

Journal of
Economic and Social Thought

econsciences.com

Volume 11

March-June 2024

Issue 1-2

**A review of the behavioural factors influencing
the housing market**

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Abstract. The importance of the housing market to households and the economy is paramount to monetary policies. However, there is limited literature on the behavioural factors influencing the decision-making process in the housing market. This article profoundly examines the psychological and neurological factors influencing the housing market. It reviews how cognitive and emotional influences shape the householders, both sellers and buyers, decisions in the housing market. More importantly, we review the literature on neuroeconomics (and neurofinance) to initiate an understanding of how the brain could work in the housing market. In summary, the householders' reactions to information and news are consistent with behavioural finance theories. Householders tend to underreact to news regarding the housing market and often suffer from biases and heuristics. One of the critical effects that householders suffer from is an illusion of control; this could be traced to the emotions of householders towards the house. Householders do not just show positive emotions towards the property; they fall in love with it. This strong emotional bond is one reason buyers overpay and sellers overprice. Both governments and monetary policymakers need to understand the psychology influencing the householders' decision-making process mainly because the housing market is vital to the economy.

Keywords. Housing market; Behavioural economics; Neuroeconomics.


JEL. D10; D81; D87; D91.

1. Introduction

As alluded by (Christie, Smith & Munro, 2008), householders often display deep positive emotions towards their house, even falling in love with it. Moreover, as highlighted by (Marsh & Gibb, 2011; Whittle *et al.*, 2014; Grum & Grum, 2015), both emotional and cognitive psychological factors play a critical role in the householders' decision-making process. Influencing both buyers and sellers. Furthermore, as (Levy & Glimcher, 2012) hint, the brain considers the context in which the decision is taken, giving rise to environmental differences in the psychological factors. This statement has an element of truth due to the different behavioural factors between crises and bubbles.

Perhaps it is crucial to define and differentiate the terms behavioural economics and modern economics. As (Colander, 2000) argues, historically, the term neoclassical economics defines the Marshallian economics of the late 1800s to early 1900s; economics have moved on significantly since then. However, as (Colander, 2000) debates, many still use neoclassical economics to criticise modern economic practices. An influential argument is that modern economics is nothing more than an updated version of the neoclassical economics school. Nonetheless, (Colander, 2000) argues that there are differences between neoclassical and modern economics in terms of

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the main attributes of neoclassical economics. Many vital features underpinning modern economics were delved long after the Marshallian economics, such as the efficient market hypothesis and rational model.

Moreover, as alluded by (Colander, 2000), there are significant issues with modern economic practices, not due to neoclassical economics but the movement away from it. So, we define the period of economics which is still practised as modern economics influenced by the efficient market hypothesis of (Malkiel, 1962; Fama, 1965) and the rational expectation model of (Muth, 1961) underpinned by the rational choice model of (Robbins, 1935). Modern economics posits that markets, i.e. housing, incorporate information into the price immediately acting on rational market participants, i.e. householders. Hence, we use the term modern economics to distinguish the practices used in economics nowadays from neoclassical economics.

Although modern economics has evolved to account for some psychological factors, it was not until the work of Daniel Kahneman and Amos Tversky in the late 1970s and early 1980s that economics entirely took account of psychological factors, leading to behavioural economics. Behavioural economics posits that the actions and reactions of householders move prices rather than the information. The householders act on the information through a combination of emotional and cognitive psychological factors. Consequently, the paper is directed at the psychological factors of the decision-makers, i.e. householders, whose actions/reactions underpin the movement in the housing market.

The main contributions to the literature on the housing market are that we delve deeper into behavioural economics to explain the psychological factors impacting the decisions of householders. We also illustrate how the brain works in the housing market using examples from neuroeconomics; we hope that in doing so, we will enable the extension of neuroeconomics into the housing market.

This paper is primarily a literature review of the behavioural theories influencing the housing market. The theoretical foundation of the paper is in the literature reviews, which initiate a critical review of the psychology and neuroeconomics of the housing market, moving on to a literature evaluation of herdings and bubbles in the housing market. The final section of the literature review examines the psychology and neuroeconomics of crises in the housing market. We conclude with a summary of the findings and future work. We also recommend monetary and governmental policies to account for behavioural changes in the housing market.

2. Literature Review of Behavioural Economics in the Housing Market

Modern economics states that most humans involved in economics, in this case, households, make decisions according to three principle theories:

- The rational choice theory of (Robbins, 1935) states that humans, as homo-economicus, are constantly rational in choice and narrowly self-interested in pursuing the optimal choice to maximise utility or wealth.
- The rational expectation model, as derived by (Muth, 1961), posits that rational expectations are economic predictions consistent with economic models used to explain the behaviour of factors.

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- The efficient market hypothesis introduced by (Malkiel, 1962; Fama, 1965) dictates that prices should incorporate all fundamental information immediately.

(Marsh & Gibb, 2011; Whittle *et al.*, 2014) note that modern economics has largely explained house prices until recently. According to (Dunning, 2017), modern economics dictates that households decide on housing options, including remaining in their current house, by maximising their utility. The housing decision should reflect the optimal option given household preferences, housing characteristics, financial constraints and market prices. Moreover, as noted by (Dunning, 2017), the search process does not matter under modern economics since preferences are explained by output and markets are in or approaching equilibrium.

However, modern economics relies on the notation of rationality to explain human behaviour. As (Thaler, 2016) contends, humans are generally homo-sapiens and not homo-economicus reacting to fundamental information regarding the asset, in this case, a house. Additionally, as (Statman, 2008) argues, to truly understand the movement of any asset's price, there is a requirement to include the psychological factors impacting the decision-making process of the economic agents, in this case, the householders.

Moreover, as (Simon, 1978) notes, householders sometimes opt for satisfactory instead of optimal options due to limitations, a behavioural process otherwise known as satisficing. Further, as argued by (Dunning, 2017), the search process becomes more significant due to information not being ex-ante. Thus, the households must collate and analyse the relevant information to satisfy their preferences, which could lead to suboptimal housing decisions. It must be noted that preferences vary according to the information and may contradict each other.

Conversely, as (Dunning, 2017) points there is a difference in the behavioural approach adopted by authors researching the housing market. The old behavioural theory approach is based on satisficing, meaning that the strategy of households is to find the will-do housing option. Under this approach, households may be influenced by social and cultural market institutions and, therefore, may not experience the complete housing search process. However, the new behavioural theory approach is based on heuristics, meaning that the households use simplifying processes to find the optimal house. Nevertheless, as (Wong, 2002) alludes, given imperfect information and uncertain events, householders are likely to use a combined heuristic and satisfice approach to find the best possible option given their preferences.

As highlighted by (Whittle *et al.*, 2014), the implications of behavioural factors on the housing market received little coverage until the 2008 financial crisis. Nevertheless, cognitive and emotional biases and heuristics tend to affect and distort house prices. Furthermore, as noted by (Akerlof & Shiller, 2009), the housing market displays several critical characteristics of animal spirits, first introduced by (Keynes, 1936). However, as argued by (Smith, 2011a), the difficulties in researching the methodological and empirical evidence in the financial and, more importantly, the housing market is a major stumbling block. However, as (Fakhry, 2018) points out, using bounded rationality and the variance bound test of (Shiller, 1979, 1981), it is possible to provide empirical and methodological backing to behavioural economics research.

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As noted by (Smith, 201b), the housing market differs from other markets; according to (Meen, 1996), the heterogeneity of the housing market complicates the categorisation, and (Boelhouwer, 2011) suggests that housing markets are imperfect. Conversely, (Simon, 1972) argues that decision-making does not follow a rational model; it is more likely to be a bounded-rationality approach. As (Dunning, 2017) implies, the bounded rationality approach is akin to a trial-and-error method of house searching.

Moreover, (Marsh & Gibb, 2011) contend that, in essence, many households do not follow the standard house purchase procedure. Additionally, (Wong, 2002) suggests that the households' decision process is independent of the housing market. (Wong, 2002) argues that households do not continuously appraise their current house; instead, they start a search once a stress threshold is activated. In essence, as (Grum & Grum, 2015) suggest, householders are impacted by psychological factors such as cognitive heuristics and biases and emotional biases.

Influenced by the seminal papers (Tversky & Kahneman, 1973, 1974; Kahneman & Tversky, 1979), the basic idea behind behavioural economics is that the decision-makers, i.e. households, are humans. Moreover, as put by Bernard Baruch: "What is important in market fluctuations are not the events themselves but the human reactions to those events."

In essence, the decision-making process of any householder relies on the information or news concerning the housing market. Householders react to this information or news, causing the market to fluctuate. While there is plenty of evidence of how market participants' reactions to news or information in the financial markets cause the market to fluctuate; yet the evidence is limited in the housing market. As hinted by (Barberis, Shleifer & Vishny, 1998), it is known that market participants tend to underreact to single and overreact to a series of news or information. Moreover, as (Barberis, Shleifer & Vishny, 1998; Daniel, Hirshleifer & Subrahmanyam, 1998) point market participants seem to underreact in the short run and overreact in the long run. Essentially, according to (Venezia, 2018, p. 129), an overreaction is a disproportionately large reaction by market participants towards newly released information or news. In contrast, an underreaction is a disproportionately limited reaction by market participants towards newly released information or news.

Additionally, householders tend to overreact when buying but underreact when selling. Generally, as (Hudson *et al.*, 2015) hint, householders may overreact or underreact to fundamental information due to cognitive or psychological limitations. As (Christie, Smith & Munro, 2008) explain, householders have an emotional relationship with the property. Thus, they will overreact to information regarding a property they want to buy while underreacting to information concerning their listed property. Furthermore, explaining why householders generally tend to overreact to information during a crisis and underreact during a bubble. However, (Tsai, 2013) hints at householders overreacting during periods of upturn and underreacting during periods of downturn. In addition, as illustrated by (Shen, Zhao & Pang, 2024) backing as (Barberis, Shleifer & Vishny, 1998; Daniel, Hirshleifer & Subrahmanyam, 1998), householders, like market participants, tend to overreact in the long run and underreact in the short run. As highlighted by (Wang, 2021), other major events could cause an overreaction by

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householders, like Covid-19 or, as illustrated by the UK house price data from Nationwide, the 2008/09 financial crisis,

Conversely, as suggested by (Fraser, Hoesli & McAlevey, 2008), the overvaluation in house prices may not be due to the reactions of householders but the housing market price dynamics. However, (Fu & Qian, 2014) found that positive feedback effects, i.e. momentum trading, could explain the price overreaction in the housing market. More importantly, as (Hazam & Felsenstein, 2007; Deng, Gan & Hernandez, 2013) illustrate, householders overreact to extreme news, such as terrorist attacks or natural disasters. Furthermore

Hence, (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992) introduced the prospect theory to overcome two critical issues of the rational expectation model: the certainty and isolation effects. Simply put, the prospect theory describes how humans choose among varying prospects by estimating each prospect's perceived likelihood, often in bias. As derived by (Tversky & Kahneman, 1992), the prospect theory relies upon four characteristics of human psychology:

- Reference dependence
- Loss aversion
- Endowment effect
- Diminishing sensitivity affirms that the marginal value of gains and losses decreases with size.

2.1. The Psychology of the Housing Market

Householders' decisions are likely to be influenced in several ways by psychological factors at each stage of the process. Nevertheless, as (Grum & Grum, 2015) suggest, although psychological factors significantly influence the housing market, there is not much research on the effect of these factors. However, as (Grum & Grum, 2015) state, the psychology of the householders is an essential factor when analysing the housing market. According to (Dunn, 2002), houses are a psychological status that reflects the households' self-image. Using fMRI, (Glimcher, 2011), amongst other researchers, have found that the brain parts most active during consumers' (essentially householders) decision-making are associated with emotions. Additionally, (Levy, Murphy & Lee, 2008) imply that emotions and other psychological factors often sway householders. In addition, (Ben-Shahar, 2007) suggests that psychological factors determine the economics of the decision.

As highlighted by (Fakhry, 2020), psychological factors during any decision process are derived from emotional and cognitive factors. According to the literature, as listed below, householders often face several psychological factors during the decision-making process, delved mainly by cognitive influences. However, as previously stated, emotions play a critical role in the process; yet, as we will see later, there is a limited amount of literature on the impact of emotions on the housing market. Therefore, there is a requirement to critically analyse the literature on psychological factors, including the impact of cognitive and emotional influences on the housing market. As (de Bondt & Thaler, 1995) allude, any decision-making theory should include the process's psychological factors. However, (Daniel, Hirshleifer & Subrahmanyam, 1998) state that it is also essential to acknowledge that sometimes people act rationally. The deviation from rationality is mainly caused by two psychological factors influencing the brain: biases and

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heuristics. As argued by (Tversky & Kahneman, 1974), heuristics are simplification methods used by the brain in everyday situations to ease the constant overload of information. However, the danger of overreliance on heuristics is that it could lead to misjudgement. In the case of the housing market, it could lead to the householder overlooking vital information, which could affect the decision.

On the other hand, a bias is a disproportionate probability placed in favour or against an idea or thing. Furthermore, as (Tversky & Kahneman, 1974) hint, this disproportionate probability could cloud the judgement, leading to the wrong decision. Householders could be biased towards a particular area and overlook all other more appropriate areas. According to (Ackert, Church & Deaves, 2003), there are two main types of biases: cognitive and emotional. Identified by (Tversky & Kahneman, 1974) as a critical psychological factor influencing the decision-making process, cognitive biases limit any individual's abilities to encode, process and retrieve information. Whereas, as stated by (Ackert, Church & Deaves, 2003), emotional biases often refer to the inability of an individual to separate emotions from the decision-making process. Moreover, as exemplified by (Ackert, Church & Deaves, 2003), emotional biases may positively or negatively affect decision-making.

Conversely, a critical element of the psychology of a householder and the prospect theory is that decision-makers are reference-dependent. As observed by (Tversky & Kahneman, 1992), people often evaluate the value of gains and losses with respect to a reference point. In the housing market, the reference point could be as diverse as a house sold in the neighbourhood or the purchase price, as alluded by (Whittle *et al.*, 2014). According to (Marsh & Gibb, 2011; Whittle *et al.*, 2014), householders are reference point dependent. A reference point often influences householders, thus making them loss-averse.

Moreover, humans tend to be attracted to a false reference point; as highlighted by (Seiler *et al.*, 2008), a false reference point is not the price at which the asset was bought but the highest or lowest point, depending on whether selling or buying respectively. As observed by (Seiler *et al.*, 2008), householders tend to dismiss the price paid for their house in favour of the highest referenced price, even if the offer they got would earn them a nice little profit. Hence, the offer would seem to be a loss relative to the false reference point.

However, as (Keynes, 1936) said “Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as the result of animal spirits—a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities.”

This statement is at the heart of the truth about the psychology of humans, and it is, above all else, never more accurate than in loss-making situations. As derived by (Kahneman & Tversky, 1979), the prospect theory dictates that humans are loss averse, meaning they are more averse to losses than happy to gains of similar magnitudes. Loss aversion is a critical psychological factor affecting many householders; therefore, many cannot contend with the idea of selling a house below a reference point. According to (Marsh & Gibb, 2011), there is plenty of evidence of loss aversion in the housing market. Conversely, as alluded by (Whittle *et al.*, 2014), in the aftermath of a housing bubble crash,

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the housing market may not fall to the fundamental price because of the effect of loss aversion.

A similar psychological effect is the endowment effect, which, as derived by (Thaler, 1980) and observed by (Knetsch & Sinden, 1984), dictates that people often demand more than they are willing to pay for any object, such as a house. Alternatively, as stated by (Marsh & Gibb, 2011), an endowment effect dictates that people often put a higher value once the object, e.g. a house, is in their possession. Consequently, they demand more as a seller than they would be willing to pay. As discussed by (Whittle *et al.*, 2014), the endowment effect may exacerbate a housing market bubble.

The endowment effect and loss aversion may lead to the status quo bias, which, as dictated by (Samuelson & Zeckhauser, 1988), is the tendency for people to maintain their current position over any alternative, even those which offer better benefits. As (Marsh & Gibb, 2011) state, loss aversion dictates a strong preference for the status quo if the householders are worse off relative to the reference point. Additionally, as (Marsh & Gibb, 2011) highlight, the endowment effect gives rise to the status quo bias where people prefer to stay at their property, even though the alternative option would seem of more significant benefit.

A close relative psychological effect of the status quo bias is the anchoring and adjustment, otherwise known as anchoring bias. As derived by (Tversky & Kahneman, 1974), the anchoring bias refers to people's tendency to anchor any decision on an initial reference point, deviating from that point insufficiently. According to (Marsh & Gibb, 2011), when considered in addition to the status quo bias, this effect has a double impact of householders preferring existing residency and underestimating how much an alternative differs from the initial starting point. Moreover, the anchoring bias raises a gripping psychological factor, money illusion. (Fisher, 1928, p. 9) defines money illusion as “the failure to perceive that the dollar, or any other unit of money, expands or shrinks in value. We simply take it for granted that a dollar is a dollar - that a franc is a franc, that all money is stable.”

Put simply, money illusion is the tendency not to account for any currency's re-valuation, upwards or downwards. Conversely, as observed by (Brunnermeier & Julliard, 2008), many householders fail to account for the inflationary effect on mortgage costs when deciding whether to purchase or rent.

Another psychological factor underpinning money illusion is the framing effect; as described by (Tversky & Kahneman, 1981), the framing effect states that when faced with alternative frames of the same decision, people tend to exhibit substantially different behaviours. (Brunnermeier & Julliard, 2008) alludes to the nominal versus real problem many householders face as an example of how the framing effect factor can play a big part. Householders' risk aversion levels depend on the framing of the issue at the heart of the decision; if the framing is in nominal terms, then householders are likely to be more risk-averse to nominal risk. However, if the framing is in real terms, then householders are likely to exhibit a more risk-averse behaviour to real risk.

Conversely, most householders, and to a certain extent people in general, rely on mental accounting for key aspects of financing. As argued by (Thaler, 1980), people tend to use different mental accounts to record gains/pleasure and losses/pains. However, as discussed by (Brunnermeier & Julliard, 2008), this separation of gains/pleasure and losses/pains may lead to an oversight of

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the link between them, which may lead to a money illusion where the householders ignore the impact of inflation on mortgage rates and income growth. Additionally, as suggested by (Prelec & Loewenstein, 1998), consumers differentiate between the pleasure of savings and the pain of debt; therefore, as long as the debt is still being paid, the pain still exists. In the housing market, the pain of paying the mortgage may sometimes overshadow the pleasure of owning a house. This conundrum explains why most householders pay their mortgages as soon as possible and the buy low and move up strategy of some householders.

A key element of risks in any asset market is the ambiguity effect; as (Ellsberg, 1961; Heath & Tversky, 1991) allude, the ambiguity effect implies that people tend to select options for which the probability of a favourable outcome is known over an opportunity for which the likelihood of a favourable outcome is unknown. During any economic or financial downturn, householders are at the mercy of unknown factors affecting financing, such as mortgages. Hence, many may opt to delay or downgrade their house search. These strategies, as during the 2008/2009 financial crises and the 2020/2021 Covid pandemic, caused the global housing market to slow down.

As observed by (Finucane *et al.*, 2000), humans often base their decisions on emotional responses rather than cognition. As noted by (Levy, Murphy & Lee, 2008), many householders decide whether to buy a particular house based on their emotional attachment to the property. Additionally, many householders may feel too emotionally attached to sell a house below the high target price, which is dictated not by a rational pricing process but by emotions. As argued by (Levy, Murphy & Lee, 2008), humans often fall in love with a house not necessarily because it is the best suited to their needs but because it has the X-factor. This romance makes it challenging to consider selling the property for anything below the hugely inflated price when it is no longer suitable. These two factors mean householders are biasedly affected by emotions when considering the most significant decision they may make in their lifetime. Many emotional biases may affect the decision-making process for buying or selling a house; however, we will concentrate on the critical emotions involved: pride, regret, greed and fear.

Humans have always had a sense of pride; according to (Ashton-James & Tracy, 2012), pride is an emotion displayed in response to a sense of achievement or mastery. As displayed by Mr Darcy in Jane Austen's *Pride and Prejudice*, pride is a double-edged sword. Moreover, as argued by (Tracy & Robins, 2007), pride has two distinct effects on emotions: hubristic and authentic. Conversely, hubristic pride is associated with disdain towards others, whereas authentic pride is associated with a sense of achievement.

Householders tend to display a sense of authentic pride, suffering from cognitive dissonance and self-attribution bias. As alluded by (Festinger, 1962), cognitive dissonance is a tendency to feel discomfort whenever an action goes against the positive self-image held by the decision-maker. Basically, people hate being regarded as a failure; hence, it is tough to admit failure. Householders certainly do not like to be regarded as failures due to their decisions; in essence, a house could be the most expensive asset a householder buys. Therefore, a householder has a sense of pride in their home; hence, a failure would be incomprehensible. As observed by (Miller & Ross, 1975), the self-attribution bias dictates that people attribute success to personal skills and failures to external factors. Many householders blame external factors,

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such as governments and banks, for their failures and attribute lower mortgage payments to their ability to secure low rates. As (Brunnermeier & Julliard, 2008) suggest, these two psychological factors also play a critical part in explaining money illusion. Essentially, householders tend to attribute rising nominal income to their decisions rather than simply higher inflation, as noted by (Brunnermeier & Julliard, 2008).

Furthermore, as alluded by (Scherbina & Schlusche, 2012), the sense of pride leads to the disposition effect, where, as argued by (Shefrin & Statman, 1985), there is a tendency to sell profit-making houses too early and hold on to loss-making houses too long. Of course, as stated by (Scherbina & Schlusche, 2012), the disposition effect impacts the housing market during a downturn, making it more resilient to crashes relative to the financial market. However, as noted by (Scherbina & Schlusche, 2012), a notable exception to this housing market resiliency is a failure in the nationwide nominal prices, such as during the late 2000s financial crisis.

In effect, pride leads housebuyers and householders to be overconfident. Thus, this gives rise to four other cognitive biases affecting the decision-making process of householders: belief perseverance, confirmation, conservatism and illusion of control. As alluded by (Lord, Ross & Lepper, 1979), belief perseverance is the tendency to hold on to a belief for too long despite the constant availability of contradictory information. When house prices eventually come down, householders tend to think they can get a better house for the best price. They often believe that the housing market will decrease or the bubble will collapse. In opposition, householders tend to believe their homes are worth more and that if they hold on for a while longer, they will get the price they want. Believing the housing market bubble will continue, even when information to the contrary is frequent. However, in both cases, they could miss an opportunity by persisting with their belief.

As described by (Wason, 1960), confirmation is the tendency to follow only information consistent with their belief, dismissing all contradictory information. The confirmation bias highlights the issue with the belief perseverance bias. Householders choose to believe information backing their view by persisting with their belief, therefore dismissing any information to the contrary.

According to (Edwards, 1982), conservatism is the tendency to revise an opinion insufficiently when new information becomes available. Often, householders revise fundamental information about the housing market insufficiently to restrict any impact on their beliefs. The confirmation and belief perseverance biases mean they frequently adjust insufficiently, eventually leading to a significant gap between reality and their belief. As alluded by (Gal, 2006), the psychological effect could result in inertia, a tendency to remain at the status quo due to loss aversion. As (Marsh and Gibb, 2011) argue, the decision-making process of householders may lead to conservatism or inertia biases that increase with uncertainty.

As (Thompson, 1999) suggests, the illusion of control is the tendency for people to overestimate their ability to control events. Moreover, according to (Langer, 1975), people with the illusion of control tend to believe that the chances of succeeding are overwhelming compared to failure. The illusion of control occurs when a person feels a sense of control over outcomes they demonstrably do not influence. People displaying the previous three biases are often accused of an illusion of control. As alluded by (Bartkowiak, Potrawiak

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& Pavlenko, 2018), householders occasionally suffer from huge bouts of illusion of control, leading them to underprice risk. Furthermore, as (Bartkowiak, Potrawiak & Pavlenko, 2018) argue, the illusion of control bias often leads householders to make decisions that do not follow the primary objective.

One emotion many humans suffer is regret; householders are not immune to this emotion. As (Fakhry, 2020) argues, regret is the tendency to harbour negative feelings due to comparing the real-world outcomes or state of events with those of an idealised world or alternative better options. As Brian Judge states: “Something you need most might be something you turn away from, something you turn away from might be something you regret, and something you regret, in the end, might cost you the one chance you ever had.”

Of all the household's financial transactions, buying or selling a house has the greatest potential for regret. As highlighted by (Muermann & Volkman, 2006), regret is another explanation for the disposition effect of (Shefrin & Statman, 1985). Economic agents, i.e. householders, hold on to winning assets because they do not want to lose the earnings, therefore, regretting they have held on to the asset. However, they also regret investing in assets that are making losses. Hence, they hold on to loss-making assets in the hope that they turn into profit.

Nevertheless, imagine a scenario where the householder could have sold their house for a significant amount but did not. Alternatively, a scenario where the householder had the opportunity to buy the house of their dream but did not. Householders tend to regret inactions rather than actions. As put by Mark Twain: “We regret the things we don't do more than the things we do”

Moreover, as the old quote goes: “Fear is only Temporary; Regret lasts Forever”

In general, humans feel regret longer than they would any other emotion. Specifically, householders tend to regret miss opportunities or mistakes for the whole of their lives. This regret is due to the cost and permanency involved in buying a house, so initially, there is much pressure to buy the right property at the right price.

These scenarios would give rise to the regret aversion bias; (Samuelson & Zeckhauser, 1988) contend that some people fear making mistakes. Therefore, they avoid any decision-making that may lead to the wrong conclusion. (Seiler *et al.*, 2008) points to householders adopting the status quo position in such situations where the householder delays or suspends a decision with potentially disadvantageous consequences. As Elbert Hubbard stated: “The greatest mistake a man can make is to be afraid of making one.”

As observed by (Seiler *et al.*, 2008), householders are reluctant to sell if houses are below the reference point. However, householders are willing to sell if they get a price above the reference point. A key observation of the regret aversion bias is that householders tend to hold onto their homes until a threshold is passed. As stated by (Seiler *et al.*, 2008), this threshold can be misleading, but many householders tend to stick to it, even though circumstances or context may have changed.

Additionally, as argued by (Samuelson & Zeckhauser, 1988), the regret aversion bias may lead to the status quo bias, where the householders favour staying at their current position rather than pursuing an option, which may lead to regret. As highlighted by (Seiler *et al.*, 2008), houses are at their highest

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prices during an upturn in the housing market. Hence, when a downturn occurs, many householders still use the false reference point set at the height of the upturn. Therefore, many householders develop regret aversion, leading to the status quo bias.

Conversely, the regret aversion bias will likely lead to the herd mentality bias. As (Scharfstein & Stein, 1990; Bikhchandani & Sharma, 2000) allude, herd mentality is the tendency to think that by following the decisions of a group of people and ignoring their own, the decision is likely to be the right one. The herd mentality bias may lead to the householders dismissing their first intuition, which may have been the correct one, and instead going for the wrong decision given the context. In other words, the decision may be correct for most of the herd, but it may be wrong for you.

(Lopes, 1987; Shefrin & Statman, 2000) define fear as an overweighing of the worst-case scenario relative to the best-case scenario. Furthermore, as stated above, fear is a temporary reactive emotion to a situation. There are many reasons for householders to fear selling or buying a house. According to many, such as (Skogan, 1986; Hazam & Felsenstein, 2007), one of the primary reasons for fear in the housing market is the presumption that an area is dangerous. (Hazam & Felsenstein, 2007) point to the danger of terrorist attacks in Jerusalem as a leading cause for householders' display of fear. Moreover, as highlighted by (Skogan, 1986), fear is aroused when a high crime rate or neighbourhood changes occur. This fear of dangerous residential areas is highlighted by the false presumption many have of East London, which was based on the 1960s and 70s. People often link events to an area and stubbornly fail to change their views with time, causing a false sense of fear.

There is another route for fear, similar to regret: the fear of making a mistake leading to the status quo bias. As highlighted by (Kishore, 2004), householders tend to fear mistakes leading to the status quo where they stay at their place even though it is no longer suited to their requirements. Moreover, as illustrated by (Christie, Smith & Munro, 2008), householders tend to fear uncertainty or the unknown, leading to them pulling out of the market or displaying a better the devil, you know attitude; thus, buyers could miss out on a golden opportunity to get a house that perfectly fits their requirements.

As argued by (Wood & Parkinson, 2009), declining house prices increase fears of negative equity and repossessions among households. The fear of losing their house may lead to householders making snap decisions about selling their property, leading to the market being oversupplied. Economics fundamentals state that prices inevitably go down when there is an oversupply in the market. Moreover, as (Gan, Wang & Zhang, 2018) alludes, another factor to consider is the impact of rising unemployment on house prices, thus, decreasing house prices and increasing the fear factor in the housing market. Furthermore, as illustrated by (Braumann, 2004), high inflationary pressures could reduce real wages and, as seen by recent events, increase the cost of living, heightening the fear many householders have in keeping with their mortgage payments. Additionally, as alluded by (Friedman, 1968), the conventional monetary policy method of controlling inflation is raising interest rates, thus increasing the mortgage payments and hence the fear factor of householders.

According to (Christie, Smith & Munro, 2008), fear and desperation could be the driving forces behind the rapid appreciation in the housing market. A

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key factor is that fear, like all emotions, is not built into the market or buyer but is shaped through association with the market. As illustrated by (Christie, Smith & Munro, 2008), there are other transmitters of fear in the housing market:

- Many householders, especially first-timers, fear being priced out of the market. Hence, they tend to appear desperate for a move, and generally speaking, when humans display anxiety, they tend to make rash and wrong decisions. Moreover, as (Christie, Smith & Munro, 2008) suggest, the irrationality of the housing market could prove contagious, meaning householders could be taken by the market's madness.
- The competitiveness and volatile nature of the market could also raise fearful emotions. The scenario of having a good offer outbid by another householder could lead to some withdrawing from the market. As alluded by (Christie, Smith & Munro, 2008, p.2302), the scenario leads to a dominant and explicit fear of the competition in the market that increased as the perceived ferocity of that competition increased.
- In some cases, fear arises from the shock and devastation of price discovery in a volatile market. Accordingly, householders feel a decreasing ability to read the market and, inevitably, lose control. As observed by (Christie, Smith & Munro, 2008), many householders thought they needed to acquaint themselves with the market methods on initial shock. However, this fear was interlaced with the enjoyment of learning the market methods to succeed.
- Despite exercising caution and control in the decision-making process of householders, fear could lead them in the opposite direction.
- Due to the fear of the market, householders made huge initial and counteroffers when they found the house to get out of the market as quickly as possible. Thus further driving up the prices in the local market.

According to the American Psychological Association, positive emotion is an emotional reaction to a positive outcome, such as achieving a target, avoiding danger or satisfaction. As hinted by (Christie, Smith & Munro, 2008), householders display positive emotions after the successful conclusion of the house search. Furthermore, as observed by (Christie, Smith & Munro, 2008), householders display affection toward their newly acquired property and show intense emotions such as love, hope and anticipation for their new homes. As noted by (Christie, Smith and Munro, 2008), this affection towards the one meant buyers were willing to pay high prices to secure the property.

In essence, positive emotions in the housing market push prices higher and keep bubbles floating. As highlighted by (Case & Shiller, 2003), emotions often initiate the decision to purchase a house. Moreover, as (Smith, Munro & Christie, 2006) argue, emotion rather than rationality drives the housing market's economic underpinning, stating that the housing market is an emotional geography as much as an economic landscape. Essentially, the housing market is governed by the heart rather than the brain; hence, positive emotions are the key drivers of upwards trends in the market.

2.2. The Neuroeconomics of the Housing Market

Neuroeconomics and neurofinance have given economics new insights into the reactions of agents. As alluded by (Camerer, 2007), neuroeconomics merges neuroscience and economics to provide a deeper understanding of

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how the brain works in economics. Conversely, as argued by (Egidi & Sillari, 2018), the psychological reaction of agents (i.e. householders) activates different brain regions to each market activity. Thus, given the imperatives to neurofinance, the merger of neuroscience with finance to analyse the agents' brain reactions, this analysis is relevant to understanding the different emotional reactions of householders.

There are two different theories of the brain's operations: the dual and single-system brain, advocated by prominent researchers in their field, such as neuroeconomics (Camerer, Loewenstein & Prelec, 2005) and neurosciences (Levy & Glimcher, 2012). (Thaler & Shefrin, 1981) argue that a departure from rationality results from the interaction between two brain systems: a rational deliberative system and an emotionally irrational system. During an interview (Schüll & Zilboom, 2011, p.523), Glimcher remarks: "But it's actually one person, so what does that mean? There are two people inside that person?"

To which Thaler replied: "Well, maybe there really are two people inside that person – who knows? The brain is a strange thing."

This interview is the crux of the argument between proponents of the one-system brain and the two-system brain.

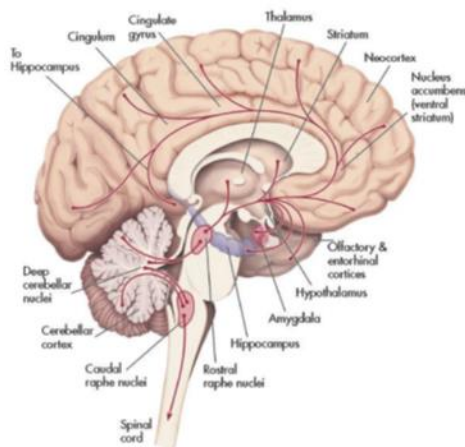


Figure 1. serotonergic pathways (Drazinic et al., 2017, p.56)

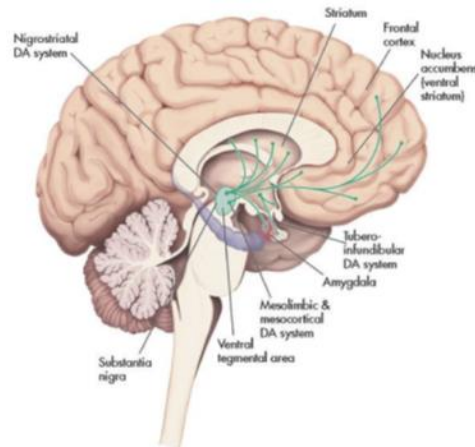


Figure 2. dopaminergic pathways (Drazinic et al., 2017, p.66)

As advocated by (Knutson & Greer, 2008), humans have a dual affect system: positive and negative, each with its own processing method in the brain. According to (Hecht, 2013), each affect system originates from a different hemisphere within the brain; the negative system is primarily based on the right, while the positive system primarily occupies the left. As observed by (Drazinic et al., 2017) and illustrated by Figure 1, the positive system increases the dopamine neurotransmitter activities and, hence, as suggested by (Breiter et al., 2001), activates the nucleus accumbens, releasing a positive emotion. Moreover, as observed by (Drazinic et al., 2017) and illustrated by Figure 2, the negative system increases the serotonin neurotransmitter activities, affecting the amygdala and releasing the negative emotion.

Likewise, as argued by (Camerer, Loewenstein & Prelec, 2005; Ardalan, 2018), there is often a battle for control within the two brain systems: the affect/cognition system and the automated/control system. Each quadrant in the two systems is derived from a different brain region. This battle for control is never more evident than during a crisis, where the extreme uncertainty

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could literally leave a householder in two minds. However, as highlighted by (Camerer, Loewenstein & Prelec, 2005; Ardalan, 2018), the key to good decision-making is to involve all four quadrants in the process, which is difficult under uncertainty.

However, many neuroscientists, such as (Levy & Glimcher, 2012), argue that there is no basis for a dual-system brain. As suggested by (Levy & Glimcher, 2012), the brain does not have a different system for reward and risk. Instead, the brain uses the same regions to decide between rewards and risks within the context. Essentially, the brain opts to take the rewards today or in the future based on its judgement of the current environment. Thus, according to (Levy & Glimcher, 2012), a significant part of the decision-making process occurs in two sub-regions of the brain's frontal lobe, an area at the front of the brain: the ventromedial prefrontal cortex (vmPFC) and orbitofrontal cortex (OFC). As alluded to by (Gage & Baars, 2018), the vmPFC is an integrated region that serves emotional processing, decision-making, memory, self-perception and social cognition. As indicated by (Wallis, 2007), the OFC plays a critical role in the reward process, integrating the sources of information required to derive the best possible decision.

Whichever system is correct, the decision-making process could be error-prone in extreme conditions such as price bubbles and crises. In the dual system, a crisis could continuously increase the serotonin neurotransmitter activities, thus leading to the householder experiencing ever-increasing fear turning to panic. Conversely, as pointed out by (Lo, 2013), counter-intuitively, a centre for pleasure, as many would believe, does not exist in the brain. However, as (Lo, 2013) argues, as householders increase their chances of a reward, they increase their positive emotions, increasing dopamine neurotransmitter activities. The problem, as (Mateu, Monzani & Navarro, 2018) contend, is that the greater the dopamine levels, the more the householders are likely to display destructive positive emotions, such as greed or arrogance.

In the single system, since as (Levy & Glimcher, 2012) contend, the brain reacts to the context in which the decision is taken; therefore, the householder could concentrate on the environment, overlooking all other information. According to (Gage & Baars, 2018), a single region of the brain is responsible for the decision-making process; amongst other vital factors, we sometimes use heuristics to ease the burden on the brain. Since the brain is context-sensitive, this raises the possibility that extreme environments could impact the heuristics. During a crisis, the brain could focus on the hostile environment, increasing the householder's fear, eventually leading to a panic reaction. However, during a bubble, the brain could get overexcited by the increasing reward and dismiss all information to the contrary, leading to increasing greed and eventually arrogance.

2.3. Herding Behaviour in the Housing Market

As stated by (Scharfstein & Stein, 1990), classical economic theory is based on rational agents who make decisions efficiently. However, another theory suggests that group psychology drives decisions in economics. As so elegantly put by (Banerjee, 1992), we, as humans, make decisions concerning many economic or social situations that are forever influenced by what others are doing or thinking. The fact is that we intentionally or unintentionally follow the herds when making decisions about anything. The concept of herding in

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economics was first devised by (Keynes, 1936) using the term animal spirit to describe the irrational motion of a group of economic agents. Keynes observed that generally, during an economic downturn, agents tend to develop an irrational pessimism towards the economy. However, during an economic upturn, agents seem to develop an irrational exuberance towards the economy. Keynes argued that the underlying issues are uncertainty and agents' limited information.

As pointed by (Becker, 1991), agents follow the herds due to the assumption that crowds have superior information, overriding their private information. Moreover, (Morone & Samanidou, 2008) highlight that individuals often overrule their private information to conform to the popular trend of the herd. As put by (Scharfstein & Stein, 1990), herding is where individuals prefer to follow others while ignoring their decision process. Therefore, as (Bikhchandani & Sharma, 2000) hint, herding behaviour is an intention to imitate the decisions of others. Conversely, as highlighted (Scharfstein & Stein, 1990), the agent's reputation significantly influences herding behaviour.

As (Mackay, 1841) says "Men, it has been well said, think in herds; it will be seen that they go mad in herds, while they only recover their senses slowly, and one by one."

Thus, as (Scherbina & Schlusche, 2012) hint, householders assume that future house price changes are based on past prices, raising house prices. Additionally, as noted by (Shiller, 1996), householders often overestimate future prices; essentially, property investors have unreasonably high capital growth expectations. Therefore, as (Whittle *et al.*, 2014) suggest, new members are encouraged to join the herd, effectively creating a Ponzi process, thus keeping the price artificially high. Furthermore, as noted by (Whittle *et al.*, 2014), positive news tends to drive the momentum of the herd, causing an increase in demand, which increases the members of the herd and pushes up the prices. Conversely, negative news has the opposite impact, driving members away from the herd and pushing the price down. This process is often referred to as the feedback effect, where a price change drives a change in the herd momentum, leading to further changes in the price. As (Mackay, 1841) hints, a positive feedback effect is where price increases lead to an increase in the herd momentum, meaning new herd members push the price higher. However, during a negative feedback effect, the momentum decreases; hence, as the price decreases, members of the herd fall apart, further decreasing the price.

As highlighted by (Xu, 2017), herding behaviour plays a significant role in our lives, impacting our decisions. However, as argued by (Xu, 2017), the reasonings influencing the decision to herd are a mixture of social and economic behavioural factors:

- Regret aversion bias, one of the vital explanations why people herd is that they tend to be averse to regret. As argued by (Koenig, 1999), regret aversion may initiate herding behaviour; a critical factor in regret aversion bias is the tendency of agents not to make decisions on their own. They fear their decisions will be wrong, hence a tendency to imitate the decisions others make.
- Group mind theory (Bon, 1895) emphasises that although agents lose all sense of self and responsibility when they join a group, they gain invincibility in numbers as part of a group. In essence, by herding, agents feel stronger.

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- Emergent norm theory is the tendency to follow certain people, assuming they have more knowledge or experience. As illustrated by (Turner & Killian, 1987), some agents are uncertain and confused; therefore, they rely on others to make decisions. In an ideal world, one of the so-called experts would eventually be regarded as the leader; hence, the agents would herd after him, overlooking their judgement and information.

According to (Shiller, 2002), positive or negative feedback effect may be driven by news that drives the herd's momentum; hence, any bad or good news concerning the housing market would be reflected in the momentum of the herd. (Herring & Wachter, 1999) argue that many householders tend to underestimate the probability of a negative shock if the previous shock occurred in a different time horizon. Another explanation is given by (Brunnermeier & Julliard, 2008), who suggest that householders often follow the herd because of excitement about the housing market. Further, as explained by (Hott, 2012) using the model of (Lux, 1995), the price/sentiment feedback effect where householders are initially influenced by the contagious sentiment of a group of investors, this herd behaviour leads to house prices rising, which increases the positive sentiment of the herd; thus more householders join the herd. There is a psychological explanation for the feedback effect influence on herd behaviour; according to the availability heuristic of (Tversky & Kahneman, 1973), there is a tendency to overestimate the likelihood of a recent similar event. Hence, hearing about some people's profits may lead others to jump on the proverbial bandwagon, thus increasing the herd.

However, according to (Martins *et al.*, 2020), herding behaviour could come about accidentally, mainly due to agents having access to the same source of information or interpreting the information using similar methods. Further, as alluded by (Martins *et al.*, 2020), mortgage lenders displayed herding behaviour by adopting similar lending policies, which makes the housing market more accessible during economic upturns; unfortunately, it also makes the market more susceptible to economic cycles. Conversely, as highlighted by (Martins *et al.*, 2020), the causes behind the herding behaviour in the housing market are informational cascades, agency problems and informational inefficiencies. As argued by (Piazzesi & Schneider, 2009), favourable or unfavourable credit conditions offered by the banking herd could dictate the trend in the housing market. As suggested by (Martins *et al.*, 2020), this leads to the feedback effect between cyclical behaviour in house prices and herding in bank lending, where an upturn or downturn in the housing market could influence the banking herd to loosen or tighten their credit conditions. Furthermore, a tightening or loosening of credit conditions impacts house prices.

As maintained by (Martins *et al.*, 2020), it is essential to distinguish between institutional and individual investors. Institutional investors are subject to regular performance checks against benchmarks and each other. According to (Scharfstein & Stein, 1990), these checks lead to herding behaviours amongst institutions in selecting assets. Nevertheless, as (Martins *et al.*, 2020) suggest, herding behaviour amongst institutional investors in the housing market is governed by the market's informational efficiency or asymmetry. Additionally, as stated by (Acharya & Yorulmazer, 2007), there is the too many to fail belief. As derived by (Acharya & Yorulmazer, 2007), this

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belief is assumed when smaller institutions (i.e. banks) herd together to imitate the larger institutions in their actions and asset collections. This belief leads to the central banks either having a systematic failure in the financial sector or saving the smaller institutions from bankruptcy.

According to (Pierdzioch, Rülke & Stadtmann, 2012a), there is another route where herding behaviour could impact the housing market. Since house buyers and investors tend to follow predictions by forecasters, it is assumed that positive or negative forecasts initiate herding behaviours. Therefore, as illustrated by (Pierdzioch, Rülke & Stadtmann, 2012b), forecaster herding can drive the housing market away from fundamentals by negative or positive feedback effects. However, as hinted by (Pierdzioch, Rülke & Stadtmann, 2012a), many forecasters prefer to publish extreme values due to the revenue-sharing issue of herding; thus, most forecasters are anti-herding. Conversely, as (Pierdzioch, Rülke & Stadtmann, 2012a) hint, this anti-herding position can change over time. During the housing market bubble of the early to mid-2000s, the forecasters adopted an anti-herding behaviour; however, in the aftermath of the Lehman Brothers bankruptcy, the forecasters adopted an increasingly herd-like behaviour.

Generally, the impact of herding behaviour on the economy and financial market is substantial. Essentially, the impact is based on the movement of asset prices and its effect on the fundamental value. Herding behaviour results in an upward or downward trend in the pricing of assets. In extreme circumstances, this trend could trigger one of two events:

- As detailed in the subsequent section, an asset price bubble is an upward trend in the asset price, leading to a substantial move away from the fundamental price. Herding initiates bubbles through the positive feedback mechanism detailed previously in this section. As alluded by (Xu, 2017), herds of investors push the price up, pulling in new investors, pushing the price higher and invoking the positive feedback mechanism. The housing market is an excellent example of the impact of herding on asset bubbles. The housing bubbles in much of the world economies are directly the result of herding behaviours: the US and European housing bubbles of the mid-2000s and the Chinese housing bubble throughout the 2000s.
- Herding behaviour could also play a critical part in any financial crisis through the negative feedback mechanism. As with the animal kingdom, a herd sensing danger could signal a run on the market, which induces others to follow as the price decreases. The further the price goes down, the more significant the herd becomes, therefore inducing the negative feedback mechanism. The financial crisis of 2008 resulted from a housing market crisis in the US, impacting the subprime loan market. Moreover, herding behaviour is associated with the European financial crisis, especially in Spain, where the housing market played a critical role.

However, as illustrated by (Xu, 2017), herding behavioural strategies could result in better outcomes. As suggested by (Arlen & Tontrup, 2015), herding strategies could help agents overcome the negative impact of regret aversion. Moreover, herding behaviours could assist agents in refocusing their investment strategies and diversification. Like anything, the critical factor is that herding can be beneficial IF the agents follow the correct herds.

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(Ngene, Sohn & Hassan, 2017) point to four factors impacting the housing market and, inevitably, the broader economy through herding behaviour within the market:

1. According to (Ngene, Sohn & Hassan, 2017), investors may generate substantial profits from herding behaviours, which are driven by an over-reliance on collective information, triggering a bubble.
2. As noted by (Ngene, Sohn & Hassan, 2017), the reliability of asset pricing models used in economic theories is rendered questionable by herding behaviours. Due to the impact of herding, the movement affects the risks and returns influencing many of these models.
3. (Hirshleifer & Hong Teoh, 2003) point to agents' imitation behaviour, leading to correlated trading patterns resulting in systematically flawed decisions. As (Baur, 2006) observes, the correlated trades amplify co-movement, meaning agents can not diversify risk.
4. As suggested by (Philippas *et al.*, 2013), herding behaviour during market turmoil could lead to financial instability a economic crises through negative feedback and feedforward mechanisms. This instability of the housing market led to the financial crisis of 2008.

2.5. Bubbles in the Housing Market

As defined by (Whittle *et al.*, 2014), a bubble is a period where the price of an asset departs from its fundamental value. As hinted by (Barlevy, 2007), the popular notion is that bubbles are initiated by rapid upwards pressures on the price of a particular type of asset or index in a short interval of time, eventually causing downward pressures to correct the price or, more dangerously a collapse in the price. In simple terms, as suggested by (Blanchard & Watson, 1982), a bubble is defined as a price deviation from the fundamental value that is apparently unjustified by the information available at the time. Thus, the price is consistently above the fundamental value derived by the efficient market hypothesis over time. It is worth remembering that the efficient market hypothesis, as originated by (Malkiel, 1962; Fama, 1965), dictates that the price of any asset should immediately reflect all available information at any given time.

The efficient market hypothesis relies on rational theories, as (Stiglitz, 1990) argues rational agents should foresee forming bubbles and thus mitigate their outcome in theory. Moreover, as (Scherbina & Schlusche, 2012) argue, theoretically rational householders should relocate when house prices become too high, therefore reducing upward pressures on the housing market in bubbled areas and rising prices in other areas.

As illustrated by (Whittle *et al.*, 2014), bubbles have frequently occurred in the housing market. The 2008 financial crisis was mainly due to a bubble in the global housing market, although the bubble in the US subprime housing market primarily caused the initial crisis. For example, according to (Niemi, 2012), house prices in the UK have doubled since the 1990s. However, as noted by (Brocker & Hanes, 2013), a burst housing market bubble has a more significant negative impact on the economy than a stock market collapse. As argued by (Brocker & Hanes, 2013), this is mainly due to the greater negative impact on the bank's balance sheets and, thus, liquidity.

As (Case & Shiller, 2003) explain, the general concept of a bubble is that public expectations over future price rises of an asset are excessively high; this high expectation leads to temporarily heightened prices. Hence, in a housing

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bubble, householders would consider taking high risks because of their expectations. Therefore, a house that, under any other circumstances, a rational householder would consider too expensive would be worth the risk. Conversely, this expectation is so overwhelming that householders expect the rises in future house prices to compensate for the lack of savings. Furthermore, (Case & Shiller, 2003) raise another issue: first-time householders are forced to consider that the bubble might outprice them if they do not act now. In addition, houses are perceived as a very safe investment due to the expectation of continued high price rises into the long-term horizon. However, as argued by (Case & Shiller, 2003), the expectation of increasingly higher house prices could not go forever; as soon as a whisper of news of a possible downturn spreads, the high expectations turn into negative thoughts on the housing market. Thus leading to a housing market bubble burst, as householders and investors see no high returns for their money.

According to (Case & Shiller, 2003), the critical factor is the relationship between the housing market fundamentals {such as the interest rates, unemployment rate and income) and house prices. The same factors that are also critical to the economy's health. The issue facing policymakers is that rising house prices positively impact the economy. According to (Erlingsson *et al.*, 2014), a key feature of increasing house prices is the positive effect on the general economy through higher aggregate demand leading to greater production and employment. The dilemma facing many policymakers is that it is difficult to recognise a bubble at its initial stages, and acting too soon will hurt the economy. Hence, it is in the interest of the economy for policymakers to maintain the increases in house prices without overcooking the economy. However, as noted by (Chakraborty, Goldstein & Mackinlay, 2013), the problem is that there is a fear that commercial lending is negatively impacted because many financial organisations are too focused on the residential mortgage market, thus harming the economy.

According to (Himmelberg, Mayer & Sinai, 2005), the real issue is how to separate a rapid growth in house prices due to fundamental factors such as supply and demand from rapid growth caused by an unsustainable bubble. (Stiglitz, 1990, p. 13) gave a possible definition: "If the reason that the price is high today is only because investors believe that the selling price will be high tomorrow—when fundamental factors do not seem to justify such a price—then a bubble exists."

Therefore, as (Himmelberg, Mayer & Sinai, 2005) and (Case & Shiller, 2003) allude, a housing bubble is driven by the unrealistic price expectations of house buyers who are willing to pay inflated prices.

As (Himmelberg, Mayer & Sinai, 2005) indicate, there is a misconception concerning the fundamentals and analysis tools in the housing market. In the view of many analysts and policymakers, basing their analysis on the fundamentals (i.e. supply and demand) and analysis tools (i.e. price-to-rent and price-to-income ratios), the housing market may appear to be in a bubble. The crucial factor is that there will always be a high demand in many cities (e.g. London), therefore keeping prices high.

As indicated by (Scherbina & Schlusche, 2012), the housing markets are, to a certain extent, dominated by financially unsophisticated households, who are swayed by optimistic views based on historical statistics, extrapolating the statistics too far into the future. Further, (Scherbina & Schlusche, 2012) argue that householders' decision-making tends to be more consistent with the

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behavioural economics perspective on bubbles than rational models based on fundamentals such as price-to-rent and price-to-income. The reasoning, as indicated by (Scherbina & Schlusche, 2012), is the lack of sophistication in carrying out such an analysis.

(Scherbina & Schlusche, 2012) provide four behavioural models explaining the move away from rationality in the housing market. They argue that the common feature in all four models is the availability of irrational agents. As alluded by (Scherbina & Schlusche, 2012), the models were derived from the equity market but can be used to reflect bubbles in the housing market.

1. Differences of opinion and short sale constraints

The model persists that the existence of optimistic agents with bounded rationality who operate in a restricted short-selling practice market environment could cause the overvaluation of an asset, thus initiating an asset price bubble. Regarding the housing market, the constraints on short-selling are permanent and binding. Furthermore, there is evidence that some householders exhibit optimistic expectations and bounded rationality or irrationality.

2. Feedback trading

This model consists of agents who decide solely based on past price trends. A rise in the price of an asset in response to positive news invokes the model. These agents pick up this rise, resulting in a further price rise. It is worth remembering that the feedback effect dictates that with every movement in the price of an asset, another group of feedback agents get involved. Therefore, the price keeps rising and inflates the bubble until diminishing interest means no more new capital; then, the price starts to fall, and the bubble deflates. The feedback trading model implies that there are two groups of agents, news watchers and momentum traders, neither of which are entirely rational. News watchers observe private news about fundamentals and initiate the price rise when positive news emerges. Momentum traders then keep the price rising, thus further inflating the bubble and encouraging new momentum traders to invest.

As suggested by (Shiller, 2002), the news media is an influential source of the feedback trading model. The more the price rises, the more the media focuses on the asset, which encourages these agents to invest in the asset, hence giving rise to the feedback effect. Thus helping inflate the bubble. The bubble deflates only when no new capital exists, and the news media stops reporting the increases.

Empirical evidence suggests that the feedback trading model could explain many housing market bubble characteristics. As alluded by (Scherbina & Schlusche, 2012), households tend to become increasingly optimistic when house prices increase. Moreover, the model is consistent with empirical evidence suggesting the continuation of past returns and heavy trading accompanying bubbles, as illustrated by (Case & Shiller, 1988; Case, 2008), respectively.

3. Biased self-attribution

Derived by (Daniel, Hirshleifer & Subrahmanyam, 1998), the model posits that agents suffer from biased self-attribution, meaning any information confirming their initial view is accepted without delay. However, any information contradicting their initial view is rejected as public noise. The mechanism underpinning this model is that agents form their initial view of an asset or market, which in this case is the housing market, from private

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information on the asset/market. Subsequent public information is either rejected for not conforming to their initial view or accepted for conforming to their initial view. The former is ignored; hence, the price remains unchanged; however, the latter is accepted as proof of their initial view, causing the price to rise. Therefore, leading to the price being unjustified by the fundamentals and thus initiating a price bubble in the asset/market. Conversely, the accumulation of contradicting public information eventually forces the agents to accept that their private information is not based on solid ground; hence, the bubble deflates.

(Shiller, 2002) argues that in the housing market, the model will likely be initiated by preceding private information regarding positive public news. However, (Scherbina & Schlusche, 2012) state that a more productive method would be to test for any buyers who withdraw after an offer has been accepted based on negative public information. Thus, the buyers do not have confidence in their private information. In comparison, if they reject the negative public information, they conform to the model's prediction. Another test of the model put by (Scherbina & Schlusche, 2012) is to test whether or not a building company changes its announced plans after a piece of public information. The model predicts that the company is more likely to upscale its original plan after good news than downscale it after bad news.

4. Representativeness heuristic and conservatism bias

As illustrated earlier, the representativeness heuristic is the tendency to make a decision solely on past information, disregarding any current fundamental information, causing an overreaction, as stated by (Scherbina & Schlusche, 2012). The conservatism bias is the tendency to revise an opinion insufficiently when new fundamental information becomes available, causing an underreaction, as (Scherbina & Schlusche, 2012) state. In a general context, as suggested by (Scherbina & Schlusche, 2012), agents displaying representativeness heuristic effects may overreact to a series of positive news about fundamentals. The reverse is true for agents displaying conservatism bias; they may underreact to negative fundamental news. In both cases, the result could be a price bubble.

Moreover, as (Scherbina & Schlusche, 2012) state, buyers who display representativeness heuristic effects in the housing market are likely to overreact to a series of positive news about fundamentals (e.g. unemployment), therefore leading to a housing market bubble. Similarly, buyers who display conservatism bias effects will likely underreact to negative news about fundamentals, causing a housing market bubble.

There are two further factors in the creation and maintenance of the bubble:

- As hinted by (Brunnermeier & Julliard, 2008), housing bubbles are frequently initiated by money illusion.
- As argued by (Shiller, 2008), another factor is in play; analysis of past booms or bubbles in the housing market has revealed that buyers seem not to understand the supply response to price increases.

As stated by (Scherbina & Schlusche, 2012), there are several ways in which a bubble may burst or deflate associated with the bubble models previously listed. According to (Scherbina & Schlusche, 2012), models 1 and 2 imply that a housing bubble will deflate or burst when the market is sufficiently oversupplied. Models 3 and 4 dictate that the housing bubble will collapse when the positive sentiment in the market turns negative. Moreover, in model

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4, the housing bubble could burst following significant negative news from external factors (e.g. the stock market).

2.6. The Behavioural Factors Influencing Crises in the Housing Market

(Mishkin, 1992) notes that there are two primary schools of thought regarding the definition of a financial crisis. The first definition advocated by (Friedman & Schwartz, 1963) states that financial crises are linked to banking panics leading to a contraction in the money supply. As highlighted by (Mishkin, 1992), a critical issue with this narrow view of financial crises is that it disregards an asset-based crisis. However, an alternative view put by (Minsky, 1972; Kindleberger, 1978) states that a financial crisis involves or is a combination of any of the following events:

- sharp declines in asset prices
- failure of large financial or non-financial organisations
- deflation or disinflation
- disruptions in FX markets

The second definition would seem more appropriate for our research due to the broader range of events that could trigger a crisis. Since 2007, the UK's economy has been in several crises, incorporating a combination of these events; listed below are the critical crises which have impacted the UK housing market:

1. Financial Crisis
2. Prolonged Economic Downturn
3. Brexit
4. Covid-19 Pandemic
5. Periods of High Inflationary Pressures

2.7. The Psychology of Housing Market Crises

Since all humans react to adverse events, especially crises, in similar fashions, we will assume that householders display emotions and cognitions similar to those of financial investors during a crisis. There is a basis for this assumption, as illustrated by (Marsh & Gibb, 2011; Whittle *et al.*, 2014); the underlying psychological factors of financial decision-making are similar to all agents. However, how these psychological factors play out may sometimes be somewhat different.

A critical factor in play during any crisis is the influence of news. Since during a crisis, the news is almost always negative; therefore, as argued by (da Rocha Lima Filho & Rocha, 2017), news has the property of increasing the adverse reaction of householders and impacting the market. A relevant factor in the spread of the crisis, as highlighted by (Brunnermeier, 2009), is the amplification mechanism, alluding to the increased velocity of negative news, increasing the fear among householders. Therefore, negatively impacts the housing market and hence increases fear amongst householders. Thus, inducing loss aversion means the tendency to hold on to a property, even if it is no longer suited for their requirement. Furthermore, as observed by (Whittle *et al.*, 2014), this tendency may mean that the housing market does not suffer the same significant impact as the financial market, thus meaning that the housing market holds its value well during a crisis.

According to (Smith, Munro & Christie, 2006), a critical factor to consider is the emotional attachment of the householders to the property. As alluded by (Christie, Smith & Munro, 2008), householders often show deep positive

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emotions towards their property, falling in love with it. Similarly, as (Case & Shiller, 2003) argue, positive emotions also affect buyers. Therefore, as (Smith, Munro & Christie, 2006) allude, buyers tend to keep prices high because of their strong affection towards the dream house. Thus, as noted by (Christie, Smith & Munro, 2008), positive emotions by both householders towards the property mean that the housing market could remain ineffective during the crisis.

However, not all crises positively impact the housing market; hence, there is a requirement to research the psychological and emotional factors influencing the negative impact of a crisis. As illustrated earlier by (Brunnermeier, 2009), fear amplifies the psychology of economic agents, i.e. householders; it increases with the velocity of negative news during a crisis. As argued by (da Rocha Lima Filho & Rocha, 2017), bad news about an event stimulates negative emotions in the brain, generating adverse psychological effects. These negative psychological effects consist of the fundamental emotional and cognitive biases and heuristics affecting human behaviour during an adverse event, such as a crisis.

As alluded by (Lo, 2013), at the heart of any crisis is the unbounded emotion of fear; it is the emotion that makes us act without conscience. In essence, as highlighted by (Brunnermeier, 2009; Brunnermeier & Oehmke, 2012; Lo, 2013), fear is an additive emotion that increases with the velocity and intensity of the crisis over time. Moreover, sometimes the psychological effect of fear is so overwhelming that we fear it, as Franklin D. Roosevelt said in his inauguration speech on 4th March 1933: "So, first of all, let me assert my firm belief that the only thing we have to fear is fear itself."

Fear constantly changes the behaviour of animals and humans. As observed by (Keynes, 1936), most actions directly result from spontaneous decision-making. In nature, the prey's instinct is to flee from the predatory clutches of a hunting animal, changing the prey's behaviour. During a crisis, humans often change their behaviour to account for the possible loss of financial security. As (Kahneman & Tversky, 1979; Kahneman, Knetsch & Thaler, 1999; Thaler *et al.*, 1997) suggest, humans are by their very nature loss-averse; so, any crisis will make them increasingly loss-averse. However, as hinted by (Lo, 2013; Mateu, Monzani & Navarro, 2018), humans are also opportunists with a hint of greed, so many householders take risks to increase their wealth during a bubble or booming economy. This change in behaviour from opportunism and greed to loss aversion and fear is at the heart of the psychology of crises. Still, many psychological factors are in play during a crisis, both emotional and cognitive.

According to (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992), humans are reference-dependent, which is more critical in adverse events. Since as noted by (Marsh & Gibb, 2011; Whittle *et al.*, 2014), most householders are influenced by reference points using diverse references such as prices in the neighbourhood or past prices at the heart of their decisions. Moreover, as argued by (Seiler *et al.*, 2008), many householders tend to dismiss acceptable offers due to the tendency to use false reference points.

Using reference points to justify house prices is somewhat falsified during a crisis because many householders tend to suffer from several biases, meaning they may not be able to comprehend the price adjustment required in the context of the crisis. These biases include:

- belief perseverance,

- conservatism
- illusion of control

Householders may steadfastly hold on to their beliefs during a crisis, contradicting all available information. Thus leading to conservatism; like any other human, householders tend to hold on to their positive beliefs during a crisis, usually making insufficient adjustments relative to environmental changes. (Marsh & Gibb, 2011) argue that increases in uncertainty, as during any crisis, mean that householders are more likely to adopt conservatism or inertia behaviour, leading to householders being accused of having an illusion of control. As (Bartkowiak, Potrawiak & Pavlenko, 2018) allude, householders occasionally suffer from an illusion of control, often underpricing risk. During a crisis, householders often display an illusion of control, which may lead to the wrong decision under the circumstances.

A key factor is the different strategies employed by the householders; the endowment effect dictates that householders will always demand more than what they are willing to pay for their property, as argued by (Marsh & Gibb, 2011). However, buyers will always offer less than what they are prepared to sell the property if it is their own. Conversely, at any time, this buyer/householder conundrum favours the householder. However, during a crisis, the factors would favour the buyers. The issue at the centre of this conundrum is the demand and supply dilemma; during a crisis, there is little movement in the housing market, mainly due to financial constraints. Therefore, supplies will slightly outpace demand. The critical factor is that buyers unaffected by financial constraints could use the limited demand during a crisis. Alternatively, the resulting behaviour could be influenced by the status quo bias where financial constraints exist. During a crisis, as (Marsh & Gibb, 2011) allude, householders often prefer the status quo of staying at their current property, mainly due to financial constraints and fear.

As alluded by (Ackert, Church & Deaves, 2003; da Rocha Lima Filho and Rocha, 2017), emotions play a critical role in the decision-making process. Moreover, according to (Kahneman & Tversky, 1979; Kahneman, 1994, 2003), many people tend to find it difficult to act rationally during financial decisions under normal conditions, let alone a crisis. Thus suggesting that emotions play a critical role in the decision of any economic agent, as argued by (da Rocha Lima Filho & Rocha, 2017). As illustrated by (Fakhry, 2020), several emotions play a critical role during any financial cycle highlighted in Figure 3.

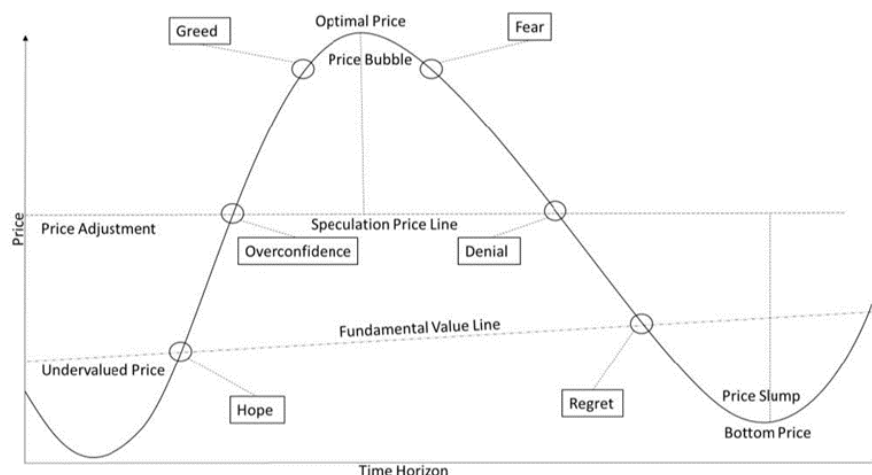


Figure 3. The Financial Cycle of Emotions (Fakhry, 2020)

As illustrated by (Fakhry, 2020), the downward slope is critical to understanding the impact of emotions on the price of any house during a crisis. During a crisis, householders' first point of emotional bias is fear, especially in a crisis that hits their financial status. During any crisis where householders' or buyers' employment or income status is affected, they increasingly tend to act according to the precautionary saving theory. As argued by (Leland, 1968; Malley & Moutos, 1996), the precautionary saving theory dictates that householders decrease expenditure and increase savings during any situation impacting their income or employment. Moreover, householders also tend to sell inessential assets to build up their capital or attempt to repay their debt during any crisis, essentially precautionary debt repayment. Thus meaning, as fear increases during a crisis, householders tend to increase their capital and reduce their debt. Therefore delaying any plans to buy a house or extend/re-decorate their existing house. However, as fear increases, panic inevitably ensues, and householders may feel they have no alternative but to sell. This scenario was in play in many countries during the 2008/2009 financial crisis and following economic recession, which harmed house prices. Nevertheless, another scenario at play during any extreme crisis is that many householders buy houses in less expensive regions as a long-term investment; during a crisis, precautionary saving and debt repayment mean divestment of these houses. This divestment leads to a regional house price crisis where some areas suffer a crash in house prices while others remain unaffected.

A deep sense of denial underpins the illusion of control bias many householders develop during a crisis. As stated by (Auchincloss & Samberg, 2012), denial is the tendency to repudiate aspects of external reality the individual does not want to know about or avoid/dismiss the painful effects of that reality. It is often hard to face the realities of a crisis; these could be financial difficulties, which means that your beloved property is under threat or your dream house is no longer an option. Considering, as (Christie, Smith & Munro, 2008) allude, the emotion and work rate householders put into owning or buying a house, it is only fair that it becomes an object of love. As with any relationship involving humans, householders feel a sense of loss when they are forced to face reality, so denial steps in. As quoted by Ken Seeley: "Denial keeps us blind to the things that we don't want to see because our brains don't feel we're ready to handle them."

Hence, householders under the illusion of control tend to act as though everything is normal during any adverse situation as far as the house is concerned. Remember, as highlighted earlier, an illusion of control occurs when a person feels a sense of control over outcomes they demonstrably do not influence. As alluded by (Bartkowiak, Potrawiak & Pavlenko, 2018), an illusion of control may lead to householders underpricing risk. Under adverse market conditions, the underpricing of risk could lead to householders losing their houses or buyers overestimating their capabilities; as argued by (Bartkowiak, Potrawiak & Pavlenko, 2018), this often leads to householders making decisions that are not in their interests during a crisis.

As highlighted earlier, illusion of control results from three biases: belief perseverance, confirmation and conservatism. All three are displayed during adverse events, such as crises, in which householders often believe they could overcome the challenging environment. Belief perseverance leads

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householders to hold out for a better price when the adverse environment is not in their favour, while buyers tend to think they can get the home of their dreams for less during a crisis. Thus, this stand-off often leads to the housing market stagnating during a crisis. Confirmation often occurs during a crisis when people only listen to information that confirms their view of a rosy pre-crisis world, meaning they cannot comprehend any adverse news. In comparison, conservatism dictates that householders often cannot accurately account for adverse information during a crisis, mainly due to their emotional inability to sufficiently update their information concerning the crisis effect.

Householders will inevitably feel regret as the crisis goes on. As put by Mark Twain, people tend to regret inaction; hence, during a crisis, householders may regret being greedy and not accepting an offer. In contrast, householders may regret not being patient in the housing market. However, another explanation for householders' behaviours during a crisis is, as (Muermann & Volkman, 2006) suggest, the resulting disposition effect. During any crisis, householders tend to hold houses that are losing value, expecting the crisis to blow over soon; thus, some housing markets do not adequately readjust. As put by (Samuelson & Zeckhauser, 1988), the explanation is that householders tend to be regret-averse, meaning they cannot comprehend seeing their homes as a loss. Therefore, pride gives rise to another critical trait during a crisis; people tend to subscribe to the disposition effect because they always see their houses as objects of pride and love. Hence, many cannot bear making a loss on an object close to their heart.

Moreover, as observed by (Seiler *et al.*, 2008), regret aversion could dissuade householders from selling their homes below a reference point. However, during a crisis, the reference point could be misleading; many householders tend to stick with the pre-crisis threshold, as highlighted by the conservatism bias. (Seiler *et al.*, 2008) note that many householders will still use the false reference point set at the bubble's height during a crisis. Therefore, as (Samuelson & Zeckhauser, 1988; Seiler *et al.*, 2008) suggest, they prefer the status quo over change, which could be why some areas hold their prices well during a crisis.

2.8. The Neuroeconomic of Housing Market Crises

As alluded to previously, there are two different theories of the brain's operations: the single system advocated by neurosciences (Levy & Glimcher, 2012) and the dual system promoted by neuroeconomics (Camerer, Loewenstein & Prelec, 2005). No matter which system is correct, there are some glaring issues in how the brain handles a crisis. According to (Bartkowiak, Potrawiak & Pavlenko, 2018), householders sometimes suffer from an illusion of control bias. As (Ardalan, 2018) notes, the illusion of control often occurs because most of the brain's workings are done by automated processes with little to no awareness. Additionally, as (Ardalan, 2018) maintains, some actions that are repeated regularly become automated, meaning they are pushed to the back of the brain. There is a danger that due to the unexpected events thrown by crises, the fast-paced automated process might lead to a decision that is out of context. In essence, a householder may decide without considering the context of a crisis, wrongly thinking they made the decision considering all the information.

Moreover, in a crisis, the brain might decide to postpone gratification until after the crisis. Since many householders tend to sell to buy, there is a danger

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that the brain concentrating on one piece of the jigsaw could overlook the whole picture. During a crisis, a buyer could take advantage of the housing market; hence, by selling their house at a lower price, they could buy a house at a lower price. However, householders are not rational; they tend to fall in love with their homes, making it difficult to see the advantageous connection.

So, how does the brain make decisions during a crisis? Since the crisis is a period when uncertainty is heightened, one could analyse how the brain makes decisions under uncertainty. Fortunately, considerable research has analysed the brain's decision-making process under uncertainty over the years. According to (Glimcher, Dorris & Bayer, 2005), the brain does not distinguish between rational and irrational decisions; thus, the neurons in the lateral intraparietal region of the brain are activated under rational and irrational decisions.

Understanding the impact of uncertainty requires understanding the brain's handling of probabilities and values. As illustrated by (Platt & Huettel, 2008), the dorsomedial prefrontal cortex was activated in an experiment where the probability remained unknown. However, the medial prefrontal cortex was activated as subjects learned about the probabilities by trial and error. The brain's insular, lateral prefrontal, and parietal cortices regions recorded increased uncertainty-related activities in experiments where information was incrementally given on choices. As highlighted by (Platt & Huettel, 2008), studies have shown increased activities within the insular cortex region when opting for risky over safer investments. However, the choice depends on the initial status of the insular region; if there were initial high activities, then the decision would be for the safe option. Indeed, as (Platt & Huettel, 2008) argue, most would opt for the safe option until the potential reward of the risky option is twice the size of the safe option. According to (Platt & Huettel, 2008), both gains and losses activate similar regions: striatum, midbrain, ventral prefrontal cortex and anterior cingulate cortex, with gains increasing activities and losses reducing activities. Moreover, following the prospect theory, losses activate these regions more than gains of similar magnitudes.

(Loewenstein, Rick & Cohen, 2008) argue that many people tend to fear outcomes they cognitively recognise as highly unlikely; thus, separately evaluating risky options by cognition and emotion. Moreover, the unfamiliarity of risks increases the emotional reactions, meaning people tend to overreact emotionally to any new risk. (Kahn *et al.*, 2002) observed increased activities in the amygdala, a brain region associated with fear, when an outcome remained unknown after making a choice. Furthermore, (Knutson *et al.*, 2001) found that happiness increased activities in the nucleus accumbens as anticipated gains increased. These and many other researches illustrate that emotions play a critical role in decision-making within the brain.

Generally, the brain is in two minds during a crisis: cognitions versus emotions and fear versus greed. Sellers tend to be emotionally connected to their house, while buyers tend to be more cognitively rational regarding the house. The householders are more fearful of selling their house during a crisis, and hence, presumably, the brain regions that deal with emotions are more active, especially the amygdala region associated with fear, as observed by (Kahn *et al.*, 2002). This increase in activities in the amygdala region as the crisis intensifies would explain why many householders tend to withdraw from

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their decision to sell their house. It also explains why previously rational householders panic and postpone their house hunt when their income or wealth is threatened. The single system of neuroscientists, such as (Levy & Glimcher, 2012), posits that the brain's negative activities increase as the context changes. However, the dual system advocated by neuroeconomists, such as (Camerer, Loewenstein & Prelec, 2005), eludes to the automated emotional, irrational system increasingly overpowering the brain as the crisis intensifies. Both systems seem to hint at a change in the regions and activities in the brain as the crisis intensifies, leading to householders reevaluating their decision-making process with negative consequences.

3. Conclusion

In summary, the paper reviews the behavioural factors influencing the housing market. Essentially, it combines the psychological and neurological views of behavioural economics to analyse the factors influencing the householders' decision-making process within the housing market. We reviewed the literature on behavioural economics and neuroeconomics to identify how householders make decisions under different contexts: herdings, bubbles and crises.

The review highlighted the complexities of the housing market's decision-making process. The householders, both buyers and sellers, are, to a certain extent, influenced by biases and heuristics, which complicate the decision-making process. However, one finding stood out that neuroeconomics should analyse the brains of householders and not just investors because there is a gap in the knowledge of how the brains of householders react.

Since the aim of this paper was originally to use the model of (Fakhry, 2021) to analyse the stability of the UK's housing market. Therefore, the future paper will analyse the UK's housing market price datasets. Moreover, it will include a timeframe review and analysis of the main events influencing the UK's housing market.

The policy conclusion of the paper is that there is a need for monetary and central government policies to take into account the behavioural factors influencing the housing market. The fact that the housing market is a pivotal contributor to volatility in the economy and that the 2008 financial crisis resulted from a housing market bubble cannot be overlooked. Monetary policy should be able to react to the housing market somehow.

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