The herding measures used (LSV and Sias) show that if investors herd at an industry level, there will be a variance between the actual percentage of stocks bought or sold and the expected percentage of stocks bought or sold, for all industries. That is, more individual investors will be on one side of the transaction (buy or sell side) than they would have been had no herding taken place (Jame & Tong, 2009).

The industry herding measure was calculated for 49 industries (as classified by Fama and French, 1997) and find a herding rate of 4.01% using the LSV herding measure (James & Tong, 2009). This was statistically significantly different from zero at a 1% level of significance ( $p < 0.001$ ). They interpret this as being strong evidence that herding does occur at an individual investor level by industry. The Sias herding measure also confirmed the existence of behaviour by individual investors at an industry level.

Brunnermeier and Nagel (2004) examine portfolio holdings of hedge funds and their investment in shares on the NASDAQ between 1998 and 2000. During this time period, there was a sharp increase in share prices. The study concludes that institutional hedge fund investors intentionally bought shares in the technology sector during the bubble, and decreased their exposure before the collapse in share prices. Although this study does not confirm the existence of herding behaviour, it does suggest that institutional investors group their investments by industry, at certain times.

In a seminal paper, Celiker, Chowdhury and Sonaer (2015) examine general equity unit trusts in the U.S. over the period 1980 to 2013 to determine if there was herding by unit trust investors at an industry level. The study also examines the extent to which herding impacts industry valuation. The study uses the 49 industry classifications created by Fama and French (1997). The herding measures of LSV (1992) and Sias (2003) are used for the analysis.

Celiker, Chowdhury and Sonaer (2015) conclude that unit trusts engage in industry herding and that the extent of industry herding was higher than could occur by chance, even though the herding rate calculated in the study was just 1.53%. They also conclude that industry herding has no destabilizing effect on industry values. Evidence from this study suggests that actively managed unit trusts herd when they trade shares in specific industries.

## **2.6. Herding in different market conditions**

The rationality of investors herding during two periods: the crisis period and non-crisis period, was examined by Chiang *et al* (2013). The sample period included the 2008 global financial crisis. The results from the study show evidence of herding by both individual and institutional

investors during the crisis period. Economou, Kostakis and Phillippas (2011) show that share prices may deviate from their fundamental values during a crisis period, due to liquidity constraints and informational asymmetries. Christie and Huang (1995) found that in extreme market movement periods, investors overturn their own beliefs and follow the consensus of the market.

Bowe and Domuta (2004) observe whether foreign and domestic investors herded before, during, and after the Asian crisis of 1997 on the Jakarta Stock Exchange (Indonesian stock exchange). The results of the study present evidence that both foreign and domestic investors herded during the crisis, with foreign investors herding more than domestic investors, especially after the crisis, due to foreign investors not being aware of when the crisis period ended.

The Korean equity market was observed between 1996 and 1997 and found significant evidence of herding by foreign investors before the Asian crisis of 1997, using the LSV herding measure (Choe, 1999). Chiang and Zheng (2010) find that herding behaviour is more likely to occur during crisis periods than other periods. Chang, Cheng and Khorana (2000) find that during stress periods (such as a crisis period), investors with imperfect information and uncertainty tend to follow other investors, which leads to herding behaviour.

An investigation of the causal relationships between herding, stock market returns, and illiquidity that focused on the major Asian markets was conducted by Chiang, Li and Tan (2010). They show that share market return dispersions decreases in times of market stress, which is evidence of herding behaviour.

Loa and Singh (2011) find that herding behaviour is more prevalent when markets are falling. This finding is consistent with that of Popescu and Xu (2014) who find herding behaviour occurs more in a bear market. Lavin and Magner (2014) also find that herding increases when there are dips in the market.

Hedge funds trade significantly during episodes of market volatility, and that this may lead to an impact on the market price during some of those volatile times (ERM crisis in 1992) but not during others (Peso crisis of 1994) (Fung and Hsieh, 2000). Garg and Jindal (2014) find that herding behaviour was exhibited during times of crisis, but after the crisis period when market conditions was set right, investors corrected their behaviour. Andreu, Ortiz and Sarto (2012)

oppose the findings of Garg and Jindal (2014), and find that herding levels are higher in times of low volatility (non-crisis period). A herding rate of 18% was calculated by Andreu, Ortiz and Sarto (2012) using the LSV method.

## **2.7. Conclusion to the literature review**

Herding is evident in investments by both institutional and individual investors (foreign and domestic) in developed and emerging markets. The literature provides a number of rational explanations for herding behaviour.

However, few studies investigate herding at an industry level. The studies that have been done provide some evidence to suggest that herding does take place at an industry level. Studies were also done on herding behaviour during a crisis and non-crisis period. Herding was more prevalent in uncertain and volatile periods, and in periods where the market is bearish.

## 3. Methodology and data analysis

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The literature review presents evidence of herding behaviour, including herding by mutual funds at an industry level. Mutual funds are referred to as collective investment schemes or unit trusts in South Africa. This study will refer to them as unit trusts. The sample of unit trusts used in this study is general equity unit trusts. General equity unit trusts have been selected in an effort to replicate the research of Celiker, Chowdhury and Sonaer (2015), who excluded international and non-equity unit trusts from their sample. Unit trusts were also chosen for this research because the information relating to their holdings is publicly available. No study of this sort has been done in South Africa. As South Africa is also an emerging market, it is interesting to compare the results of this study with those of other emerging markets, which have been covered in the literature review in section 2.

Methods to measure herding behaviour were discussed in the literature review. These were the LSV method developed by Lakonishok, Shleifer and Vishny (1992), and methods developed by Sias (2003), and Christie and Huang (1995). The LSV method is used in this study for the reasons already provided in section 2.3 above.

This chapter introduces the research questions and discusses the research method and process. The chapter also highlights the limitations of the study.

### 3.1. Research Questions

The study aims to test whether there is herding behaviour by unit trusts in the South African equity market, specifically in the consumer services sector. The study will also test whether herding is more prevalent during a financial crisis period than a non-crisis period.

The research aims to answer the following research questions:

1. Do general equity unit trusts herd when investing in the consumer services sector in the South African equity market?

The null hypothesis is that there is no herding in investments by general equity unit trusts in the consumer services sector in South Africa. The hypothesised herding rate (described below) would therefore be zero.

2. Is herding by general equity unit trusts in South Africa in the consumer services sector more prevalent during a financial crisis period than a non-crisis period?

The null hypothesis is that herding behaviour is no more or less prevalent among general equity unit trusts during a crisis period. A crisis period occurred in South Africa from the second quarter of 2008 until the first quarter of 2010. This is the period during which there was a sharp drop and then recovery of the gross domestic product (GDP) in South Africa (Statistics SA, 2016).

### **3.2. Research Method**

This research seeks to replicate some of the analysis by Celiker, Chowdhury and Sonaer (2015), in which merged data from the Thomason-Reuters Mutual Fund Holdings database and monthly stock files from the CRSP were analysed for the period 1980 to 2013. The data comprised full fund holdings of all the shares, including the number of shares held by the unit trusts in the sample, and the price of the shares in each quarter. As noted previously, industries were classified according to the 49 industry classification categories created by Fama and French (1997). The LSV herding measure methodology was used by Celiker, Chowdhury and Sonaer (2015) to determine the presence of herding by unit trusts in industries. This is done by calculating the herding rate using the LSV methodology shown in the steps below. The herding rate is the proportion of trades by general equity unit trusts in the consumer services sector in excess of the expected random and independent proportion.

LSV is calculated in three stages:

### Stage 1:

A Dolch measure is calculated in the first step of the LSV herding measure methodology. Dolch determines the Rand amount of the quarterly change for each share in the unit trust. A positive Dolch indicates that shares were bought, while a negative Dolch indicates that shares were sold. The formula is as follows:

$$\text{Dolch}_{j,k,t} = \sum_i^N (\text{price}_{i,t-1})(\text{Holdings}_{i,j,t} - \text{Holdings}_{i,j,t-1}) \quad (1)$$

where  $N$  is the number of unique shares held by the unit trust  $j$  over quarter  $t-1$  to  $t$ , and belonging to industry  $k$ .  $\text{Holdings}_{i,j,t}$  ( $\text{Holdings}_{i,j,t-1}$ ) is the number of shares belonging to company  $i$  (which is a company listed on the JSE in the consumer services sector) owned by unit trust  $j$  at the end of quarter  $t$  ( $t-1$ ).  $\text{Price}_{i,t-1}$  is the price per share of the share in company  $i$  at the end of quarter  $t-1$ . Due to changes in the share price, a unit trust's Rand holdings in the consumer services sector may change (increase or decrease) even when the fund does not trade shares in the quarter. To eliminate the effect of share price changes on the rand amount, the previous quarter end price is used in the Dolch calculation. The sum of each individual share's Dolch is calculated for each general equity unit trust for each quarter.

Dolch is calculated for each of the thirty quarters, for each of the twenty-one general equity unit trusts in the sample, totalling 630 Dolch calculations. Some of these were buyers (positive), some were sellers (negative) and some had no calculation. A Dolch calculation has no calculation if:

- The unit trust had no shares in the consumer services sector during two consecutive quarters in which the Dolch was calculated.
- There was no change in the number of shares held.
- The data was missing. Missing data is one of the limitations of the study, which is discussed in more detail in section 3.5 of this chapter.

## Stage 2:

The number of buyers, sellers and no calculations are counted, depending on whether the Dolch was positive (a buyer) or negative (a seller) for each quarter, for each of the twenty-one unit trusts in the sample. This provided a count of the positive, negative, and no calculation Dolchs of the summed individual Dolch's. Based on these results, the ratio of the number of buyers to the total number of buyers and sellers in the consumer services sector  $k$  during quarter  $t$  was calculated. This ratio is referred to as the "unit trust demand ratio". The ratio is as follows:

$$P_{k,t} = B_{k,t} / (B_{k,t} + S_{k,t}) \quad (2)$$

Where  $B_{k,t}$  is the number of unit trusts that are buyers in the quarter and  $S_{k,t}$  is the number of unit trusts that are sellers. If a unit trust had no calculation for the period, it is denoted "none", and ignored in the calculation of the ratio above.

## Stage 3:

To calculate the LSV herding rate, the unit trust demand ratio calculated in (2) above,  $P_{k,t}$ , is compared to the market's unit trust demand ratio,  $P_t$ .  $P_t$  is the cross-sectional average of the fraction of buyers across all industries in quarter  $t$ . This determines the extent of herding in investments in the consumer services sector, relative to all industries. The absolute difference between the unit trust demand ratio for consumer services and the unit trust demand ratio for the entire market is calculated as follows:

$$HM_{k,t} = | P_{k,t} - P_t | \quad (3)$$

## Wermer's herding measure

The LSV herding measure discussed above only determines whether there is an imbalance in the number of buyers and sellers in an industry, compared to the total market (comprised of all industries). Wermers (1999) developed a method to distinguish whether this imbalance is in

shares bought or shares sold. With this measure, the equation from Stage 3 of the analysis is used before the absolute difference between the unit trust demand ratio and the market demand ratio has been applied.

$HM_{k,t}$  is a herding measure based on the following criteria:

$$\text{Buy } HM_{k,t} > 0.5 \quad (4)$$

$$\text{Sell } HM_{k,t} < 0.5 \quad (5)$$

The average of each of the quarters classified as a buying (selling) herding measure is calculated separately to calculate Wermer's buying (selling) herding measure and a statistical test is used to determine if the results suggest the presence of herding using the Wermers method.

### **3.3. Research Process**

#### **3.3.1. Data collection**

FundsData Online<sup>1</sup> is a website that provides a comprehensive and continuously updated information resource covering unit trusts available in South Africa and globally. The professional subscription includes full asset holdings of all unit trusts in South Africa. The database covers a period of twenty years, and includes data on the number of equity shares owned by each unit trust and the price of the holding at the end of the each quarter.

FundsData Online provided thirty quarters of data. This data included the total market value of the shares held by each unit trust at the end of each quarter for the period 30 June 2008 to 30 September 2015. The data included the number of shares held as well as the percentage of each unit trust invested in a particular share. The data on the number of shares held in each quarter enabled the determination of whether the unit trust was buying or selling shares in a particular industry, based on whether the number of shares increased or decreased between two consecutive quarters.

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<sup>1</sup> <http://www.fundsdata.co.za>

Share prices from the shares listed on the JSE are required for the calculation of the herding measure. Share price data was sourced from the INET BFA database for the observation period. INET BFA is Africa's leading provider of financial data feeds and analysis tools. It covers African and global share prices as well as other financial information. Access was obtained through an INET BFA terminal at the University of Cape Town. The share prices retrieved were on the dates of quarter ends, that is; 31 March, 30 June, 30 September and 31 December, for the sample period.

### **3.3.2. Period under review**

The eight-year period of the sample data is suitable to determine whether there has been herding in the South African stock market. Indeed, many similar studies have been undertaken which covered shorter time periods such as Kremer and Nautz (2013) (who used a period between 2006 and 2009), Walter and Weber (2006) (who used a period between 1998 and 2002), Choe (1999) (who used a period between 1996 and 1997) and Andreu, Ortiz and Sarto (2012) (who used a period between 2000 and 2007).

### **3.3.3. Sector**

The consumer services sector was selected for this study for a number of reasons:

1. The sector includes a large number of shares relating to clothing and food retailers, which provide a sample of sufficient size. There are 45 shares in this sector (listed in Appendix 2). These include clothing, food, and drug retailers, travel and leisure companies, as well as media companies.
2. The number of shares in each category of market capitalisation in the consumer services sector is similar and therefore the shares in the sector have a similar chance of being selected by unit trusts wanting to purchase shares in different market capitalization categories. Appendix 2 shows average market capitalisation per share over the thirty quarters. It identifies each market capitalisation as small (<1 billion), medium (1 billion –

10 billion) or large (>10 billion), according to the JSE classification criteria. Table 1 below sets out of how many shares are in each market capitalisation category<sup>2</sup>.

**Table 1: Number of shares in each market capitalisation category**

Market Cap Size	Small	Medium	Large
Number of shares	18	14	13

- Appendix 3 shows how many of the shares in the sector are held by the twenty-one unit trusts in the sample. 93.5% of the 45 consumer services shares are traded by unit trusts in the sample. This broad holding further justifies the choice of this sector in this study.

### 3.3.4. Exclusions

There were approximately one hundred and twenty general equity unit trusts in South Africa in 2015. There are 43 general equity unit trusts that made up some 80% of the total net asset value of all publicly available general equity unit trusts in South Africa at 30 September 2015. A number of general equity unit trusts are excluded from this study.

First, unit trusts with restrictions on which shares may be held are excluded. These are not suitable for an investigation of herding because the unit trust may not be able to buy or sell all shares in the consumer services sector.

Second, unit trusts that are a fund of funds are excluded. This would result in double counting, which would compromise any determination herding behaviour from the data.

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<sup>2</sup> The number of shares in each category is similar based on a chi-squared distribution. The null hypothesis was that each category (small capitalisation, medium capitalisation and large capitalisation) has the same number of shares (15 shares in each) was not rejected at a 5% significance level (the Chi-squared test statistic was 0.9333 and there were 2 degrees of freedom). The p-value calculated was 0.6272, an indication that the difference between the number of shares in each category is not statistically significant. The null hypothesis was not rejected.

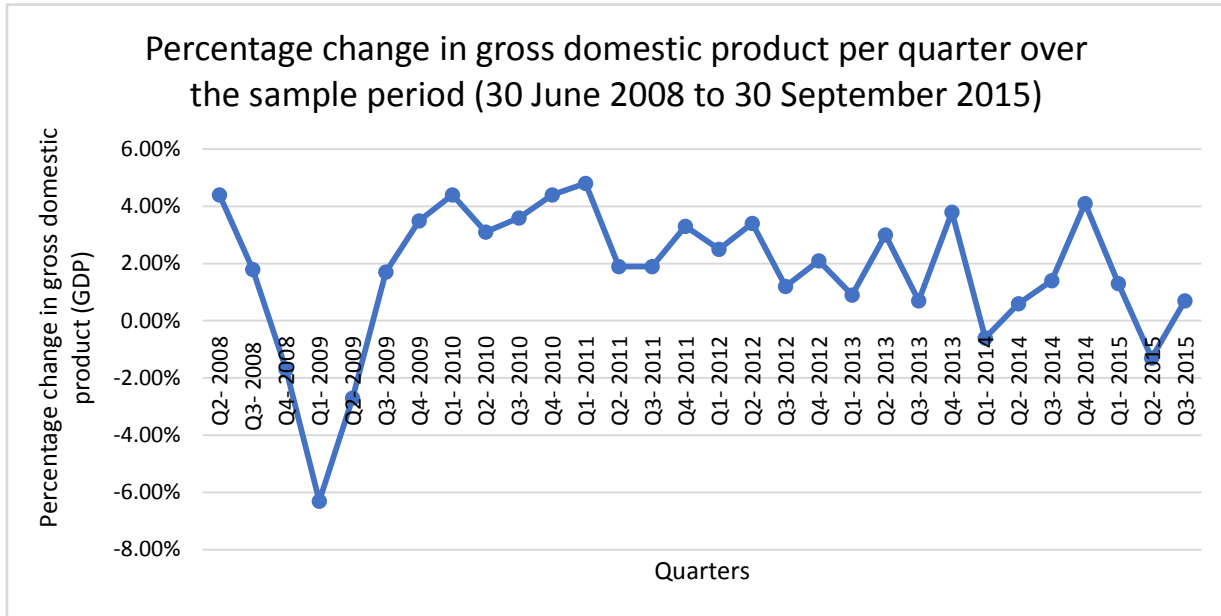
Third, general equity unit trusts are excluded where the information was not available or recorded for the full thirty quarters. This would not provide an accurate measure of herding behaviour as data is compared between quarters to determine whether there is herding in the consumer services sector. There were a number of other unit trusts that were not included in the sample as they held no shares in the consumer services sector during the thirty quarter period under examination.

After applying these exclusions, the remaining twenty-one unit trusts were analysed over the thirty quarter period. The analysis in this study used 480 herding measures over the thirty quarters of data, and 2 034 share trading decisions which provide a suitably large sample. Appendix 4 gives a list of the general equity unit trusts in this sample.

### **3.4. Herding behaviour in a crisis period**

The financial crisis period in South Africa is a major event that affected the economy over the sample period (Du Plessis and Kotzé, 2010), and therefore will be used to divide the aggregate sample period. This is similar to the division made by Walter and Weber (2006), who divided the sample period by a crisis and non-crisis period. Figure 1 shows the percentage change in GDP per quarter from 2008 to 2016, and this has been used to identify the two distinct periods. The average herding measure is calculated for each of the two periods. The first period is during the crisis period from the second quarter of 2008 (coincidentally, at the start of the sample period) to the first quarter of 2010. Kannan, Scott and Terrones (2009) define the financial crisis cycle as peak to trough to peak. The second period is the non-crisis period (from the second quarter of 2010 to the third quarter of 2015). The averages of the herding measures for the respective periods are statistically compared to determine whether there are differences in herding behaviour between the crisis and non-crisis period.

**Figure 1: Percentage change in gross domestic product per quarter**



(Statistics SA, 2016)

### 3.5. Limitations and Risks

The most significant limitation of this study is missing data. Although FundsData Online provided data for every period from 30 June 2008 to 30 September 2015, data was missing for some general equity unit trusts, which made it impossible to calculate any change in the Rand value of holdings between two consecutive quarters. Furthermore, some of the largest funds were not in the FundsData Online database. Further, there was survivorship bias in the sample of unit trusts as FundsData Online could only provide data for unit trusts that were still active at 30 September 2015.

The herding measure calculated is a naïve herding measure as it ignores any adjustment factor, owing to the lack of any consensus in the literature as to the nature and quantum of any such factor.

Another limitation of the study was that the share prices of the various holdings calculated by the data from FundsData Online differed slightly from the closing price, as reported by the JSE on

INET BFA. The differences in the prices each quarter were less than 1% of the FundsData Online prices. The prices from INET BFA were used for consistency in order to overcome this limitation.

## 4. Results and explanation of the results

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### 4.1. Herding by general equity unit trusts investing in the consumer services sector

The results of analysis using the LSV herding measure on the sample of twenty-one general equity unit trusts in South Africa over the period 30 June 2008 to 30 September 2015 are presented in table 2 below:

**Table 2: Results of herding**

Time period	<u>Total period</u>
Herding rate	7.75%
Median	4.99%
T-stat (one-sided)	6.336
p-value	0.0000034
Significant/not significant	Significant (1% level)

The herding rate of 7.75% is the average of the absolute difference between the unit trust demand ratio for the consumer services sector and the unit trust demand ratio for the market as a whole, over the thirty quarters in the study. The herding rate for each consecutive quarter is given in Appendix 5. The herding rate of 7.75% can be interpreted thus: if 100 unit trusts trade a given sector in a given period, approximately 7.75 more unit trust trades are on the same side of the market than would be expected if all general equity unit trust managers chose their sectors independently. The median of 4.99% is lower than the mean of 7.75%. This is an indication that the distribution of the data is skewed to the right (positive skew).

The test statistic of 6.336 (p-value 0.0000034) was calculated for the results, by comparing the herding rate in each quarter to zero (the result if there was no herding), using a one-sided t-test. This results in a rejection of the null hypothesis for this research question and evidence to

suggest that there is herding by unit trusts in the consumer services sector in South Africa. The studies by Lavin and Magner (2014) and Celiker, Chowdhury and Sonear (2014)) also presented statistically significant results with lower herding rates of 2.8% and 1.53% respectively

Wermers buy and sell herding rates were calculated for the sample of thirty quarters and the results are presented in the table 3 below:

**Table 3: Wermers herding measure**

<b>Wermers herding measure</b>	<b><u>Sell herding measure</u></b>	<b><u>Buy herding measure</u></b>
<b>Herding rate</b>	-7.746%	7.758%
<b>Median</b>	-4.669	4.988
<b>T-stat</b>	-4.2401	4.8772
<b>p-value</b>	0.00225	0.00043
<b>Significant/not significant</b>	Significant (1% level)	Significant (1% level)

The LSV herding measure is always positive as a result of using the absolute difference between the two unit trust demand ratios. To calculate the Wermers buy and sell herding rates, the amount before the absolute difference (applied in Stage 3), is used. This will show the direction in which unit trusts trade in each quarter. The buy (sell) herding rate is the average of the quarters that presented buys (sells). A positive (negative) herding rate represents buying (selling) of shares by the unit trust in the two consecutive quarters. The calculation for the Wermers herding measure can be seen in Appendix 6. The results above show that the mean herding rates for both the buy and the sell measures are close to each other (approximately 7.75%) as well as close to the herding rate for the entire sample (7.75%).

The median was calculated for both the buy and sell categories for the 29 quarters. There were 17 quarters that represented buying by unit trusts, and 12 quarters that showed selling by unit trusts, in the consumer services sector. The respective medians are approximately the same with the buy side being 4.988% and sell side being 4.669%.

A statistical test was conducted on the Wermers measures to determine if each category (buy and sell) presented statistically significant herding results. The test statistic was calculated independently for the buy and sell data categories using a one sided t-test. The test statistic was 4.8772 for the buy category, with a p-value of 0.00043. The sell category has a test statistic of -4.2401 (the negative is to indicate it was a sell) and a p-value was 0.00225. Both of the p-values are less than 1%, which indicates that there is statistical significance at a 1% tolerable level.

## 4.2. Analysis of results for herding by investors in the consumer services sector

The table 4 below presents the herding rate of a number of studies discussed in the literature review.

**Table 4: International results**

International results	Country	Context of the study	Herding rate
Lakonishok, Shleifer and Vishny (1992)	U.S.	Pension Funds	2.70%
Grinblatt, Titman and Wermers (1995)	U.S.	Unit Trusts	2.50%
Wermers (1999)	U.S.	Unit Trusts	3.40%
Celiker, Chowdhury and Sonear (2014)	U.S.	Unit Trusts	1.53%
Wylie (2005)	UK	Unit Trusts	3.40%
Walter and Weber (2006)	Germany	Unit Trusts	5.59%
Lavin and Magner (2014)	Chile	Unit Trusts	2.80%
Lobao and Serra (2007)	Portugal	Institutional holdings	13.96%
Voronkova and Bohl (2005)	Poland	Pension Funds	11.50%
Andreu, Ortiz and Sarto (2012)	Spain	Pension Funds	18.00%
This study (2017)	South Africa	Unit Trusts	7.75%

Table 4 presents the developed markets first (U.S., U.K. and Germany) which show lower levels of herding than the emerging markets (Portugal, Poland, Spain). This is consistent with the literature presented above in section 2. South Africa (also an emerging market) has a herding rate (in the consumer services sector tested in this study) that lies between the developed and the emerging markets at 7.75%. This is not directly comparable as the above studies were done at different time periods, through different institutional investors and using the entire equity market (as opposed to just the consumer services sector in this study).

The factors that influence herding behaviour in South Africa are discussed below. The literature provides a number of reasons that could explain herding behaviour. Below is a discussion of the possible reasons for herding behaviour in South Africa. These include; consumer services companies are profitable investments in South Africa, and a small numbers of investment analysts in South Africa.

### **Consumer services companies are profitable investments in South Africa**

Retail companies make up a large proportion of companies listed in the consumer services sector. Monthly aggregate sales data for South Africa covering the period 2001 to 2012 show growth of approximately 92% in retail sales with an upward trend forecasted (Aye *et al*, 2015). With consumer spending also increasing from R1.55 trillion in 2010 to R1.85 trillion 2016, a 19.35% increase (as shown in appendix 7). Vent, Fenwick and Dallamore (2005) show that investment in retail companies has become a profitable investment choice.

Retail companies have been growing through expanding into other areas, including; the online space, owning their supply chains and expanding offshore and into Africa. This allows for further growth, which is another reason for them being selected as a good investment (Hosken & Reiffen., 2004). Aye *et al* (2015) believe the South African retail market is one of the largest retail markets in the sub-Saharan region. The number of retail companies tradable in South Africa and the historical growth and future prospects makes the consumer service sector sought after by many investors, including unit trusts. This could encourage herding behaviour in the consumer services sector.

### **Small numbers of investment analysts in South Africa**

There are 1800 members of The Investment Analysts Society of South Africa (Investment Analysts Society , 2016). Investment analysts may be under pressure to make the correct recommendation that result in good returns for investors and therefore focus on a few, larger consumer service companies as investment targets, as it is easier to manage and communicate recommendations. If all investment analysts (from institutions) have the same strategy, which is often influenced by share characteristics, this could lead to unintentional herding behaviour as they all select the same companies in which to recommend, resulting in investors selecting the same shares or the same sector.

### 4.3. Herding in a crisis period

Table 5 below presents herding rates for the financial crisis period (30 June 2008 – 31 March 2010) in South Africa and for the non-crisis period (30 June 2010 – 30 September 2015).

**Table 5: Herding results during a crisis and non-crisis period**

Time period	<u>Crisis Period</u>	<u>Non-crisis period</u>
Herding rate	12.14%	6.36%
Median	10.25%	3.54%

The results show that the average herding rate was higher for the crisis period, where the herding rate is 12.14%, than the non-crisis period, which has a herding rate of 6.36%. A two-sample t-test shows that the two periods are not statistically different from one another despite the differences in the absolute herding rates. The two-sample t-test has a t-stat of 0.5175. The critical value for 27 degrees of freedom was 2.052. The null hypothesis is that the two periods are different is not rejected, indicating that there is no difference between the two periods. Appendix 5 provides the calculations for the two periods.

### 4.4. Analysis of herding behaviour during the crisis period

The high average herding measure during the financial crisis period could be a result of uncertainty and volatility in the stock market during that time.

In the financial crisis period, investors were uncertain. The JSE all-share index fell from a high of 35 542 on the 23<sup>rd</sup> of May 2008 to a low of 18 066 on 21 November 2008; by 5 January 2010 it recovered to 27 895 (Statistics SA, 2016). It is possible that the volatility and uncertainty caused investors to mimic one another in order to converge to the consensus opinion in order to avoid losses. This may have resulted in greater herding behaviour during the financial crisis period (based on their herding rates) than the non-crisis period (non-crisis period) but the difference of herding rates between the two periods is not statistically different. South Africa

also has a large international investor presence (46% of the free-float on the All Share Index), which may have resulted in a more efficient market and a less noticeable difference in herding behaviour between the two periods.

# 5. Conclusion, recommendations, and suggestions for future research

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## 5.1. Conclusion

This study is the first study to research the existence and extent of herding by general equity unit trusts in the consumer services sector in South Africa. Using a sample period of just under eight years, a sample of twenty-one general equity unit trusts was examined. A commonly used herding measure, LSV, was adopted to quantify herding behaviour in the sample.

The results from the study present evidence of herding in the consumer services sector in South Africa. These results show an overall herding rate of 7.75%, which is significant at the 1% level.

Possible explanations for this herding behaviour have been posited using evidence from previous studies and other considerations that are relevant to South Africa. Herding in South Africa could be a result of:

- Consumer services companies being profitable investments in South Africa owing to increased retail growth and opportunities available;
- Recommendations by investment analysts are often followed to maximize the wealth of investors. This could result in herding behaviour if the same investment analysts is followed resulting in the same trading decisions.

The study also finds that herding behaviour was not more prevalent during the financial crisis than the non-crisis period as the differences in herding rate of the two periods were not statistically significant, although the average herding rate of the crisis period was high (12.14%) compared to the non-crisis period (6.36%).

## 5.2. Recommendations

The findings of this study indicate that a significant amount of herding behaviour occurs in the South African stock market (at a 1% level of significance), although the amount of herding found is small on a scale basis. Explanations for this herding behaviour are presented with reference to the character of the South African financial market, in Section 4.2.

This study adds value to both institutional and individual investors in that they can now be aware of the presence of herding in the South African stock market and the degree to which herding takes place. Individual investors often do not have the resources to know about the latest trends in the market and are generally the last to enter the market on a trade. Institutional investors, which include pension fund managers and unit trust managers, often have access to financial information sources or follow other institutional investors who appear to have access to superior information. This allows institutional investors to know about good investments earlier than individual investors but are often restricted by what their clients want. It is important for these types of investors to have mandates and investment policy statements with their clients to allow them to quickly make trades before too many herd investors enter the trade.

It is very difficult to time trades correctly so as to ensure that an investor is entering the trend when it is starting. By the time a herd investor knows about the newest trend, most other investors (who do not herd and use their own knowledge to independently make trades) have already taken advantage of the news, and the wealth-maximizing strategy has already peaked. Investors need to think carefully as to how they make their decisions, as entering the trade too late could result in greater costs or trade losses. A herd investor needs to be aware of the volume of shares that have been traded on the particular share on the day that they would like to trade and compare this to the average daily volume trade. This will enable them to assess whether more investors than usual have already bought or sold the particular share and try to determine whether they are entering the trade too late and thereby increase their chances of losses. Further transaction costs are high and investors want to make trades that are profitable enough to cover transaction costs and therefore should try not to invest in a share just because other investors have done so.

### **5.3. Areas for future research**

The research done in this dissertation is prima facie and there are a number of areas that could be explored further. Potential topics for future research are listed below;

#### **Sample expansion**

The sample included South African general equity unit trusts that made up the top 80% of net asset value of all South African general equity unit trusts at 30 September 2015. After all exclusions are applied, this amounted to twenty-one general equity unit trusts. The research could be extended to include all one hundred and twenty South African general equity unit trusts, to determine whether there is still herding in this expanded sample. Further, the period under investigation could be expanded to cover more than thirty quarters, as the data is available from FundData Online for at least twenty years. The frequency of the testing could be changed from quarterly to daily, monthly, or annually.

#### **Impact of herding on share prices**

A number of studies have investigated whether herding behaviour affects the fundamental value of shares, such as the seminal study done by Celiker, Chowdhury and Sonaer (2015) in the U.S. Future research could examine how herding by investors (individual and institutional) in the South African equity market affects share prices on the JSE.

#### **The effect of trade size and market liquidity**

Additional research could determine whether the size of the trade affects herding. The size of the trade is how much an investor (such as a unit trust) has invested. Many companies in the consumer services sector do not have the liquidity to trade all the shares that the unit trust may require. This may cause herding in shares where trades can more easily occur. Research could be done to determine whether the liquidity of a company's share could influence herding behaviour. This would be an interesting study because the market in South Africa is concentrated, with only approximately four hundred shares available on the JSE.

## **Herding by investors in other industries in South Africa**

This research is concentrated on the consumer services sector. However, other industries (Appendix 3 lists these industries) could be investigated to determine whether and to what extent investors herd in these industries. Some industries may exhibit greater amounts of herding based on the dominance of certain shares in the industry and this could be studied in more detail to determine if other industries result in herding behaviour.

## **Foreign investment in South Africa**

This study only considered a sample of domestic (South African) unit trusts. Approximately 46% of the free-float of the JSE All Share Index is owned by foreigners, according to research findings by the Bank of America Merrill Lynch (Merrill Lynch, 2015). There is evidence to suggest that foreign investors herd more than domestic investors (Kim & Wei, 2002). Agarwal *et al* (2011) find that foreign investors may not understand the South African market, and this could be examined as a spur to herding among these investors. The large amount of foreign investment on the JSE may also be a cause of herding among foreign investors, and this merits further investigation.

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# 7. Appendices

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## Appendix 1

### Methodology of Sias and Christie and Haung

#### Sias

Sias (2003) presents another method that compares the proportion of institutional investors that are buying in a quarter across all assets with the proportion of institutional investors buying in the previous quarter. In other words, herding is evaluated by estimating the cross-sectional correlation between the demand for an asset by institutional investors in the current quarter with the demand in the previous quarter. The Sias herding measure methodology is presented in three steps below;

#### Step 1:

The first step of the Sias method is the calculation of the unit trust demand ratio. This is the proportion of institutional investors that are buying in the consumer services sectors compared to the total number of institutional investors that are trading (buying and selling) in the consumer services sector during a quarter(t). This is denoted as the “raw fraction of institutions buying” the sector (k) and is presented in the ratio below (Sias,2003);

$$Raw\Delta_{k,t} = \frac{\#Institutions\ buying_{k,t}}{\#Institutions\ buying_{k,t} + \#Institutions\ selling_{k,t}}$$

#### Step 2:

If institutional investors herd by following each other or their last quarter trades, the “raw fraction of institution buying” in the current quarter will be positively correlated with the fraction

in the previous quarter. In order to enable better comparison between coefficients, a standardized “fraction of institution buying” the sector (k) in quarter t, denoted as  $\Delta_{k,t}$ ;

$$\Delta_{k,t} = \frac{\overline{Raw\Delta_{k,t}} - \overline{Raw\Delta_t}}{\sigma(\overline{Raw\Delta_{k,t}})}$$

Where  $\overline{Raw\Delta_t}$  is the cross-sectional average (across k sectors) of the “raw fraction of institutions buying” in quarter t and  $\sigma(\overline{Raw\Delta_{k,t}})$  is the cross-sectional standard deviation (across k sectors) of the “raw fraction of institutions buying” in quarter t.

### Step 3:

The correlation between the institutional demand in this quarter and the previous quarter has two components. The cross-sectional correlation can be written as:

$$\beta = \rho(\Delta_{k,t}, \Delta_{k,t-1}) = \left[ \frac{1}{(K-1)\sigma(\overline{Raw\Delta_{k,t}})\sigma(\overline{Raw\Delta_{k,t-1}})} \right] \sum_{k=1}^K \left[ \sum_{n=1}^{N_{k,t}} \frac{(D_{n,k,t} - \overline{Raw\Delta_t})(D_{n,k,t-1} - \overline{Raw\Delta_{t-1}})}{N_{k,t}N_{k,t-1}} \right] + \left[ \frac{1}{(K-1)\sigma(\overline{Raw\Delta_{k,t}})\sigma(\overline{Raw\Delta_{k,t-1}})} \right] \sum_{k=1}^K \left[ \sum_{n=1}^{N_{k,t}} \sum_{m=1, m \neq n}^{N_{k,t-1}} \frac{(D_{n,k,t} - \overline{Raw\Delta_t})(D_{m,k,t-1} - \overline{Raw\Delta_{t-1}})}{N_{k,t}N_{k,t-1}} \right]$$

where  $N_{k,t}$  ( $N_{k,t-1}$ ) is the number of institutional investors trading sector k in quarter t ( $t-1$ ) and  $D_{n,k,t}$  ( $D_{n,k,t-1}$ ) is a dummy variable that equals one (zero) if trader n ( $m$ , where  $m \neq n$ ) is a buyer (seller) of sector k in quarter t ( $t-1$ ). The first term is the contribution to the cross-sectional correlation of institutional investors duplication their own trades between two consecutive quarters (t and t-1). The second term is the proportion of correlation that results from institutional investors following other institutional investors’ trades in two consecutive quarters. Unit trusts repeating their own trades would not be considered to be herding and would therefore not be recorded as herding in the herding measure. The measure by Sias is more of a direct test for whether institutional investors are following each other’s trades than LSV (which is more indirect) (Sias, 2003).

## Christie and Haung

Christie and Huang (1995) and Hwang and Salmon (2004) suggest a different method for calculating herding that measures investors herding towards consensus in the market. Their herding measure calculates how much individual returns deviate from market returns. Herding behaviour occurs when the return dispersion is low. The Christie and Huang methodology is presented in two steps below;

### Step 1:

The cross-sectional standard deviation (CSSD) of a single share return relative to the industry mean return is calculated using the formula:

$$CSSD_t = \sqrt{\sum_{i=1}^N (R_{i,t} - R_{m,t})^2 / (N-1)}$$

Where  $R_{i,t}$  is the observed share return of company  $i$  at quarter  $t$ ,  $R_{m,t}$  is the cross-sectional average of  $N$  shares in the industry in quarter  $t$  and  $N$  is the number of shares in the industry in quarter  $t$ .

### Step 2:

The CSSD is significantly affected by outliers and therefore Christie & Huang (1995) propose the cross-sectional absolute deviation (CSAD) as a better measure of dispersion. When either  $CSSD_t$  or  $CSAD_t$  is low, it indicates high levels of herding because individual shares in the same industry move together.  $CSAD_t$  is calculated using the formula:

$$CSAD_t = \sum_{i=1}^N |R_{i,t} - R_{m,t}| / N$$

## **Limitations to using LSV, the Sias measure and the measure used by Christie and Huang**

According to Bikhchandani and Sharma (2000) LSV follows a purely statistical approach and assesses the correlation in trading trends between unit trusts. The LSV herding measure documents sequential trading, irrespective of the reasons for such trading, and therefore cannot differentiate between intentional and unintentional (spurious) herding. The Sias herding measure also uses a statistical approach and will suffer from the same problems.

The LSV herding measure is aimed at determining whether herding in a particular share occurs over time. This measure cannot determine a change in fund managers in charge of different unit trusts, or other non-financial information, which may have an impact on herding results.

Wylie (2005) argues that the LSV herding measure rests on two main assumptions. Firstly, there are restrictions that prohibit fund managers from short selling. This restricts the number of sales that can occur, which will affect the herding measure. Secondly, it is assumed that the part of the LSV herding measure is based on a binomial distribution (the adjustment factor), which is difficult to calculate. Another limitation is that the shares bought are normally based on the size of a unit trusts manager's holdings (initial weight of the share in the unit trust manager's portfolio) and net fund flows (the amount of money the unit trust manager may need to invest), which may limit the investment choices available to an investor. This will affect the LSV herding measure, especially when a small number of unit trust managers are trading.

Another limitation of the Sias herding method is that it requires a calculation of the cross-sectional correlation between buyers and all investors. This requires unobservable inputs and these are difficult to calculate, as the formulae are complex to use and understand. The method proposed by Christie and Haung requires the cross-sectional standard deviation to be calculated which involves a large amount of calculations. Christie and Haung do not take into account that some industries have low or high levels of herding and investors may consistently go long or short in some industries. This is taken into account in the LSV herding measure, which is a relative measure and compares herding in the industry to the average herding across all industries.

## Appendix 2

Average market capitalisation for each share in the consumer services sector including a classification of whether they are large, medium or small capitalisation shares according to the JSE. There are 13 shares that are classified as large capitalisation, 14 shares that are classified as medium capitalisation and 18 shares that are classified as small capitalisation.

### **Large capitilisation shares (greater than R10 billion)**

	Share code on JSE	Share full name	Average market capitilisation in rands
1	NPN	Naspers Ltd -N- (Close)	277,728,132,629
2	SHP	Shoprite Holdings Ltd (Close)	68,542,054,259
3	WHL	Woolworths Holdings Ltd (Close)	42,410,922,943
4	TRU	Truworths Int Ltd (Close)	30,804,524,476
5	MSM	Massmart Holdings Ltd (Close)	27,970,659,893
6	MRP	Mr Price Group Ltd (Close)	26,622,345,063
7	TFG	The Foschini Group Limit (Close)	22,096,363,594
8	PIK	Pick N Pay Stores Ltd (Close)	21,516,244,251
9	TSH	Tsogo Sun Holdings Ltd (Close)	18,462,295,103
10	SPP	The Spar Group Ltd (Close)	18,426,249,869
11	CLS	Clicks Group Ltd (Close)	12,819,586,232
12	SUI	Sun International Ltd (Close)	10,578,700,262
13	PWK	Pick N Pay Holdings Ltd (Close)	10,043,040,514

**Medium capitilisation shares (greater than R1 billion and smaller than R10 billion)**

	Share code on JSE	Share full name	Average market capitilisation in rands
1	CHP	Choppies Enterprises Ltd (Close)	7,717,479,337
2	CAT	Caxton Ctp Publish 6%Pf (Close)	6,964,090,551
3	LEW	Lewis Group Ltd (Close)	6,339,214,296
4	COH	Curro Holdings Limited (Close)	6,132,505,960
5	ITE	Italtile Ltd (Close)	6,025,137,082
6	FBR	Famous Brands Ltd (Close)	6,001,774,561
7	CLH	City Lodge Hotels Ltd (Close)	4,100,464,794
8	HIL	Homechoice Int Plc (Close)	3,455,551,165
9	CSB	Cashbuild Ltd (Close)	3,129,220,775
10	ADH	Advtech Ltd (Close)	2,699,758,342
11	SUR	Spur Corporation Ltd (Close)	1,968,013,945
12	HSP	Holdspport Limited (Close)	1,932,266,851
13	COM	Comair Limited (Close)	1,218,306,272
14	CMH	Combined Motor Hldgs Ltd (Close)	1,125,357,975

**Small capitilisation shares (smaller than R1 billion)**

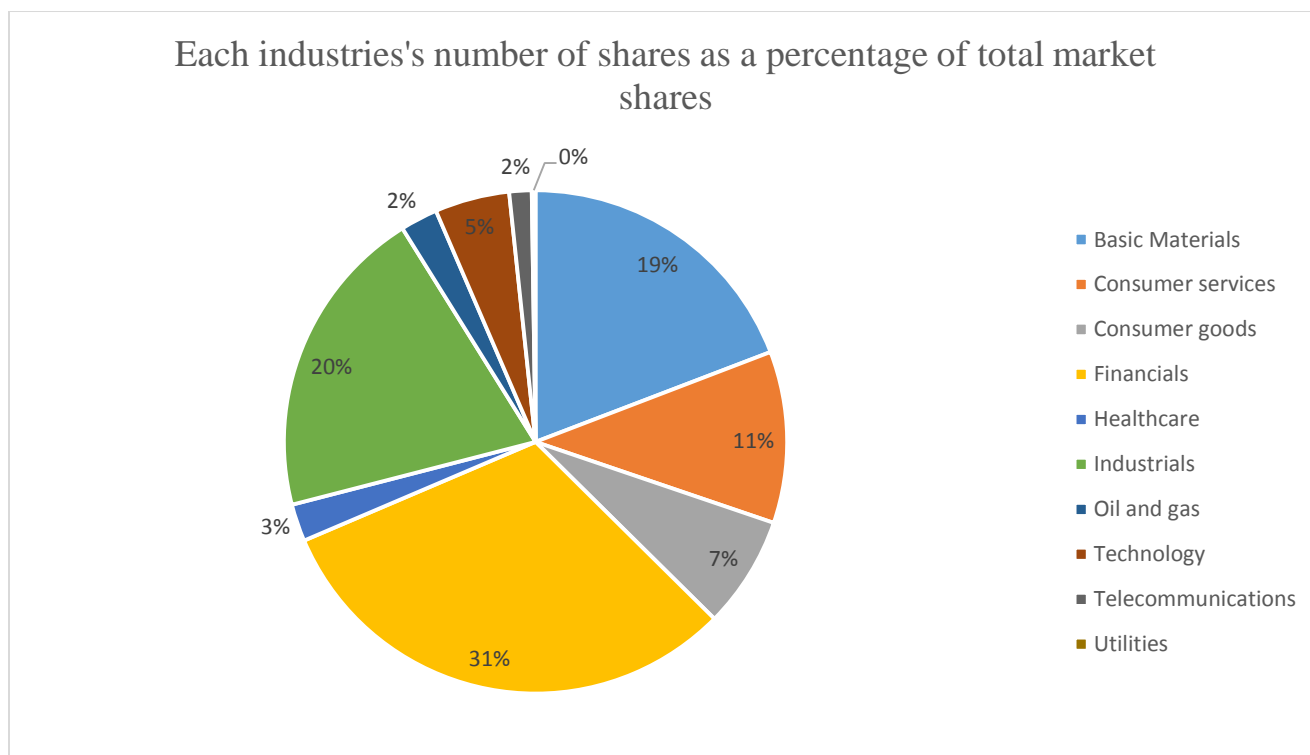
	Share code on JSE	Share full name	Average market capitilisation in rands
1	PHM	Phumelela Game Leisure (Close)	987,073,986
2	ILA	Iliad Africa Ltd (Close)	971,377,668
3	WIL	Wilderness Holdings Ltd (Close)	965,042,005
4	CUL	Cullinan Holdings Ltd (Close)	890,933,915
5	AME	African Media Ent Ltd (Close)	455,760,277
6	TAS	Taste Hldgs Ltd (Close)	448,693,714
7	RTN	Rex Trueform Cl Co -N- (Close)	210,399,389
8	AON	African & Over Ent Ltd - (Close)	120,530,794
9	AET	Alert Steel Holdings Ltd (Close)	97,618,568
10	VMK	Verimark Holdings Ltd (Close)	92,560,585
11	1TM	1Time Holdings Ltd (Close)	83,136,667
12	GDN	Gooderson Leisure Corp (Close)	76,625,000
13	NCS	Nictus Ltd (Close)	76,528,954
14	MNY	Money Web Holdings Ltd (Close)	54,402,947
15	RTO	Rex Trueform Cloth Co Ld (Close)	35,988,395
16	AOO	African & Over Ent Ltd (Close)	14,675,417
17	CAT	Caxton Ctp Publish 6%Pf (Close)	7,645,333
18	AOV	African & Over Ent Ltd P (Close)	2,618,825

## Appendix 3

### Number and percentage of shares traded per industry by the 21 unit trusts in the sample.

Sector	Number of shares in each industry on JSE	Number of shares trades by sample unit trusts	Proportion of shares traded by unit trust from each industry
<b>Basic Materials</b>	80	58	<b>72.5%</b>
<b>Consumer services</b>	45	42	<b>93.5%</b>
<b>Consumer goods</b>	30	21	<b>70.0%</b>
<b>Financials</b>	130	107	<b>82.3%</b>
<b>Healthcare</b>	10	7	<b>70.0%</b>
<b>Industrials</b>	84	72	<b>85.7%</b>
<b>Oil and gas</b>	10	10	<b>100%</b>
<b>Technology</b>	20	18	<b>90.0%</b>
<b>Telecommunications</b>	6	5	<b>83.3%</b>
<b>Utilities</b>	1	1	<b>100%</b>
<b>Total</b>	<b>416</b>	<b>342</b>	

### Number of shares in each industry as a percentage of total shares on the JSE



## Appendix 4

### General equity unit trusts included in the sample

<b>Unit trusts in the sample</b>	
<b>1</b>	<b>36ONE MET Equity Fund</b>
<b>2</b>	<b>Absa Select Equity Fund</b>
<b>3</b>	<b>Allan Gray Equity Fund</b>
<b>4</b>	<b>Coronation Equity Fund</b>
<b>5</b>	<b>Fairtree Equity Prescient Fund</b>
<b>6</b>	<b>First Avenue Sanlam Collective Investments Equity Fund</b>
<b>7</b>	<b>Foord Equity Fund</b>
<b>8</b>	<b>Investec Equity Fund</b>
<b>9</b>	<b>Investec Value Fund</b>
<b>10</b>	<b>Momentum Equity Funds</b>
<b>11</b>	<b>Nedgroup Investments Rainmaker Fund</b>
<b>12</b>	<b>Nedgroup Investments Value Fund</b>
<b>13</b>	<b>Old Mutual Albaraka Equity Fund</b>
<b>14</b>	<b>Old Mutual Investors' Fund</b>
<b>15</b>	<b>Old Mutual Top Companies Fund</b>
<b>16</b>	<b>Prudential Equity Fund</b>
<b>17</b>	<b>PSG Equity Fund</b>
<b>18</b>	<b>SIM General Equity Fund</b>
<b>19</b>	<b>SIM Value Fund</b>
<b>20</b>	<b>STANLIN Equity Fund</b>
<b>21</b>	<b>STANLIB SA Equity Fund</b>

## Appendix 5

### Results of herding over the crisis period (30 June 2008 – 31 March 2010)

<b>Crisis period results</b>		
<b><u>Quarter</u></b>	<b><u>Quarter end date</u></b>	<b><u>Herding measure</u></b>
<b>Q2</b>	30-Sep-08	<b>2.67</b>
<b>Q3</b>	31-Dec-08	<b>19.47</b>
<b>Q4</b>	31-Mar-09	<b>10.248</b>
<b>Q5</b>	30-Jun-09	<b>3.88</b>
<b>Q6</b>	30-Sep-09	<b>6.40</b>
<b>Q7</b>	31-Dec-09	<b>26.81</b>
<b>Q8</b>	31-Mar-10	<b>15.53</b>
<b>Average</b>		<b>12.15</b>
<b>Median</b>		<b>10.25</b>

**Results of herding of the non-crisis period (30 June 2010 – 30 September 2015)**

<b>Non-Crisis period results</b>		
<b><u>Quarter</u></b>	<b><u>Quarter end date</u></b>	<b><u>Herding measure</u></b>
<b>Q9</b>	30-Jun-10	<b>9.05</b>
<b>Q10</b>	30-Sep-10	<b>8.55</b>
<b>Q11</b>	31-Dec-10	<b>11.53</b>
<b>Q12</b>	31-Mar-11	<b>3.13</b>
<b>Q13</b>	30-Jun-11	<b>1.79</b>
<b>Q14</b>	30-Sep-11	<b>0.20</b>
<b>Q15</b>	31-Dec-11	<b>5.39</b>
<b>Q16</b>	31-Mar-12	<b>3.01</b>
<b>Q17</b>	30-Jun-12	<b>1.15</b>
<b>Q18</b>	30-Sep-12	<b>1.10</b>
<b>Q19</b>	31-Dec-12	<b>3.95</b>
<b>Q20</b>	31-Mar-13	<b>0.36</b>
<b>Q21</b>	30-Jun-13	<b>11.59</b>
<b>Q22</b>	30-Sep-13	<b>17.11</b>
<b>Q23</b>	31-Dec-13	<b>11.10</b>
<b>Q24</b>	31-Mar-14	<b>4.99</b>
<b>Q25</b>	30-Jun-14	<b>22.36</b>
<b>Q26</b>	30-Sep-14	<b>0.46</b>
<b>Q27</b>	31-Dec-14	<b>19.43</b>
<b>Q28</b>	31-Mar-15	<b>7.96</b>
<b>Q29</b>	30-Jun-15	<b>0.67</b>
<b>Q30</b>	30-Sep-15	<b>12.64</b>
<b>Average</b>		<b>6.36</b>
<b>Median</b>		<b>3.54</b>

**Results of herding for the full period (31 June 2008 – 30 September 2015)**

<b>Results</b>		
<b><u>Quarter</u></b>	<b><u>Quarter end date</u></b>	<b><u>Herding measure</u></b>
Q1	30-Jun-08	N/A
Q2	30-Sep-08	2.67
Q3	31-Dec-08	19.47
Q4	31-Mar-09	10.25
Q5	30-Jun-09	3.87
Q6	30-Sep-09	6.40
Q7	31-Dec-09	26.81
Q8	31-Mar-10	15.54
Q9	30-Jun-10	9.05
Q10	30-Sep-10	8.55
Q11	31-Dec-10	11.53
Q12	31-Mar-11	3.13
Q13	30-Jun-11	1.79
Q14	30-Sep-11	0.20
Q15	31-Dec-11	5.39
Q16	31-Mar-12	3.01
Q17	30-Jun-12	1.15
Q18	30-Sep-12	1.10
Q19	31-Dec-12	3.95
Q20	31-Mar-13	0.36
Q21	30-Jun-13	11.59
Q22	30-Sep-13	17.11
Q23	31-Dec-13	11.10
Q24	31-Mar-14	4.99
Q25	30-Jun-14	22.36
Q26	30-Sep-14	0.46
Q27	31-Dec-14	19.43
Q28	31-Mar-15	7.96
Q29	30-Jun-15	0.67
Q30	30-Sep-15	12.64
<b>Average</b>		7.75
<b>Median</b>		4.99
<b>T-stat</b>		6.336
<b>P-value</b>		0.0000034

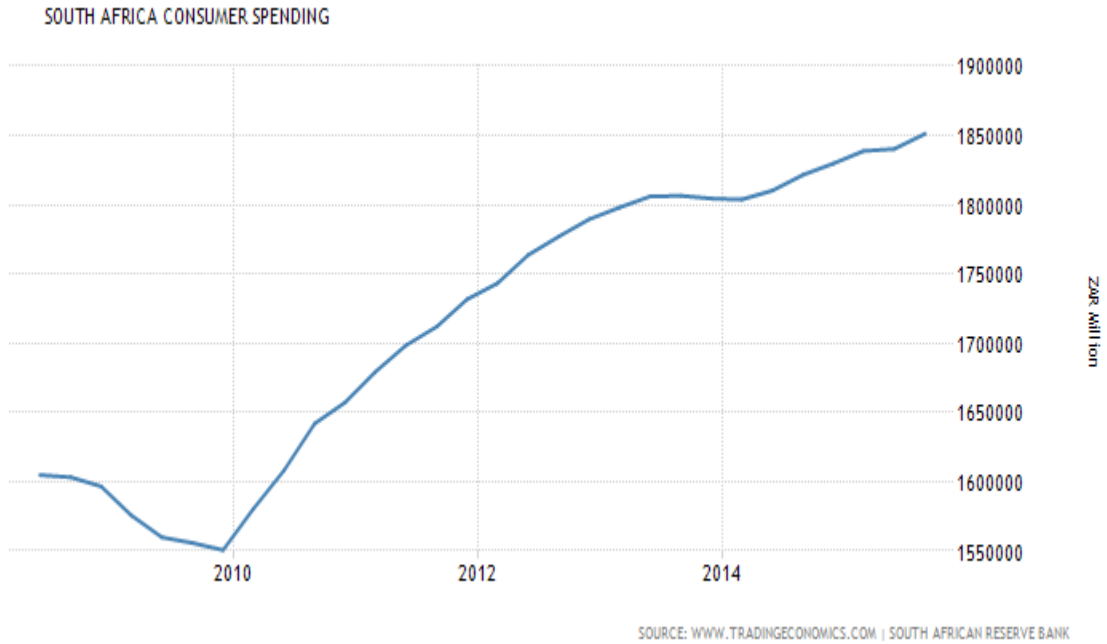
## Appendix 6

### Results of Wermers buy and sell herding measure

<b>Wermers Buy and Sell herding measure</b>				
<u>Quarter</u>	<u>Quarter end date</u>	<u>Herding measure</u>	<u>Sell (&lt;0)</u>	<u>Buy (&gt;0)</u>
Q1	30-Jun-08	N/A		
Q2	30-Sep-08	-2.67	-2.67	
Q3	31-Dec-08	-19.47	-19.47	
Q4	31-Mar-09	10.25		10.25
Q5	30-Jun-09	3.87		3.87
Q6	30-Sep-09	6.40		6.40
Q7	31-Dec-09	26.81		26.81
Q8	31-Mar-10	15.54		15.54
Q9	30-Jun-10	-9.05	-9.05	
Q10	30-Sep-10	8.55		8.55
Q11	31-Dec-10	11.53		11.53
Q12	31-Mar-11	3.13		3.13
Q13	30-Jun-11	1.79		1.79
Q14	30-Sep-11	0.20		0.20
Q15	31-Dec-11	-5.39	-5.39	
Q16	31-Mar-12	3.01		3.01
Q17	30-Jun-12	1.15		1.15
Q18	30-Sep-12	-1.10	-1.10	
Q19	31-Dec-12	-3.95	-3.95	
Q20	31-Mar-13	-0.36	-0.36	
Q21	30-Jun-13	11.59		11.59
Q22	30-Sep-13	-17.11	-17.11	
Q23	31-Dec-13	-11.10	-11.10	
Q24	31-Mar-14	4.99		4.99
Q25	30-Jun-14	22.36		22.36
Q26	30-Sep-14	0.46		0.46
Q27	31-Dec-14	-19.43	-19.43	
Q28	31-Mar-15	7.96		7.96
Q29	30-Jun-15	-0.67	-0.67	
Q30	30-Sep-15	-12.64	-12.64	
<b>Average</b>			<b>-7.746</b>	<b>7.758</b>
<b>Median</b>			<b>-4.669</b>	<b>4.988</b>
<b>T-stat</b>			<b>-4.2401</b>	<b>4.8772</b>
<b>P-value</b>			<b>0.00225</b>	<b>0.00043</b>

## Appendix 7

### Consumer spending levels from 2008 to 2016



(Trading Economics , 2016)