



Herd Effect

Bachelor's Degree Final Project

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1. ABSTRACT

Financial markets are highly characterized by uncertainty, which means that on many occasions there are ups and downs in the markets, which cannot be explained by real economic variables. These ups and downs can be very prolonged, because a multitude of economic actors have made the same decision.

When investors make decisions because a multitude of people are doing so, they are letting themselves be influenced by the behaviour of others, based on the exchange of information between economic agents and not on real economic variables. This crowd behaviour is known as the herd effect. This paper analyses the herd effect and its presence in the financial markets.

2. INTRODUCTION

Many may wonder how financial markets can create an upward or downward trend without decisions being made based on an analysis of fundamental variables, economic variables or business variables. The financial system is increasingly characterized by uncertainty; this has led to the fact that currently more action is taken based on trends than on real market information (Miguel, 2011). Therefore, the study of investor behaviour is gaining importance in the world of finance, studying the processes involved when a person or group of people select, acquire or discard products, services, ideas or experiences to meet needs and desires (Solomon, 2017). Within the study of investors' behaviour, the imitating behaviour, also known as herd behaviour or herd effect, stands out (hereinafter, herd effect).

The herd effect is the phenomenon that defines an investor's behaviour as the decision that individuals make because a multitude of people are doing so. This decision isn't made by the exchange of information between individuals, but because they join the crowd, since the people who are part of their reference group have already made this decision. Thus, based on social pressure and reflecting the security of hiding in the crowd, knowing that if something fails, it is the fault of collective action and not their own (Ashraf et al, 2005).

The herd effect cannot be fully understood from a single perspective. The history of herd behaviour has been studied from two directly related perspectives, economic and

psychological. From the economic perspective, the factors causing the behaviour, the effects of the herd phenomenon and the problem of how to benefit from it are analysed. And from the psychological point of view, an attempt is made to respond to why it occurs and when people are motivated (Solomon, 2017).

Because of the decisions made by investors in financial markets without carrying out an analysis of fundamental variables, economic variables or business variables, the general purpose of this research is to check whether financial markets are affected by the herd effect, whether this herd behaviour is the cause of ups and downs in the markets and whether it can currently be observed and controlled.

Since the 1980s, the financial environment has been characterized by a marked tendency towards globalization (González and Armando, 2010). The benefits in the global financial system are undeniable but it also has certain disadvantages. Therefore, in recent decades we have come to question the classic economic theories, which explain that an investor's behaviour in decision-making is totally rational, thus qualifying the usual definition of market efficiency within a limited rational behaviour, since prices don't seem to be the only relevant information in the market (Vasile et al, 2011). This is how the study of the behaviour of economic agents came about, where, thanks to the awarding of the Nobel Prize in Economics to the Behavioural Economist Daniel Kahneman in 2002, the study of "behavioural economics" was disseminated and generalised.

The investigation of the herd effect will begin by analyzing the most relevant theories that have been carried out on the herd effect. Once the context has been entered after the introduction on the subject and the studies previously carried out, the research will carry out the study of the causes of the herd effect on investors, dividing the causes into two directly related perspectives; that of Neuroeconomics and Sociology.

Afterwards, three different moments will be analyzed where the herd effect on the financial markets can be observed, relating them to the causes previously analyzed and observing the consequences that derive from them. And finally we will analyse how to measure and control it.

3. STUDIES ON THE HERD EFFECT

3.1. Medical Model Theories

Among the irrational theories, the most relevant study that was carried out is that of Kelly and Gráda (2000), was the theory known as "Medical Model Theories". This theory relates the imitation of the behaviour of the crowd with a disease, hence the name. In this theory, to analyze the phenomenon of the herd effect, the authors focus on analyzing the social contagion that can be observed in the behaviour of the depositors of a New York bank, the Emigrant Industrial Savings Bank, during two banking panics that occurred in the years 1854 and 1857. It was observed that some of the deviation of the investors' panic and the withdrawal of their money could be predicted in both banking panics. This prediction could be made thanks to two factors, one factor was the size of the client portfolio and the other, the years of immigration to the US.

In conclusion, that both banking panics were due to the wave of immigration in the wake of the Irish famine, got some of the depositors to receive it as a result, the bank was going to have solvency problems, and these depositors are starting to spread the word. In effect, it caused a tendency to close their bank accounts. This led to the imitation of the behaviour of the crowd, which as a consequence, caused both banking panics.

With this theory Kelly and Gráda (2000) concluded that clearly the individual's behaviour isn't only personal, but that the information and opinion of others exercises power over his decision making.

3.2. Socionomic Theory

On the other hand, we find the most recent theory on the herd effect, the "Socionomic Theory", carried out by Parker and Prechter (2007). These authors differentiate the behaviour of an economic agent, according to the given situation, certainty or uncertainty, which is determined respectively according to the economic and financial context.

They argue that under conditions of certainty, people act consciously, but under conditions of uncertainty, they tend to unconsciously follow the crowd, a herd effect.

And as I said, this relates directly to the context in which they find themselves. In the economic context there is a situation of certainty, and in the financial context there is a situation of uncertainty.

Prechter and Parker (2007) determine that there is a problem in the neoclassical theories, since they consider that prices are determined in a rational way, without taking into account human behaviour. Both authors solve it with the "Socionomic theory", explaining that the economic and financial market cannot be directed by the same model, differentiating thus, that the economic model is the one in which goods and services are exchanged, and that the financial market is the one in which investments and speculation are made.

As for the economic market model, both authors explain that producers and consumers make their decisions rationally, because goods and services are governed by the law of supply and demand, this relationship achieves balance in the market, making prices stable. In other words, when individuals have a situation of certainty, they make their decisions based on rational choice.

While in the financial market model, the authors explain that the law of supply and demand doesn't govern the price in that market, since, for example, the price of shares will never be as stable as that of a good, a car for example. Therefore, financial markets are fundamentally based on uncertainty. This uncertainty produces uncertainty in decision making, and that is when in decision making, they get carried away by the crowd, a herd effect. Prechter and Parker (2007) argue that the herd effect takes place because investors are secure in following the crowd.

The Socionomic theory adds sociological and psychological aspects to the decision-making process, which will be further explained in the next point of the research.

Prechter and Parker (2007) argue that social trends are unconsciously determined by endogenous mechanisms and that these trends are what create the evolution of prices in the financial market.

For all these reasons, the Socionomic theory concludes that human behaviour in decision making cannot be explained solely by reason, nor solely by the herd effect. Therefore Prechter and Parker Prechter and Parker (2007) propose the separation of finance and economics, due to the differences explained above between both markets.

4. CAUSES OF THE HERD EFFECT.

4.1. From the perspective of Neuroeconomics.

The study of the nervous system is based on neuroscience, which helps us to understand the functioning of the brain in an endogenous way and its specific field, trying to explain decision making from the field of study that concerns us (Bermejo, 2014), in this case, as our economic objective, we will talk about Neuroscience.

Neuroeconomics is the science that studies what happens in the human brain during decision making, and the relationship between emotions and the behaviour of economic agents (Maldonado and Velasco, 2007), especially with regard to how financial decisions are made.

Numerous treatises on economics have been written throughout history and all of them explain it as an exact, rational and explicable science through classical mathematics. According to this traditional view, prices are determined by the balance between supply and demand in a market that functions efficiently. The current crisis and others that have existed, question the efficiency of that market and force to assume the significant differences between the theoretical and real economy (Bermejo et al, 2011). However, the development of neuroscience has made it possible, through functional magnetic resonance, to study the brain structures involved in economic decision-making, which has led to the emergence of neuroeconomics. Pedro Bermejo suggests that "neurologists should define our role in this new science that is emerging and that is gaining more and more followers and the development of increasingly powerful brain imaging techniques predict further growth of this discipline in the coming years".

Within the studies of Neuroeconomics we can understand the neurological causes that provoke the herd effect in the investment and stock market behaviour. The herd effect, as we have already explained, is the decision that individuals make because a multitude of people are doing it (Ashraf et al, 2005). Although the brain mechanisms involved in these social behaviours aren't clear, Pedro Bermejo et al suggest that rational and emotional decisions have their origin in different regions of the brain. Focusing on emotional decisions, the brain is affected by:

- 1. The cerebral amygdala.** Is in charge of recognizing and responding to threatening or dangerous stimuli, so there is a rapid, almost automatic, action when we feel pain, fear, distress, or any other alarming sensation. This creates an emotional state, which causes decisions to be made differently from the way we would make them if we were not emotionally affected. This blocks the prefrontal cortex (which involves rational decisions).

- 2. Brain insulin.** Is activated when we make decisions that aren't socially accepted, such as a news item from an entity, which is responsible for a large impact on the environment. Here the rational investor will take advantage of the fall in price to benefit from the rise in price when everything stabilizes. But many of them avoid this situation.

- 3. Tryptophan and Serotonin.** Serotonin seems to regulate the acquisition of social behaviour. This substance is derived from a dietary amino acid, tryptophan, and when it is removed from the diet, serotonin levels in the brain drop. In subjects with poor tryptophan diets, more antisocial behaviour and increased self-interest versus group interest have been found. This implies that people with low serotonin levels are less influenced by the herd effect.

- 4. The mirror neurons.** They are a type of neurons that are activated when an action is executed and when we observe that action being executed or have a mental representation of it, leading us to imitate behaviours, actions or decisions. For this reason, they were assigned as a surname "mirror", because in some way, they reflect what is seen (Cuevas, 2019). Thus, deducing what others think, feel or do is possible thanks to their activation, since they specialize in understanding not only the behaviour of others but also how they feel.

«We are social creatures. Our nature depends on understanding the actions, intentions and emotions of others. Mirror neurons allow us to understand the minds of others, not only through conceptual reasoning but through direct simulation. By feeling, not by thinking"».

-Giacomo Rizzolatti-

ILUSTRACIÓN 1. SCHEME OF NEUROECONOMIC CAUSES



SOURCE: OWN ELABORATION

The Neuroeconomic point of view, as Pedro Bermejo suggests, the decisions that a person can make in life aren't always rational, there are emotional decisions. With this point of research, we can observe that our brain reacts to stimuli caused as we have seen, by the recognition and response to threatening or dangerous stimuli (Cerebral amygdala), by avoiding decisions not socially accepted (Cerebral insulin), by imitating

movements, behaviours and decisions of others (mirror neurons), and even we can be affected by excess serotonin in the system (Tryptophan and Serotonin). These four reasons for emotional decisions are relevant to this research work, as they are causes that help explain the herd effect. Although to continue with the investigation, within the four causes that we have seen regarding the decisions provoked by the emotion, we are going to deepen the one in charge of the recognition and the response to threatening or dangerous stimuli, the cerebral amygdala.

4.2. From the perspective of Sociology.

Social psychology attempts to solve practical problems that arise in social relationships. It is the science that studies or investigates conscious processes and states, as well as their origins and effects (Rohracher, 1967).

As psychology expert Oscar Castellero explains, people are social beings and live in society, so by being in contact with each other, with or without intention, we transmit our intentions, attitudes, thoughts etc... What is known as social influence?

The study of social influence is found since ancient times, great philosophers like Plato or Aristotle made social theories judging human behaviours, due to the repetition of behaviours and attitudes among people who formed that society.

“In the individual psychic life, it always appears integrated, effectively, <<the other>>, as model, object, auxiliary or adversary, and in this way, the individual psychology is at the same time and from the beginning, social psychology, in a wide sense, but fully justified”

- Sigmund Freud -

Herd behaviour in the economy can be better understood thanks to social psychology, in particular mass psychology. Mass psychology, points out that people follow their individual behaviour, but when there is more emotion and personal suggestibility, impulses emerge that are determined by social behaviour (Munné, 1971).

“Mass psychology is that which tries to explain the sociological phenomenon whose unity is given by the fact that a plurality of people are in such interaction that they can react or react in a more or less homogeneous and simultaneous way, to a common

stimulus or according to a shared interest, without getting organized” - Frederic Munné-

Therefore Sociology explains, how the herd effect is reached from the point of view of social psychology, it is caused by a certain process of social influence. Depending on the reason, social influence can be divided into two large groups (Deutsch and Gerard, 1955).

On the one hand, we find the normative social influence. This process occurs when a person imitates a majority by receiving social approval or avoiding rejection. Thus, they conform to what they have decided, and may not be convinced of the decision they have made (Solomon, 2017). This influence is characterized by the conformism that the economic agent carries out. This conformism isn't an automatic process; there are many factors that create this type of behaviour. Among them are (Deutsch and Gerard, 1955):

- 1. Cultural constraints.** There are cultures that are more focused on individualism and others more on collective well-being. For example, the United States in the 1960s reflected a rejection of conformity and an approach to individualism, and others, such as Japanese society, focused more on the collective welfare and group loyalty over individual needs. So in the latter, there will be a cultural pressure, which will lead to make a decision based on conformism, imitating each other.
- 2. Fear of rejection/integration into the group.** The investor believes that by making the same decision as his reference group he will be more integrated, or else he will be rejected.
- 3. Commitment.** The more you value belonging to a group and the more you dedicate yourself to it, the more you will let go of the rest.
- 4. Unanimity, size and knowledge of the group.** The more power, the more people and prestige, the more influence will be exerted on a person, simply by how many or who they are, thus settling for what they have decided and their imitating actions or behaviour.

On the other hand, the social influence of information can be observed. This process occurs simply because the person doesn't know what response to give in a decision, which leads him or her to make the decision to act according to another person or a group of people, considering that their behaviour is evidence of the correct way to act (Solomon, 2017).

This social influence is characterized by reliability. Trusting that others are a valuable source of information. The most relevant motivational factors for the social influence of information are (Deutsch and Gerard, 1955):

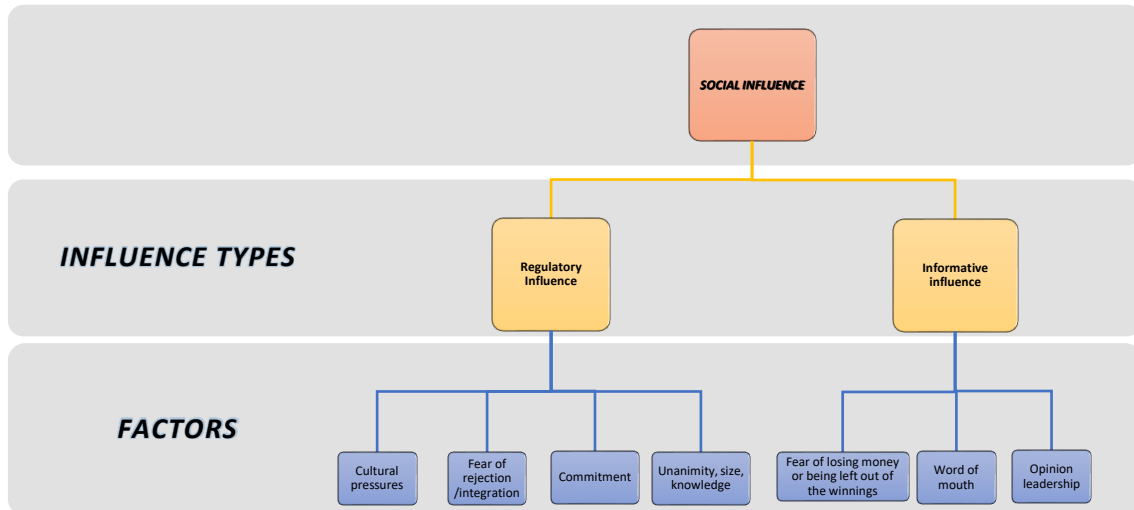
- 1. The fear of being left out of the profits or the fear of suffering losses.** The fear and euphoria that comes with a news story, for example, causes many of the economic agents to make a series of decisions. Positive news could lead to an excessive rise in prices, or conversely, very bad news could lead to a sudden and disproportionate fall in prices. The large decreases and increases in a very short time are explained by the dragging effect, because the economic agent thinks that he will not be "the only one who loses" or "the only one who doesn't win". He really has no real information to make that decision, so his decision is made by simple social push.
- 2. Word of mouth.** Uncertainty about the purchase or sale of a financial product is reduced by obtaining information about the approval of others who have made such a decision. In other words, you can let yourself be carried away by what you hear repeatedly that most people are doing, when in fact there is no real information to confirm any benefit from making that decision. As far as stock market or financial information is concerned, this transmission of information between people can be very fast, which can have a great impact on the economy. It should also be taken into account that due to risk aversion, economic agents take more account of negative word-of-mouth communication than positive comments. For example, when an investor makes the decision to invest in a new product, he is more likely to direct his attention to negative information than to positive information and to comment on his experience to others.

3. Opinion leadership. When there is full confidence in the opinion of a person considered to be an expert in the knowledge of a specific subject. These people are considered opinion leaders and often have a great influence on the attitudes and behaviour of others. In the world of finance, opinion leaders are the first to buy financial products, so they take most of the risk and this leads to less uncertainty for the rest of the economic agents, or on the contrary, the first to sell, in most cases causing a herd effect.

For example, there are magazines that are leaders in economic opinion, which exercise great influence on economic agents. Some of them are, Forbes magazine, which is one of the most recognized in the world of finance and business worldwide, Fortune, which is also known worldwide, Harvard Business Review, which is consulted by professionals, researchers and academics and nationally we also find the magazine Expansion...

Although both are social influences that an individual receives in order to make a decision, we can clearly observe on the one hand, how the social normative influence responds to questions such as: Which option is better according to my principles or my culture, if I make the same decision as them, will I feel like one more, if I don't make it, will they reject me, etc. On the other hand, the informative social influence responds to questions such as: Will I be the only one who loses? Am I going to be the only one who doesn't win, if everybody does it? Should I do what a person specialized in the subject says?

ILLUSTRATION 2 TYPES OF SOCIAL INFLUENCE

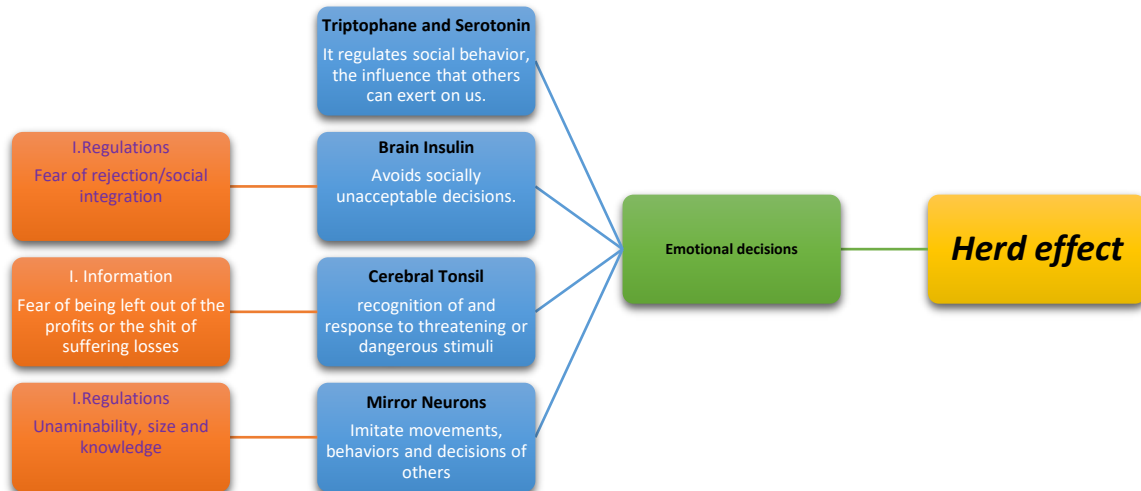


SOURCE: OWN ELABORATION.

The sociological point of view shows the existence of two kinds of social influences relevant to this research, in order to better understand the factors that originate the herd effect. Despite the influence that both have on a person's decision making, the informative social influence is the most relevant for understanding the herd effect on finances. Therefore, from here on, we will continue to focus on this research topic by referring to the latter social influence.

4.3. Direct relationship between two perspectives.

ILLUSTRATION 3. HERD EFFECT CAUSES



SOURCE: OWN ELABORATION.

The own elaboration of this scheme, shows us the direct relation between the sociological and neurological perspective of the herd effect. For example, as we can see, cerebral insulin was the factor of neurology that had previously specified that it was "activated" at the time of avoiding decisions that were not socially accepted, for this reason I have related it directly to one of the factors of normative influence, the "Fear of rejection/Social integration" factor. Clearly they are closely linked, if one is given, the other will be given at the same time, and hence an emotional decision will arise. When this same process is repeated many times, the herd effect is produced, which translated into financial terms, can have serious consequences, as we will see later on.

To explain these consequences and how they were reached later, the research will focus exclusively on the informative social influence, which is given for fear of being left out of the profits or for fear of suffering losses. This influence, as can be seen in the diagram, will be related at all times to the cerebral amygdala, which recognizes and

responds to this fear, and as we will see, totally emotional decisions will be made, which have originated at many times in the history of the economy serious crises, some of which we will analyze later.

5. THE HERD EFFECT ON THE FINANCIAL MARKETS

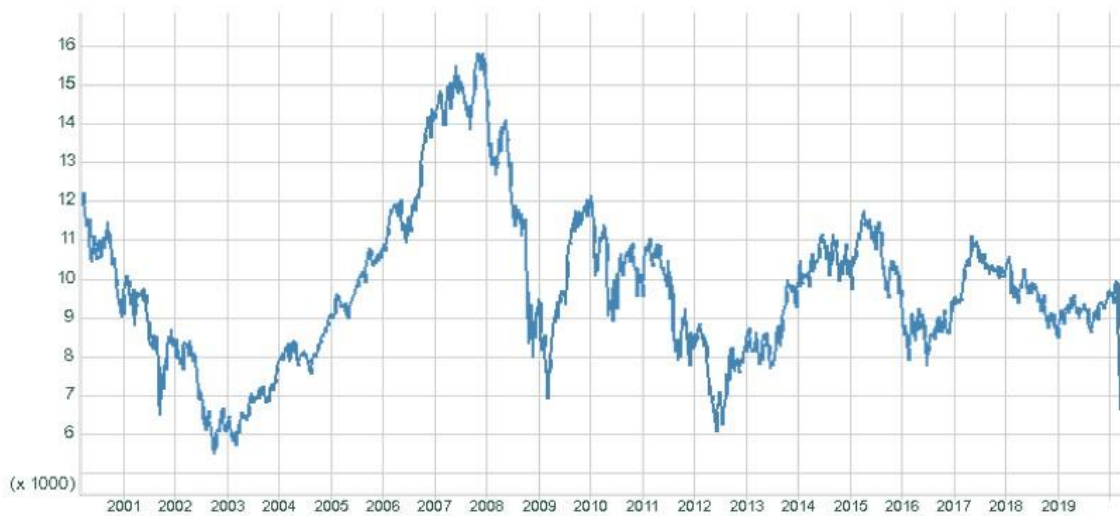
5.1. 2008 Financial Crisis.

As José Antonio Álvarez, Chief Financial Officer of Banco Santander describes, financial crises are often the result of imbalances that accumulate until they become unsustainable. The reason attributed to the beginning of the crisis acts on a potentially unstable situation. Financial markets are prone to violent and therefore highly volatile changes, if the imbalance reached is significant.

Often, those who invest in stock markets find it very difficult, or too costly, to get the information needed for basic market analysis. Therefore, observing and imitating the decisions of other investors becomes the easiest and cheapest method of making decisions (Devenow and Welch, 1996). Valuations depend on yield expectations, which are susceptible to sudden changes. The essential characteristic of financial crises is panic, which encourages emotional reactions and herd behaviour (Huang and Salmon, 2004).

To explain the herd effect in financial crises, the research will focus on explaining this effect in the 2008 financial crisis in Spain, analysing the herd effect in the stock market index that refers to the Spanish area, the Ibex 35. The Ibex 35 records all the movements of its 35 most liquid and actively traded shares (Aiken, 2005).

GRAPH 1. IBEX35 IN THE LAST 20 YEARS.



SOURCE: IBEX 35 Index Stocks Prices- Investing.com

To be able to understand the financial crisis after all the consultations to BBC news the world and articles of economists like Donato Fernandez Navarrete (2016), can be summarized as follows:

On 1 January 1999, the Euro was introduced in Spain, causing interest rates to fall, and the housing sector saw a perfect opportunity for financing. In 2002 the pace of construction in Spain began to shoot up, and there was also a labour reform, where labour rights were reduced, to make it more attractive for employers to hire more staff and thanks to this unemployment could be reduced. It was achieved that the demand for labour in the construction industry will shoot up.

This resulted in higher income and savings for economic agents, both companies and families observed a clear economic expansion. The euphoria for buying flats was unleashed and as the demand for housing shot up, the price of flats shot up.

In 2005 Spain was already building more homes than France, Germany and Italy combined. Thanks to the engine of construction, our economy continued to expand. The price of housing continued to rise, but the Spanish were still euphoric about the growing economic situation. According to data from the I.N.E., unemployment had fallen to a record high of 9.2%. But while the price of housing had risen, wages were frozen. At that time, there was only one way to buy a flat, a bank loan. As the economy was growing, the banks began to lower the requirements for granting loans and the

term was extended to 40 years so that the payments could be assumed. If the time came when you couldn't pay it, you only had to sell the flat, and as the prices "only went up", you had the hope of being able to pay the mortgage and even make a profit. The euphoria was such that we Spaniards had gone into debt because others were doing the same, at that time it seemed normal (Bermejo and Garcia, 2019). With this, we could say that we were living beyond our means, which produced such a high demand for construction and such a high level of indebtedness on the part of companies, families, entities... this is what is known as the 2008 real estate bubble.

In mid-2007, fear began to arrive, there began to be a series of layoffs and the debts of public administrations, companies, families and savings banks were enormous, as well as those of the savings banks to other financial institutions. It was thought that growth had led to wealth, but the reality was that debt was causing growth, and from there growth had unleashed wealth.

In September 2007, the financial crisis in the United States broke out after the collapse of the global financial services company Lehman Brothers. This crisis quickly spread around the world, closing international financial markets... and in 2008 it reached Spain, Spanish banks stopped lending money due to liquidity problems, and the lack of credit in the brick sector, was what made the real estate bubble explode.

Whole process of the 2008 financial crisis in Spain is clearly reflected in the Ibex 35, where we can see the herd effect carried out by investors both by euphoria and panic, making it clear how variable and volatile the stock market becomes due to the herd effect.

GRAPH 2. IBEX35 IN THE LAST 20 YEARS.



SOURCE: OWN ELABORATION.

In graph 2, we can see the moments in which the herd effect is perceived by investors, as the previous events explained in the 2008 financial crisis occur.

In 2002, the construction boom in the Spanish economy created economic hope, which translated into the stock market is pure speculation. This speculation on the part of the investors, makes the price of the shares begin to rise. The demand for real estate, continues to rise, unemployment decreases and optimism appears due to the economic situation that was taking place. Investors are taking advantage of the stock market, a benefit that some were already having. That, attracts the attention of the rest, which as you can see, many investors choose to observe and imitate the decisions of other investors, as it becomes the easiest and cheapest method to make decisions (Devenow and Welch, 1996). This optimism is beginning to increase, with the help of the banks, which, being in economic growth, began to lower their demands. Everyone could buy what they wanted, the banks rarely refused to grant a loan. So the herd effect is growing even faster, economic agents think that they aren't going to be "the only ones not to win". News begins and word of mouth that "it's time to invest", "the economy will only continue to grow", "the Spanish economy is expanding" ...all this is spreading among investors, this leads to companies, families, public administrations, savings banks and entities begin to get into debt without control, thus growing what we

know as the real estate bubble. The euphoria appears in investors, which is reflected in the Ibex 35, where we find the highest peak in mid-2007, as a result of the high expectations found in the financial market. Hence, in the Ibex 35 speculative investments grew disproportionately from 2002 to 2007.

At the end of 2007, unemployment began to rise, and the debts of public administrations, companies, families and savings banks were enormous, as well as those of the savings banks to other financial institutions. With all this, anxiety began to grow among investors, with the opposite effect that in 2002, the Ibex 35 began to fall. When the real estate bubble burst in 2008, investment speculation disappeared and we can see how volatile and vulnerable the financial market is to the effect of the investors' herds, causing the stock market to fall in a short time and in an abrupt manner (Devenow and Welch, 1996).

With all this, it is clear that investors are highly sensitive to their emotions, so their decisions aren't entirely rational (Huang and Salmon, 2004). With the beginning of the economic expansion in 2002, we can see the increase in hope of economic investors, optimism, and we reach euphoria, which is one of the most key moments of the herd effect, since with it we can see in the graph the increase of the Ibex in an excessive way; and with the beginning of the economic recession at the end of 2007, we can see that uncertainty begins, anxiety is created in the economic agents, fear and in the case of this crisis, panic, with the rapid consequences in the graph of the Ibex 35, the sudden and disproportionate fall of the market.

It is the herd effect that intensifies stock market volatility (Huang, S. and M. Salmon, 2004). The degree of emotion intensifies or reduces investors' subjective assessments, which marks the intensity of the effect, and therefore that of stock market volatility (Devenow and Welch, 1996).

"Markets don't always react rationally or as neoliberal or neoclassical theory says they do. Today they are down, yesterday they were up, the day after tomorrow they will be down again. Who knows? That is why I don't think we should be guided by what happens one day but by a longer term," said economist Alan Cibils.

5.2. Unexpected Notice.

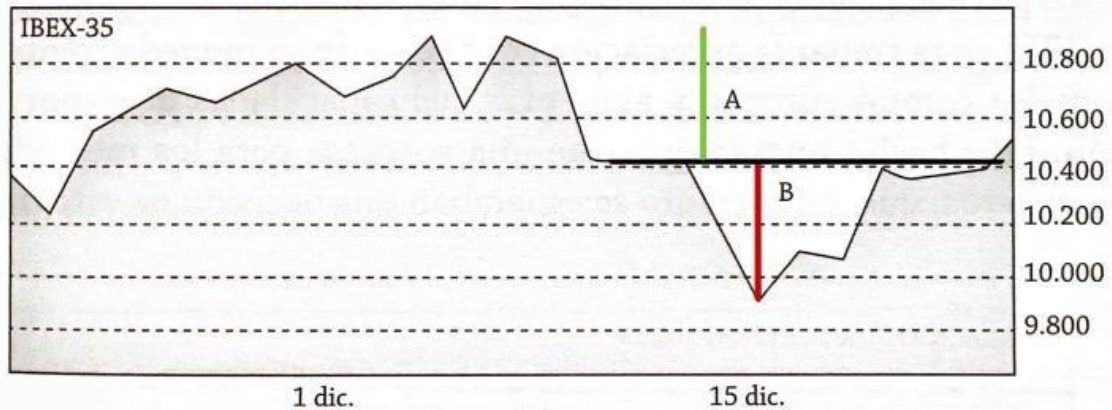
In order to explain the herd effect in the face of a news story, the investigation will focus on explaining the herd effect in the face of an unexpected negative news story, exactly the one due to the decrease in oil prices, which was unexpectedly decided by Saudi Arabia. To this end, the herd effect on the stock market index referring to Spain, the Ibex 35, will be analysed. The Ibex 35 records all the movements of its 35 most liquid and most actively traded shares (Aiken, 2005).

In order to understand how the event occurred, a summary of what happened thanks to the report on the collapse of oil prices by Mariano Marzo (2015) would be:

During 2014 the oil market was characterized by an increase in supply. This increase took place mostly outside OPEC (Organization of Petroleum Exporting Countries), particularly in the USA, thanks to the fracking technique, which was a new extraction technique using hydraulic fracturing. Saudi Arabia was traditionally the "swing producer" of the cartel, the maximum power in this sector, due to its surplus production capacity, allowing it to increase and reduce the supply of this resource with the aim of stabilising prices at a given time. So that this US method would not make it lose its world leadership in the oil sector, it decided to lower the price of oil in order to quickly stop the competition from the oil trade, as this technique required large capital investments and could only be developed if oil was sold at a high price. This decision was taken in December 2014, which led to a large drop in the financial markets. Some countries, such as Russia or Venezuela, came very close to bankruptcy.

This negative news for investors is clearly reflected in the Ibex 35, where we can observe the herd effect that investors carry out, showing again how variable and volatile the stock market becomes due to the herd effect.

GRAPH 3. IBEX35 December 2014



SOURCE: PEDRO BERMEJO AND LUIS GARCÍA, 2019. IBEX 35 DROP AFTER SAUDI ARABIA'S OIL PRICE DROP IN DECEMBER 2014.

The sharp drop in the stock market index after the Saudi Arabian decision to lower the price of oil can be divided into two parts, part A and part B, shown in the graph. Part A, marked by a green line on the graph, represents what actually affects the decline in oil prices to the value of assets, the actual loss of value. Part B, is the potential drop that causes investors' behaviour, is the overreaction of investors due to the loss of confidence, it keeps the index falling and causes fear in investors and everyone decides that the best thing is to disinvest. Thinking that whoever has already sold, has lost less, leads the rest to think that this is a good decision, and behaviours are imitated. This drop, marked in the graph with a red line further down, is the one that in the long run is usually recovered in the stock market, since due to the over-action, it is nothing more than an excess of drop over the index. So the herd effect, will cause a loss that is visually real at the time, but can be categorized as a loss "unreal", because it will be recoverable, to the extent that truly real, the point A. It should be noted that this over-action has caused large losses for many investors (Bermejo and Garcia, 2019).

5.3. Covid-19

The herd effect in the financial markets today can be seen due to the health crisis, produced by the already known as Covid-19.

In order to understand the herd effect caused by this crisis, we will first analyse how this global health crisis came about.

The summary of what happened thanks to the information provided by newspapers such as BBC el mundo, el Pais and Infobae would be:

The Chinese city of Wuhan was the epicentre of the world's declared crisis. In December 2019, cases of pneumonia of unknown cause began to be diagnosed in Wuhan. In January the World Health Organization (WHO) confirmed that it is a new virus, called Covid-19 or Coronavirus. In Spain the first case occurred on February 1st. The number of cases was increasing, reaching approximately 1500 cases at the beginning of March. Due to the great spread of the virus, the Spanish government on March 14 declared a state of alarm for the management of the health crisis situation caused by Covid-19. In the United States, the first case of contagion occurred on January 21, and at first the spread was slower. On March 19, the U.S. State Department only advised citizens to avoid international travel. A few days later, the contagion began to spread, and the Federal Emergency Management Agency (FEMA) told the U.S. Army Corps of Engineers (USACE) that they immediately planned to build hospitals and intensive care units. By March 22, the United States had tripled its number of infections, and four days later, it became the country with the most cases of Covid-19 in the world, surpassing China.

This led to a global collapse in the financial markets, which began in February during the beginning of the global spread of the pandemic (Hugo Gutierrez, Ignacio Fariza, 2020). In order to better understand the herd effect on the financial market caused by the beginning of this current health crisis, we will now analyse the great initial impact on the Ibex-35 index, which records all the movements of its 35 most liquid and actively traded shares, and on the Dow Jones index, which reflects the behaviour of the share price of the 30 oldest and most potential industrial companies in the United States

GRAPH 4. IBEX35 IN THE LAST 6 MONTHS



SOURCE: IBEX 35 INDEX STOCKS PRICES- INVESTING.COM (2020)

GRAPH 5. IBEX35 IN THE LAST 6 MONTHS



Fuente: Dow Jones Industrial Average (DJIA) Index – Investing.com (2020)

In both graphs we see an almost identical evolution, due to the global impact of the epidemic. They clearly show the moments when the herd effect is perceived by investors. Both indices show stability until February, the Ibex 35 was between 9,500 basic points and the Dow Jones between 28,500. But, with the arrival of the first cases of contagion in February, both in Spain and the United States, the index begins to fall. The number of cases of contagion increases and investors' fears are felt, so the fall doesn't stop and the index continues to fall, standing at 7,436 and 25,018 points respectively in less than a month. Until this fall, shown in both graphs as the rest of the graph caused by the feeling of fear that investors suffer and represented with a green line, it is considered the part A of the herd effect, where we would talk about what really affects the decrease in the value of assets caused by the arrival of the pandemic, the real loss. But, the measures that both governments are starting to take make the part B of the graph visible, shown in both graphs as the rest of the index caused by the feeling of panic that investors suffer and represented with a the purple line. This part represents the potential decrease that originates the behavior of investors, it is the part of overreaction of investors due to the total loss of confidence, leading all investors to a wave of disinvestment, seeing this as the best decision. In the Ibex we find the peak of the break on March 16th, the biggest drop in the history of the Ibex-35, where it reached 6,107 points, two days after the Spanish State of Alarm was declared on March 14th, due to the situation of the pandemic in the country, and the Dow Jones, reached its minimum on March 23rd with 18. 591 points, after it was announced that the number of infections had tripled, this is the biggest daily decrease in percentage points since the 1987 crash. a The thought that those who have already sold, have lost less, leads the rest to think that this is a good decision, and they imitate behaviour.

However, we observe that it is an overreaction, since in a very short time we can observe a new increase of both indices, placing them again in the lower limit of part A. The Ibex 35 is once again at around 7,436 basis points and the Dow Jones index at around 25,018.

The flock effect shows us how it causes a loss that is visually real at the time, but can be categorized as an "unreal" loss, because it will be recoverable, to the extent that it is truly real, point A. It should be noted that this over-action has caused large losses for many investors (Pedro and García, 2019).

6. MEASURING THE HERD.

So far we have analyzed the causes of the herd effect on investors and its effect on the financial markets, focusing on the most relevant factors, which are fear and euphoria. How could they be measured in the financial markets? There are various indicators, which analyse market sentiment, among which the following stand out Fear and Greed index and Investor Sentiment Survey.

6.1. Fear and Greed Index

It is an index produced by CNN money, the economic part of the prestigious American news network CNN. Its objective is to measure the degree of greed or fear at a given moment. Through the analysis of the sentiment of seven indicators we will obtain a single market sentiment index, the fear and greed index. The results are shown on a scale from 0 to 100. Panic and euphoria are the two extremes of market sentiment, so the number zero on the scale will represent panic and the number one hundred euphoria, so 50 will be a neutral position.

ILLUSTRATION 4. INDEX OF FEAR AND GREED



SOURCE: CNN MONEY. 17 APRIL 2020.

This illustration shows the representation of the fear and greed index as it appears. The more to the left, the closer to zero, the more fear, and the more to the right, the closer to 100, the more euphoria. Moreover, thanks to the data on the right of this index, we

can observe its evolution, being able to buy the index of fear and greed today, with that of a year ago, a month ago and a week ago. The seven indicators to form it are:

1. **Momentum of actions.** This is the average performance S&P 500 index over the last 125 trading days.
2. **Strong stock price.** This is the number of shares with the greatest ups and downs during the last 52 weeks on the New York Stock Exchange (NYSE).
3. **Broadening of the share price.** Volume of shares up versus volume of shares down. The McClellan Volume Summation Index is used as a reference.
4. **Put and Call options.** This is the Put/Call ratio, which compares the trading volume of bullish options (Call) to the trading volume of bearish options (Put).
5. **Junk bonds.** This is the difference between the yields of high grade bonds and those classified as "junk bonds".
6. **Market volatility.** This is the index that measures the volatility of the markets. The VIX index of volatility is taken as a reference.
7. **Demand for risk-free assets.** Yield differential between assets with risk, such as stocks, and assets without risk, such as Treasury Bonds.

This index gives us a "clue" of situations of maximum effusiveness and maximum panic. Taking into account this index, investors could be saved from emotional exaggerations, thus slowing down the herd effect. The point is to see rationally that extreme fear is a sign that most investors are very worried, which can lead everyone to make an emotional decision, and can create the herd effect in the financial markets. The herd effect, in this situation can lead to a sudden drop in the value of financial items and it is better to buy than to react like the majority. When investors are getting greedy, it means that the market has made a correction.

6.2. Investor Sentiment Survey

It is a survey conducted every week by the American Association of Individuals (AALL), a non-profit association whose sole purpose is to help investors assess the market situation. The AALL, publishes every week, the results of the well-known survey "AAll Investor Sentiment Survey", whose question is always:

Do you think the direction of the market in the coming months will be up, unchanged or down?

The results of the day 15/04/2020 were:

ILLUSTRATION 5. INVESTOR SENTIMENT SURVEY 15 APRIL 2020

Resultados de la encuesta para el fin de semana 15/04/2020

Los datos representan la dirección que los miembros sienten que será el mercado de valores en los próximos 6 meses.



SOURCE: AAll

And then a brief summary of the situation is shown, since this same question has a history, that is, it is formulated every week, and thus the results are compared with its historical average.

AAll's opinion, taking into account that this date corresponds to the health crisis discussed in the previous point was: "Neutral sentiment rose above 20% for the first time since early March" and "Bullish sentiment, expectations that stock prices will increase in the next six months, fell 1.7 percentage points, optimism is below its historical average of 38%, for the sixth consecutive time".

This survey provides us with the sentiment of most investors, so you can anticipate what may happen in the market due to excessive optimism or excessive fear.

A fall in optimism from one extreme may be a sign of selling, but the current level of pessimism may not be enough pessimism to favour buying, that's when we see the herd effect that optimism has produced, it does what the crowd does, simply relying on the movements of others.

The key is to understand the market cycle that we are in, so that we can understand whether we are overbuying or overselling in the market. A bullish market isn't the same as a bearish market. Extreme levels can vary depending on whether we are in a bullish or bearish market (Sanchez, 2019).

7. Conclusion

The research that has been carried out, has consisted of an analysis of the herd effect to understand how the volatility of the financial markets isn't always conditioned to a totally rational behaviour, where the investor uses to take his observable variable decisions.

In 2002 this phenomenon gained prominence with the awarding of the Nobel Prize in Economics to behavioural economist Daniel Kahneman, who disseminated and generalized the study of "behavioural economics".

Two of the most relevant theories on the study of this phenomenon, known as "Medical model Theories", where Kelly and Grada concluded that the investor's behaviour isn't only personal, but also the information and opinion that others exercise on their

decision making; and the most recent theory "Socionomic", where Parker and Prechter conclude, that human behaviour in decision making cannot be explained solely by reason, nor solely by the herd effect, proposing the separation of finance and economy, where in the economic market, prices are stable due to supply and demand and as there is no uncertainty the decisions are totally rational and the herd effect doesn't appear in any case and on the contrary, in the financial market, which is always loaded with uncertainty, it is when uncertainty is produced in decision making, letting itself be carried away by the crowd, that the herd effect is found.

The most frequent reasons that explain the herd effect in the financial markets are news, both positive and negative, making totally emotional decisions, without analyzing real economic data. In other words, a decision was made due to sociological and neurological causes, which go hand in hand. As for the sociological level, the news creates fear of being left out of the profits or fear of suffering losses, so the investor doesn't know what answer to give in a decision after this news and is confident that the decision taken by the rest of the investors will be the correct one, this is known as informative social influence. At the moment that the decision of the rest is trusted, the investor is carrying out a recognition of what is happening, acting in a fast and almost automatic way controlled by the cerebral amygdala, that is to say taking emotional decisions, for that reason they are considered irrational decisions. These decisions are different from the ones he would make if he were not emotionally affected, that is, if it were not for the investor's feeling, the decisions would be based on real data, thus being considered as rational decisions.

The analysis of the financial crisis of 2008, the unexpected news of the decision to lower the price of oil by Saudi Arabia and the current health crisis, allows us to conclude that the study of the effect of the herd on the financial markets, since it isn't real data but a market sentiment, is as complex as it is useful, since it can make us understand the great impacts that have occurred, are occurring and may occur again in the world economy. Therefore, it can be confirmed that financial markets are continuously affected by the herd effect, the most relevant case being the current health crisis that is economically over affecting all financial markets.

Thanks to the graphs and the facts of the events, we can interpret, that the herd effect isn't the cause of the ups and downs in the financial markets, but that this phenomenon is a trend-setter, that is, it produces an excess of effect in the financial markets.

Therefore, it is always observed that after a large fall in a stock market index, the herd effect has created an excessive fall, due to the overreaction. In other words, the herd effect has created a loss, which visually was real, but in reality should not have occurred, since if this overreaction is to be reversed, it will soon be recovered.

The herd effect produces large losses in many investors, because of the importance of this phenomenon in the financial markets, it has been necessary to create market sentiment indicators where the effect can be observed and monitored. These indicators allow us to evaluate the extreme feeling that the market may be carrying, where the following stand out: the Fear and Greed Index and the Investor Sentiment Survey.

In the future, demand for the use of these indicators is expected to grow, as this is the easiest way for an investor to anticipate the corrections that can occur in the financial markets, thus avoiding decisions based on sentiment, which produce the herd effect, and large economic losses.

In an ongoing study of the herd effect, an optimistic market sentiment could be observed in the financial markets due to the possible economic recovery after the fall of the markets due to the current health crisis. This optimism could lead to euphoria among investors and it could be observed that, contrary to when a crisis breaks out, gains are observed that aren't real, since in this case an upward overreaction would take place, which would soon be corrected.

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