Put your head in the sand or lose a grand?
– A natural experiment of the ostrich effect and the disposition effect

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Abstract

This thesis presents an attempt to find evidence of the ostrich effect and the disposition effect, as well as individual differences in self-assessed financial knowledge and its effect on these biases. The ostrich effect refers to the tendency to deliberately avoid information that might be negative, by "sticking your head in the sand". The disposition effect refers to people who hold on to losing assets too long while selling winning ones too early. The two effects were examined through a natural experiment which emerged from the stock market crash that occurred February 5th, 2018. The data was collected during an internship at Länsförsäkringar AB and originates from the usage of Länsförsäkringar's application Sparnavigatorn, where customers can manage their savings. The customers login activity and number of placed sales orders were observed. The data material is unique, and the study enabled a unique presentation of real life behaviour within a financial context and an analysis of whether individual differences affect behaviour. To our knowledge, neither the ostrich effect nor the disposition effect have earlier been examined through a large scale natural experiment. The results show no significant indication of the ostrich effect, but rather a relatively constant login activity not affected by the stock market crash. Furthermore, they show a contradictory reaction to what the disposition effect suggests, meaning the respondents place more sales orders during the stock market fall than at the time before and after. The results imply that further research needs to be done to either reject or confirm the existence of the ostrich effect and the disposition effect.
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1 Introduction

How do you react when reached by news about a stock market crash? Do you "put your head in the sand" and avoid checking your savings and investments? This is a common behaviour (see e.g. Galai and Sade, 2006; Karlsson, Loewenstein and Seppi, 2009; Hertwig and Engel, 2016; Gigerenzer and Garcia, 2017). Instead of acting to improve the situation, people evade information that could benefit their economic decision-making and do nothing instead. If you do pass this first obstacle and actually log in to check your portfolio, will you be able to act rational and realise your possible losses? A general reaction is to hold on to losing assets for too long, while selling winning ones too soon. These are two examples of behaviours within behavioural economics, known as the ostrich effect (Galai and Sade, 2006) and the disposition effect (Shefrin and Statman, 1985). The effects are related to how people acquire and process information in the everyday life, something that is more demanding and depleting than one first can believe. The fact that many people are oblivious when it comes to decision-making leads to the use of heuristics – mental short cuts to ease the cognitive load from decision-making, such as rules of thumb (Simon, 1955; Gigerenzer, Hertwig and Pachur, 2011). It is not unusual that people encounter problems when prioritising during decision-making, as in spending a lot of time thinking about relatively small financial decisions, compared to more important ones (Ariely and Kreisler, 2017). People tend to spend more time thinking about where to get the cheapest groceries, rather than where to place their pension or how to handle a stock market change.

Avoiding or failing to acquire and process information can be associated with the concept of "misbehaving", coined by Richard H. Thaler (2016), and refers to the behaviour that diverges from assumptions about rational behaviour in standard economic theory and Homo Economicus. Homo Economicus is a fully rational and utility maximising person, who will always choose more of a good, e.g. information, compared to less. Most models in standard economic theory are based on equivalent assumptions (Hertwig and Engel, 2016). Examples of divergence from standard economic thinking can be classified as bounded rational behaviour and might be: the ostrich effect, referring to information avoidance (Galai and Sade, 2006); the disposition effect, referring to riding losing assets too long and selling winners too early (Shefrin and Statman, 1985); overconfidence, referring to stated judgements reflecting more certainty than knowledge (see e.g. Twersky and Kahneman, 1974; Arkes, 2001; Ringuest and Graves, 2016); the bandwagon effect, referring to the desire to feel belongingness to a group (see e.g. Leibenstein, 1950; Winkler and Moser, 2016); and the endowment effect, referring to people ascribing a higher value to things they own than they would be willing to pay to acquire it (Thaler, 1980; Kahneman, Knetsch and Thaler, 1991). A fully rational individual, Homo Economicus, will realise that the opportunity cost for the extra time and money spent while looking for bargains most often will be higher than the actual gain. Nevertheless, for many people these are common mistakes, deeply rooted in the frequent misunderstanding of basic economics - a reason to why several new assumptions about human behaviour have evolved within the field of economics. An increased knowledge about this enables helping individuals to make better decisions by the means of nudging – a concept illuminated by Thaler and Sunstein (2009). The ambition of this thesis is to examine the ostrich effect and the disposition effect in real life. Furthermore, it aims to analyse
whether individuals differ in their decision-making within financial contexts, based on these effects.

Related to the concept of bounded rationality is the notion of Homo Ignorans and deliberate ignorance, which refers to situations where information is easily accessible at a low cost, but people choose not to acquire or process it. Such characteristics of Homo Ignorans are frequently discovered amongst people and two biases that often trouble them are the ostrich effect and the disposition effect. The ostrich effect refers to situations where people deliberately avoid information to evade psychological discomfort. As a supplement to Galai and Sade’s (2006) original definition, Karlsson, Loewenstein and Seppi (2009: p. 96) describe it as follows:

"We use the term in a related, but expanded sense, as avoiding exposing oneself to information that one fears will cause psychological discomfort. Given preliminary bad news – or as it turns out in our model, ambiguous news – people may optimally choose to avoid collecting additional information: they "put their heads in the sand" to shield themselves from further news. In contrast, given favourable news, individuals seek out definitive information."

Gigerenzer and Garcia-Retamero (2017) found in a study, that 85-90 percent of the respondents wanted to avoid information about upcoming negative events. Together with similar studies, this suggests that previous assumptions about humans as being informavores\(^1\) might be wrong. Karlsson, Loewenstein and Seppi (2009) confirms this behaviour within the financial context by studying individuals' likelihood to check their portfolios during a stock market downturn, compared to when the market is up. They found that the login activity was significantly lower during a market downturn. This is in conformity with what Hertwig and Engel (2016) declare, that people seem to systematically and deliberately avoid information, instead of acquiring it. In contrast to these findings, Brown and Kagel (2009), as well as Gherzi et al. (2014), did not find any evidence of the ostrich effect in their studies.

Hertwig and Engel (2016) argue Homo Economicus would take all available information into consideration and make a fully informed decision in situations where most humans would choose to abstain information. The authors developed a theory of Homo Ignorans, an individual who will sometimes deliberately avoid accessible information since they cannot and do not want to process it all. There are many reasons to evade information, where one might be a strategic choice to eschew regret or maximise the feeling of surprise. Thus, one can argue whether it is good or bad to ignore information, since there is a possibility it can affect individuals' financial situation. To log in and check your portfolio during stock market fluctuations is an opportunity to get free information about your current financial situation that could possibly help you make better decisions. Researchers who find evidence for the ostrich effect claim few people are financial information seekers despite low-cost alternatives, indicating they put their heads in the sand.

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\(^1\) Refers to the human behaviour of consuming information in the modern information society.
The disposition effect, defined by Shefrin and Statman (1985), may also have a big impact on households' economy. It derives from, and is consistent with, prospect theory (Tversky and Kahneman, 1992), especially related to two aspects: risk seeking behaviour when confronted by losses and the use of a reference point when valuing gains and losses (Weber and Camerer, 1998). Within the financial context, the disposition effect involves the tendency to sell investments with increasing value and keep investments with decreasing value. This financial behaviour has been confirmed in studies by Shefrin and Statman (1985), as well as Weber and Camerer (1998), but in contrast, Brown and Kagel (2009) did not find any evidence of the disposition effect in their simplified stock market experiment.

The supply of various tools and applications to help people save money is rich, but do they really favour individuals' optimal choice? People are exposed to a lot of information and it is important to be able to sift amongst different sources. Limited capacity to process and comprehend necessary information may affect individuals' savings negatively (Strömbäck et al., 2017; Skagerlund et al., 2018). This may be enhanced by e.g. financial illiteracy (van Rooij, Lusardi and Alessie, 2012) and lack of self-control (Strömbäck et al., 2017; Skagerlund et al., 2018). These are anomalies that deviate from standard economic theory, which have laid the foundation for a different definition of human behaviour, Homo Ignorans. On these premises the ostrich effect and the disposition effect were examined through a natural experiment which emerged from the stock market crash that occurred February 5th, 2018. The crash reached Stockholm's exchange market after disturbances in the U.S. market, presumably due to tax cuts for businesses and speculations about inflation (Cox, 2018; Egan, 2018a). One of the reasons why this downturn was interesting to study was the global media coverage, providing people with almost unavoidable information about the occurrence. Media in Sweden reported "U.S. exchange markets: Blood-red Monday on Wall Street" and "Warnings about stock market crash even in Stockholm", amongst other headlines (Fellman, 2018; Lundberg Andersson, 2018) and U.S. media reported the biggest stock market downturn since 2011 (Egan, 2018b). Figure 1 shows the development in Stockholm's exchange market from September 2017 to April 2018.
The data was collected during an internship at Länsförsäkringar AB and originates from the usage of Länsförsäkringsb's application Sparnavigatorn, where customers can manage their savings. It is an application created to simplify and increase the long-term and short-term savings, and most banks today have comparable solutions with equivalent features and ambitions. The customers' activity before, during, and after the market downturn was observed. More specifically, we defined the activity as the login activity in Sparnavigatorn, meaning logins to access account information, as well as placed sales orders, in other words the sales of assets. The vision of Sparnavigatorn, which was clarified during informal interviews with staff members at Länsförsäkringar, is to target customers with low financial interest and experience, whom they believe is a large part of their customer base.

The research data from Länsförsäkringar AB also includes a suitability assessment which is used as a measurement of self-assessed financial knowledge. The suitability assessment is a requirement for customers who opens an investment savings account [ISK]² and implies answering three questions about financial knowledge and experience. Based on the theory of Homo Ignorans, we will use this measurement as an indication on how strong the characteristics of Homo Ignorans are within individual behaviour and distinguish individual differences. We will further examine whether the ostrich effect and the disposition effect are more pronounced amongst people with characteristics that could be linked to deliberate ignorance, i.e Homo Ignorance oriented behaviour. The data enables a unique study of peoples' reaction and pursuance during an actual economic downturn. Studies on the ostrich

² An ISK is a combination of stock shares and funds, with the purpose of making it easier for individuals to invest.
effect are somewhat limited (see e.g. Galai and Sade, 2006; Brown and Kagel, 2009; Karlsson, Loewenstein and Seppi, 2009; Gherzi et al., 2014), but the disposition effect is more frequently explored in empirical studies (see e.g. Shefrin and Statman, 1985; Odean, 1998; Weber and Camerer, 1998; Brown and Kagel, 2009). To our knowledge none of the effects have earlier been examined through a large scale natural experiment.

1.1 Aim and research questions

This thesis aims to explore changes in financial information seeking and financial behaviour during a sudden stock market downturn. In addition, it aims to explore how these are affected by individual differences in self-assessed financial knowledge.

By a natural experiment we more specifically seek to answer the following research questions:

- How does financial information seeking, measured as login activity in Sparnavigatorn, change during a sudden downturn in the stock market and is there evidence of the ostrich effect?
- How does financial behaviour, measured as number of placed sales orders in Sparnavigatorn, change during a sudden downturn in the stock market and is there evidence of the disposition effect?
- Based on the answers of the suitability assessment, how do individual differences in self-assessed financial knowledge affect financial information seeking and financial behaviour during a sudden downturn in the stock market?

1.2 Delimitations

This study is delimited to the stock market downturn that occurred on February 5th, 2018 and does not observe effects during any other specific downturn. The study does only include customers from Länsförsäkringar and their activity in Sparnavigatorn thus, the purpose is not to study customers from other banks. In addition, only long-term savings goals are observed, excluding short-term savings goals. The main effects are the ostrich effect and the disposition effect hence, other effects or anomalies are only briefly mentioned in relevant contexts.
2 Frame of reference

Behavioural economics is a relatively new branch within economics that merges the disciplines of economics and psychology (Brocas and Carrillo, 2004). The purpose of behavioural economics is not to replace but to expand the theories of standard economic theory and add more explanatory power. The reason for its origin was the notion that standard economic theory did not consider aspects such as the cognitive, emotional, psychological, and social factors, which clearly affect behaviour and economic decision-making. One of the main focuses of behavioural economics is bounded rationality, a deviation from the premises of standard economic theory where individuals are supposed to act fully rational (Wilkinson and Klaes, 2012). Bounded rationality is a description of the behaviour considered to better apply to real circumstances by being more realistic and acknowledge market inefficiencies through mispricing, non-rational decision-making, heuristics, and framing. The field is also covering the financial market and aims to explain anomalies in the stock market. It is assumed not only market outcomes affect individuals' decisions, but also the information structure and other market actors (see e.g. Brocas and Carrillo, 2004; Wilkinson and Klaes, 2012). There are several biases discussed in behavioural economics that are associated with the main effects analysed in this thesis – the ostrich effect and the disposition effect. Information avoidance and overconfidence are biases associated with the ostrich effect and loss aversion, mental accounting, and the endowment effect are associated with the disposition effect. These are all examples of misbehaving and it may lie within both the individual and the society's interest to overcome these biases. Nudging, a relatively new concept coined by Thaler and Sunstein (2009), might be a way to do this. Nudges are small changes in the choice architecture, designed as non-regulatory and non-monetary interventions. The purpose is to help individuals in situations where they act with bounded rationality, to make better decisions without depriving them their freedom of choice.

2.1 From Homo Economicus to Homo Ignorans

Fully rational, fixed preferences, not affected by emotions, calculating and controlling when processing information – these assumptions, together with the capacity not to underestimate or overestimate information, are all part of the decision-making process according to the standard model of Homo Economicus (see e.g. Wilkinson and Klaes, 2012). However, many people do not recognise themselves in this type of behaviour, but their decisions vary depending on things as emotions and occasion (Västfjäll et al., 2016). This is aggravated by the constantly increasing supply of information in the modern society and the capacity to sift amongst it becomes more important. Acquiring information and making decisions may be affected by media coverage and the digitalisation have increased the competition amongst and within different media sources. Leung and Lee (2014) argue negative news have a higher basic news value than positive news, leading to the broad prevalence of it. A reason for this

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3 Framing refers to the way choices are angled and affects decision-making. Thaler and Sunstein (2009) gives an example where a doctor informs a sick patient in two different scenarios, followed by the question "What will you do?: "Of one hundred patients who have this operation, ninety are alive after five years." and: "Of one hundred patients who have this operation, ten are dead after five years." They conclude there is a large difference between the answers, depending on how the information is framed. In this case, more people were positive to the operation when the information was framed as in the first option.
might be that auditing journalists in general aim to find news that deviates from normal circumstances, often resulting in remarkable and provocative headlines to attract readers.

When exposed to a lot of information, the opportunity cost rises since the choice of actively absorbing one source of information implies rejecting all other sources. These circumstances lead to a constant need to make decisions that are influenced by the surroundings and emotions, making our brains over stressed (Gigerenzer and Brighton, 2009). Since the explanatory power of Homo Economicus is incomplete when it comes to human behaviour, additional attempts to conceptualise human decision-making has evolved, such as Homo Heuristicus and Homo Ignorans. Gigerenzer and Brighton (2009) describe Homo Heuristicus as an individual who makes more efficient decisions by ignoring pieces of accessible information and instead uses mental "rules of thumb", in other words, heuristics. While Homo Economicus makes decisions by thoroughly evaluating costs and benefits, Homo Heuristicus trust their intuition and make fast and emotional decisions, that "feels right" or are "good enough".

In addition, the conceptualisation of human decision-making as Homo Ignorans explains that people sometimes deliberately choose to stay ignorant, even though information is available at low or no cost. Gigerenzer and Garcia-Retamero (2017) show that for both positive and negative events, a majority of the respondents choose not to know, even though more information could be beneficial for their decision-making. They outline four possible reasons for why individuals sometimes choose to stay ignorant: i) because people want to avoid negative emotions from prior knowledge, ii) to gain a strategic advantage, iii) to maintain the positive emotions of surprise, and iii) to evade partiality and unfairness. When people cannot prevent a happening, they tend to avoid information that could potentially be bad news. In conformity with Gigerenzer and Garcia-Retamero, Hertwig and Engel (2016) exemplifies strategic deliberate ignorance as a tool for eschewing responsibility, since deliberately avoiding knowledge about the outcomes of one’s actions disengage the person from having to intervene. In addition, fairness is not considered within standard economic models, something that can be argued is not consistent with individuals’ actual behaviour. Individuals do care about fairness and studies have shown it can be either an altruistic or a strategic choice (see e.g. Cappelletti, Güth and Ploner, 2011; Wilkinson and Klaes, 2012; Achtziger, Alós-Ferrer and Wagner, 2016). Hertwig and Engel (2016) show that information avoidance can appear in situations where people do not want to create unfair conditions, such as in legal matters. They illustrate this by mentioning that attorneys may choose to avoid facts about their defendant, to stay impartial and fair. Another bias that might affect decision-making in a negative way is overconfidence. Evidence for overconfidence have been found in many studies and refers to the tendency to have a higher credence to the own knowledge and ability than what is true (Mellers and McGraw, 2004). Arkes (2001) claims that overconfidence might be bad since individuals neglect remaining alternatives and recommendations, which in turn can increase the risk of making a poor decision.

In conclusion, all decisions made can be expected to have some shares from Homo Economicus, Homo Heuristicus and Homo Ignorans, respectively. However, this study will focus on the characteristics of Homo Ignorans since the ostrich effect and the disposition effect to a large extent implies people are deliberately choosing not to know or are incapable of processing information. A sudden downturn in the stock market could mean consequences
for the household economy and therefore, seeking information by checking your portfolio could create a feeling of discomfort, which people in general try to avoid. If not affected by this bias, people might act as risk seekers if they realise that the market downturn has led to a loss. This implies holding on to a losing asset, even though it is not an optimal choice. Thus, potentially relevant alternatives are excluded in favour of emotionally motivated decisions to keep a losing asset.

There is evidence of both the ostrich effect and the disposition effect from recent studies, but to our knowledge there are no studies of whether the effects are more distinct for people with characteristics of Homo Ignorans. Even though there is previous research about deviations from Homo Economicus' behaviour, there are no studies associated with the conceptualisation of Homo Ignorans. This study distinguishes Homo Ignorans from others and based on previous literature we predict they are more prone to act in compliance with the ostrich effect and the disposition effect.

2.2 The ostrich effect

The ostrich effect is the tendency that people do not always think that more information is better, a fact that violates the assumption of monotonicity⁴ in standard economic theory. One of the earliest mentioning of the ostrich effect was by Galai and Sade (2006) and refers to the expression that ostriches stick their head in the sand to avoid trouble, not entirely different from the human characteristic to avoid information that might cause psychological discomfort. Karlsson, Loewenstein and Seppi (2009) describes the most common example within the financial context, that investors are less likely to check their portfolios during a stock market downturn compared to when the market is up. Postponing acquiring information may deteriorate individuals' decision-making process but is frequently done by people who thinks the information will bring possible disappointments, causing mental suffering (Karlsson, Loewenstein and Seppi, 2009). Loewenstein (2006) argues information per se can also give direct value and people can derive either positive or negative utility from it. This may affect the demand for information and people might avoid acquiring information even if it is free or helpful. Confirming studies within other fields have been done, where deliberate ignorance has been observed. One study showed that 55 percent of people tested for HIV in the south-eastern United States did not return to get their results, as a way of avoiding potential bad news (Hightow et al., 2003). Another reason to evade information is to keep the sense of surprise or suspense. This has been shown in studies where the willingness to know or not to know the sex of an unborn child, or what you are getting for your birthday, have been observed (Gigerenzer and Garcia-Retamero, 2017).

Both Galai and Sade (2006) and Karlsson, Loewenstein and Seppi (2009) find support for the ostrich effect through two different studies. The first study, carried out on the Israeli capital market by Galai and Sade (2006), involves the choice between two similar investments, where the only difference is whether the risk is reported or not. The observed period was February 1999 to November 2002 and included 182 weekly observations. The data was obtained from Israel's central bank and two of the largest commercial banks. The results showed that individuals preferred the investment with the unknown risk before the

⁴ Monotonic preferences indicate a consumer will always prefer more of a quantity of a good as compared to less.
investments where the risk was reported frequently, even at cost. This indicates a deliberate choice of information avoidance even though more information could result in better financial choices.

The other study, executed by Karlsson, Loewenstein and Seppi (2009) finds evidence of the ostrich effect when testing two large different datasets, from U.S. and Sweden. The study presents a model in where they examine to what degree people attend to further information after receiving preliminary incomplete information that could either be positive or negative. The data from Sweden originates from the premium pension system and includes long-term savings that are monitored through the web or by telephone services. The results show the login frequency is approximately 0.0021 per person and day, and 0.00022 reallocations are made per person and day, which implies people are not monitoring their savings frequently. Karlsson, Loewenstein and Seppi (2009) predicts that the investors will monitor their savings selectively depending on if the stock market is up or down. They suggest that the incentive to acquire information is stronger when the market is up because people derive utility from good news. Also, when the market is up, it offers the option of possible trades and the authors suggest that part of the login activity derives from trading instead of the interest to acquire more information. The study finds that investors are less likely to check the value of their portfolios when the market is down, something that will be in line with the ostrich effect. However, they present the asymmetric media coverage as an alternative explanation for this and argues that media deliver more frequent reports when the market is up, based on the higher demand for good news. This makes investors pay more attention to their portfolios when the market is up, while a lower login activity is associated with a market that is down. Regardless of the explanation, they found that the frequency was significantly lower when the market performance was down than when it was up.

Contradictory to the findings in line with the ostrich effect, Brown and Kagel (2009) find no evidence of the ostrich effect in their simple laboratory experimental study. It showed subjects are acting more rational than the ostrich effect suggests, meaning respondents acquire information even though it may potentially be bad news. The study takes place at a university in Ohio, U.S., observing 21 respondents while making investment decisions. The respondents were supposed to choose a stock to hold and received information about its performance. However, to get information about its relative performance, respondents had to actively acquire more information, easy accessible at no cost. The results show more information was acquired when holding a losing stock compared to a winning stock, contrary to the ostrich effect. Although, the authors themselves criticise the study for being too simple and unrealistic, something that might have influenced the results. They argue that the reason they used this setting was that effects shown in a simple laboratory experiment should also exist in the real, more complex, market.

Similarly to Brown and Kagel (2009), Gherzi et al. (2014) find no evidence of the ostrich effect but observe investors increase their monitoring both when the market is up and when it is down, naming this behaviour "the meerkat effect". They intentionally tried to replicate Karlsson, Loewenstein and Seppi's (2009) study to find corroborative evidence for the ostrich
effect and associate monitoring activity with neuroticism and individual differences. The study included 617 respondents from Great Britain, whose logins and trading were observed from 2004-2009. The deviating results Gherzi et al. (2014) find show a more attentive behaviour, similar to a vigilant meerkat rather than an averting ostrich. Moreover, the authors find evidence that contradicts previous thoughts about selective avoidance of negative information. The respondents were more likely to acquire information about other stocks when holding a losing one, than when holding a winning stock. Respondents holding a winning stock turned out to be ignorant towards information about other stocks.

Previous research within this specific area is not yet substantial and the major contributions are mentioned above. Given this literature we predict we will find evidence of the ostrich effect in our natural experiment, since the respondents most likely have received preliminary, incomplete negative information, possibly from media coverage. This is based on the fact that people derive utility from positive information, hence will not acquire further information when it is expected to affect them negatively.

2.3 The disposition effect

The concept of the disposition effect was coined by Shefrin and Statman (1985) and is derived from prospect theory (Kahneman and Tversky, 1979). In short, the effect denotes the tendency to sell winning assets too early and keep losers too long. Prospect theory includes other bounded rational behaviours which form the basis of the disposition effect, such as loss aversion and mental accounting. As can be seen in Figure 2, which shows the value function of prospect theory, loss aversion implies that individuals see losses as more painful than what an equal gain would give pleasure. The function deviates from the reference point (origo) and is concave for gains and convex for losses. One marginal unit of either gains or losses creates different changes in value since the graph is steeper for losses than for gains. Loss aversion creates inertia, which makes people stick to status quo and possibly turn down beneficial trades.

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5 Neuroticism is the definition of an emotionally unstable person with high levels of anxiety. Neurotic traits imply a higher tendency to experience negative emotions (Gherzi et al., 2014).
Experiments on loss aversion have been carried out by Thaler and Sunstein (2009). Groups were observed where half of the participants were given an item and the other half was not. The results show individuals valued the item differently. The individuals who received the item are willing to sell it for roughly twice the price compared to what the others are willing to pay for it. The same experiment has been conducted with two different items that people initially value the same. Half of the group received the first item and the other half received the second item. When asked if they wanted to switch, only one out of ten people said yes. This indicates that individuals appreciate the feeling of possession and therefore experience greater pain giving things up, a cognitive bias commonly referred to as the endowment effect (Kahneman, Knetsch and Thaler, 1990). The finding that people hold on to losing assets too long might partially be explained by this effect.

Shefrin and Statman (1985) describe that since losses create psychological discomfort, people become more risk-seeking to avoid them. They illustrate the risk-seeking behaviour in a financial context by explaining the disposition effect. The example postulates an investor who owns a stock with an initial value of $50. After a period, the value of the stock has decreased by $10 and the investor has the choice to either: (A) realise the $10 loss and sell the stock immediately or (B) keep the stock with a 50 percent chance of losing an additional $10 or a 50 percent chance of gaining $10, in other words break even. The hypothesis of the disposition effect suggests that (B) will be the preferred choice, thus, people will take a risk and hold on to a losing stock. In summary, the choice is between selling a losing stock or risk losing more, alternatively break even. Nofsinger (2005) argues selling a winning stock stimulates a good feeling and a sense of pride, while selling a losing stock causes a feeling of regret.
As a complement to the results of Shefrin and Statman’s (1985) study, Thaler (2016) presents another study with additional conclusions regarding the situation where breaking even is not an alternative, as it is in option (B) in the example above. He shows that people will be risk-seeking when there is an option to break even, but risk-averse when there is not. Thaler (2016) argues this might have to do with mental accounting, which is the tendency of people to categorise their money in to different imaginary accounts, named after their purpose. For example, people budget different items by sorting their income into imaginary jars, one each for clothes, food, and pleasure, etcetera. People are then unwilling to redistribute the money and use them for other causes than their initial purpose. This is a violation of the assumption of standard economic theory that money is fungible and should not be ear marked. However, this behaviour is not necessarily negative. Thaler and Johnson (1990) argue investments may be considered as different mental accounts, where the reference point for gains or losses is the initial purchase value. All gains and losses that occur above the reference point are seen as “house money”, in this case referring to the bank’s money and not a personal asset. Therefore, losses are only considered as a reduction in gain, until the reference point is reached. The house money effect will influence how people frame their choices in the case of different events, such as a stock market downturn. Thus, according to Thaler’s (2016) theory, individuals will hold a losing stock, or in other words take a risk, if they have a chance to break even or as long as they stay above the reference point. If not, individuals will choose the sure thing.

Shefrin and Statman (1985) suggests an alternative explanation for this behaviour, namely that investors have a reluctance towards realising their losses since it will confirm that their decision to invest at all was wrong. The effect of the misjudgement will be amplified if the person’s loss is acknowledged by others. Furthermore, Thaler and Johnson (1990) argues that individuals are confronted with mental obstacles when closing losing accounts. Odean (1998) claims the bounded rationality associated with the disposition effect might be caused by a general belief that today’s losers will outperform today’s winner within a near future. His study verifies the effect and implies this behaviour is not agreeable with the rational thinking of Homo Economicus, such as a will to rebalance a portfolio or avoid the high trading costs of low priced investments. In conclusion, regardless the underlying reason for this behaviour, the disposition effect causes an inability to leave status quo in favour of an option that might benefit the individual more.

In conclusion, the disposition effect has been examined in several studies except from the above mentioned (see e.g. Grinblatt and Han, 2005; Barberis and Xiong, 2006; Frazzini, 2006; Chen et al., 2007; Ploner, 2017). Given the findings in recent studies, that investors are more prone to hold on to losing stocks or funds than winning ones, we expect the respondents in this study to act in accordance with the disposition effect. We predict they are unwilling to realise a loss, confirm they have made a mistake, or are hoping the stocks will increase in value over time hence, not sell losing assets. The fact that the respondents in general are not widely experienced in trading, strengthens our assumptions about them being more prone to a behavioural bias like this.

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6 The term “house money” is used by Thaler and Johnson (1990) and refers to the amount won in a gamble, in excess of the gambler’s own initial stake. The house signifies the casino and any money beyond the gambler’s own will be considered the casino’s, thus, be treated differently.
3 Method

3.1 Experimental design

The study was based on a natural experiment which in contrast to a controlled experiment is not performed in a laboratory, but as a natural event in people’s daily life. In a laboratory experiment, the researcher is able to hold everything constant except from the variable of interest, which can be varied between or within different control groups. Harrison and List (2004) argue this kind of control is not possible during a natural experiment, which rather enables an opportunity to observe people’s behaviour in a true environment. In that way the researcher can observe a reaction from the subject that is not affected by the knowledge of being observed, something that may cause a divergence from normal reactions. The likelihood that the subject will act truthful will be higher, especially when the subject does not know what kind of reaction the experiment is examining.

The stock market crash on February 5th, 2018 was a unique opportunity to perform a natural experiment where people’s behaviour and the current effects in real life could be observed. Compared to a laboratory experiment, this method is more cost efficient and less time consuming (Moffatt, 2017), which suited the framework of this thesis. Furthermore, the conditions might have been difficult to replicate and control for in a laboratory experiment.

The crash started in the U.S. presumably due to speculations about inflation and tax cuts for businesses (Cox, 2018; Egan, 2018a), but quickly spread globally and eventually reached Stockholm's exchange market, OMX. Since the speculations were general and did not target any specific branches, the whole stock market was affected. This turned out to be a valuable opportunity to study and analyse the ostrich effect and the disposition effect among Länsförsäkringar’s customers in a real financial context. One of the reasons why this downturn was interesting to observe was because it was widely mentioned in global media, including social medias. This implies the information about the stock market crash would have been difficult to avoid, meaning most people would have been informed and worried about their own assets being affected by it in some way. The thesis analysed the financial information seeking and financial behaviour that occurred as a reaction to this information.

3.2 Data material

The data material used in this study was continuously gathered by Länsförsäkringar via the application Sparnavigatorn, available for Länsförsäkringar customers only. According to informal interviews with staff members, Sparnavigatorn is supposed to increase the availability and make it easier for customers to conquer obstacles as risk assessment and other difficulties that are associated with saving. Besides simplifying saving, the application has features that enables naming accounts and uploading personal pictures associated with the individual "savings goal". The essential part for Länsförsäkringar in their communication towards customers is to focus on the savings goal itself instead of the risk or the amount.

Sparnavigatorn was launched in March 2017 and as of April 2018 13,314 people are using it. This represents approximately 1.5 percent out of a total of 877,984 bank customers. The
average number of savings goals is 1.38 per person, and Sparnavigatorn allows up to five savings goals per customer. The ambition of Länsförsäkringar is for all their bank customers to use the application’s service, but since it is still considered a fairly new product work remains to be done. In the application the customers have the choice of short-term or long-term savings goals, distinguished by a specific time horizon. If choosing a short-term savings goal, one to three years, the customer will be directed to a regular savings account, while a long-term savings goal, three years or more, implies opening an investment savings account. The savings amount and time horizon will through an advanced algorithm determine what funds the portfolio will consist of. The customer then has the choice to accept the suggestion (the default) or to make own adjustments. Sparnavigatorn will also present the probability of achieving the goal, something that is affected by the time horizon, the savings amount, the asset holding and market fluctuations.

Financial information seeking – the ostrich effect

To explore the ostrich effect we retrieved data for all the users in Sparnavigatorn during a period of seven months – September 2017 to the beginning of April 2018. This sample is from now on referred to as the full sample and aims to describe trends in activity and in people’s behaviour during the stock market downturn. The key variable to observe the ostrich effect was login activity in Sparnavigatorn. This was compared to the development in the stock market, the OMX Stockholm 30 Index [OMXS30]7, to examine whether there was any correlation between this variable and the fluctuations. If the login activity in Sparnavigatorn decreases and follow the stock market activity as a reaction to initial and incomplete information, e.g. from media reports, this would confirm the existence of the ostrich effect.

In Table 1, descriptive statistics are presented for the full sample. The studied population consists of 13,314 respondents who have joined gradually from the beginning of March 2017, but descriptive statistics are only available for the 9,141 respondents who started using Sparnavigatorn from July 2017. For those users the average age is 39.5 years and most of the respondents are men. The average number of logins per day is 0.1, which is approximately once every tenth day. This is comparable to the findings in Karlsson, Loewenstein and Seppi’s (2009) study, which indicated that people monitor their savings 0.0021 times per person and day. It implies the login activity in general is low. The average login per day was the dependent variable, explained by OMXS30. To explain if there was a significant difference in login activity during the stock market crash on February 5th, 2018, time periods were included in the model. The time before and after the crash were defined as dummy variables, while the time during the crash was used as baseline. The period before the crash consisted of 157 days, the period during of 8 days, and the period after lasted 50 days. This means a total of 215 days were observed.

Financial behaviour – the disposition effect

Those customers who do not follow the ostrich effect but do log in, could act according to the disposition effect instead. To explore the disposition effect we excluded the respondents who had not logged in during the observed period – September 2017 to April 2018. Monitoring the

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7 An index of the thirty most traded shares in the Stockholm Stock Exchange.
sales orders placed in Sparnavigatorn enabled us to observe the respondents’ financial behaviour, as a reaction to the stock market crash. A placed sales order indicates a customer’s will to sell a fund or stock. A downturn in the stock market suggests the value of the assets will decrease and the disposition effect will be confirmed if customers keep their losing funds, in other words place less sales orders compared to when the market is up.

Table 1 shows the average number of sales orders per logged in user and day is 0.03, which aggregates to approximately one sales order per logged in user and month. Karlsson, Loewenstein and Seppi (2009) found that the respondents in their study reallocated investments 0.00022 times per person and day. This indicates the number of placed sales orders as well as reallocated investments are low in general. The average number of placed sales orders per day is the dependent variable, explained by OMXS30 and the different periods. To observe if there were any differences in the number of placed sales order during the crash, the time before and after the crash were included in the model. They were defined as dummy variables and the time during the crash was kept as baseline.

**Table 1.** Descriptive statistics of the full sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>Mean</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Standard deviation</th>
<th>Type of variable*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of logins per day</td>
<td>13,314</td>
<td>982.38</td>
<td>1,632</td>
<td>414</td>
<td>265.89</td>
<td></td>
</tr>
<tr>
<td>Average number of logins per day</td>
<td>13,314</td>
<td>0.10</td>
<td>0.15</td>
<td>0.05</td>
<td>0.02</td>
<td>DV</td>
</tr>
<tr>
<td>Number of sales orders per day</td>
<td>7,069</td>
<td>28.67</td>
<td>160</td>
<td>6</td>
<td>15.63</td>
<td></td>
</tr>
<tr>
<td>Average number of sales orders per day</td>
<td>7,069</td>
<td>0.03</td>
<td>0.1</td>
<td>0.009</td>
<td>0.01</td>
<td>DV</td>
</tr>
<tr>
<td>OMXS30</td>
<td></td>
<td>1,598.80</td>
<td>1,677.65</td>
<td>1,496.59</td>
<td>43.18</td>
<td>C</td>
</tr>
<tr>
<td>Gender</td>
<td>9,273</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5,586 (60.24 %)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3,687 (39.76 %)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>9,273</td>
<td>39.49</td>
<td>86</td>
<td>18</td>
<td>11.43</td>
<td></td>
</tr>
</tbody>
</table>

*C = continuous variable, DV = dependent variable

**Individual differences in self-assessed financial knowledge and its effect on financial information seeking and financial behaviour**

To explore the influence of individual differences in Homo Ignorans oriented behaviour on financial information seeking and financial behaviour we used Länsförsäkringar's suitability assessment as an instrument. The customers' answers indicated certain characteristics and
enabled a distinction of typical Homo Ignorans attributes. The suitability assessment is a requirement for opening an investment savings account, connected to the savings goal. Customers must answer three questions about their experience of, and knowledge about, fund trading. The questions, independently translated from Swedish, are presented below:

1. In the previous three years, have you carried out at least three fund transactions, each corresponding to at least 10,000 SEK [approximately 990 Euro]?
   Answering alternatives: Yes or no
2. Do you have any knowledge about funds?
   Answering alternatives: Yes or no
3. Are you aware of the risks associated with trading in funds?
   Answering alternatives: Yes or no

If the answer is "no" to at least two of these questions, Sparnavigatorn generates a message saying:

"You have answered questions in a suitability assessment. Based on your responses, we have concluded that you do not have enough experience or knowledge to trade. You can choose to trade anyway, but do not trade more than you can afford to lose. Our recommendation is that you contact us [Länsförsäkringar], and we will assist you with your investments."
Answering alternatives: "Change your answer" or "Trade anyway"

A Homo Ignorans scale was constructed based on the suitability assessment, where all individuals who answered "no" at least twice were considered to be more prone to make decisions in compliance with Homo Ignorans. This classification has, according to our knowledge, not been encountered before but is for this purpose both appropriate and useful. Based on the customers' own statement and according to Länsförsäkringar's judgement, two negative answers implies that the customers' knowledge about and experience of financial trading is inadequate. In addition to their inadequate financial knowledge, they also act ignorant and show tendencies of overconfidence if they chose to "trade anyway", despite the bank's recommendations.
Table 2. Suitability assessment: self-assessed financial knowledge amongst Sparnavigatorn users

<table>
<thead>
<tr>
<th>Answers from suitability assessment</th>
<th>Number of customers (proportion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes / Yes / Yes</td>
<td>780 (39 %)</td>
</tr>
<tr>
<td>Yes / Yes / No</td>
<td>160 (8 %)</td>
</tr>
<tr>
<td>Yes / No / Yes</td>
<td>30 (1.5 %)</td>
</tr>
<tr>
<td>Yes / No / No</td>
<td>49 (2.5 %)</td>
</tr>
<tr>
<td>No / Yes / Yes</td>
<td>645 (32 %)</td>
</tr>
<tr>
<td>No / Yes / No</td>
<td>10 (0.5 %)</td>
</tr>
<tr>
<td>No / No / Yes</td>
<td>211 (10.5 %)</td>
</tr>
<tr>
<td>No / No / No</td>
<td>116 (6 %)</td>
</tr>
<tr>
<td>Total</td>
<td>2,001 (100 %)</td>
</tr>
</tbody>
</table>

Table 2 presents the distribution of the answers from the suitability assessment. It shows the total number of customers who answered the questions between January 15\textsuperscript{th} and April 3\textsuperscript{rd}, 2018. Most people have answered "yes" to all three questions and the smallest group consists of people who have answered "no" to the first question, "yes" to the second one, and "no" to the last one. The most common combination of answers where two of them are "no" is "no" to the first two questions and "yes" to the last one. This indicates these people have not carried out at least three fund transactions á 10,000 SEK during the previous three years, nor do they claim to have any knowledge about funds but are aware of the risks.

Even though the suitability assessment was a useful variable to enable a categorisation of the sample, the data for this variable did not emerge until after January 15\textsuperscript{th}, 2018, unfortunately resulting in a relatively small sample. The reason for the introduction of the suitability assessment was due to a new regulatory framework in the European Union [EU], known as the MiFID II directive and the MiFIR regulation. It aims to constitute and create equal terms and conditions on the financial market, as well as regulate the transparency (Finansinspektionen, 2017).

The ostrich effect and the disposition effect were re-examined, this time to recognise any individual differences based on the self-assessed financial knowledge and the Homo Ignorans classification. We wanted the respondents to have had the opportunity to log in for the entire observed period, hence customers who registered and answered the suitability assessment after February 4\textsuperscript{th}, 2018, were excluded from the sample. This resulted in a cohort based on whether the respondents registered as users in Sparnavigatorn before the market downturn, between January 15\textsuperscript{th} and February 4\textsuperscript{th}, 2018. The cohort included 938 respondents who were observed from February 5\textsuperscript{th} until April 3\textsuperscript{rd}, 2018. This sample will from now be referred to as the cohort.
Table 3. Descriptive statistics of the cohort based on the differences in self-assessed financial knowledge

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>Mean</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Standard deviation</th>
<th>Type of variable*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of logins</td>
<td>938</td>
<td>7.47</td>
<td>58</td>
<td>0</td>
<td>13.33</td>
<td></td>
</tr>
<tr>
<td>Average number of placed sales orders</td>
<td>252</td>
<td>0.27</td>
<td>5</td>
<td>0</td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td>Number of logins per day during the crash</td>
<td>938</td>
<td>0.13</td>
<td>1</td>
<td>0</td>
<td>0.26</td>
<td>DV</td>
</tr>
<tr>
<td>Number of logins per day after the crash</td>
<td>938</td>
<td>0.13</td>
<td>1.02</td>
<td>0</td>
<td>0.24</td>
<td>DV</td>
</tr>
<tr>
<td>Number of placed sales orders during the crash</td>
<td>938</td>
<td>0.01</td>
<td>0.38</td>
<td>0</td>
<td>0.04</td>
<td>DV</td>
</tr>
<tr>
<td>Number of placed sales orders after the crash</td>
<td>938</td>
<td>0.004</td>
<td>0.08</td>
<td>0</td>
<td>0.01</td>
<td>DV</td>
</tr>
<tr>
<td>Homo Ignorans characteristics</td>
<td>145</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>D</td>
</tr>
<tr>
<td>Gender</td>
<td>938</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>639</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>D</td>
</tr>
<tr>
<td>Female</td>
<td>299</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DR</td>
</tr>
<tr>
<td>Age</td>
<td>938</td>
<td>40.2</td>
<td>86</td>
<td>19</td>
<td>12.42</td>
<td>C</td>
</tr>
</tbody>
</table>

*C = continuous variable, DV = dependent variable, D = dummy variable, DR = dummy reference variable

In Table 3, descriptive statistics are presented for the cohort, based on the self-assessed financial knowledge. The sample consists of 938 respondents where the majority are men and the average age is approximately 40.2 years. The average number of logins is 7.47 and the average number of logins per day is 0.13 for the observed period, February 5th until April 3rd, 2018 (58 days). The number of placed sales orders per logged in user is 0.27 and 0.0047 per logged in user and day. The number of logins per day during and after the crash are the two dependent variables when studying the ostrich effect. The dependent variables when studying the disposition effect are the number of placed sales orders per day during and after the crash. The models used to study the individual differences for the effects control for gender and age, and Homo Ignorans is included as a dummy. As shown in Table 3, 15 percent of the cohort were categorised as Homo Ignorans.

3.3 Data analysis

Financial information seeking – the ostrich effect

The ostrich effect was observed for the full sample by monitoring the average login activity per day in Sparnavigatorn and comparing it to the OMXS30 Index. The observations for the login activity cover every day while the OMXS30 Index only covers weekdays since the stock
market is closed on weekends, Swedish public holidays included. To be able to observe the login activity and the sales orders for every day we decided to carry forward the index value from the Friday each week to the weekend.

An Ordinary Least Square [OLS] estimation was run and tested for autocorrelation through a Breusch-Godfrey Serial Correlation Lagrange Multiplier test, since the data was a time series. Autocorrelation, which occurs when the error terms are correlated over time, is a usual problem in time series data (Gujarati and Porter, 2009). In addition, the data set was tested for heteroscedasticity, which occurs when the standard deviations of a variable have non-constant variance, with a Breusch-Pagan-Godfrey test. Gujarati and Porter (2009) argue this test is suitable when the model contains dummy variables. Autocorrelation and heteroscedasticity affects the efficiency of the estimates and it is logic to assume that at least autocorrelation exists in our model since the stock market index depends on earlier periods. Both heteroscedasticity and autocorrelation can be adjusted for with means of the Heteroscedasticity- and Autocorrelation-Consistent Standard Errors [HAC], also referred to as the Newey-West Standard Errors. This method is useful in relatively large samples, with fifty or more observations, and produce estimators that are efficient (Gujarati and Porter, 2009).

To answer the question regarding how the financial information seeking, in terms of login activity, change in Sparnavigator during a sudden downturn in the stock market, a regression model was specified as follows:

\[
\text{Model 1} \\
\text{average_login_sparnavigator}_{it} = \beta_0 + \beta_1 \text{OMXS30}_t + \beta_2 \text{date}_t + \beta_3 \text{before_crash}_t + \beta_4 \text{after_crash}_t + \epsilon_{it}
\]

Financial behaviour – the disposition effect

To observe the disposition effect the average number of placed sales orders per day was analysed for the full sample and compared to OMXS30 Index. The data was treated similarly to the analysis of the ostrich effect. An OLS estimation was used and once again autocorrelation and heteroscedasticity were adjusted for by HAC. To be able to analyse how sales orders change in Sparnavigator during a sudden downturn in the stock market the following model was specified:

\[
\text{Model 2} \\
\text{average_sales_orders_sparnavigator}_{it} = \beta_0 + \beta_1 \text{OMXS30}_t + \beta_2 \text{before_crash}_t + \beta_3 \text{after_crash}_t + \epsilon_{it}
\]

To isolate the disposition effect and get rid of the influence of the ostrich effect, we chose to exclude the customers who had not logged in in Sparnavigator. There might exist an inverse causal reasoning between monitoring savings and placing sales orders. This implies respondents could either log in to monitor their savings and as a result of the information acquired decide to proceed with a transaction; or they could log in with the pure intention of selling or buying assets. This approach differs from how Karlsson, Loewenstein and Seppi (2009) handled the problem in their study of the ostrich effect. They wanted to observe the pure monitoring of savings and to isolate the ostrich effect they chose to exclude all
respondents who placed sales orders from their sample. In this study the underlying reason for the login activity was irrelevant, since the first step of information acquiring was in focus. Therefore, our approach can be considered appropriate.

**Individual differences in self-assessed financial knowledge and its effect on financial information seeking – the ostrich effect**

To analyse the individual differences, based on the answers from the suitability assessment, for the ostrich effect, the average login activity per day in Sparnavigatorn was observed for the cohort. We observed the period during and after the stock market downturn, meaning February 5th until February 12th and February 13th until April 3rd, 2018. This means our data was no longer treated as a time series but as a cross-section data. To see if there were any significant differences in login activity between respondents with Homo Ignorans oriented behaviour and the others a t-test was performed. An OLS estimation was run to control for gender and age.

An analysis of how the individual differences in self-assessed financial knowledge affect financial information seeking during a stock market downturn was enabled by the following models:

**Model 3A**

\[
\text{average\_login\_during\_crash\_sparnavigatorn}_i = \beta_0 + \beta_1 \text{HomoIgnorans}_i + \beta_2 \text{gender}_i + \beta_3 \text{age}_i + \epsilon_i
\]

**Model 3B**

\[
\text{average\_login\_after\_crash\_sparnavigatorn}_i = \beta_0 + \beta_1 \text{HomoIgnorans}_i + \beta_2 \text{gender}_i + \beta_3 \text{age}_i + \epsilon_i
\]

The main difference between this test and the analysis of the ostrich effect for the full sample was the group comparison based on the suitability assessment, which made it possible to draw conclusions about any individual differences.

**Individual differences in self-assessed financial knowledge and its effect on financial behaviour – the disposition effect**

We observed the disposition effect by monitoring the sales orders in Sparnavigatorn, for customers who answered the suitability assessment. The grouping was done in the same way as for the ostrich effect for the cohort, meaning it was defined by customers who registered as users between January 15th and February 4th, 2018. Although, to isolate the disposition effect and exclude any influences from the ostrich effect, we only included customers who logged in at least once during the period February 5th to April 3rd, 2018. To analyse the disposition effect and the impact of individual differences, the average number of placed sales orders per day was observed during and after the downturn. Similarly, as for the analysis of the ostrich effect for the cohort, the data was treated as a cross-section. A t-test was performed to analyse the individual differences and the Homo Ignorans oriented behaviour for the disposition effect. We controlled for gender and age through an OLS estimation.
To enable an analysis of how the individual differences in self-assessed financial knowledge affect financial behaviour during a stock market downturn, the following models were specified:

**Model 4A**

\[
\text{average	extunderscore sales	extunderscore orders\textunderscore during	extunderscore crash\textunderscore sparnavigator}_i = \beta_0 + \beta_1 \text{HomoIgnorans}_i + \beta_2 \text{gender}_i + \beta_3 \text{age}_i + \epsilon_i
\]

**Model 4B**

\[
\text{average	extunderscore sales	extunderscore orders\textunderscore after	extunderscore crash\textunderscore sparnavigator}_i = \beta_0 + \beta_1 \text{HomoIgnorans}_i + \beta_2 \text{gender}_i + \beta_3 \text{age}_i + \epsilon_i
\]

The main divergence between this test and the analysis of the disposition effect for the full sample was the group comparison based on the suitability assessment, which made it possible to draw conclusions about any individual differences.

### 3.4 Reflections on method

The respondents in this study have not been approached about their contribution to this research before the data was collected, nor has it been collected solely for the purposes of this study. However, the use of the data material follows the guidelines of the Swedish Research Council [Vetenskapsrådet] (Vetenskapsrådet, 2011), since it has been depersonalised by Länsförsäkringar by removal of the Social Security Numbers, hence cannot be related to a certain individual. The data material is considered to hold sensitive information and have therefore been treated with caution, e.g. by signing a confidentiality agreement that regulates the usage of the data.

Problems with the data will be declared in short but discussed more thoroughly in Chapter 6. However, studies based on small samples or short periods are often less generalisable and it should be considered when analysing the results. The sample size in our study varies and is not perfectly representative to the Swedish population (Statistiska Centralbyrån, 2018), but it will still allow us to draw conclusions about behaviour within financial contexts. Results based on self-assessed information should also be analysed with caution since the answers may be ambiguous or even false.

An OLS analysis could cause problems when the reference period is short, as was the case for this study. In specific, the time during the stock market downturn was short, only including eight days. However, to expand the reference period and include more days might reduce the chance of observing the effects of the crash. The regression could have been run on a weekly basis instead of a daily, but that would have reduced the explanatory power and caused certain problems since the period during the crash would only have one observation, instead of eight.
Experimental studies often experience some limitations due to budget or time restrictions. A natural experiment however, is more time and cost efficient compared to a laboratory experiment. Furthermore, in a natural experiment it is not possible to control for other variables than already observed, neither is it possible to be certain of causality. Therefore, it might sometimes be difficult to determine whether they actually measure what they are supposed to measure (Wilkinson and Klaes, 2012). Compared to a laboratory experiment where the respondents can be provided with additional information, a natural experiment offers the possibility to observe the respondents' real behaviour, without influence from the researcher. In a natural experiment it may be more difficult to control for selection bias and determine randomisation of the sample. It is not assured the sample is representative for the whole population. Neither is it possible to double check results or repeat the exact treatment. However, a natural experiment provides a chance to observe real life behaviour which is the purpose of this thesis. This implies corresponding results will be applicable in reality (Wilkinson and Klaes, 2012). We examine the feelings and reactions connected to peoples' own assets and since it involves more capital than usually can be allowed for in a laboratory experiment's budget, it would not be possible to re-construct in a laboratory.
4 Results

The two graphs below give an overview of the two examined effects. In Figure 3, the login activity in relation to the OMXS30 Index is shown. As displayed, the login activity is following approximately the same pattern as the OMXS30 Index, but an increase in login activity can be seen during the crash.

**Figure 3.** Number of logins in Sparnavigatorn per day in relation to OMXS30 Index
Figure 4 shows the number of placed sales orders in relation to the OMXS30 Index. A distinct change in behavioural pattern can be observed during the stock market downturn where the number of placed sales orders increased drastically compared to an otherwise smooth activity.

**Figure 4.** Number of placed sales orders in Sparnavigator per day in relation to OMXS30 Index

### 4.1 Financial information seeking – the ostrich effect

To explore how financial information seeking change during a sudden downturn in the stock market and examine the presence of the ostrich effect we observed the login activity in Sparnavigator before, during, and after the crash. Figure 5 shows a scatterplot over the average login activity per day, from September 2017 to the beginning of April 2018. Since the login activity per day held a positive time trend we chose to adjust for this by using the average login activity per day instead. This was due to our suspicion that the time trend depended on the constantly increasing number of customers joining Sparnavigator. As can be seen in Figure 5, there is no positive time trend to be observed. However, another trend can be noticed based on the constant empty space in the middle of the scatterplot. This trend could be following the pattern of weekends since the market is closed at that time. Given the short time period and the research questions, we made the judgement the weekend trend would not have a substantial effect on our analysis and is therefore not adjusted for.
Figure 5. Scatterplot over average login activity per day – the ostrich effect, full sample

Table 4 shows the results of an OLS regression with average login activity per day in Sparnavigatorn as dependent variable. The results of the regression show weak positive relation between the average login activity per day and the OMXS30 Index, ceteris paribus. This conforms with our predictions about the ostrich effect – that the respondents login more frequently when the OMXS30 Index increases, implicating preliminary positive information leads to an increased login activity. The change however, is marginal. On the contrary, although not significant, the regression shows the average login activity per day is higher during the stock market crash, in comparison to the time before and after, ceteris paribus. These results indicate our assumptions about the ostrich effect is not correct, but since the results are insignificant this might be an inaccurate interpretation. The variable date is included to assure the time trend is adjusted for and the insignificance of the variable suggest we no longer have a time trend in our model. The regression is adjusted for heteroscedasticity and autocorrelation with HAC. As assumed, autocorrelation was detected and therefore we used HAC. We found no support that the model consisted heteroscedasticity.
Table 4. OLS regression with average login activity per day in Sparnavigatorn as dependent variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMXS30</td>
<td>0.000140***</td>
</tr>
<tr>
<td></td>
<td>(5.09E-05)</td>
</tr>
<tr>
<td>Date</td>
<td>-5.30E-05</td>
</tr>
<tr>
<td></td>
<td>(4.02E-05)</td>
</tr>
<tr>
<td>Before crash</td>
<td>-0.015391</td>
</tr>
<tr>
<td></td>
<td>(0.012538)</td>
</tr>
<tr>
<td>After crash</td>
<td>-0.011843</td>
</tr>
<tr>
<td></td>
<td>(0.010578)</td>
</tr>
<tr>
<td>n = 215</td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.086143</td>
</tr>
</tbody>
</table>

Adjusted with HAC Standard Errors and Covariance. Standard deviation within parenthesis.
*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

4.2 Financial behaviour – the disposition effect

The changes in sales orders in Sparnavigatorn during a stock market downturn, and whether there is any evidence of the disposition effect, was examined by observing the number of placed sales orders. Figure 6 shows a scatterplot of the average number of placed sales orders in Sparnavigatorn per day, from September 2017 to the beginning of April 2018. In contrast to the login activity per day, this data does not show any trends. However, two outliers can be observed in the beginning of February 2018, more specifically on February 5th and 6th, which coincides with the time for the stock market crash. Thus, there is a clear indication the number of placed sales orders increased remarkably during the downturn. This implies the respondents’ financial behaviour might be affected by the fluctuations on the market and the OMXS30 Index.
Figure 6. Scatterplot over average number of placed sales orders per day – the disposition effect, full sample

Table 5 shows the results of an OLS regression with average number of placed sales orders per day in Sparnavigator as dependent variable. The regression shows insignificant results of a negative relation between the OMXS30 Index and the average number of placed sales orders per day, ceteris paribus. A significant negative relation would have indicated the opposite of the disposition effect, namely a tendency to sell fewer assets when the OMXS30 Index increases. Furthermore, the regression shows an insignificantly lower number of placed sales orders before the crash and a weakly significant lower number of placed sales orders after, ceteris paribus. These results, specifically the significant variable, indicate our prediction about the disposition effect is disproved. Selling more assets during the crash, when the OMXS30 Index is relatively low, implies the respondents might not be holding on to losing assets. The variable date is not included in this regression since a time trend would reduce the effect of the high number of placed sales orders during the crash, the outliers. The regression is adjusted for heteroscedasticity and autocorrelation with HAC. HAC was used because autocorrelation and heteroscedasticity were detected in our model.
Table 5. OLS regression with average number of placed sales orders per day in Sparnavigatorn as dependent variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMXS30</td>
<td>-1.93E-05</td>
</tr>
<tr>
<td></td>
<td>(2.03E-05)</td>
</tr>
<tr>
<td>Before crash</td>
<td>-0.016856</td>
</tr>
<tr>
<td></td>
<td>(0.011595)</td>
</tr>
<tr>
<td>After crash</td>
<td>-0.020648*</td>
</tr>
<tr>
<td></td>
<td>(0.011528)</td>
</tr>
</tbody>
</table>

n = 215
Adjusted R-squared 0.133459

Adjusted with HAC Standard Errors and Covariance.
Standard deviation within parenthesis.
*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

4.3 Individual differences in self-assessed financial knowledge and its effect on financial information seeking – the ostrich effect

To examine the individual differences in self-assessed financial knowledge and its effect on financial information seeking we observed the average login activity per day in Sparnavigatorn. The respondents studied were the ones included in the cohort, based on the customers' answers from the suitability assessment. In our data, the Homo Ignorans variable was treated as a dummy variable where 1 equals Homo Ignorans characteristics and 0 equals the opposite. The respondents were studied during February 5th until February 12th, referred to as the period during the crash, and February 13th until April 3rd, 2018, referred to as the period after the crash.

As seen in Table 6, the column for Homo Ignorans 1, the respondents who answered "no" at least twice represents a small part of the total number of customers who answered the suitability assessment, only 19.5 percent. Because of this, we chose to expand the analysis and include all respondents who answered "no" at least once and compare them to the others. This resulted in two different categorisations of Homo Ignorans – Homo Ignorans 1 and 2. When the sample was expanded to Homo Ignorans 2 the distribution became more even – 61 percent of Homo Ignorans 2 to 39 percent of the others.
Table 6. Suitability assessment: self-stated financial knowledge amongst Sparnavigator users, categorisation of Homo Ignorans 1 and 2

<table>
<thead>
<tr>
<th>Answers from suitability assessment</th>
<th>Number of customers (proportion)</th>
<th>Homo Ignorans 1</th>
<th>Homo Ignorans 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes / Yes / Yes</td>
<td>780 (39 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes / Yes / No</td>
<td>160 (8 %)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Yes / No / Yes</td>
<td>30 (1.5 %)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Yes / No / No</td>
<td>49 (2.5 %)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>No / Yes / Yes</td>
<td>645 (32 %)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>No / Yes / No</td>
<td>10 (0.5 %)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>No / No / Yes</td>
<td>211 (10.5 %)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>No / No / No</td>
<td>116 (6 %)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Total</td>
<td>2,001 (100 %)</td>
<td>386 (19.5 %)</td>
<td>1,221 (61 %)</td>
</tr>
</tbody>
</table>

To see if there were any differences in login activity between respondents with Homo Ignorans oriented behaviour and the others a t-test was performed. Figure 7 shows there is no significant difference in the average number of logins per day between either Homo Ignorans 1 or Homo Ignorans 2 and the others. The groups’ financial information seeking is compared both during and after the crash. As seen in Figure 7 there is a small but insignificant difference in average login activity during and after the stock market crash between the respondents classified as Homo Ignorans 1 and the others. Even though the results are insignificant it indicates people classified as Homo Ignorans 1 have a lower login activity in general. Thus, there is no indication that people classified as Homo Ignorans 1 are more prone to avoid financial information during a market downturn than others. There is however an indication that they avoid financial information more in general. Although, since the results are insignificant, this might be an inaccurate interpretation.
Figure 7. Individual differences in self-assessed financial knowledge and its effect on financial information seeking – the ostrich effect, the cohort

As is also demonstrated in Figure 7 the same t-test was run but for the expanded group, including all respondents who answered "no" at least once – the Homo Ignorans 2-group. The differences between Homo Ignorans 2 and the others are smaller, and the results are still insignificant. Notice that the differences in Figure 7 might appear more distinguished than they are, because of the scale on the y-axis. These results imply our predictions about the Homo Ignorans oriented behaviour cannot be confirmed. Even though the results do not show any signs of the ostrich effect, one can observe a difference in behaviour depending on the categorisation of Homo Ignorans. Homo Ignorans 1 shows a more distinguished difference in behavioural pattern, compared to the others, than Homo Ignorans 2.

To control for gender and age we regressed two OLS estimations. Model 3A:1 in Table 7 shows the regression for Homo Ignorans 1, where the dependent variable is average login activity per day during the crash, while Model 3B:1 display the time after the crash. Model 3A:1 shows that Homo Ignorans characteristics seems to have an insignificant negative relation with average login activity, ceteris paribus. If the results had been significant, it would have implied that characteristics related to Homo Ignorans behaviour can be associated with a lower average login activity during the crash. Age has a negative but insignificant relation with average login activity during the crash, ceteris paribus. The male respondents
have a lower average login activity than women during the crash, significant at the 10 percent level, ceteris paribus.

Model 3B:1 shows no significant relations between average login activity after the crash and the control variables. Homo Ignorans 1 and male indicate an insignificant negative relation, while age now shows an insignificant positive relation with the average login activity.

Table 7. OLS regression with average login activity per day during (Model 3A:1) and after (Model 3B:1) the stock market crash as dependent variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 3A:1</th>
<th>Model 3B:1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homo Ignorans 1</td>
<td>-0.032934 (0.022022)</td>
<td>-0.030992 (0.019380)</td>
</tr>
<tr>
<td>Male</td>
<td>-0.031437* (0.017925)</td>
<td>-0.015505 (0.016645)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.000573 (0.000699)</td>
<td>0.000104 (0.000637)</td>
</tr>
</tbody>
</table>

n = 938
Adjusted R-squared | 0.002254 | -0.000283 |

Adjusted with Huber-White-Hinkley Heteroscedasticity Consistent Standard Errors and Covariance.
Standard deviation within parenthesis.
*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

Table 8 shows the regression for Homo Ignorans 2, where the dependent variable is average login activity per day during the crash (Model 3A:2) and after the crash (Model 3B:2). Model 3A:2 shows no significant relations between the average login activity per day during the crash and the control variables. All three variables are negatively related to the dependent variable, ceteris paribus.
Table 8. OLS regression with login activity per day during (Model 3A:2) and after (Model 3B:2) the stock market crash as dependent variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 3A:2</th>
<th>Model 3B:2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homo Ignorans 2</td>
<td>-0.000307 (0.017640)</td>
<td>-0.001466 (0.016530)</td>
</tr>
<tr>
<td>Male</td>
<td>-0.028557 (0.018110)</td>
<td>-0.012926 (0.016836)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.000475 (0.000718)</td>
<td>0.000186 (0.000665)</td>
</tr>
<tr>
<td>n = 938</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>-0.000135</td>
<td>-0.002480</td>
</tr>
</tbody>
</table>

Adjusted with Huber-White-Hinkley Heteroscedasticity Consistent Standard Errors and Covariance Standard deviation within parenthesis.

*** Significant at the 1 percent level
**  Significant at the 5 percent level
*   Significant at the 10 percent level

Model 3B:2 does not show any significant relations either, however, the variable age now shows a positive relation to the dependent variable, ceteris paribus. In summary, neither Homo Ignorans 1 or Homo Ignorans 2, nor age consistently seem to explain the average login activity during or after the crash. Gender, on the other hand, seems to explain the average login activity during the stock market crash when the respondents were categorised according to Homo Ignorans 1 criteria.

4.4 Individual differences in self-assessed financial knowledge and its effect on financial behaviour – the disposition effect

To explore the individual differences in self-assessed financial knowledge and its effect on financial behaviour, the cohort was observed once again. To examine the disposition effect, we observed the average number of placed sales orders per day during and after the crash. The time period was the same as for the analysis of the full sample, meaning the period during the downturn was referred to as February 5th until February 12th, and the period after was referred to February 13th until April 3rd, 2018.

Figure 8 shows none of the t-tests are significant and the differences displayed are noticeably small. However, the average number of sales orders placed during the crash are more than the average number of sales orders placed after. If the results would have been significant this could indicate the respondents have reacted contradictory to the disposition effect. The Homo Ignorans groups have a lower average sales frequency in all cases which is an indication that our predictions about Homo Ignorans oriented behaviour is correct. Respondents with lower financial knowledge seems to be more prone to hold on to losers for too long. In conclusion,
there are no clear indications of the disposition effect and no distinct differences in individual behaviour.

**Figure 8.** Individual differences in self-assessed financial knowledge and its effect on financial behaviour – the disposition effect, the cohort

To further explore the results presented in Figure 8 and control for gender and age, we conducted OLS regressions. Table 9 shows the regression for Homo Ignorans 1 where average sales orders per day during and after the crash is the dependent variable. Model 4A:1 shows that Homo Ignorans characteristics seems to have an insignificant negative relation to the number of placed sales orders, ceteris paribus. In other words, corresponding significant results would have indicated a Homo Ignorans oriented behaviour leads to a lower average number of placed sales orders. Gender and age both indicate an insignificant positive relation to the average number of placed sales orders during the crash, ceteris paribus.

In Model 4B:1, the average number of placed sales orders per day after the crash in relation to the control variables is presented. Homo Ignorans 1 has the same negative, insignificant relation to the average number of placed sales orders as in Model 4A:1. The variable age has changed from positive to negative and is still insignificant. However, gender is significant at the 5 percent level and has a positive relation to the average number of placed sales orders. This implies men place more sales orders than women after the crash, ceteris paribus. In
conclusion, only gender seems to explain the average number of placed sales orders after the stock market crash. None of the other variables can explain the variation in neither model.

Table 9. OLS regression with average number of placed sales orders per day during (Model 4A:1) and after (Model 4B:1) the stock market crash as dependent variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 4A:1</th>
<th>Model 4B:1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homo Ignorans 1</td>
<td>-0.000117 (0.003097)</td>
<td>-0.000726 (0.000922)</td>
</tr>
<tr>
<td>Male</td>
<td>0.003995 (0.002491)</td>
<td>0.001536** (0.000722)</td>
</tr>
<tr>
<td>Age</td>
<td>5.19E-05 (0.000105)</td>
<td>-3.55E-05 (3.13E-05)</td>
</tr>
</tbody>
</table>

n = 938
Adjusted R-squared -0.000362 0.003209

Adjusted with Huber-White-Hinkley Heteroscedasticity Consistent Standard Errors and Covariance.
Standard deviation within parenthesis.
*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

Table 10 shows the regression for Homo Ignorans 2, where the dependent variable is the average number of placed sales orders per day during the crash (Model 4A:2) and after the crash (Model 4B:2). We find the same relations in these regressions as in Table 9. In general, neither Homo Ignorans oriented behaviour or age have a significant relation to the average number of placed sales orders. Gender however, is significant at the 5 percent level in Model 4B:2, indicating the male respondents have a higher number of average placed sales orders than the female respondents after the crash, ceteris paribus. The variable for gender is not significant for the time during the crash.
Table 10. OLS regression with average number of placed sales orders per day during (Model 4A:2) and after (Model 4B:2) the stock market crash as dependent variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 4A:2</th>
<th>Model 4B:2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homo Ignorans 2</td>
<td>-0.003644</td>
<td>-0.000146</td>
</tr>
<tr>
<td></td>
<td>(0.002620)</td>
<td>(0.000691)</td>
</tr>
<tr>
<td>Male</td>
<td>0.003605**</td>
<td>0.001584**</td>
</tr>
<tr>
<td></td>
<td>(0.002484)</td>
<td>(0.000722)</td>
</tr>
<tr>
<td>Age</td>
<td>1.95E-05</td>
<td>-3.46E-05</td>
</tr>
<tr>
<td></td>
<td>(0.000103)</td>
<td>(3.04E-05)</td>
</tr>
</tbody>
</table>

n = 938
Adjusted R-squared | 0.001793 | 0.002690


*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

To summarise, neither Homo Ignorans 1 or Homo Ignorans 2, nor age, consistently seem to explain the average number of placed sales orders before or after the crash. Gender explains the average number of placed sales orders after the crash but not during.
5 Discussion

The purpose of this thesis is to explore changes in financial information seeking and financial behaviour during fluctuations in the stock market. It also aims to contribute to an increased knowledge of the factual behaviour and individuals’ decision-making within financial contexts. The analysis of the research questions is based on our findings from the data in Sparnavigatorn.

We have used a natural experiment as a method to study the stock market crash that occurred in February 2018. Medias’ coverage of the crash was intense and presumably most people registered that a downturn was in its preface due to this. Since the news could potentially be negative and imply personal losses, it allowed us to examine whether people reacted in accordance with the ostrich effect or the disposition effect. The method enabled us to capture real life behaviour and according to the results, the ostrich effect and the disposition effect might not be as prominent as we predicted.

5.1 Main findings

The first main finding is that we find no support for the existence of the ostrich effect in this natural experiment. The results show there are no distinct differences in financial information seeking, in terms of login activity, when comparing the time before and after the crash with during. However, the average login activity per day have a positive relation with the OMXS30 Index. These results are ambiguous since they show customers log in more frequently during the crash, when the OMXS30 Index has decreased, simultaneously as the login activity and the OMXS30 have a positive relation. A speculation about these contradictory results is that the effects of the salient fluctuations could be eliminated due to the average value of the OMXS30 Index. This could mean that even though the login activity has a positive relation with the OMXS30 Index on average, the relation is occasionally the opposite, as during the crash. This could result in small and insignificant differences in login activity between the studied periods.

We predicted to find evidence of the ostrich effect, where the login activity would be less frequent during the crash. We assumed people would deliberately avoid seeking financial information by sticking their heads in the sand. In contrast to this, our results tend to be more in line with Gherzi et al.’s (2014) meerkat effect, describing people’s tendency to monitor their investments more often both during occasions when the market is up or down. The results may indicate the respondents acquire information regardless if it is positive or negative. A speculation could be that the presumably low financial experience and knowledge amongst Sparnavigatorn customers affect the ability to acquire information. Therefore, they attend to all information, unable to sift and determine what information is important to act on. Furthermore, the results in our study can also be considered to be in line with Brown and Kagel’s (2009) findings. They found no support of the ostrich effect, suggesting that people act more rational than what the ostrich effect assumes. Their study however, was conducted as a simple laboratory experiment, while ours reflect real life behaviour. These three studies are all different but despite this, none of them find any evidence of the ostrich effect which suggests the effect might not be as pronounced as we predicted.
We argue the high login activity during the crash may have been affected by the media coverage during the stock market downturn. The initial thought was that preliminary information from media would create uncertainty and lead to a lower login frequency. Since our results do not conform with our predictions, we argue there might be other possible explanations. The preliminary, negative news might have triggered other potentially offsetting biases, for example the bandwagon effect. This effect implies people tend to act like other people, regardless their own beliefs. In this context, media coverage may trigger an increased login activity during the stock market crash due to peer pressure. Supposedly, a reason why the ostrich effect is not prominent in our results might be because it may have been superseded by the bandwagon effect. We argue the discourse in media often have a negative perspective, using provocative and moving headlines. This contradicts Karlsson, Loewenstein and Seppi’s (2009) reasoning about media’s asymmetric coverage, primarily reporting when the market is up. They suggest that people derive utility from positive news which creates a bigger demand for good news. Initial, positive information leads to an increased interest for monitoring portfolios. We apply the same reasoning, but reversed, on our study. We suggest a downturn leads to more frequent media reports which in turn might lead to a higher login activity since people get reminded to acquire information, aggravating the crash. At the same time, a crash originates from people's increased will to sell assets quickly. Hence, this turns into a circular reasoning since an increased number of sales orders must also imply an increased login activity.

Our study is in many aspects similar to the one Karlsson, Loewenstein and Seppi (2009) conducted, particularly regarding the login activity and monitoring long-term savings accounts. Karlsson, Loewenstein and Seppi (2009) found evidence of the ostrich effect, but compared to our study their sample was larger and they observed a longer period. In addition, the Swedish data originated from retirement savings which indicates a more long-term investment than the data in our study. This may imply that people in general should have to monitor their portfolios less frequently compared to our respondents. The average login activity is, as assumed, low in both studies but even lower in Karlsson, Loewenstein and Seppi’s (2009) study. However, the technical innovation has evolved rapidly the last decade which has increased the user availability for technical services. Between the year 2002 and 2004, when Karlsson, Loewenstein and Seppi’s (2009) study was conducted, people used either computers or telephones to monitor their portfolios and handle their assets. Our study focuses on a service available in an application, reached through a smart phone, which virtually every person carries at all time. We speculate that this fact might have changed the meaning of login activity as a variable to measure the ostrich effect. The high availability could have affected the act of logging in, making it a second level of preliminary information instead of a definitive act of information seeking. The ostrich effect today might rather be observed in the behavioural pattern of information avoidance after monitoring a portfolio. When realising a personal economic loss, it is possible no more information is acquired to handle the situation. This might be due to a low financial capacity and a shortage of time and energy to acquire information. If the login activity does not measure the ostrich effect in the same way today, this might be a reason why we find no indication of the ostrich effect in our sample.
Our second main finding is that we do not find any evidence of the disposition effect. The results rather show the opposite financial behaviour, namely a tendency to place more sales orders during the crash than after. Even if the regression does not show any distinct differences in financial behaviour, the statistics show an apparent increase in the number of sales orders during February 5th and 6th in particular. Although this is inconsistent with the disposition effect, speculations can be made about whether this behaviour is rational or not. The respondents included in this study have had their savings account for one year at the most, meaning they have at least two more years of saving left until they have reached their goals. Acting impulsive on media reports about fluctuations on the stock market and sell assets might therefore not be a rational behaviour for long-term savings. What we find in our results might not be the disposition effect, but nevertheless a bias that implicates bounded rational behaviour. In the long run, long-term savings investments are not usually affected by occasional fluctuations. In this case it might therefore be rational to keep funds that have lost value due to a turbulent stock market, until the fluctuations have settled.

On the contrary, a sign of the disposition effect may be shown in the lower frequency of sales orders placed the time after the crash, which are significantly lower than sales orders placed during the crash. Even though the market is continuously unstable and the index level is lower compared to the time before the crash, the number of sales orders have decreased after the market downturn. Since the OMXS30 Index is lower after the crash compared to before, the customers’ reference points, in other words the purchase price, should be higher than the current value of the funds. Hence, a lower number of placed sales orders after the crash indicates people are holding on to losing funds. However, in relation to long-term savings, this period is still short, and it could therefore be rational to desist selling losing funds. Moreover, this downturn concerned the whole stock market and not particular businesses alone, meaning all funds lose value and not only specific business funds. Thus, there should be few or none winning funds in the market, indicating the disposition effect might not get the same meaning in our study, as in previous research. These factors make the results somewhat ambiguous. It might signal a Homo Ignorans related behaviour, acting in compliance with the disposition effect; or advert a different bias of bounded rationality.

Furthermore, it might be relevant to discuss the value of money in the context of financial behaviour. Until recently, cash has been generally accepted as a concrete value of money, whereas money in an account is more abstract and difficult to relate to. It is possible however, that Sweden now has undergone both a paradigm and a generation shift. We argue that most people, at least in the younger generations, respect money in their accounts more than cash in their pockets. This is partly based on the increased demand for cashless payment solutions. The same reasoning leads us to think people might view their accounts differently depending on whether it is their ordinary bank account or a savings account. This is in line with Thaler’s (2016) and Airley’s (2017) reasoning about fungibility and emotions connected to money. Thaler (2016) argues that long-term savings are the most sacred form of accounts and there is a general reluctance towards spending money from a savings account, based on the theory of mental accounting. The nature of money might have changed as a part of the digitalisation, where the primary use of money has gone from cash to numbers in an account. Saving may also have a new meaning, from money under the mattress to investing in funds and stocks. If people, like Thaler (2016) describes it, consider their long-term savings accounts as sacred and in addition are unexperienced traders, it may make them more prone to act on impulse.
during a sudden stock market downturn. This impulse may be affected by the circumstances and individual characteristics. Some might put their heads in the sand and act passively, while others might become more risk-seeking and make short-term decisions for long-term savings. Thus, we argue the understanding of money might affect financial decision-making.

The concrete value of money might be difficult to understand and because the nature of money is ambiguous, it might also be difficult to realise when an investment is increasing or decreasing in value. People often prefer a reference point to be able to determine the value of a good or a service, which serves as a benchmark when making a purchase decision. When investing in an asset, people often refer to the purchase price as their reference point, meaning a gain or loss is determined based on this. Since Sparnavigator has only been active for 13 months, as of April 2018, the customers' savings goals cannot be older than this. No drastic increases in value of funds can be expected to occur in such a short time. The sudden market downturn in February 2018 might therefore mean the value of the investments has passed below the reference point. Based on Thaler's (2016) discussion about risk-aversion and risk-seeking behaviour, depending on the chance to break even, we suggest the respondents may be risk-averse. If they suspect the crash might imply they cannot break even, they do not fall for the risk-seeking behaviour of the disposition effect but sell their losing assets instead.

Moreover, the respondents in this study are mostly investing monthly instead of a one-time investment, where it is easier to distinguish gains from losses. The monthly savings plan might make it difficult to separate the own investment from “the house money”, i.e. the bank's money. When investing in long-term savings, the purchase price of the fund will be the reference point. If people expect a sudden market downturn, they might fear losing money from their sacred savings account and act impulsively on media reports. The confusion arising from the valuing of an investment might be a reason why our results show a sudden increase in placed sales orders during the market downturn. The respondents make short-term decisions for their long-term savings, which describes how the sales orders change in Sparnavigator during a sudden downturn in the stock market.

Our third main finding is that individual differences, based on the answers from the suitability assessment, does not seem to affect financial information seeking during a sudden downturn in the stock market. However, the insignificant difference in login activity between Homo Ignorans 1 and the others during the crash might indicate that our prediction about Homo Ignorans as more prone to deliberately avoid information might be correct. Homo Ignorans 1 distinguishes more from the others than Homo Ignorans 2, which implies the variable for the Homo Ignorans scale could be appropriate for the ostrich effect. It seems like the difference in behaviour is reflected in the number of “no”-answers and the self-assessed financial knowledge. The respondents with a lower self-assessed financial knowledge have a lower login activity on the margin than the others. Moreover, the difference during and after the crash is negligible, suggesting that the crash had an inconsiderable effect on the login activity. In conclusion, individual differences do not seem to affect financial information seeking.

The fourth main finding is that individual differences, based on the answers from the suitability assessment, does not seem to affect financial behaviour during a sudden downturn in the stock market. However, the results imply that the respondents categorised as Homo Ignorans 1 and Homo Ignorans 2 place less sales orders than the others, as we predicted. Even
if the results indicate there is no biased behaviour in accordance with the disposition effect, we might have observed a bounded rational behaviour since the respondents are making short-term decisions for their long-term savings. If this is the case, the respondents categorised as Homo Ignorans 1 in specific, but also Homo Ignorans 2, are acting more rational than the others, who are acting more impulsively. This is interesting, but presumably only by coincidence. Homo Ignorans’ resistance towards acquiring information and their low financial knowledge might have been helpful this time, resulting in a status quo situation where it might pay off acting passively. It is possible that people desist from either monitoring or reallocating their investments in the case of a stock market downturn, only because they do not have the capacity or financial knowledge to handle the situation optimally.

Furthermore, it is noticeable that for the disposition effect, Homo Ignorans 2 distinguishes more from the others than Homo Ignorans 1, as opposed to our findings for the ostrich effect. This might imply the suitability assessment is not an appropriate measurement to distinguish individual differences. However, the results could have been different if we had a larger sample. Still, speculations can be made about the respondents’ liability regarding their self-assessed financial knowledge and therefore also the categorisation. If people have been lying during the suitability assessment they have been categorised into the wrong group leading to an over or under estimation of the results. There may be several reasons for dishonest answers, besides from lying, overconfidence or pure ignorance might lead to three positive answers. This could mean the group of Homo Ignorans are underrepresented, which in turn leads to smaller differences between the groups than expected. In summary, individual differences do not seem to affect financial behaviour.

5.2 Study limitations

There are a few limitations with this study that should be acknowledged. Firstly, Sparnavigat orn as data source might not be appropriate to study the ostrich effect and the disposition effect for mainly two reasons. On the one hand, the application aims to provide a maintenance-free and simple savings service; hence people’s activity, both concerning logins and placed sales orders, cannot be expected to reach a particularly high level. Speculations about the target group is that Länsförsäkringar’s customers in general are neither active nor experienced investors and if they do trade, these services might be provided by other market actors, such as Avanza and Nordnet. This also implies that our sample may be biased since there might exist a self-selection based on the expectations of the application, thereby possibly attracting primarily financially inactive people. If so, people who act more in compliance with the effects are excluded which could result in an underestimation of the effects. On the other hand, the data only included information about the long-term savings, which complicated the analysis of both the ostrich effect and the disposition effect. Observing long-term savings might require a longer time period than only a few months. The short period covered in this study may be problematic since a person with a long-term savings goal cannot be expected to be particularly active during the first month of their saving. Despite this, it is surprising that we find no indications of neither the ostrich effect nor the disposition effect, or any distinguished individual differences.
Secondly, the suitability assessment that lays the foundation for the cohort resulted in a relatively small sample. This was due to the MiFID II directive and the MiFIR regulation, imposed January 3rd, 2018. Even though the sample made it possible to study the individual differences in behaviour, the small sample and the short period observed limits the possibilities to draw any generalised conclusions. Furthermore, the time period might be too short to observe any trends in the behavioural pattern, meaning deviations from normal activities may be difficult to discover.

Thirdly, there is a possibility of both lying and changing the answers in the suitability assessment in Sparnavigatorn. This opportunity presumably leads to a smaller group of respondents who answered "no" at least twice, thus a bigger share should have been categorised as Homo Ignorans. Since there is no way of knowing if the suitability assessment has been answered truthfully, there is no guarantee this is an optimal variable for a Homo Ignorans categorisation. Since it is obvious that “yes” is the correct answer to all these questions and everybody who answer “no” at least twice get an opportunity to change their answers, it is fair to assume that the categorisation might have turned out differently if the circumstances were different. Presumably, the group with more pronounced characteristics of Homo Ignorans would have been larger if we could have prevented lying and there was no option of changing answers. The small differences in our result might therefore be both underestimated and overestimated. The tendencies that are shown in our result suggest the Homo Ignorans group have a lower activity both concerning logins and sales orders, compared to the other group. If there is a risk that the other group contained respondents who by rights should have been categorised as Homo Ignorans, the differences between the groups may have been more distinguished.

Lastly, in earlier studies where the disposition effect has been examined the stock trading has been in focus. This study mainly concentrates on funds, why tendencies of the disposition effect might be more difficult to capture. Stocks in general requires a higher participation and engagement than funds, which are administrated by a professional investor. Sparnavigatorn is mainly concentrated to funds and the purpose is to ease the customers savings and reduce the required time spent. Therefore, the need for monitoring and reallocation is smaller for funds than for stocks, which in turn reduces the likelihood to observe the ostrich effect and the disposition effect. However, if the behavioural biases were to be observed in this study, it would have been a strong indicator that people behave in accordance with the two effects in real life.

5.3 Conclusions and implications

This thesis has presented an attempt to find evidence of the ostrich effect and the disposition effect, as well as individual differences' effect on these biases. The results show no significant indications of the effects, but rather a relatively constant login activity not affected by the stock market crash. Furthermore, they show a contradictory reaction to what the disposition effect suggests, meaning the respondents place more sales orders during the stock market downturn than the time before and after. The approach of this study deviates compared to previous research since it is based on a natural experiment. The benefit of this method is that it enables observing real life behaviour in relation to a stock market crash, while the
disadvantage is a different environment compared to where the ostrich effect and the disposition effect have been observed before. If this study would have found evidence for these effects, it would have proved that people are affected by behavioural biases. The results rather imply that further research needs to be done to either reject or confirm the existence of the ostrich effect and the disposition effect.

While we find no support for neither the ostrich effect nor the disposition effect, it leads us to discuss other potential biases that possibly could affect peoples' behaviour in a sudden market downturn. We predicted that initial and incomplete information, e.g. in media coverage, would lead to the ostrich effect where the respondents' stick their heads in the sand to avoid further information that might be negative. The results however, rather show that initial information resulted in an increased login activity. We speculate this might be a result of peer pressure and social transmission, closely related to the bandwagon effect. The lower number of placed sales orders that can be observed in the period after the crash could be a sign of the disposition effect. However, this does not explain the higher number of placed sales orders observed during the crash which contradicts our predictions. This financial behaviour may imply bounded rationality, closely related to misbehaviours, such as the need for a reference point, mental accounting, and the fungibility of money. The respondents may act impulsively due to a fear of losing personal assets, leading to an increased number of sales orders which in turn indicates a bounded rational behaviour regarding long-term savings.

Even though the results were not in line with what we predicted, they are still useful for both further research and for Länsförsäkringar to utilise. We managed to narrate people's real-life behaviour during a market downturn, implicating the respondents log in rather frequently regardless market fluctuations and seems to place more sales orders in the immediate vicinity of a crash. Länsförsäkringar can use the processed data from this study and hopefully have some new insights and knowledge about how their customers behave, especially through a behavioural economics perspective. More substantially they can use the correlation between the fluctuations on the market and the customers' financial information seeking and financial behaviour to advice and nudge them into a desired behavioural pattern. The results from this study show an increased number of placed sales orders during the first two days of the crash. Länsförsäkringar can use these results to get a wider apprehension of their customers' behavioural pattern. Depending on whether it is in Länförsäkringar's interest and if the behaviour is desirable, they can advise customers in other directions. Furthermore, it may be possible to segment the customers differently based on their self-assessed financial knowledge. This enables Länsförsäkringar to customise dissemination of information in Sparnavigatorn. Homo Ignorans oriented customers might demand additional, easy accessible information, compared to more experienced customers. Because Homo Ignorans is characterised as a person who deliberately avoid acquiring information, they need concise, unavoidable information, e.g. as push notifications in Sparnavigatorn. This might in turn increase the customers potential to make well informed decisions, beneficial for their personal economy. Thus, improvements in Sparnavigatorn might favour individuals' optimal choice.

For future research, it would be interesting to replicate this study with a bigger sample. It would also be interesting to examine how media coverage correlates with the stock market fluctuations and the login activity, as well as the sales orders. Karlsson, Loewenstein and Seppi (2009) argues that the media coverage is more frequent when the market is up, but we
claim the opposite. We encourage similar studies to examine if asymmetric media coverage exists and how it affects peoples' reactions in market fluctuations. In addition, further studies of the disposition effect with a more intense focus on the reference point could be conducted. Since previous studies have shown people have several reference points, it might be interesting to compare the purchase price and the previous market price to investigate whether this is true and if the reference point is floating to some extent. We expect the reference points are of great importance concerning the disposition effect and wish we could have examined this further in our study. Statistics of the purchase and sales price for each fund respectively, in relation to the stock market index, would enable a deeper analysis of underlying reasons for reallocations of investments. That being said, our aim was to examine how financial information seeking and financial behaviour change during a sudden stock market downturn. The study and the data material are unique and enabled us to present results of real life behaviour within a financial context and analyse whether individual differences affect decisions.
References


