

Investor Sentiment and Property Prices: The Relationship between Sentiment and Auckland  
Property Prices.

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INVESTOR SENTIMENT AND PROPERTY PRICES: THE RELATIONSHIP BETWEEN  
SENTIMENT AND AUCKLAND PROPERTY PRICES

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## **Abstract**

A body of literature has shown that investor sentiment has a role in influencing financial asset prices. This dissertation will investigate the role of sentiment, as measured by the tone of media articles, on aggregate property prices in Auckland. For many people, media reports represent their main source of financial information. The tone of those articles presumably can influence the view of investors, and their ultimate actions, in terms of their willingness to transact and the price they are willing to pay. Past literature surrounding media sentiment is used to develop a media sentiment index, which does not currently exist in NZ, for the Auckland property market over a five-year period from 2014-2019. I will seek to investigate the relationship between the media sentiment index, investor sentiment index and ASB sentiment index and whether these phenomena effects changes in aggregate property prices. I expect that there will be a strong correlation between media sentiment and property prices in Auckland. Bullish media sentiment is likely to encourage investors to participate in the market to secure capital gains, encouraging speculative behaviour and therefore driving up property prices at a faster rate. Likewise, negative media sentiment, as marked by stories talking about falling prices or slower sales, may reduce demand and so slow property price changes. My results show housing media sentiment has an insignificant relationship with house prices, yet has a positive correlation with investor sentiment. When testing the relationship between investor sentiment and changes in house prices, the results showed a statistically significant positive relationship, however, when testing the effect media sentiment has on investor sentiment, due to limitations, I cannot definitively say whether investor sentiment proxied through media influences property prices.

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## **1 Introduction**

Owning a property in New Zealand is widely perceived as a safe financial investment. As a result, many New Zealanders see buying a house as an essential addition to their financial portfolio at some point in their lives, and many will seek to have more than one house. In recent times the housing market has seen significant price increases, the average house price in Auckland has increased from \$575k in 2014 to \$805k in 2019, peaking at \$900k in 2017 (Real Estate Institute of New Zealand, 2019), resulting in home-owners making substantial capital gains. There is a view that the market has become bubble like, with prices not related to underlying fundamentals such as asset to income ratios. One possible explanation is that investor sentiment is driving the increases (Skilling, 2015). While property is viewed as a safe investment, there can be considerable negative consequences for investors when prices fall. For instance, sharp declines in house prices within the US in 2006 and 2007, due in large part to the resetting of adjustable rate mortgages, triggered a recession and resulted in a large number of mortgage foreclosures. Falling house prices, and the flow on effects, would be the likely consequence of a house price bubble bursting. Typically, bubbles result from overly optimistic investors driving prices beyond levels that can be explained by economic fundamentals. It is therefore important to understand the role investor sentiment plays in the housing market, and also to explore factors that drive investor sentiment.

The purchase of a property will be the biggest financial decision many people will make. However, it is unclear how potential homeowners make their house buying decisions, especially around when to buy and what price to pay. New Zealanders have been shown to lack knowledge of basic financial concepts such as the relationship between risk and return, the time value of money, inflation or tax on property investments (Wood, 2017). One possibility is that investors rely heavily on perceived expert opinion in the form of news reports and media about the property market. This means that the tone, or sentiment, of media reporting could influence aggregate demand for residential property, and in turn influence the size of increases or decreases in the average house price. Recently, textual analysis of media has been used to develop empirical measures of media sentiment based on the tone of media articles. Empirical evidence has found that media tone, as a proxy for media sentiment, can move prices across a range of assets (Tetlock, 2007) by influencing investor sentiment. In essence, media can either serve to report on investor sentiment, reflecting the mood of investors, or it can itself influence the mood of investors, serving to amplify investor sentiment. Soo (2018) used Tetlock's methodology to demonstrate that media sentiment can have a predictive effect on property



prices upto two years in advance of price changes. This dissertation looks at whether a media sentiment index can predict house prices for the Auckland market, and whether the media acts as a reporter or an influencer for property prices.

To analyse whether media sentiment influences aggregate house prices in Auckland, I will collect media articles and data on the Auckland housing market over a five-year time frame. The media articles will be collected from multiple news sources in NZ such as the New Zealand Herald, The National Business Review, and Stuff.co.nz. The collected articles will then be analysed using textual analysis to count the net percentage of positive words in an article (number of positive words minus negative words, divided by total words in article). Textual analysis was first used in finance by Tetlock (2007) who showed, that movement in the stock market can be predicted by the tone of media reports. I use the Loughran-McDonald Word Sentiment list, which has been specifically crafted for use in analysing financial text, to classify words as positive or negative. The average of the tone of articles for each quarter is used to generate a historical sentiment index.

House price data is collected from the Real Estate Institute of New Zealand (REINZ) statistics website. REINZ provide previous month's activity in the New Zealand real estate market and specialise in all facets of real estate including residential sales, rural, commercial and industrial sales and leasing. The data is gathered from the REINZ House Price Index, which is measured in monthly, quarterly or annual figures, is calculated as the median Auckland house price from sales in that period. Publication of the data is lagged three months, meaning the sales results for January are only made public in April. The index allows us to filter the data into region, suburb, housing category (e.g. dwelling or apartment), number of bedrooms and price. For this particular research, we will only filter for the Auckland region at a monthly frequency. I conduct regression analysis looking at the impact of media sentiment on changes in house prices. This paper is the first that I am aware of that has attempted to quantify sentiment in the Auckland property market through news media content.

To ensure the robustness of the media sentiment index I compare it against two other measures of property investor sentiment. The first is the ASB Bank housing sentiment survey, which is released every quarter and provides a comprehensive summary of housing sentiment among typical New Zealanders across the country. The survey data provides an insight into Auckland house price expectations creating an opportunity to validate the media sentiment index developed in this research paper against ASB's available survey. Results show that our media sentiment index is correlated with the ASB Housing confidence survey indicating similar movements between the measures. I also create a further sentiment index based on the

principle composite approach of Baker & Wurgler (2007) using three potential proxies that capture different aspects of housing sentiment; *Total Sales Volume*, *Price-to-Rent Ratio* and *Loan-to-Value Ratio*. This B&W based sentiment index is based on the work by Soo (2018) who creates a similar index in the US. I modify the proxies used to generate the index based on the data available for the NZ market. Results show that there is a positive correlation of 0.1546 between the media sentiment index and investor sentiment index, and an even stronger correlation between the media sentiment index and the ASB sentiment index of 0.6787, suggesting that all three sentiment indexes could be measuring the same or a similar type of sentiment. I find a statistically significantly positive relationship between investor sentiment and changes in house prices after controlling for economic variables. However, when the media sentiment index was added to the regression, I did not find the expected significant positive relationship suggesting that changes in house prices are a function of investor sentiment, but not media sentiment, after controlling for economic variables.

In the final section, we will discuss the limitations of the research which highlight the effects of restricted observations due to time-consuming data collection, limited data sources and technically outdated databases. Even with limitations the research highlights the potential of sentiment on property prices and suggestions for further research however we cannot draw any definitive conclusions.

## **2 Sentiment**

### **2.1 Literature and Past Research Review**

Quantifying sentiment has been a challenge for researchers. Behavioural finance studies tend to consider two types of sentiment, that of investor sentiment which is the characteristics and behaviour of the investor that are not determined by facts or literature (Baker & Wurgler, 2007). Measures of investor sentiment look at the impact that investors beliefs have on the price and activity of financial markets. The other type of sentiment is media sentiment, defined through the positive or negative tone of articles and other publicly disseminated information, in which the degree of positivity or negativity in the text is referred to as sentiment (Kearney & Liu, 2014). Textual analysis sentiment is predominately based on public corporate disclosures/filings, media articles and communications through the internet. The other way to think of this is investor vs media/analyst sentiment. Investor sentiment manifests itself in things such as rising prices even when there is no fundamental reason for it. News media sentiment is reflected through the context of media articles and likely influences markets via investor sentiment (Soo, 2018).

Investor mood and investor emotions play a critical role in the way we observe risk and reward, gains and losses. Traditional finance theories assume that people make rational investment decisions based around wealth maximisation. As a result, asset pricing models have been developed on the assumption that market prices should reflect the markets expectation of the present value of expected future cash flows, based on all available information in the efficient market (Baker & Wurgler, 2007). In essence, this links pricing to the economic and financial fundamentals of the underlying asset.

Psychology and behavioural finance researchers argue that individuals are not always rational but are driven by behavioural factors such as sentiment, emotion, and biases. Hirschleifer (2001), for instance, shows that the way investors make decisions is in fact affected by investor mood or certain patterns of behaviour, although many investors don't actually realise that mood affects their decisions. Kamstra et al (2000) find a positive correlation between disruptions in sleeping patterns following daylight-savings and equity returns. This evidence suggests if an investor has had a negative sleep pattern or the day is depressing or dreary, stocks will decline, while good mood and bright days will cause an increase in stocks. Additionally, Hirshleifer & Shumway (2003) show how sunshine has a positive effect on a person's mood, an interesting point that suggests investors in good moods are psychologically available to make more informed and rational decisions because they are happier and manifest

in positive ideas. An extension of this idea is ‘investor sentiment’ developed in the 1980’s as an offshoot to the belief that investors don’t always make rational decisions because they are affected by biases. The phenomena is also defined as how investors form expectations off future earnings based on emotion of the investor rather than facts or evidence (Daniel, Hirshleifer, & Subrahmanyam, 1998).

Literature has argued that the consequence of investor sentiment is that stocks and financial assets may wind up being mis-priced, and that the mis-pricing may persist for relatively long periods of time. This is based on two sets of findings. The first is that, investors are subject to sentiment (De Long, Shleifer, Summers, & Waldmann, 1990; Coval & Shumway, 2001). The second observation, as shown by Barberis, Shleifer, & Vishny (1998), finds that betting against sentimental investors is costly and risky, meaning that arbitragers are not as aggressive as traditional financial models would predict. An example of this is the fact that financial market bubbles are able to form, such as the Dot-Com bubble in the early 2000’s, or the everything bubble that is argued as existing presently (Murphy, 2018). While rational investors can identify that prices are too high compared to fundamentals, these conditions can last for a long period before inexplicably correcting.

Investor sentiment has been found to influence asset pricing in a number of settings including the stock market, private and public markets and within open and closed economies (Daniel, Hirshleifer, & Subrahmanyam, 1998). Investors trade on emotion. Optimistic investors are more likely to buy, and buy at higher prices than ‘rational’ investors with evidence from Kyle and Wang (1997) and Benos (1998) suggesting when the level of overconfidence increases, trading volume, price volatility as well as price efficiency also tend to increase. A model developed by Kyle (1985) explains expectations from a pessimist are negative and increase in absolute terms as the trader becomes more pessimistic. Shiller (1990) finds excessive belief in the investors’ ability of judgement and is what influences investor sentiment which may also facilitate investors’ willingness to rely on sentiment.

There is no denying that investor sentiment exists, however, measuring the phenomena has proven to be a challenge. Sentiment has been measured in a number of ways starting with the Baker and Wurgler (2007) measure who broadly define sentiment as how investors form expectations of future earnings based off characteristics of the investor not off facts or historical evidence. Through a multifactor index, the authors use a broad bundle of economic fundamentals and financial proxies to measure sentiment on the stock market. Sentiment proxies are also used by Farese (2011) who runs OLS regression analysis, alongside other

determinants such as macroeconomic variables, to discover whether investor sentiment helps to explain house prices in the United States.

To quantify investors' perception on the economy, confidence indices in the form of news sentiment have been tested and developed along with financial proxies to describe a potential relationship between sentiment and house prices. Macroeconomic variables are used as control variables as they are standard determinants of house prices in the market and is an approach which is commonly referred to as the "top-down" approach mainly used when analysing the effects of investor sentiment on stocks. The tone of which news articles attempt to convey to their audience is a key factor influencing media sentiment. This is demonstrated by Ho et al. (2013) who demonstrate the large influence that negative news has on volatility of the stock market in comparison to positive news. Some of the first studies to study the relationship between news media content and financial markets identify many interesting connections. Tetlock (2007), who examined the interaction between news media sentiment, based on media pessimism from the Wall Street Journals' "Abreast of the Market" column, and the stock market in the United States finds that a large influx of media pessimism results in strong downward pressure on market prices. Antweiler & Frank (2004) characterise internet chat content as "buy," "sell," or "hold" and find a relationship between message activity, trading volume and return volatility, although the relationship was not statistically significant. Dougal, Engelberg, García, & Parsons (2012) show a causal relationship between financial media sentiment and investor behaviour and stock market returns. Riordan et al. (2012) use messages from Newswire, an international distribution of real-time information on financial markets to compare positive and negative tone messages and find that negative messages are more informative and significantly impact asset price volatility.

The current literature shows an abundance of evidence to suggest that investor sentiment and media sentiment influence financial decisions. What the literature lacks is direct evidence explaining decisions made by property investors. Much of the current literature suggests property investors make calculated, rational decisions based on historical data leading to optimal decisions (Anderson & Settle, 1996). This intuitively makes sense, as when buying a property, most will compare prospective investments with surrounding properties reflecting similar characteristics and decisions are made on the basis that the potential investment can fulfill the criteria (Auckland Council, 2018; Herring, 2006). Gallimore & Gray (2002) suggest property investors who make decisions based on sentiment show signs of irrational behaviour, similar to the foregoing literature surrounding investment decisions in the stock market. However, unlike stocks where prices reflect all available information, property investors may

turn to sentiment as they are less likely to have access to all available information. Sentiment is used in this respect not to undermine the raw data but to expand what limited information is available.

Soo (2018) is one of the first papers that uses news articles to measure media sentiment across the housing market in the U.S. Consistent with the methodology of Baker & Wurgler (2007), the evidence shows housing media sentiment predicts future housing price growth across several housing markets. This is interpreted through overconfidence which exaggerates prices away from normal economic housing factors. An alternative explanation of the results suggests that the media sentiment index captures local market indicators that are otherwise unobserved in the market.

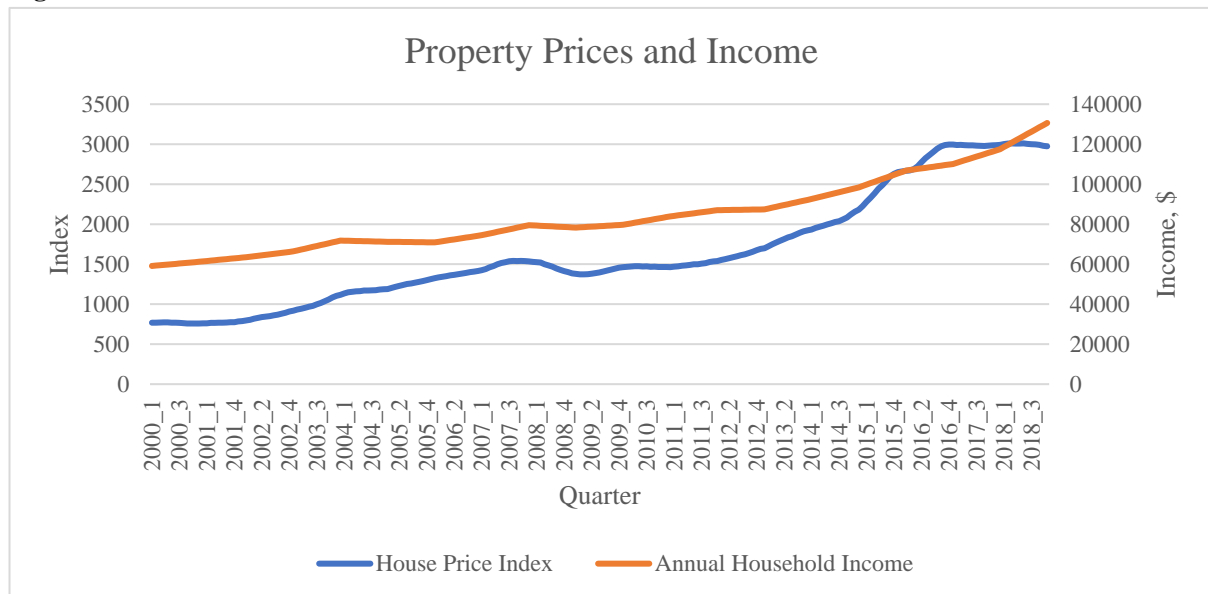
Due to the low level of financial knowledge of many New Zealanders, many potential homeowners rely on what they read in newspaper for information about property markets. As a result, media reporting likely has a disproportionately large influence on the investment decisions people make in the housing market (Herring, 2006). There isn't a lot of empirical research available on the relationship between investor sentiment and the property market in New Zealand, however, papers that do analyse this relationship show property decision making as a rational analysis and evaluation assessment.

Bruin & Flint-Hartle (2003) use a bounded rationality framework to explain motivations for investor behaviour in the New Zealand residential rental market and find that decisions of individual investors are based on imperfect knowledge; limited real estate knowledge and intellectual influences of control. Herring (2006) examines the vulnerability of the New Zealand housing market. Within the Organisation for Economic Cooperation and Development (OECD), New Zealand stands out for the largest proportion of net wealth focused in residential housing, along with New Zealand banks maintaining unusually large exposures to the market. It's not so much a lack of knowledge about housing in New Zealand, moreover, an ignorant approach is taken with the perception of safety, as most generally regard their homes as their "safest and most profitable investment". Whilst there is much discussion around a lack of financial literacy and the potential role sentiment has in a particularly sensitive property market, there has been limited research and empirical evidence surrounding theories of sentiment due to the nature of the phenomena and lack of quantifiable measures. Thus, provides an opportunity for this paper to examine the role of sentiment in the Auckland property market.

## 2.2 Residential House Price Index

News content has an important relationship with investor beliefs especially in times of financial bubbles and economic downturns (Shiller R. J., 2005). Over the past five years, the Auckland property market has demonstrated, when comparing prices to market fundamentals, characteristics of a financial bubble. A straight definition of ‘financial bubble’ is open to interpretation, however, broadly defines an asset’s price which strongly deviates away from its intrinsic value (King, Smith, Williams, & Boening, 1993). Figure 1. plots the quarterly house price index from 2000 until 2019 compared with the mean annual income for Auckland households. The results show a significant increase in house prices from 2000, rising from an index value of 769 to 2996 over the past 18 years, an increase of 289% in 18 years. Specifically, there is a rapid increase from 2012 until 2016. House prices then plateaus for 18-months up until 2018 when there is a small decline in prices, resulting in an 18-point drop of the index. Income levels have also showed a steady increase over the past 19 years, rising from \$59,275 to \$130,626 in 18 years, an increase of 120%. In effect, house prices have risen more than twice as fast as incomes, demonstrating some characteristics of a bubble. The faster increase for house prices also indicate that there are potential affordability issues in the region.

**Figure 1. – REINZ House Price Index and Mean Annual Household Income**



Source: REINZ and Regional Economic Activity NZ.

REINZ house price index is calculated using SPAR methodology and captures total housing market activity through a series of metrics by looking at how the sale price is influenced by certain housing characteristics such as land area, floor area, number of bedrooms. Income data shows the mean annual household data for the Auckland region, and is linearly extrapolated. Data are for year ending June.

There are a few potential explanations for the sudden stall in the property market at the end of 2016. The biggest impact of which include new government laws abroad, tightening rules around foreign acquisitions and flow of money out of China (Tang, 2017). Chinese capital was poured into overseas investment including the New Zealand property market, however, when China's foreign reserves fell by around US\$1 trillion over the period from mid-2014 to the end of 2016, it had a sizeable impact on our small economy. Once capital controls were tightened and less inflow of money from China, the range of buyers in the Auckland market decreased consequently slowing the growth of property prices as seen prior to 2016 (Norman, 2017).

October 22<sup>nd</sup>, 2018 saw the introduction of a foreign buyer ban for existing homes in New Zealand. This restriction was introduced because foreign buyers have recently been dominating the property market, especially in Auckland, hiking up property prices and outbidding New Zealanders (Newshub, 2018). Due to legislation only coming into effect six months ago, we cannot fully perceive whether the law has had any effect on property prices. However, according to Statistics NZ Statistics the percentage of residential properties sold to overseas buyers declined in the first quarter of 2019 (Hargreaves, 2019).

LVR restrictions have also been a factor in influencing the slowdown of the property market. These restrictions took place on 1 October 2013, and the RBNZ made further changes to the LVR policy on 1 November 2015, 1 October 2016, 1 January 2018 and 1 January 2019. A loan-to-value ratio (LVR) is a measure of how much a bank lends against mortgaged property, compared to the value of that property and essentially provide a safeguard if the market were to face a sharp down-turn (Reserve Bank of New Zealand, 2019). Due to rapid house growth particularly in Auckland, and an increase in the use of low-deposit loans, RBNZ introduced the policy to protect the banks opposed to impact the market. The concern was that banks were over-exposed to potentially overvalued properties. If the prices fell hard then banks would need to top up capital which could lead to market instability. The impact on the markets was a positive side effect. From late 2014, we can see a sharp incline in house prices along with increased levels of investor lending, posing new risks to financial stability and so revisions of the policy took place with an immediate effect seen in 2016 when property prices plateaued (Reserve Bank of New Zealand, 2019). Auckland Council's Chief Economist, David Norman suggested a slowdown of all buyers (FHBs, investors, & movers) also contributed to the halt of the property market (Norman, 2017).



### 2.3 Summary Statistics

The amount of capital held in the Auckland property market is astonishing. The average household income in Auckland at the end of 2018 was \$125,000 and according to Auckland Council as at June 2018 there are 540,000 dwellings in the Auckland region, made up of stand-alone houses, terraced housing and apartments (Auckland Council, 2018). Over this period, median house prices were around \$850,000. These fundamentals represent approximately \$459 billion of estimated capital value with a house price-to-income ratio of 6.8, however, the price to income ratio has risen sharply from around 4 in 2002. These results suggest that affordability of property in Auckland has decreased rapidly and suggests Auckland faces an affordability crisis. Table 1. presents the summary statistics of the price data, sentiment indexes and economic fundamentals across the 5-year sample period. The table shows the marked increase in median Auckland sale price, rising from 604,000 in 2014 to 854,333, an increase of \$250,000 in three years. Interestingly, the loan to value ratio has stayed reasonably consistent over the period, ranging between 23.6% and 27.4%. Supporting the bubble argument, the price to rent ratio (like the rental yield measure) increased between 2014 and 2017, going from 334.32 to 409.69, before coming back to \$374.85 due to static house prices, but increasing rental prices.

With only 5 years of data, it is very hard to interpret trends over such a short period of time, however, with everything growing faster than the average income and people paying more in rent we look to the question of whether the ‘everlasting bubble’ of the Auckland housing market is starting to decompress. The New Zealand economy overall has been strong with employment showing significant growth of 5.56% from 2016 and unemployment dropping to the lowest it’s ever been since before the GFC in 2008. Roback (1982) suggests that the labour market is an important factor in the growth of housing demand and is seen to play a supportive role in the property market.

Mortgage rates have consistently fallen over the entire time frame of the study indicating that the cost of borrowing is becoming cheaper. With flat housing prices and the ongoing decline in mortgage rates, Auckland may see a turning point in affordability, a significant advantage for first home buyers. This is also supported by steady growth of the average income in Auckland which is up by 26.42% since 2014. The real interest rate is calculated using the 10-year government bond minus the inflation rate and has an overall decreasing trend, similar to that of the official cash rate (OCR). Monetary policy which defines and influences interest rates and inflation, are important factors for the future of New Zealand economy (Richardson, 2016). The OCR increased by 1% during 2014 and stayed the same for the first half of 2015

due to expected growth in the economy and was also increased to help contain inflation, visible in the increase of the real interest rate for this time. From June 2015 to November 2016 the OCR decreased by 1.5% due to uncertain economic conditions. Real interest rates also slightly decreased in 2016 but then plummeted to 0.98% from 3.05% in 2017 reflecting weak inflation and an unchanged OCR, increasing slightly in 2018 as economic outlook increased however decreased in 2019 which encouraged support in household spending and business investment (Reserve Bank of New Zealand, 2019) .

**Table 1. – Summary Statistics**

Summary	2014	2015	2016	2017	2018	2019
<i>Price Data</i>						
Median Sale Price	604000	682333	769000	854333	853333	841667
REINZ Price Index	1874	2157	2543	2862	2874	2821
Sales Volume	1550726500	2366682500	2290267417	1911496667	1913007334	1555807333
Loan-to-Value Ratio	0.2555	0.2664	0.2369	0.2453	0.2486	0.2743
Price-to-Rent Ratio	334.32	357.37	382.21	409.69	391.2	374.85
<i>Economic Fundamentals</i>						
Rent	1807	1909	2012	2085	2181	2245
Unemployment Rate	6.60	6.50	6.10	5.00	4.50	4.40
Employment Rate	64.00	65.20	64.70	67.10	67.90	68.30
Mortgage Rate	7.04	6.81	5.75	5.84	5.91	5.56
Real Interest Rate	3.20	3.44	3.05	0.98	1.73	0.99
Population	1500000	1600000	1600000	1700000	1700000	1700000
Income	103326	106453	110694	120664	124578	130626

Summary statistics for price data and economic fundamentals. Price data is sourced from REINZ and is mean annual data. LVR ratio is calculated as average loan size (total lending/total borrowers) by median sale price, data for lenders and borrowers is sourced from RBNZ. Price-to-rent ratio is calculated as average rent by median sale price. Rent data is sourced through Ministry of Business, Innovation and Employment (MBIE). Employment and unemployment, population and income data are sourced through Statistics NZ calculations are explained in section 4. Mortgage and real interest rate are sourced from RBNZ, the real interest rate is calculated using 10-year government bond minus inflation rate and mortgage rates are represented as the 5-year new standard residential mortgage interest rates.

## 3 Measures of Sentiment

### 3.1 Media Sentiment Index

In this paper, I constructed a media sentiment index based on textual analysis. I begin by searching for newspaper articles focused on the Auckland housing market using the Newztext database which contains the full text of many New Zealand newspapers. Newztexts keyword extraction is used to find articles that best describe the subject of a document and organises articles from the highest accuracy to lowest accuracy. I used the keywords “Auckland Property Prices”. Articles regarding commercial property are not included as the research focuses purely on residential housing and residential investor sentiment. Real estate listings or advertising are not included nor are news agency articles (for example Reuters or Bloomberg) as they do not appear in the Newztext database, nor provide an opinion on the market and act as an information source on a specific property or real estate company.

The New Zealand Herald, Stuff.co.nz and The National Business Review were the three main publications used. All three publications are well established news sources. *The New Zealand Herald* dominates the Auckland market with an average readership of 459,000 while *Stuff.co.nz* is the number one for online news with a total audience of 2.1million readers as at June 2018 with *nzherald.co.nz* following closely behind (Murphy, 2018). *The National Business Review (NBR)* is the leading business related publication in New Zealand. Articles were collected for the period January 2014 to January 2019. For each article, I extract the full text and record the corresponding publication date, author and media source, resulting in a final data set of 931 articles over a 60 month period.

Textual analysis, an increasingly popular method to extract the tone of a document (Loughran & McDonald 2011, Soo 2018) is used to capture media sentiment across the content in newspapers. In order to identify types of words used, an external word list is used to identify and count positive and negative words in the content. This employs a very basic methodology yet ensures confidence as the dictionary-based approach is predetermined and less sensitive to subjectivity. The Loughran-McDonald dictionary has been designed specifically for use in analysing financial discussions. Words such as “boom” and “surge” may be understood as having a negative effect, however in the context of property, a ‘property boom’ is seen as something that is positive and reflects increasing house prices. Loughran & McDonald (2011) argue this point and state, to reduce measurement error, word lists should be specific to discipline.

A concern had when processing the word list was language. The original word list is in American English, suggesting that differences in spelling of words, for example, “color” and “colour” would pose as a problem because the original dictionary wouldn’t include the New Zealand spelling in the analysis. I collated a list of ‘unrecognised’ words, which primarily included names of people, place names, and misspelt words. Any words spelt with NZ spelling were added to the word list, with the same categorisation of positive and negative as the American spelling of the word. In order to compensate for inflections and tenses the expanded list incorporated the methodology of Loughran & McDonald (2011) that preserves the original meaning of the word. So, for example word counts for the word “boom,” also include, “booms,” “boomed,” and “booming.” Table 1 represents the top twenty most frequent positive and negative words in the articles

To ensure the analysis of both positive and negative words that capture the overall tone of the news content, we define the sentiment index as the difference between the total number of positive words and negative words divided by the total number of words across each article.

**Equation 1 – Sentiment Index**

$$\text{Investor Sentiment Index, } S_t = \frac{\text{Positive-Negative}}{\text{Total Words}_t}$$

Authors such as Tetlock et al. (2008) have used only the number of negative words divided by the total number of words and don’t capture the full share of positive and negative words in each article. The above calculation explicitly takes into account both positive and negative words and alternative models were not taken into consideration (Soo, 2018).

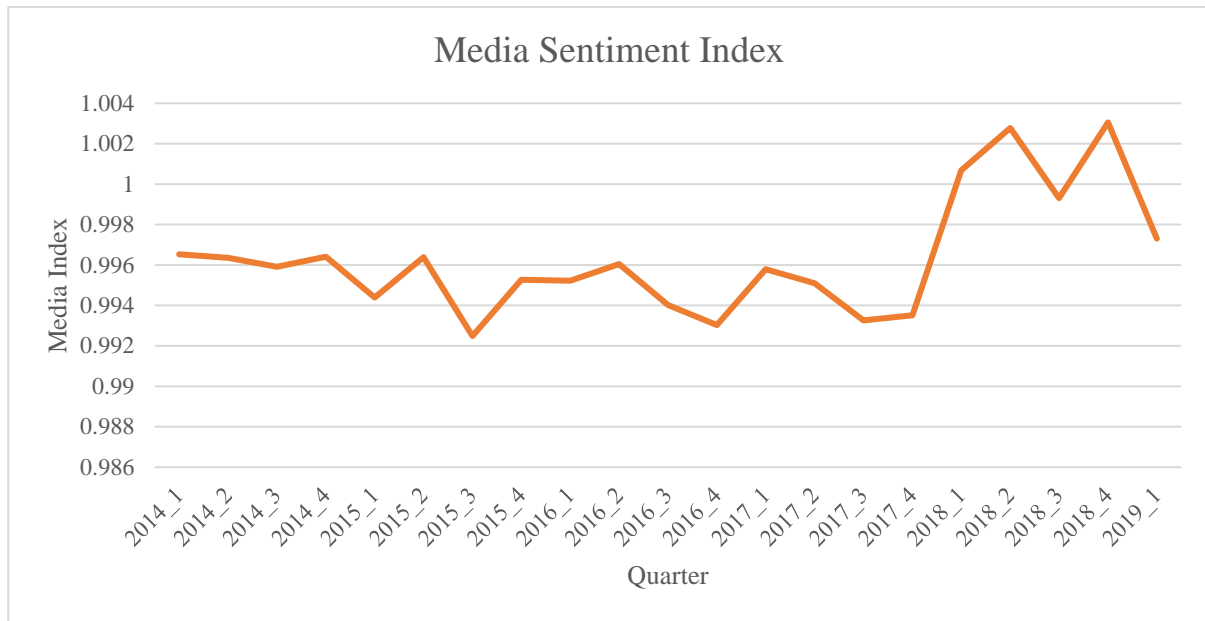
**Table 2. – Top twenty most frequent positive and negative words**

#	Positive	% of pos words	Negative	% of neg words
1	gain	9.21	slow	5.58
2	good	8.97	problem	3.68
3	strong	7.27	shortage	3.59
4	great	5.32	crisis	3.03
5	better	4.54	dropped	2.43
6	boom	4.27	concern	2.41
7	able	3.78	warn	2.19
8	improve	3.72	force	2.10
9	stable	3.49	worse	1.98
10	easy	3.34	cut	1.89
11	despite	3.03	difficult	1.85
12	best	2.94	decline	1.83
13	highest	2.65	lack	1.79
14	opportunity	2.40	late	1.77
15	popular	2.29	question	1.73
16	achieve	2.25	against	1.69
17	positive	1.51	challenge	1.32
18	dream	1.47	corrects	1.27
19	encouraged	1.45	fail	1.20
20	advantage	1.40	loss	1.11

Different tenses and inflections are included in the word count for each listed word. For example, “great” includes counts for “greater,” “greatly,” and “greatest.”

The constructed media index presented some interesting data points. As we can see in Figure 2. from 2014 until 2015 media sentiment dropped from 0.997 to 0.994, it then gradually increased hitting a peak of 1.001 in 2018 and then dropping back to 0.997 in 2019. Unfortunately, after reducing the data frequency from monthly to quarterly due to data analysis with economic variables which only provided me with quarterly data, the total number of observations in the media sentiment index was very small and consisted of only 21 observations over 5 years. This significantly restricted my study and limits the definitive conclusions I make and will be discussed in thorough detail throughout the report.

**Figure 2. – Time-series Media Sentiment Index**



Media sentiment is calculated using equation 1. (positive-negative)/total words. The index is normalised = 1+ sentiment index.

### 3.2 Investor Sentiment – Baker & Wurgler

The second measure of investor sentiment is a multifactor sentiment index based on a modification of Soo (2018), who employed the Baker & Wurgler (2006) methodology to develop a property market sentiment index. The multifactor sentiment index uses a number of time-series variables that are influenced by the expectations of property buyers. To capture the investor housing sentiment, I employ three variables:

- *Total Sales Volume*: Sales are a reflection of demand. If there is higher sentiment we would expect to see an increasing number of sales in the property market as investors are more optimistic about the market, and therefore willing to buy.
- *Price-to-Rent Ratio*: A popular indicator for monitoring the property market and one which measures the relative affordability of buying and renting. Soo (2018) states that housing pays dividends in the form of rent, suggesting the fundamental value of the asset should be related to the relative price compared to the rent you can receive. If sentiment is high, we would expect to see house prices increase faster than rents, pushing the price to rent ratio higher.
- *Loan-to-Value Ratio*: A measure used by banks to compare the amount of the loan to the value of the property. Banks take on a significant amount of risk when servicing loans as well as the risks that accompany the client, this includes the volatility of

sentiment. Sentiment can change quickly due to changes in the market or economy and has the potential to lead to absurdly high or low loan-to-value ratios.

Economic variables have been shown to potentially influence fundamentals in the housing market and therefore we orthogonalize each sentiment measure on a set of economic variables. The variables used are population, income, rent, employment and unemployment rates, mortgage and real interest rates.

### **3.3 ASB Housing Confidence Index**

To compare overall trends from existing measures of sentiment we analyse a survey-based measure of property investor sentiment produced by the ASB Bank of New Zealand, which summarises housing expectations and perceptions of the market in relation to house prices. The ASB Housing Confidence Survey surveys just under 3000 individuals each quarter on their expectations toward the property market, conditions of buying property and outlook on interest rates. In particular, the ASB survey asks the question, “Do you think it is a good or bad time to buy a house?” Respondents answer “yes” or “no” and is a simple yet effective way to gather buyer confidence in the market. The index is calculated as the net percentage of people who believe it is a good time to buy a house which equals “Good” – “Bad” + 100. For the past 5 ½ years pessimists have outnumbered optimists in Auckland’s response rate, reflecting high interest rates in 2014 and high property prices deteriorating confidence and affordability. The ASB index hit an all-time low for sentiment in October 2016, with the greatest proportion of people thinking it’s a bad time to buy a house since 1996 (ASB Economics, 2016). During this period, RBNZ released new loan-to-value restrictions on lending, knocking investor confidence. At the same time, China also announced restrictions on foreign investment reducing the number of buyers in the Auckland property market. In the first quarter of 2019, after gradually improving sentiment, Auckland attained a 6 year high of sentiment with an equal number of optimists and pessimists and has been driven by slower house price growth and movements of interest rates looking promising (ASB Economics, 2019).

### 3.4 Comparison of Sentiment Measures

The role of sentiment in three different environments has been measured using three different components; Media, Economic Fundamentals, and Survey Analysis. Table 3. presents the summary statistics of the sentiment measures.

**Table 3. – Sentiment Summary Statistics**

Summary	2014	2015	2016	2017	2018	2019
<i>Sentiment Indexes</i>						
<b>Media Sentiment</b>	0.997	0.994	0.995	0.996	1.001	0.997
<b>Investor Sentiment</b>	100.67	100.51	97.37	99.29	99.38	100.82
<b>ASB Sentiment</b>	99.79	99.85	99.78	99.73	99.96	100.00

Media sentiment is calculated using equation 1. (positive-negative)/total words. The index is normalised = 1+ sentiment index. Investor sentiment index is calculated by orthogonalizing the three financial proxies; transaction volume, loan-to-value ratio and price-to-rent ratio. ASB Housing Confidence Index is sourced through the ASB website and quarterly reports.

Assuming all three measures should broadly correlate, I contemporaneously analyse the dynamics of the three sentiment measures in Figure 3. All three measures have very similar movements from the beginning of 2016 until the start of 2017, Investor sentiment seems to lag slightly behind Media and ASB indexes, which suggests that investors are influenced by the media. All three sentiment measures are positively correlated, the strongest is reflected between media sentiment and ASB sentiment with a correlation of 0.6787. The positive correlation between the measures suggests they are all measuring the same type of sentiment.

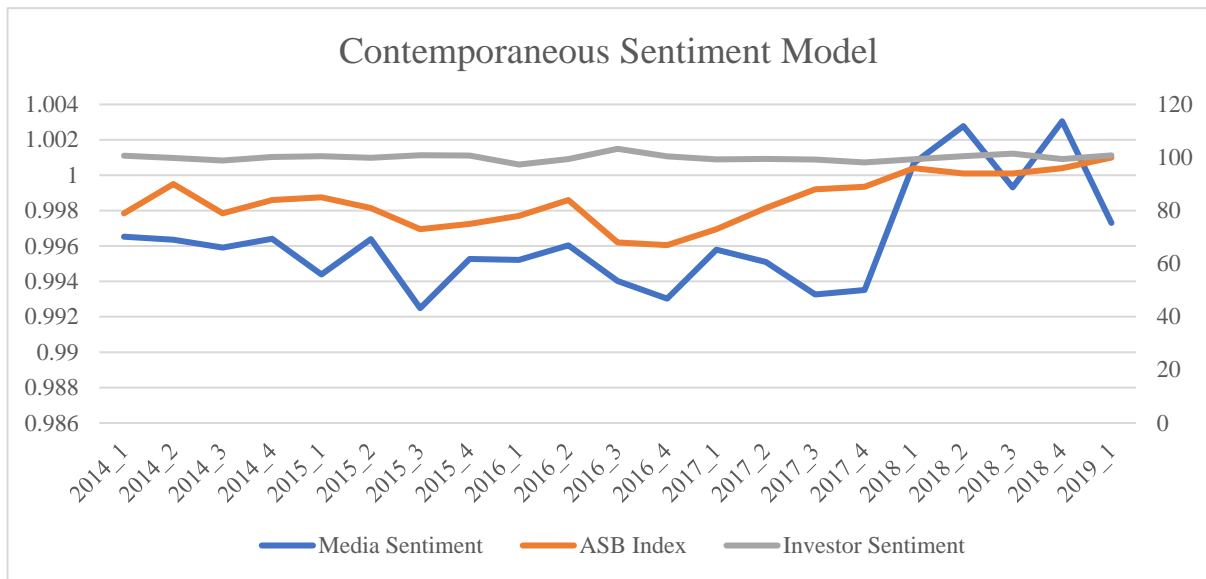
**Table 4. – Correlation between Sentiment Measures**

Correlation	Media Sentiment	Investor Sentiment	ASB Sentiment
<b>Media Sentiment</b>	1.0000		
<b>Investor Sentiment</b>	0.1546	1.0000	
<b>ASB Sentiment</b>	0.6787	0.0958	1.0000

The property sentiment literature tends to argue that reader preferences and investors response to changes in the housing market will be picked up and reported on by the media (Soo, 2018). Intuitively, this suggests that investor sentiment leads media sentiment, as the media reports on the investor.

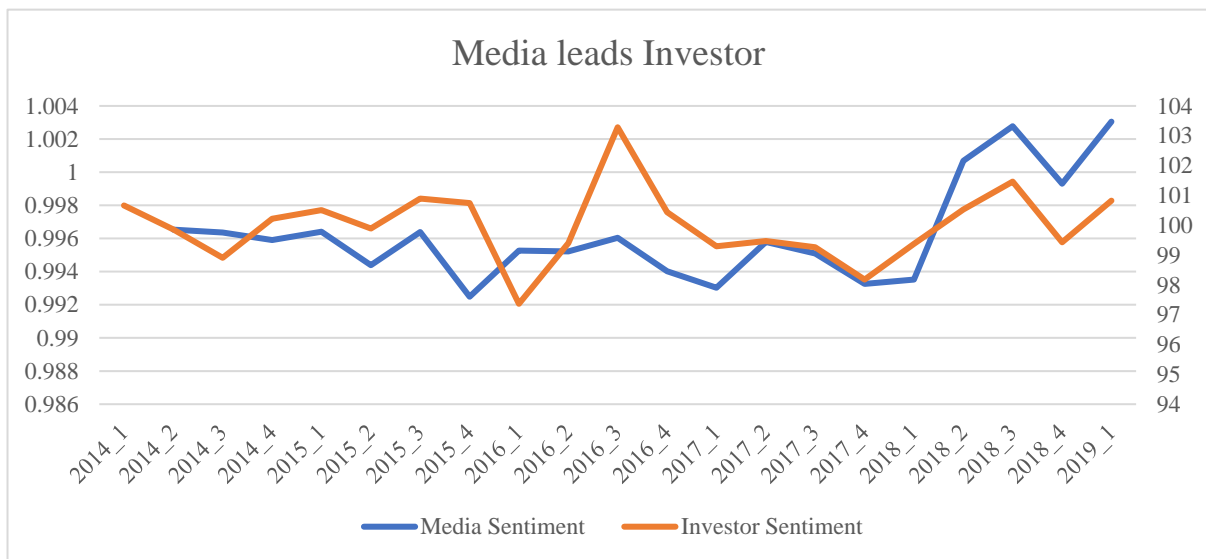


**Figure 3. – Contemporaneous Sentiment Comparison Model**



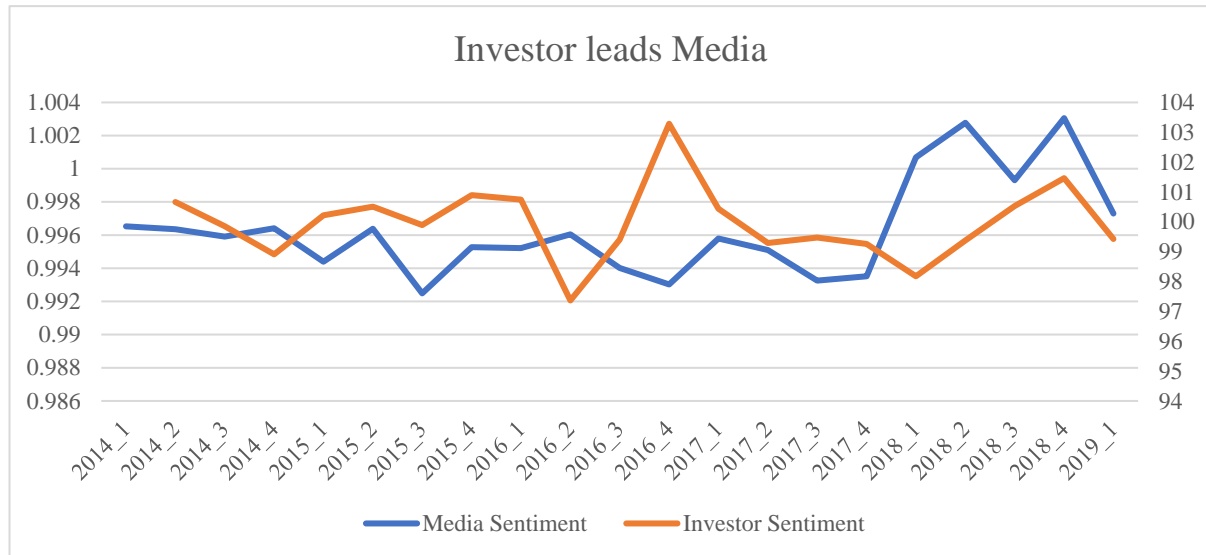
It is not obvious whether media influences sentiment or sentiment influences media, through observation from my contemporaneous model. I then developed two situations; media reporting on investors and media influencing investors. Figure 4. representing investor sentiment leading media suggests that media reports on investors decisions. The indexes co-move in most places but there is an obvious lead by the media index at the end of 2015 as well as in the beginning of 2018, however, there is not enough evidence to suggest the causal relationship that media reports on investors. The correlation between media sentiment and investor sentiment reflects a positive relationship of 0.1546.

**Figure 4. – Media Reporting on Investors**



As expected, we can see in Figure 5. there is a strong lead from the media sentiment index, also with a positive correlation of 0.1546, which reflects that media is in some way influencing investors, suggesting that investors to some degree use media as a source of information. As with Figure 4. there is not enough evidence that statistically suggests media influences investors.

**Figure 5. – Media Influencing Investors**



To test whether media sentiment has an impact on investor sentiment, is a relationship that cannot be thoroughly tested in this research due to limitations in the number of data observations. With a larger time-series I could not only run models but test structural breaks, which help to determine whether there is a significant change in the data and when exactly it happens. There would be a definitive structural break over a period of 10-15 years, whereas with five years of data I wouldn't expect to see a structural break. Visually, the assumption that media influences investors is strong however further testing is required to report on something definitive.

## 4 Sentiment and House Prices

### 4.1 Impacts of Investor Sentiment on House Prices

Residential house price data for Auckland was collected from the Real Estate Institute of New Zealand (REINZ) database. The REINZ House Price Index is based on the SPAR methodology, which is the sales price to appraisal ratio (SPAR). The SPAR method has been applied to the New Zealand market since the 1960s and is commonly used by international government

agencies for developing house prices indexes (Real Estate Institute of New Zealand, 2019). Researchers including Vries et al. (2009) and Bourassa, Hoesli, & Sun (2006) recommend this methodology when creating house price indexes as it reflects nearly all house price data available adjusting for compositional change and based solely on price changes of matched pairs. Many empirical studies have examined the predictability of changes in house prices. For instance, Shiller (2008) concludes that the booms and busts of the housing market cannot always be fully explained by economic factors. Shiller argues that house price changes have always been reported alongside extensive psychological fundamentals, meaning that house prices reflects the willingness of the buyer to pay a certain price and if this mindset changes, then it must consequently impact prices. If house price changes are not purely driven by economic factors, then it follows that investor sentiment must play a role. Soo (2018) examines this and finds the set of economic fundamentals used does a very good job at explaining changes in house prices before 2000 but has difficulty explaining trends in the new century, once taking into consideration a media proxy she finds media plays a predictive role in house prices. Following the linear framework of Soo (2018) I estimate the equation:

$$\Delta p_{t+1} = \alpha + \lambda L^k \Delta p_t + \beta L^k s_t + \gamma x_t + \epsilon_{t+1} \quad (1)$$

where  $t$  indicates a quarterly period.  $\Delta$  denotes the difference such that

$$\Delta p_{t+1} = \log P_{t+1} - \log P_t$$

Initially, I included one lag of price changes and kept this number of lags the same for sentiment,  $L^k \Delta p_t$ . All indexes have been normalised and also include one lag. With limited observations we could not lag the data anymore than  $k=1$  as too much data would be lost. The economic variables included in the regression analysis, denoted by  $x_t$ , are characteristics that past research have shown to influence house price growth over time. These control variables include population, based on the estimated resident population in Auckland per annum from Statistics New Zealand. Average household income is a key factor in determining affordability of the market, and is also collected from Statistics New Zealand. Both population and income figures are documented on an annual basis, therefore I extrapolate the data in order to gather the approximate quarterly average. Rent is used to control for the income that can be earned from a property, and is measured as the average rent for the Auckland region from the Ministry

of Business, Innovation & Employment (MBIE). The labour market is an important factor in housing demand (Roback, 1982), therefore I include employment as defined by the number of people in the labour force, which is collected from Statistics NZ. The cost of borrowing for a house is also a key determinant in the demand for residential property. To control for mortgage rates I use the latest residential 5-year mortgage interest rates. In addition I add real interest rates for robustness, computed by subtracting the Reserve Bank of New Zealand's (RBNZ) inflation rate from the 10-year Government bond.

To test the relationship between changes in house prices and investor sentiment I regress the economic factors, ASB sentiment index and orthogonalised investor sentiment index, lagged by  $k = 1$ , against the change in sale price which is represented by Equation 1. If there is a relationship between investor sentiment and house prices,  $\beta$  should be different from zero. I exclude the unemployment rate, mortgage rate and population variables which were insignificant in the regression and which increased the adjusted  $R^2$  from 0.4305 to 0.5719. The investor sentiment coefficient indicates a statistically significant positive relationship between changes in house prices and investor sentiment suggesting a 1% change in sentiment will have a positive effect on house prices by 0.0044 percentage points. The ASB sentiment index indicates an insignificant relationship with the change in sale price. Of the other controls, we do not see persistence with changes in sales prices as the lag of the change in sale price is insignificant. Of the economic control variables we see significant and negative relationships between real interest rates and income, indicating that higher incomes result in lower growth in sales prices, the opposite of the effect we would expect. All other controls were insignificant.

Alternatively, I ran the same regression again with the exception of excluding the lag of one, so that  $k=0$ . I excluded the employment rate, mortgage rate and population variables which increased the adjusted  $R^2$  from 0.5029 to 0.5904, the results are presented in Table 5. Both investor sentiment and ASB sentiment coefficients indicate a statistically significant positive relationship between changes in house prices and investor sentiment. Other control variables including rent, real interest rates and income were also statistically significant.

**Table 5. – Regression House Prices and Investor Sentiment**

$\Delta$ sale price	Coefficient	t	P> t	Value
<b>Investor sentiment</b>	0.0042683	2.11	0.055	
<b>ASB sentiment</b>	0.000662	2.26	0.042	
<b>Rent</b>	0.0003264	3.79	0.002	
<b>Unemployment rate</b>	-0.0053158	-0.99	0.341	
<b>Real interest rate</b>	-0.0262585	-3.39	0.005	
<b>Income</b>	-8.78E-06	-4.39	0.001	
<b>Constant</b>	-0.0381363	-0.18	0.863	
<b># of observations</b>				<b>20</b>
<b>R-squared</b>				<b>0.7198</b>
<b>Adj R-squared</b>				<b>0.5904</b>

#### 4.2 Impacts of Media Sentiment on House Prices

To test the relationship between changes in house prices and media sentiment I regress the economic factors and media sentiment index, against the change in sale price. If media sentiment is a proxy for investor sentiment (i.e. media reports on investors) then there should be a positive relationship in the same way that there was with investor sentiment. The results of the regression are shown in Table 6. and include a lag of  $k=1$  and  $k=0$ , both show an insignificant relationship between media sentiment and changes in house prices.

**Table 6. – Regression House Prices and Media Sentiment**

$\Delta$ sale price	Coefficient	t	P> t	Value
<b>Media sentiment</b>	0.4459216	0.39	0.701	
<b>Rent</b>	0.0001122	1.05	0.309	
<b>Employment rate</b>	-0.0012658	-0.32	0.754	
<b>Real interest rate</b>	-0.0044158	-0.49	0.630	
<b>Income</b>	-2.65E-06	-1.10	0.291	
<b>Constant</b>	-0.2658719	-0.24	0.815	
<b># of observations</b>				<b>20</b>
<b>R-squared</b>				<b>0.3840</b>
<b>Adj R-squared</b>				<b>0.1640</b>

With investor sentiment having a small but statistically significant effect on house prices, I now bring media sentiment into the multifactor regression. To test whether media sentiment is impacting house prices over and above investor sentiment and economic fundamentals, I follow the same methodology I used when testing the relationship between house prices and investor sentiment however I add in media sentiment variable. . If there is a relationship between media sentiment and house prices,  $\beta$  should be different from zero. The results show an insignificant

relationship between the media sentiment index and the changes in house prices, which can be seen in Table 7. The ASB investor sentiment index is statistically significant and other control variables including rent, real interest rates and income are also statistically different from zero. I also repeated the regression, this time with investor sentiment rather than ASB sentiment. Similar outcomes emerged, the media sentiment coefficient is still insignificant. All other control variables are also insignificant. As I cannot test the impact of media sentiment on investor sentiment, I am unable to definitively say whether investor sentiment proxied through media sentiment has an impact on house prices.

**Table 7. – Regression House Prices, Media Sentiment and Investor Sentiment**

<b>Δ sale price</b>	<b>Coefficient</b>	<b>t</b>	<b>P&gt; t </b>	<b>Value</b>
<b>Media sentiment</b>	-0.0456779	-0.05	0.962	
<b>ASB sentiment</b>	0.0006263	1.61	0.131	
<b>Rent</b>	0.0002696	2.64	0.020	
<b>Employment rate</b>	-0.0022204	-0.70	0.494	
<b>Real interest rate</b>	-0.0256998	-2.95	0.011	
<b>Income</b>	-7.17E-06	-3.06	0.009	
<b>Constant</b>	0.4843086	0.50	0.624	
<b># of observations</b>				<b>20</b>
<b>R-squared</b>				<b>0.6369</b>
<b>Adj R-squared</b>				<b>0.4693</b>

## **Limitations**

While there have been significant results from the data used in this research, there have been many restrictions that limit the findings, including inadequate observations due to the extensive time frame of data collection and limited data sources. Creating the media sentiment index involved hand-collection of articles relating to the Auckland residential property market. Unfortunately, while Newztext was able to search based on the search term Auckland Property Prices, it was less than perfect, necessitating a careful screening of all articles. Initially, over 21000 articles were found using the search term, this was eventually reduced to around 1100 articles over the five-year period. This process was more time consuming than anticipated and resulted in the index being created for a five year period, rather than a longer period. Reflecting on this method it took approximately 4 months from the start of the collection process to gather 5 years' worth of articles which was extremely time consuming and exhausting.

An additional problem with Newztext was replication of articles. Authors from the likes of Stuff.co.nz would quite often recycle the same article as that published by The New Zealand

Herald but with different headlines and dates of publication. If I skimmed through article content or recorded article information incorrectly then this would be reflected in a misrepresentation in our overall dataset. I recorded the articles collected, in an excel spreadsheet which included details about each article; title, author, key points, source and the date, and provided another way of filtering the articles, so the overall dataset was as accurate as possible, however this added to the extensive process of the data collection and a limitation to the results.

Due to limitations in the available data, we could not extensively follow Baker & Wurgler's (2007) methodology of using lagged data due to the process reducing the total number of observations. I ran regressions using only one lag of data and then comparing this with regressions using no lags of data which resulted in stronger adjusted  $R^2$  and statistically significant results. Further robustness of the data could potentially show a stronger correlation if more lags were used and is consistent with past research papers.

Time is noted in all the limitations of data collection and in order to provide more accurate regression and correlation results, the data analysis needed more than 19 observations and the time period needed to be extended. I realised very quickly that the number of observations we had were limiting the analysis when attempting to lag our data which reduced the number of observations even further restricting the regression to analyse data with only one lag period. Unfortunately, due to the extensive amount of time it took to collect 5 years' worth of data, we did not have time to go and collect 10 years. The current results, however, do provide a positive insight into the significance that investor sentiment, proxied through media, has on property prices and has the potential to undertake a greater variety in explaining the property market if the number of observations were significantly expanded which is recommended for future research.

## **Conclusion**

The lack of quantifiable measures of the ‘psychological’ phenomenon in financial markets have led many investors to discuss factors of unobserved effects on the boom and bust cycles of the housing market. Property markets, like financial markets, are impacted by behavioural factors like sentiment. Economic factors such as rent, employment and interest rates also participate in driving the housing market and help to explain variation across price movements.

There has been limited research and empirical evidence surrounding theories of sentiment in the New Zealand property market. To the best of my knowledge this is the first paper that contributes a real-time measure of housing sentiment across Auckland by quantifying the tone of articles from newspapers. To ensure we capture the overall tone of the newspaper articles, we employ a model which explicitly takes into account positive minus negative words. Visually, media sentiment and investor sentiment have a strong positive correlation and suggests media reports help influence investor decisions. Due to a lack of data, nothing definitive can be said and further tests on the relationship is needed to identify structural breaks.

Both investor sentiment and ASB sentiment coefficients indicate a statistically significant positive relationship between changes in house prices and investor sentiment when regressed with no lags. Other control variables including rent, real interest rates and income were also statistically significant. The relationship between media sentiment with and without investor sentiment and changes in house prices resulted in an insignificant relationship. As we cannot test the impact of media sentiment on investor sentiment I cannot definitively say whether investor sentiment proxied through media sentiment has an impact on house prices.

Even though a few areas have posed as limitations in the research, current observations and regressions are a positive insight into the potential role sentiment plays on the property market in Auckland. Media sentiment and investor sentiment on property deserves greater attention for developing the data set in upcoming research. Future research based on the results of this paper might address testing the relationship media sentiment has on investor sentiment, or sentiment as a cause of unmeasured factors or investigating what factors of media sentiment specifically determine the phenomena.



## References

- Anderson, B. F., & Settle, J. W. (1996, June). The influence of portfolio characteristics and investment period on investment choice. *Journal of Economic Psychology*, 17(3), 343-358.
- Antweiler, W., & Frank, M. Z. (2004). Is All That Talk Just Noise? The Information Content of Internet Stock Message Boards. *Journal of Finance*, 59, 1259-1293.
- ASB Economics. (2016). *Housing Confidence*. Auckland: ASB Bank.
- ASB Economics. (2019). *Housing Confidence*. Auckland: ASB Bank.
- Auckland Council. (2018, June). *Auckland Plan*. Retrieved from Auckland Council: <https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/auckland-plan/about-the-auckland-plan/docsprintdocuments/section-4-homes.pdf>
- Baker, M., & Wurgler, J. (2006). Investor Sentiment and the Cross-Section of Stock Returns. *The Journal of Finance*, 1645-1680.
- Baker, M., & Wurgler, J. (2007). Investor Sentiment in the Stock Market. *Journal of Economic Perspectives*, 129-151.
- Barberis, N., Shleifer, A., & Vishny, R. W. (1998). A Model of Investor Sentiment. *Journal of Financial Economics*, 49(3), 307-343.
- Benos, A. V. (1998). Aggressiveness and Survival of Overconfident Traders. *Journal of Financial Markets*, 1(3-4), 353-383.
- Bourassa, S. C., Hoesli, M., & Sun, J. (2006). A simple alternative house price index method. *Journal of Housing Economics*, 15(1), 80-97.
- Bruin, A. d., & Flint-Hartle, S. (2003). A bounded rationality framework for property investment behaviour. *Journal of Property Investment & Finance*, 21(3), 271-284.
- Case, K. E., Shiller, R. J., & Thompson, A. K. (2012). What Have They Been Thinking? Home Buyer Behavior in Hot and Cold Markets. *Brookings Paper on Economic Activity*, 265-315.
- Coval, J. D., & Shumway, T. (2001). Is sound just noise? *Journal of Finance*, 56, 1887-1910.
- Daniel, K., Hirshleifer, D., & Subrahmanyam, A. (1998). Investor Psychology and Security Market Under- and Overreactions. *The Journal of Finance*, 53(3), 1839-1885.
- De Long, J., Shleifer, A., Summers, L. H., & Waldmann, R. J. (1990). Noise Trader Risk in Financial Markets. *Journal of Political Economy*, 98(4), 703-738.

- Dougal, C., Engelberg, J., García, D., & Parsons, C. A. (2012). Journalists and the Stock Market. *Review of Financial Studies*, 25, 639-679.
- Farese, S. (2011). *Investor sentiment and house prices: pre-bubble versus post-bubble*. Wilmington: University of North Carolina.
- Gallimore, P., & Gray, A. (2002). The role of investor sentiment in property investment decisions. *Journal of Property Research*, 19(2), 111-120.
- Gentzkow, M., & Shapiro, J. M. (2010). What Drives Media Slant? Evidence from U.S. daily newspapers. *Econometrica*, 78, 35-71.
- Hargreaves, D. (2019). *Stats NZ says number of residential properties sold to overseas buyers plummeted in the March quarter after the foreign buyer ban came fully into place*. New Zealand: Interest. Retrieved from <https://www.interest.co.nz/property/99475/stats-nz-says-number-residential-properties-sold-overseas-buyers-plummeted-march>
- Herring, R. J. (2006). *Booms and Busts in Housing Markets: How Vulnerable is New Zealand?* Wellington: Reserve Bank of New Zealand.
- Hirschleifer, D. (2001). Investor Psychology and Asset Pricing. *The Journal of Finance*, 56(4), 1533-1597.
- Hirshleifer, D., & Shumway, T. (2003, June). Good Day Sunshine: Stock Returns and the Weather. *Journal of Finance*, 58(3), 1009-1032.
- Ho, K.-Y., Shi, Y., & Zhang, Z. (2013, December). How does news sentiment impact asset volatility? Evidence from long memory and regime-switching approaches. *The North American Journal of Economics and Finance*, 26, 436-456.
- Kamstra, M. J., Kramer, L. A., & Levi, M. D. (2000, February). Losing Sleep at the Market: The Daylight Saving Anomaly. *American Economic Review*, 90(4), 1005-1011.
- Kearney, C., & Liu, S. (2014). Textual sentiment in finance: A survey of methods and models. *International Review of Financial Analysis*, 171-185.
- Khan, S. (2018). *Advertising with NBR*. Retrieved from The National Business Review: [https://www.nbr.co.nz/sites/default/files/NBR\\_MediaKit\\_2018\\_0.pdf](https://www.nbr.co.nz/sites/default/files/NBR_MediaKit_2018_0.pdf)
- King, R. R., Smith, V. L., Williams, A. W., & Boening, M. V. (1993). The Robustness of Bubbles and Crashes in Experimental Stock Markets. In R. H. Day, & P. Chen, *Nonlinear Dynamics and Evolutionary Economics*. New York: Oxford University Press.

- Kyle, A. S. (1985, November). Continuous Auctions and Insider Trading. *Econometrica*, 53(6), 1315-1335.
- Kyle, A. S., & Wang, F. A. (1997). Speculation Duopoly with Agreement to Disagree: Can Overconfidence Survive the Market Test? *Journal of Finance*, 52(5), 2073-2090.
- Loughran, T., & McDonald, B. (2011). When is liability not a liability? Textual Analysis, dictionaries, and 10-Ks. *Journal of Finance*, 35-65.
- Mullainathan, S., & Shleifer, A. (2005). The Market for News. *American Economic Review*, 95, 1031-1053.
- Murphy, J. (2018). *What happens if the 'everything bubble' bursts?* Auckland: NZ Herald. Retrieved from [https://www.nzherald.co.nz/business/news/article.cfm?c\\_id=3&objectid=11974827](https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=11974827)
- Murphy, T. (2018, June 25). *MediaRoom: Beyond the headlines*. Retrieved from Newsroom: <https://www.newsroom.co.nz/2018/06/24/128523/mediaroom-beyond-the-headlines>
- Newshub. (2018). *Foreign buyers ban comes into effect on Labour Day*. Auckland: Newshub. Retrieved from <https://www.newshub.co.nz/home/politics/2018/10/foreign-buyers-ban-comes-into-effect-on-labour-day.html>
- Norman, D. (2017). *What's really happening to house prices*. Auckland: Auckland Council. Retrieved from <https://www.aucklandcouncil.govt.nz/about-auckland-council/business-in-auckland/docsoccasionalpapers/auckland-economic-quarterly-november-2017.pdf>
- Real Estate Institute of New Zealand. (2019, May 14). *Monthly House Price Index Report*. Retrieved from REINZ: <https://www.reinz.co.nz/Media/Default/Statistic%20Documents/2019/Residential/April/REINZ%20Monthly%20HPI%20Report%20-%20April%202019.pdf>
- Reserve Bank of New Zealand. (2019, 07 19). *Loan-to-value ratio restrictions*. Retrieved from Reserve Bank of New Zealand: <https://www.rbnz.govt.nz/faqs/loan-to-value-ratio-restrictions-faqs>
- Reserve Bank of New Zealand. (2019). *Official Cash Rate unchanged at 1.75 percent*. Wellington: Reserve Bank of New Zealand. Retrieved from <https://www.rbnz.govt.nz/news/2019/03/official-cash-rate-unchanged-at-1-75-percent>
- Richardson, A. (2016). *RBNZ Bulletin*. Wellington: Reserve Bank of New Zealand.
- Riordan, R., Storkenmaier, A., Wagener, M., & Zhang, S. S. (2013, April). Public information arrival: Price discovery and liquidity in electronic limit order markets. *Journal of Banking and Finance*, 37(4), 1148-1159.

- Roback, J. (1982). Wages, Rents, and the Quality of Life. *Journal of Political Economy*, 90(6), 1257-1278.
- Shiller, R. J. (1990). Speculative Prices and Popular Models. *Journal of Economic Perspectives*, 4(2), 55-65.
- Shiller, R. J. (2005). *Irrational exuberance*. Princeton, NJ: Princeton University Press.
- Shiller, R. J. (2008). Historic turning points in real estate. *Eastern Economic Journal*, 34(1), 1-13.
- Shiller, R. J. (2009). *Animal Spirits*. Princeton, NJ: Princeton University Press.
- Skilling, H. (2015). *A deeper look at recent housing market trends: Insights from unit-record data*. Wellington: Reserve Bank of New Zealand.
- Soo, C. K. (2018). Quantifying Sentiment with News Media across Local Housing Markets. *The Review of Financial Studies*, 31(10), 3689-3719.
- Tang, F. (2017). *China's forex reserves drop below US\$3 trillion for first time in six years*. China: South China Morning Post. Retrieved from <https://www.scmp.com/news/article/2068798/chinas-forex-reserves-drop-below-us3-trillion-first-time-6-years>
- Tetlock, P. C. (2007, June). Giving Content to Investor Sentiment: The Role of Media in the Stock Market. *The Journal of Finance*, 62(3), 1139-1168.
- Tetlock, P. C., Saar-Tsechansky, M., & Macskassy, S. (2008, June). More Than Words: Quantifying Language to Measure Firms' Fundamentals. *The Journal of Finance*, 63(3), 1437-1467.
- Vries, P. d., Haan, J. d., Wal, E. v., & Mariën, G. (2009). A house price index based on the SPAR method. *Journal of Housing Economics*, 18, 214-223.
- Wood, P. (2017, August 07). *Opinion: Why you should care about your staff's finances*. Retrieved from Massey University: [https://www.massey.ac.nz/massey/about-massey/news/article.cfm?mnarticle\\_uuid=CE14DB50-F0AC-425B-A6A5-DBB92E1C742D](https://www.massey.ac.nz/massey/about-massey/news/article.cfm?mnarticle_uuid=CE14DB50-F0AC-425B-A6A5-DBB92E1C742D)