Sentiment Measurement and its Relationship with Housing Prices: Review of Contemporary Dimensions

Benjamin Kwakye[*] and Chan Tze Haw

Graduate School of Business, Universiti Sains Malaysia (USM).

Abstract: This study systematically review literature on the relationship between sentiment measurement and house prices in the contemporarily from 2012 to 2020, using a systematic review methodology. It identified news media, google trends, twitter and the stock market sentiment indexes as the nascent sentiment index quantification in the real estate market. And each according to literature has a link with house prices usually fueling price. The study again discovered new empirical and theoretical research opportunities in the field for future studies. To the best of the authors knowledge this is the first review work in recent past to synthesize the approaches to sentiment measurement and house prices in the contemporarily. The study makes contribution to the scanty extant literature in the real estate sentiment fraternity and would be beneficial to academics, policy makers and investors who are interested in sentiment analysis in the housing market.

Keywords: Sentiment index, house price, housing market, financial market and behavioral finance.

INTRODUCTION

Housing is an inevitable essential need to households and viewed as one of the main boosters of economic growth in many countries. Its increasing importance was heightened and linked to the 2008 global financial crises (see Agnello, Castro, & Sousa, 2019: Jorda`, Schularick, & Taylor, 2016: Cerutti, Dagher, & Dell'Ariccia, 2017: Korkmaz, 2019: Shukor, Said & Majid, 2016). And as a result, have been given concerted attention in main stream finance and economic research (Martínez-García & Grossman, 2020: Singh & Nadkarni, 2018 and Cesa-Bianchi, Cespedes, & Rebucci, 2015).

Housing prices have long time been instigated by macroeconomic fundametals but studies have shown that movements in house prices are sometimes diverged from the fundamental (Tunc, 2020: Das et al., 2020 and Gazzani, 2019). But Deng, Girardin, & Joyeux, (2018) stated that there is a difficulty in decting house price deviation from fundamentals. This calls for the need to look at how some unexplained factors impact on house prices in the market. Behaviourial finance theory have shown that the beliefs, attitudess and the aspirations of investors in the financial market are to a larger extent causes variations in asset prices. Ling, Ooi, & Le, (2015 pg. 88) posits that "behavioral approach explicitly recognizes some investors and homeowner's base expectations on non-fundamental factors and that systematic biases in their beliefs can induce them to trade on non-fundamental information (i.e., sentiment)".

Cognitive phycology study emphasizes on how people make choices, reason and allot their attention among other things and their emotions impact on their decision -making (Saydometov, Sabherwal, & Aroul, 2020 and Freybote & Seagraves, 2017). Zheng & Osmer, (2019) also opined that knowing how and when changes in attitude occure can be important in the determination of swings in the price of financial assets. Consiquently, the need to effectively measure investor sentiment to mirror the confidence investors in the market helps to estimate the market perspective and make future predictions in the price of properties (Hui & Wang, 2014).

In the housing market behaviourial finance is reflected through sentiment analysis since the quest to invest, buy, sell or rent a property is contingent on the beliefs and aspirations of the individual in the market coupled with other economic, location and other property specific factors. According to Das et al., (2020) sentiment plays a crucial role in the real estate market and sometimes give rise to bubbles (Kholodilin, Michelsen, & Ulbricht, 2018 and Abildgren, Hansen, & Kuchler, 2018). Housing sentiment can be explained as a misguided confidence in house price rise, the possibility of house price inflation, or both, which cannot be explained by the actual economic evidence accessible to participants in the housing sector (Ling, Ooi, & Le, 2015).

Even though, the role of sentiment in real estate cannot be under estimated, its relationship with house price is not clearly defined due to its measurement. For example, Das et al., (2020) and Saydometov, Sabherwal, & Aroul, (2020) postulated that although sentiment has greater influence on property prices its measurement impedes its study. Whereas Heinig & Nanda, (2018) added that the function of sentiment

*Address correspondence to this author at Graduate School of Business, Universiti Sains Malaysia (USM); E-mail: kwakye@student.usm.my

is well known, but its measurement and effect is not straightforward under dynamic and informationally asymmetric economic conditions, as it may vary for various types of agents through different asset classes at different times. So therefore, every causal study would suffer from significant endogeneity problems leading to skewed results and incorrect statistical inferences. Aggarwal, (2019) also stated that the task of measuring sentiment is challenging because the definition of sentiment existing in theories are in abstract.

Similar to the above the "Shiller (2008) states that over the past decades, housing booms and busts have always been accompanied by substantial psychological elements, and therefore, cannot be explained fully by underlying fundamental economic factors. This brought him to the conclusion that house prices reflect buyer willingness to pay, therefore, a change in this willingness must per-se impact on prices. Hence, in his view, it would be wrong to work on the basis that markets are driven solely by fundamentals, just because the underlying "sentiment" cannot be measured accurately" (cited in Dietzel, 2016 pg. 109).

This therefore postulates that even though sentiment may influence property values its construction present a challenge to scholars in the field thereby undermining its study. Hence, the need to first know the prevailing approaches to sentiment constructed in the real estate market, its dynamics and its relationship with house prices will open doors for academics, policy makers and investors who are interested in real estate sentiment analysis. The study would identify the various approaches to sentiment constructed in the housing market and unearth new research gaps for future research. The contributions of the study are made through this perspective.

It is against this background that this study seeks to review the contemporary dimensions sentiment measurement and its relationship with housing prices so as to synthesize and summarise the nascent studies for the past few years, dwelling on the various approaches, findings, data, methodology and the country of study. The rest of the study is scheduled in the following sections: Section 2 highlights on data and methodology, section 3 defines real estate sentiment, section 4 talks about the classification of sentiment, Section 5 sheds light on the review of real estate sentiment measurement, section 6 is the summary and future studies while Section 7 concludes the study.

Data and Methodology

In this study, 52 research papers were reviewed in relation to real estate sentiment and house prices from 2012 to March 2020. The sample of the scholarly papers were made from database of high repute.

- This research adapted the systematic review process followed by McLean and Antony, (2014) and Saini and Sighania, (2019). The purposive sampling technique was used to identify the relevant database for the study. This is because based on previous experiences and recommendation from experts in the field, the selected database could give me the required information to accomplish the task. In the first place, the study conducted the search using the database of Taylor and Francis (TF), Elsevier's Sci-

ence Direct (ESD), Emerald insight (EI), Springer, Wiley online library (WOL) and Google scholar (GS). Key words such as housing sentiment and house prices were used for the search which produced thousands of results. In the second phase, peer reviewed articles published from 2012 to March, 2020 were given heed. In the third instance, the respective papers were referenced from the Scimago Scientific Journal Ranking (SJR), 2018 and the journal citation report (JCR) 2018 for the quality of the journals. In an attempt to manage the numerous literatures, the inclusion criteria were set up below:

- Scholarly articles in peer – review journals were included for the study. However, where necessary book chapters and working papers from international organisations were used to buttress an argument.

- Peer - review papers indexed in Scimago Scientific journal rankings (SJR) based on the quartiles (Q1, Q2, and Q) or ranked in the journal citation report (JCR) – web of science was of much priority.

- Scholarly papers that shows a relationship between real estate sentiment and housing prices were considered and of much priority.

- Due to inaccessibility of some equally good papers, only articles where full – text was available and can be obtained were considered for the study.

- The study included only articles published or available online from 2012 to March, 2020. However, where references have to be made to the "gurus" such as Robert J. Shiller and Malcom Baker, the study specifically considered that hither-to 2012.

With the focus of the studies in perspective the research was left with 52 scholarly papers for evaluation and discussion. Please, refer to Appendix "A" Table I for the detailed summary of journals, journal rankings and the database.

Defining Real Estate Sentiment

The word sentiment has been noted to influence the decisions of many individuals both positively and negatively in the financial market. However, its studies are prevalent in finance literature particularly the stock market while in the real estate market it is at its infantile stage, though given concerted attention. Knotting sentiment to behavioural finance has led to the replication of borrowed terms in other disciplines including the real estate market. Investor sentiment is defined as the idea of beliefs concerning future cash flows and risks in investment which the existing market information cannot be explained (Barker and Wurgler 2007 as cited in Hui, Dong, Jia, & Lam, 2017).

On the other hand Saydometov et al., (2020) explained sentiment as the reflection the attitude of individuals, in aggregate, about the future prospects of the financial market whereas Soo, (2018) defined sentiment as the phycology behind investors belief in the determination of asset prices. In relation to real estate, housing sentiment is defined "as a misguided belief about the growth in housing prices, the risk of house price appreciation, or both, that cannot be justified

by the current economic information set available to housing market participants" (Ling et al., 2015 pg. 88). While Freybote, (2016) defined real estate sentiment as investors attitude either optimism or pessimism towards commercial real estate, Freybote & Seagraves, (2017) also explained it as the universal behavior of a specific investor type towards office real estate, revealed through trading activity without the influence of economic fundamentals. Amidst, the definitions it can be averred that investors beliefs or expectations are central in the determination of asset prices. Hence, in the context of this review real estate sentiment is explained as the positive and negative expectations of market participants that causes movements in property prices devoid of devoid of economic fundamentals.

Classification of Sentiment Measurement

From the broader perspective the measurement of sentiment can be classified into two main groups, namely direct and indirect sentiment measure. Though, this broad classification was based on the stock market, its application is replicated in the real estate market.

Direct measures are based on frequently scheduled polls, from which views are sampled from people, families, businesses or financial experts. The respondents are interviewed in these polls, among other items, to determine their financial condition, their view of the economic environment or the present and potential growth of either the economy or the stock sector ((Ho, 2012). It gathers comments on a series of questions describing the calculated component. A bull-bear spread is calculated as a difference between the percentage of bullish and bearish investors, which allows for separate analysis of individual and institutional feelings.

The classification and use of this class of sentiment is prevalent in in the advanced countries dominated by the United State of America. To highlight few are: The University of Michigan Consumer Sentiment Index, Investors Intelligence confidence index, the American Association of Individual Investors (AAII) survey, and the investor survey by the SITUS/ Real Estate Research Corporation (Das et al., 2020: Freybote, 2016 and Das et al, 2015) and the European Commission's ESI in the UK (Lang & Schaefers, 2015). Market sentiment constructed though surveys have been established to prdict changess in asset prices (Tsolacos, 2012).

According to Finter, Niessen-Ruenzi, & Ruenzi, (2012) indirect sentiment indicators are obtained from the stock market or other trading activities. These variables or indicators have been highlighted to include: closed-end fund discount, share turnover, the dividend premium, number of IPOs and their first-day returns, or the contemporaneous and lagged equity share in new issues (see Lee, Shleifer, and Thaler, 1991; Neal and Wheatley, 1998; Lowry, 2003; Baker and Wurgler, 2006, 2007; Ling, Naranjo, and Scheick, 2014 all as cited in Das et al., 2020). These indirect proxies are usually treated at exogeneous variables. Conditioning on investor sentiment, the sentiment index has helped to understand the cross-section returns on securities that are subject to elevated rates of volatility and individual views, like young, low, extremely unpredictable, troubled, and intense growth companies.

Composite sentiment indices originating from the first set of multiple sentiment proxies from the principal component (PCA) are capable of integrating both logical and unreasonable components of sentiment. Once the PCA steps are established to define the unreasonable dimension of market sentiment, sentiment variables are regressed on a collection of control variables representing global macroeconomic factors (Baker & Wurgler, 2007). The corresponding sentiment indicator is thus unaware of the variance in the market cycle and measures only the portion of the perceptions and opinions of consumers that is not based on fundamental factors.

Review of Sentiment Measurement in Real Estate

The imperfection of the real estate market characterized by high transaction cost, illiquidity and information asymmetry makes it complex and differentiated from the other financial market but to some extend discourages informed traders from leveraging seeming profit opportunities (Glaeser & Nathanson., 2014). Nonetheless, behavioral explanations in the market causes variations in asset prices including house prices. This section of the study reviews empirical literature on the relationship between sentiment and housing values in the contemporarily through the use of news, google trends and the stock market.

News-base Sentiment Measurement and House Prices

News in the market plays a key role in asset pricing and influence the decision making of investors in the market. For example García, (2013), recounted that in bad times market participants are more sensitive to news than in good times. Basing on positive and negative financial news from the New York Times for the period 1905 to 2005, he unearthed that news content have a greater effect on asset prices. On the other hand, embarking on the trained network to predict the polarity of news articles in the real estate market from the S&P Global Market Intelligence news database from January 2006 and December 2018 (Braun, Hausler, & Schäfers, 2019) detected that, the constructed real estate sentiment index have significant link with market liquidity and impact on price and transaction volume. Chen, Xie, Zhang, Xing, & Li, (2020) in China, used monthly data from 2015 to 2018 and reported that news pessimism leads to downwards pressure on housing market price while optimism increase house prices in the market.

Walker, (2016) Used the mean weekly returns premium portfolio from the UK, he documented a significant relationship between real estate investing and stock returns based on the amount of news with the trading volume. Hausler, Ruscheinsky, & Lang, (2018) also used the machine learning approach to analyze news-base sentiment in real estate in the US and discovered that sentiment indicators predict the total returns in real estate even after controlling for macroeconomic factors whereas newspaper pessimism was also found to reduce REIT returns and increase net asset value (Jandl, 2016). This confirms the argument raised by (Ruscheinsky, Lang, & Schäfers, 2018) that sentiment deduced from newspaper headlines can be used to predict movement in REIT returns in the US when they studied real estate media sentiment through textual analysis over the period 2005 to 2015.

Gazzani, (2019) in examining news and noise bubbles in the housing market, discovered that in the long-run, the US housing market is mainly driven by news sentiment using quarterly data from 1963 to 2016 and embarking on the non-standard (SVAR) technique. Similarly, Walker, (2014) examined the link between the mainstream media and the latest increase in UK house prices by using more than 30 000 papers in the housing market from 1993 to 2008 discovered that media Granger caused actual house price variation, indicating the views in the property market is influenced by the media. However, the news media did not contribute to the housing booms in the early 2000's. Contrary to this, in the US Soo, (2015:2018) found that the booms in price variations in the early 2000's in the property market was chiefly ascribed to local newspaper reporting. Nonetheless, he averred that media sentiment in real estate has considerable predictive capacity for potential housing values, above and beyond historically predictive variables and historical returns and sentiment leads market fluctuations by more than two years, which is strongly associated with the metrics available for survey perceptions.

Google trends Sentiment Measurement and House Prices

In recent times the use of internet search engines in the construction of real estate sentiment indexes are gradually gaining grounds in real estate research. Dietzel, (2016) posits that google provides free information and a wide range of information for searchers that can be accessed since 2004. Da, Engelberg, & Gao, (2015) developed a new measure of sentiment index using internet search volumes of Financial and Economic Attitudes Revealed by Search (FEARS) from 2004 to 2011. They discovered that short-term return reversals, temporary increases in volatility, and mutual fund flows are among the areas where their sentiment constructed index helped to predict changes in price and adding that difficult to arbitrage are more favored by investor sentiment. Using google search frequencies to construct sentiment indices (Saydometov et al., 2020) relied on monthly data from 2004 to 2014 and reported that, negative sentiment negatively impact on future house prices unlike positive sentiment and as well house prices are more reactive to sentiment in recessionary periods. However, in analyzing the extent to which future cross-sectional differences in property values are forecasted by online search intensity through google (Beracha & Wintoki, 2013) established that future house prices can be predicted through abnormal online search intensity.

According to Dietzel, (2016) even though, google search can sometimes be inaccurate for market timing, but when it comes to foreseeing a turning point in the future, it can give a correct indication. He used monthly data from 2004 to June, 2014 and found that sentiment constructed through google trends helps to predict changes in price even on monthly basis. In related studies, Hohenstatt & Kaesbauer, (2014) and Wu & Brynjolfsson, (2015) also averred that changes in house prices are sensitive to market sentiment through the use of the search volume indices. In the REIT market Braun, (2016), Rochdi & Dietzel, (2015) and Marcato & Nanda, (2014) found that google search volumes also helps in predicting movements and volatility in REIT returns.

Heinig & Nanda, (2018) stated that in measuring sentiment, online search volume data gives a better result compared to the other approaches. In a spatial analysis of twitter sentiment in Turkey involving a data set of 1.7 million tweets (Hannum, Arslanli, & Kalay, 2019) posits that twitter sentiment have a significant negative relationship with house price appreciation. However, considering the percentage of check-in tweets few positive relationships were recorded. Grover and Grover, (2014) also highlighted that house price variations may be attributed to twitter sentiments which are of much interest to investors and policymakers while Smailović, Grčar, Lavrač, & Žnidaršič, (2014) investigated whether twitter sentiment have any bearing on asset price movement. Regardless of the strong relationship between google trend sentiment constructed index and house prices, it is not always accurate in-terms of market timing (Dietzel, 2016).

Market Sentiment Measurement and House Prices

In the real estate market unlike the stock market, house prices cannot quickly respond to the changes in the market and according to Baker, Wurgler, & Yuan, (2012) investors sentiment are more susceptible to assets with limited arbitrage. In the housing market several empirical studies have established a link between market sentiment and the real estate market through house prices. Resulting to the use of data emanating from 2005 to 2015 in China (Zhou, 2018) found that negative market sentiment have significant impact on house prices, to the extent that even tightening the policies could not reduce the optimism in the market and usually high sentiment is followed by low returns. Akin to this Ling et al., (2015) in the US documented that changes in market sentiment of all the three participants in the property market namely buyers, sellers and creditors affects movements in house prices, particularly it appreciation and the effect is persistent. Their study embarked on the reduced form of the VAR model using data from 1990Q2 to 2010Q3.

Freybote & Seagraves, (2017) used quarterly data from 2000 to 2014 and discovered that changes in private real estate sentiment have greater influence on returns since institutional investors in the market relies on the market sentiment to make investment decisions and Lang & Schaefers, (2015) opined that higher sensitivity yields higher returns whereas lower sensitivity yields low returns in the housing market. They further indicated that high sentiment in real estate market are prone to higher risks compared to the low sentiments. In investigating the speculative bubbles or market fundamentals in the US Shi, (2017) found that the national housing market is not moved by speculation using data from 1978 to 2015. However, he recounted only one bubble episode in the early to mid-2000's in the whole sample. Similarly, Kholodilin et al., (2018) and Wong, Lee, & Koong, (2019) in Germany and Malaysia respectively recorded that house prices were not moved by speculative activities at the national level. But in many cities' speculation was found to increases house prices (Kholodilin et al., 2018). Based on the classical and the Bayesian VAR with the help of quarterly data from 1995Q1 to 2014Q3, Gupta, Lau, Plakandaras, & Wong, (2019) discovered that that market sentiment gives more accurate results in forecasting US home sales

Also in an attempt to investigate the role of market sentiment in the private real estate market, relying on monthly data from July, 1991 to December, 2011 involving 2,077,957 observations in Hong Kong, Hui & Wang, (2014) and Wang & Hui, (2017) documented that sentiment quantified through the market index is an efficient predictor of house prices and reflects changes in liquidity. They concluded that sentiment is regarded as the origin of the chain. However, (Hui et al., 2017) established that in China, buyer-seller sentiment have negative effects on property returns whereas developer sentiment was found to be positive, using data from January, 2006 to July, 2017. Chun, (2017) used the consumer sentiment index and found a positive effect on house prices while Mathieu & Ziet, (2016) also used a similar index and found a significant positive impact on new home sales. Wadud, Ali Ahmed, & Tang, (2020) reported that anticipated consumer sentiment increases loan delinquencies. A unidirectional causality was also found to run from the NAHB sentiment index to the house prices developed by S&P/ Case-Shiller index (Rodriguez Gonzalez, Basse, Kunze, & Vornholz, 2018).

Abildgren et al., (2018) on the other hand detected that house prices in the market are partly caused by over-optimism and can be decoupled from macroeconomic fundamentals, but Marfatia, (2019) noted that over-optimism rather reduces housing returns. Zheng & Osmer, (2019) also used data from 1991 to 2014 and established that median property prices are usually higher in periods of pessimistic sentiment. They further stated that the relationship between composite stock market sentiment and house price returns are time-varying and rises at a faster rate during economic recessions. However, market sentiment played a minimal role in the determination of house prices while the effects of macroeconomic variables were amplified (Lowis, Hall, & Cloete, 2015).

Contrary to this (Heinig & Nanda, 2018 pg. 255) enunciated that "Price determination in the property market is often fraught with irrational behaviour and trends cannot be explained by fundamental drivers of the sector". And the effects of negative information on the volatility of real estate from data emanating from 2000Q1 to 2017Q4 was also documented by (Alkali, Sipan, & Razali, 2019). Freybote, (2016) established with the help of monthly data from 2010 to 2013 that REIT bond yield are negatively related to sentiment regardless of the credit rating and the S&P index inclusion. Analogously, Lama & Hui, (2018) also found a negative relationship between sentiment and future real estate returns. Revelations from the relationship between sentiment and house prices shows different results, however most of the studies shows that in times of optimism house prices rise while low pessimism leads to low prices but generally, sentiment increases house prices on large scale.

6. SUMMARY AND FUTURE STUDIES

The quest by individuals to invest, buy, sell or let a new home is dependent on several factors including the economic and financial conditions, location characteristics and other information in the market. In making financial decisions and forecasts people do rely on all the necessary available decisions in the market (Aggarwal, 2014). But Saydometov, Sabherwal, & Aroul, (2020) posited that one of the utmost eco-

nomic decisions to make is to sell or buy a house. Putting the housing market into perspective, expressing the beliefs and thoughts of participants in the market is also denoted as behavioural finance but reflected through sentiment analysis. But its studies have been crippled and limited in literature due to the difficulty in its quantification (Dietzel, 2016: Heinig & Nanda, 2018: Das et al., 2020: Saydometov, Sabherwal, & Aroul, 2020 and (Gazzani, 2019).

The review avers that several studies have used different approaches to construct sentiment indexes and showed its relationship with the housing market. News media (García, 2013: Walker, 2016: Braun, Hausler, & Schäfers, 2019 and Gazzani, 2019), google trends (Beracha & Wintoki, 2013: Da, Engelberg, & Gao, 2015: Dietzel, 2016: and Saydometov et al., 2020) and the stock market (Ling et al., 2015: Freybote & Seagraves, 2017: Shi, 2017 :Zhou, 2018: Kholodilin et al., 2018 and Wong, Lee, & Koong, 2019) have dominated sentiment analysis in the real estate market. However, the use of the stock market proxies developed by (Baker & Wurgler, 2007) to predict movements in asset prices is the chief among all other approaches used. Nontheless, twitter sentiment (Hannum, Arslanli, & Kalay, 2019 and Grover & Grover, 2014) are once a while use by some researchers but incomparable to the earlier one's mentioned. Please, refer to Note 1 for details on the summary of literature.

Noted from the above, it can be deduced that measuring sentiment through any of the above means have a relationship with property values even though each has its own drawbacks limiting its research. Rizkiana, Sari, Hardjomidjojo, & Prihartono, (2019) in an attempt to develop a composite sentiment index in Indonesia based on the internet-available data, argued each of the approaches to sentiment construction indexes comes with its own limitation in the form of data sources, methods and different sentiment measures. Hence, in choosing the appropriate approach to sentiment measurement one needs to be careful, since there is no perfect and or incontrovertible proxies to measure investor sentiment in the market. Particularly, when he uncovered that news media sentiment has a day lag compared to google trends and social media sentiment.

The review therefore present the following opportunities for future studies: since, studies have shown that each approach has an effect or a relationship with house price, a more comaparative empirical study could be carried out to examine the relationship between the approaches or the approach that the most frequent and the strongest effects on house prices in the market. Again, it has become a public conjecture that the influence of social media as a means to receive or desiminate information cannot be downplayed. Hence, further studies could look at the other social media platforms such as whatsapp, facebook and instagram to construct sentiment indexes from varied sources. While most studies resort to the use of investor sentiment, others prefer to use consumer sentiment, an empirical study could therefore be carried out to examine the relationship between investor and consumer sentiment index and its predictive power on house prices in the housing market.

Also, the study of sentiment analysis in the housing market is gaining momentum at an accelerated rate in the devel-

oped countries such as the US, UK, Gemany, China and Hong Kong but in the emerging and the frontier economies literature is either at it teething stage or in death. Could, this be attributed to the difficulty in constructing sentiment as literatures have declared or other factors?. In any case it an eye-opener to scholars in many emerging or frontier economises particularly through the construction of of the sentiment index which has been one of the hallmarks of Baker & Wurgler, (2007). Finally, in the real estate market sentiment is reflected through the behaviourial finance theory but since news, noise and bubbles exist in the market, a review study could also be carried out to look at the interrelatedness or the overview of the leading housing sentimental theories to reflect the above approches.

7. CONCLUSION

Research on behaviourial finance was heightened in the early 1990's. Yet, the housing sector have received little attention from both academicians and policy makers. But after the 2007-2008 global financial crises, the sector has been given concerted attention due to the role it played in the recession. In an attempt to look at the myriad of factors that causes booms and burst in the housing market, the lens was placed on behaviourial finance reflected through sentiment analysis. But its best measurement to reflect the beliefs and aspirations of market participants remains a challenge to scholars in the field. This study however review literature on the relationship between the approaches to sentiment measurement and house prices from the period 2012 to 2020 adapting the systematic review process followed by Mclean and Antony, (2014) and Saini and Sighania, (2019).

This review has identified the various approaches to sentiment measurement (news media, google trends, twitter and the stock market) in the housing industry and how each impact on house prices. The collective insight into the study also brought about literature gaps for future empirical and theoretical research. The study is therefore and eye-opener and contributes to the limited extant literature in the field benefitting both academicians and practitioners. For academics, it gives and insight on previous findings to aid discussions, methodologies, variables, references and possible research gaps for attention. To enunciate on the references, the study has helped to bring together recent and quality journal under one umbrella on real estate sentiment analysis which may be beneficial to researchers in the field. To practitioners and policy makers, it helps in accumulating and developing a reliable knowledge base from myriad of studies from different countries, particularly countries with similar market characteristics when some of the possible factors instigating or mitigating house prices are blurred. Since market participants can behave irrationally, knowing where and when to invest is necessary to investors.

NOTES

A summary of the detailed extract from the extant literature in relation to authors, year, country, data periods and findings can be accessed from: https://drive.google.com/open?id=1sj2IbFwpWaPycDEF6sO3-7GZRKkMrp7- However, further details can be provided upon request.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflict of interest.

APPENDIX "A"

Table II: Outline of Review Journals and Database.

S/No	Name of Journal	No. of Papers	Quartile	ISI	Database
1	Applied economics	1	Q2	0.986	TF
2	Cogent economics and finance	1	Q3	na	TF
3	Economic modelling	1	Q2	2.059	ESD
4	Economic reseaech- Ekonomska Istrazivanja	1	Q2	na	TF
5	Emerging markets and trade	1	Q2	na	TF
6	Emerging markets review	1	Q1	2.108	ESD
7	Empirical economics	1	Q2	1.029	Springer
8	Expert systems with application	1	Q1	4.292	ESD
9	Habitat international	3	Q1	3.846	ESD
10	Housing policy and debate	1	Q1	na	TF
11	Housing theory and society	1	Q1	1.478	TF
12	Information sciences	1	Q1	5.524	ESD
13	International journal of housing market and analysis	4	Q2	na	EI
14	International journal of urban sciences	1	Q2	na	TF
15	Journal of banking and finance	1	Q1	2.205	ESD

16	Journal of behavioural and experimental finance	1	Q2	na	ESD
17	Journal of european real estate research	3	Q2	na	EI
18	Journal of financial economics	1	Q2	4.694	ESD
19	Journal of housing economics	1	Q2	1.640	ESD
20	Journal of macroeconomics	1	Q2	0.910	ESD
21	Journal of money credit and banking	2	Q1	1.782	WOL
22	Journal of property investment and finance	3	Q2	na	EI
23	Journal of property research	2	Q2	na	TF
24	Journal of real estate finance and economics	1	Q1	1.174	Springer
25	Journal of real estate literature	1	Q2	na	ARES
26	Journal of real estate research	1	Q1	1.250	ARES
27	North American journal of economics and finance	1	Q2	1.199	ESD
28	Others	2	na	na	Google scholar/Springer
29	Qualitative research in financial markets	1	Q3	na	EI
30	Quarterly review of economics	1	Q2	na	ESD
31	Real estate economics	1	Q1	1.764	WOL
32	Review of economic dynamics	1	Q1	1.580	ESD
33	Review of financial economics	1	Q2	na	ESD
34	Review of financial studies	2	Q1	4.975	OUP
35	The journal of finance	1	Q1	na	WOL
36	Working paper series	2	Q4	na	NBER/ Springer
37	Working paper series	1	na	na	Rose school of business

Source: authors compilation from database.

APPENDIX "B"

Figure I: Distribution of database
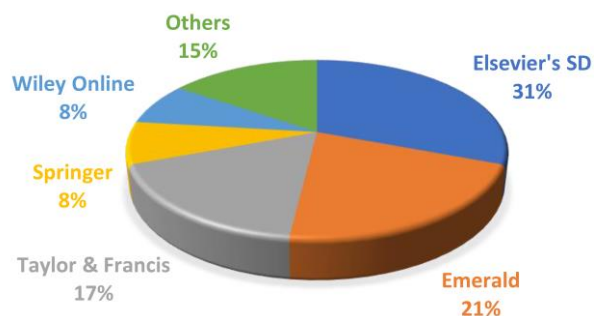
APPENDIX "C"

Figure II: Journal rankings

REFERENCES

Abildgren, K., Hansen, N. L., & Kuchler, A. (2018). Overoptimism and house price bubbles. Journal of Macroeconomics, 56(January), 1–14. https://doi.org/10.1016/j.jmacro.2017.12.006

Aggarwal, D. (2019). Defining and measuring market sentiments: a review of the literature. Qualitative Research in Financial Markets. https://doi.org/10.1108/QRFM-03-2018-0033

Aggarwal, R. (2014). Animal spirits in financial economics: A review of deviations from economic rationality. International Review of Financial Analysis, 32, 179–187. https://doi.org/10.1016/j.irfa.2013.07.018

Agnello, L., Castro, V., & Sousa, R. M. (2019). The Housing Cycle: What Role for Mortgage Market Development and Housing Finance? Journal of Real Estate Finance and Economics. https://doi.org/10.1007/s11146-019-09705-z

Alkali, M., Sipan, I., & Razali, M. N. (2019). The effect of negative information on the volatility of real estate residential prices in Abuja, Nigeria. International Journal of Housing Markets and Analysis. https://doi.org/10.1108/IJHMA-03-2019-0036

Baker, M., & Wurgler, J. (2007). Investor sentiment in the stock market. Journal of Economic Perspectives, 21(2), 129–151. https://doi.org/10.1257/jep.21.2.129

Baker, M., Wurgler, J., & Yuan, Y. (2012). Global, local, and contagious investor sentiment. Journal of Financial Economics, 104(2), 272–287. https://doi.org/10.1016/j.jfineco.2011.11.002

Beracha, E., & Wintoki, M. B. (2013). Forecasting residential real estate price changes from online search activity. Journal of Real Estate Research, 3(35), 35(3), 283–312.

Braun, J., Hausler, J., & Schäfers, W. (2019). Artificial intelligence, news sentiment, and property market liquidity. Journal of Property Investment and Finance, (2015). https://doi.org/10.1108/JPIF-08-2019-0100

Braun, N. (2016). Google search volume sentiment and its impact on REIT market movements. Journal of Property Investment and Finance, 34(3), 249–262. https://doi.org/10.1108/JPIF-12-2015-0083

Caraiani, P., Gupta, R., Lau, C. K. M., & Marfatia, H. A. (2019). Effects of Conventional and Unconventional Monetary Policy Shocks on Housing Prices in the United States : The Role of Sentiment. Pretoria.

Cerutti, E., Dagher, J., & Dell'Ariccia, G. (2017). Housing finance and real-estate booms: A cross-country perspective. Journal of Housing Economics, 38, 1–13. https://doi.org/10.1016/j.jhe.2017.02.001

Cesa-Bianchi, A., Cespedes, L. F., & Rebucci, A. (2015). Global liquidity, house prices, and the macroeconomy: Evidence from advanced and emerging economies. Journal of Money, Credit and Banking, 47(S1), 301–335. https://doi.org/10.1111/jmcb.12204

Chen, Y., Xie, Z., Zhang, W., Xing, R., & Li, Q. (2020). Quantifying the Effect on Real Estate Stock Movements. Emerging Markets Finance and Trade, 00(00), 1–5. https://doi.org/10.1080/1540496X.2019.1695596

Chun, H. (2017). A study on the impact of changes in consumer sentiment on the housing market in Korea. International Journal of Urban Sciences, 21(2), 129–146. https://doi.org/10.1080/12265934.2016.1239548

Da, Z., Engelberg, J., & Gao, P. (2015). The sum of all FEARS investor sentiment and asset prices. Review of Financial Studies, 28(1), 1–32. https://doi.org/10.1093/rfs/hhu072

Das, P., Roland, F., Hanle, B., Russ, I. N., Hanle, B., & Russ, I. N. (2020). The Cross-Over Effect of Irrational Sentiments in Housing , Commercial Property , and Stock Markets. Journal of Banking and Finance, 105799. https://doi.org/10.1016/j.jbankfin.2020.105799

Deng, Y., Girardin, E., & Joyeux, R. (2018). Fundamentals and the volatility of real estate prices in China: A sequential modelling strategy. China Economic Review, 48, 205–222. https://doi.org/10.1016/j.chieco.2016.10.011

Dietzel, M. A. (2016). Sentiment-based predictions of housing market turning points with Google trends. International Journal of Housing Markets and Analysis, 9(1), 108–136. https://doi.org/10.1108/IJHMA-12-2014-0058

Finter, P., Niessen-Ruenzi, A., & Ruenzi, S. (2012). The impact of investor sentiment on the German stock market. Zeitschrift Für Betriebswirtschaft, 82(2), 133–163. https://doi.org/10.1007/s11573-011-0536-x

Freybote, J. (2016). Real estate sentiment as information for REIT bond pricing. Journal of Property Research, 33(1), 18–36. https://doi.org/10.1080/09599916.2016.1146791

Freybote, J., & Seagraves, P. A. (2017). Heterogeneous Investor Sentiment and Institutional Real Estate Investments. Real Estate Economics, 45(1), 154–176. https://doi.org/10.1111/1540-6229.12132

García, D. (2013). Sentiment during Recessions. Journal of Finance, 68(3), 1267–1300. https://doi.org/10.1111/jofi.12027

Gazzani, A. (2019). News and noise bubbles in the housing market. Review of Economic Dynamics, 1(2009), 1–27. https://doi.org/10.1016/j.red.2019.08.001

Glaeser, E. L., & Nathanson., C. G. (2014). Housing Bubbles." NBER Working Paper No. 20426.

Grover, R., & Grover, C. (2014). The role of house price indices in managing the integration of finance and housing markets in the European union. Journal of European Real Estate Research, 7(3), 270–294. https://doi.org/10.1108/JERER-02-2014-0013

Gupta, R., Lau, C. K. M., Plakandaras, V., & Wong, W. K. (2019). The role of housing sentiment in forecasting U.S. home sales growth: evidence from a Bayesian compressed vector autoregressive model. Economic Research-Ekonomska Istrazivanja, 32(1), 2554–2567. https://doi.org/10.1080/1331677X.2019.1650657

Hannum, C., Arslanli, K. Y., & Kalay, A. F. (2019). Spatial analysis of Twitter sentiment and district-level housing prices. Journal of European Real Estate Research, 12(2), 173–189. https://doi.org/10.1108/JERER-08-2018-0036

Hausler, J., Ruscheinsky, J., & Lang, M. (2018). News-based sentiment analysis in real estate: a machine learning approach. Journal of Property Research, 35(4), 344–371. https://doi.org/10.1080/09599916.2018.1551923

Heinig, S., & Nanda, A. (2018). Measuring sentiment in real estate – a comparison study. Journal of Property Investment and Finance, 36(3), 248–258. https://doi.org/10.1108/JPIF-05-2017-0034

Ho, C.-W. (2012). The Role of Investor Sentiment in Asset Pricing. (Durham University). https://doi.org/10.3905/joi.2012.21.4.099

Hohenstatt, R., & Kaesbauer, M. (2014). GECO's Weather Forecast for the U.K. Housing Market: To What Extent Can We Rely on Google Econometrics?. Journal of Real Estate Research, 36(2), 253–281.

Hui, E. C. M., Dong, Z., Jia, S. H., & Lam, C. H. L. (2017). How does sentiment affect returns of urban housing? Habitat International, 64, 71–84. https://doi.org/10.1016/j.habitatint.2017.04.013

Hui, E. C., & Wang, Z. (2014). Market sentiment in private housing market. Habitat International, 44, 375–385. https://doi.org/10.1016/j.habitatint.2014.08.001

Jandl, J. O. (2016). Information processing in securitized real estate markets - how newspaper content and online search behavior help explaining market movements. Proceedings of the Annual Hawaii International Conference on System Sciences, 2016-March, 1092–1101. https://doi.org/10.1109/HICSS.2016.139

Jorda`, O. `scar, Schularick, M., & Taylor, A. M. (2016). The great mortgaging: housing finance, crises and business cycles. Economic Policy, (31.85), 107–152.

Kholodilin, K. A., Michelsen, C., & Ulbricht, D. (2018). Speculative price bubbles in urban housing markets: Empirical evidence from Germany. Empirical Economics, 55(4), 1957–1983. https://doi.org/10.1007/s00181-017-1347-x

Korkmaz, Ö. (2019). The relationship between housing prices and inflation rate in Turkey: Evidence from panel Konya causality test. International Journal of Housing Markets and Analysis. https://doi.org/10.1108/IJHMA-05-2019-0051

Lama, C. H.-L., & Hui, E. C.-M. (2018). How does investor sentiment predict the future real estate returns of residential property in Hong Kong? Habitat International, 75(February), 1–11. https://doi.org/10.1016/j.habitatint.2018.02.009

Lang, S., & Schaefers, W. (2015). Examining the sentiment-return relationship in European real estate stock markets. Journal of European Real Estate Research, 8(1), 24–45. https://doi.org/10.1108/JERER-10-2014-0036

Ling, D. C., Ooi, J. T. L., & Le, T. T. T. (2015). Explaining house price dynamics: Isolating the role of nonfundamentals. Journal of Money, Credit and Banking, 47(S1), 87–125. https://doi.org/10.1111/jmcb.12194

Lowis, G. A., Hall, J. H., & Cloete, C. E. (2015). The role of market fundamentals versus market sentiment in property investment decision-making in South Africa. Journal of Real Estate Literature, 2(23), 297–314.

Marcato, G., & Nanda, A. (2014). Information content and forecasting ability of sentiment indicators: case of real estate. Journal of Real Estate Research, 1(1).

Martínez-García, E., & Grossman, V. (2020). Explosive dynamics in house prices? An exploration of financial market spillovers in housing markets around the world. Journal of International Money and Finance, 101. https://doi.org/10.1016/j.jimonfin.2019.102103

Mathieu, A., & Ziet, J. (2016). The impact of consumer sentiment on the number of new homes. In Essays on the Impact of Sentiment on Real Estate Investments. https://doi.org/10.1007/978-3-658-11637-8

McLean, R., & Antony, J. (2014). Why continuous improvement initiatives fail in manufacturing environments? A systematic review of the evidence. International Journal of Productivity and Performance Management, Vol. 63, pp. 370–376. https://doi.org/10.1108/IJPPM-07-2013-0124

Rizkiana, A., Sari, H., Hardjomidjojo, P., & Prihartono, B. (2019). The development of composite sentiment index in Indonesia based on the internet-available data. Cogent Economics and Finance, 7(1). https://doi.org/10.1080/23322039.2019.1669399

Rochdi, K., & Dietzel, M. (2015). Outperforming the benchmark: Online information demand and REIT market performance. Journal of Property Investment and Finance, 33(2), 169–195. https://doi.org/10.1108/JPIF-11-2014-0069

Rodriguez-Gonzalez, M., Basse, T., Kunze, F., & Vornholz, G. (2019). Early warning indicator systems for real estate investments: Empirical evidence and some thoughts from the perspective of financial risk management. Zeitschrift Fur Die Gesamte Versicherungswissenschaft, 107(4), 387–403. https://doi.org/10.1007/s12297-018-0426-1

Ruscheinsky, J. R., Lang, M., & Schäfers, W. (2018). Real estate media sentiment through textual analysis. Journal of Property Investment and Finance, 36(5), 410–428. https://doi.org/10.1108/JPIF-07-2017-0050

Saini, N., & Sighania, M. (2019). Environmental impact of economic growth, emission and FDI: systematic review of reviews. Qualitative Research in Financial Markets, Vol. 11, pp. 81–134. https://doi.org/10.1108/QRFM-09-2017-0087

Saydometov, S., Sabherwal, S., & Aroul, R. R. (2020). Sentiment and its asymmetric effect on housing returns. Review of Financial Economics, (June 2019), 1–21. https://doi.org/10.1002/rfe.1097

Shi, S. (2017). Speculative bubbles or market fundamentals? An investigation of US regional housing markets. Economic Modelling, 66(June), 101–111. https://doi.org/10.1016/j.econmod.2017.06.002

Shukor, N. B. B. M., Said, R. Bin, & Majid, R. B. A. (2016). The Relationship between Housing Finance and Macroeconomics Variables in Malaysia. MATEC Web of Conferences, 66. https://doi.org/10.1051/matecconf/20166600100

Singh, B., & Nadkarni, A. R. (2018). Role of credit and monetary policy in determining asset prices: Evidence from emerging market economies. North American Journal of Economics and Finance, 51(2018), 100874. https://doi.org/10.1016/j.najef.2018.11.003

Smailović, J., Grčar, M., Lavrač, N., & Žnidaršič, M. (2014). Stream-based active learning for sentiment analysis in the financial domain. Information Sciences, 285(1), 181–203. https://doi.org/10.1016/j.ins.2014.04.034

Soo, C. K. (2015). Quantifying Animal Spirits: News Media and Sentiment in the Housing Market. In SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2330392

Soo, C. K. (2018). Quantifying sentiment with news media across local housing markets. Review of Financial Studies, 31(10), 3689–3719. https://doi.org/10.1093/rfs/hhy036

Tsolacos, S. (2012). The role of sentiment indicators for real estate market forecasting. Journal of European Real Estate Research, 5(2), 109–120. https://doi.org/10.1108/17539261211250690

Tunc, C. (2020). The Effect of Credit Supply on House Prices: Evidence From Turkey. Housing Policy Debate, 30(2), 228–242. https://doi.org/10.1080/10511482.2019.1661266

Wadud, M., Ali Ahmed, H. J., & Tang, X. (2020). Factors affecting delinquency of household credit in the U.S.: Does consumer sentiment play a role? North American Journal of Economics and Finance, 52(November 2019), 101132. https://doi.org/10.1016/j.najef.2019.101132

Walker, C. B. (2014). Housing booms and media coverage. Applied Economics, 46(32), 3954–3967. https://doi.org/10.1080/00036846.2014.948675

Walker, C. B. (2016). The direction of media influence: Real-estate news and the stock market. Journal of Behavioral and Experimental Finance, 10, 20–31. https://doi.org/10.1016/j.jbef.2016.02.001

Wang, Z., & Hui, E. C. man. (2016). Fundamentals and Market Sentiment in Housing Market. Housing, Theory and Society, 34(1), 57–78. https://doi.org/10.1080/14036096.2016.1196240

Wong, W. L., Lee, C., & Koong, S. S. (2019). Housing prices in peninsular Malaysia: supported by income, foreign inflow or speculation? International Journal of Housing Markets and Analysis, 12(3), 424–441. https://doi.org/10.1108/IJHMA-01-2018-0001

Wu, L., & Brynjolfsson, E. (2015). How Google Searches Foreshadow Housing Prices and Sales. In National Bureau of Economic Research. https://doi.org/10.3386/w19549

Zheng, Y., & Osmer, E. (2019). Housing price dynamics: The impact of stock market sentiment and the spillover effect. Quarterly Review of Economics and Finance. https://doi.org/10.1016/j.qref.2019.02.006

Zhou, Z. (2018). Housing market sentiment and intervention effectiveness: Evidence from China. Emerging Markets Review, 35(10), 91–110. https://doi.org/10.1016/j.ememar.2017.12.005