Uneven recovery patterns: home value trajectories in Las Vegas before and after the housing crisis

Submitted as partial fulfilment of a Master's of Science in Geospatial Technologies

Nina Kerr

University of Washington, Tacoma
ninak83@uw.edu

Abstract

Using zip code-level data, I identify 3 different types of markets in the Las Vegas Metropolitan areas based upon their volatility before, during, and after the housing crisis. These markets are Most Recovery, Average Recovery, and Least Recovery. I then performed a multivariate analysis of demographic, socioeconomic and geographic characteristics to detect a predictive correlation with the identified market types. Some of the key findings of this analysis show that lower-priced zip codes of higher minority and lower-income populations had more volatility of housing prices before, during, and after the housing crisis. Low-priced zip codes neighbouring higher-priced zip codes saw the most price volatility while higher-income, predominantly white neighborhoods saw less overall home value recovery but more price stability throughout the boom and bust market cycle. Some of the variables associated with more extreme price volatility include low median income, high minority populations, and shorter distances to city center. Although overall home price change had higher appreciation in these zip-codes, there is also more vulnerability to depreciation and extreme price changes in lower-priced zip codes in the case of another housing bust. The findings of this study suggest that certain areas are more vulnerable to house price instability based on demographic, socioeconomic, and geographic determinants. Understanding the complex relationships between race, housing, and geography is integral to developing more equitable community investments and housing policy that would create more stability in housing markets if a housing market crash were to occur again.

1. Introduction

The collapse of the U.S housing market in 2007 resulted in a large number of households with negative equity. As housing prices dropped to new lows, millions of homeowners saw their mortgage debt become higher than their home was worth (Mayer et al., 2008). In the years since the crash, cities have been working towards recovery of home values, but this recovery has large variations in both amount and speed of recovery (Immergluck, 2015). Though the market crash affected the entire nation, it is important to note that the impact was concentrated in certain parts of the country. Wial and Shearer (2011) reported that 25 of the largest U.S metropolitan areas saw housing values fall with severe declines in Las Vegas, Phoenix, and metropolitan areas in Florida and California. In Las Vegas one in three homes fell into foreclosure (CoreLogic, 2012). Presently,

Las Vegas is experiencing massive economic and housing market growth like the kind seen prior to the 2007 housing collapse. According to data from the Las Vegas Global Economic Alliance (2018) home and rental prices are up more than 15 percent and rising at more than 3 times the national average. This explosive growth is raising fears of another housing crash and widespread negative impacts on the city once again.

Recovery from the 2007 housing collapse has not been even throughout cities in the U.S and many neighborhoods still have high negative equity rates even as new homes are increasingly being built and sold (Fischer and Howe, 2015). As of 2017 Las Vegas still had one of the highest rates of negative equity among the largest U.S. metros, affecting 16.6 percent of homeowners (Zillow, 2017). If the housing market crashes again, certain areas around the city are more vulnerable to being significantly impacted again as well as having longer recovery periods.

Using spatial analysis of house price variables and analysis of demographic and housing characteristics, it is possible to predict the housing trajectory and determine areas that will potentially be more distressed in the case of another housing market crash. From the outcomes of these analyses, trends emerge that show what neighbourhood-level demographic and socio-economic indicators are consistent with uneven recovery after housing market crashes. This provides a better understanding of areas within Las Vegas, and potentially other cities, most vulnerable before and after boom and bust cycles in the housing market.

1.1 Literature Review

Many factors have been found to impact recovery from housing market instability including spatial patterns, demographic, and socioeconomic trends. My research is influenced by an interdisciplinary body of work that address these and many other facets of a continually changing housing market and its effects on metropolitan areas. The geography of mortgage foreclosure and the spatial variations of recovery from housing market busts are elements of housing crash recovery that are essential in understanding conditions that can predict whether an area experiences housing volatility during boom and bust cycles and the extent to which it recovers after a bust cycle. Research has investigated city-level variations in housing crisis outcomes by focusing on causation factors such as new home construction and subprime lending (Mian and Sufi, 2008). However, there has been little work to date focusing on the Las Vegas area at zip-code level variation in home prices and the demographic, geographic, and economic factors that contribute to differential recovery levels. The diverse demographic makeup of Las Vegas and its turbulent history of housing market trends make Las Vegas a prime location to study how recovery from a boom and bust cycle can vary throughout a city. This section highlights research that has been done in the study of housing market crash recovery and how my research extends previous hypotheses on the topic by using these factors to identify areas of volatility and stability before, during, and after the housing crisis in the context of zip-codes in Las Vegas.

1.2 Geography of Foreclosure

During the housing crisis of 2006 to 2009, foreclosure rates rapidly increased in cities across the U.S., with the biggest increases in areas where housing prices had declined rapidly (Immergluck, 2010). Prior to 2006, housing growth in newer suburban and exurban communities expanded rapidly, fuelled by subprime mortgages and high-risk lending (Guerrieri et al., 2013). Subprime

mortgages are usually offered to borrowers with low credit ratings when conventional mortgages are deemed too high risk (Calem et al., 2004). These loans often offer no down-payment but carry high-interest rates making it difficult for borrowers to reasonably pay them back. Many homeowners we able to purchase homes with zero-down payments resulting in negative equity as housing prices plummeted (Calem et al. 2004). In other cases, unrealistic mortgage terms resulted in high repayment rates on a home that was worth less than its purchasing price. Studies have concluded that these financial practices were a leading factor in home price volatility leading up to the housing market crash in 2006 (Gerardi et al., 2011; Kaplan, 2008; Kaplan et al., 2009).

Looking at the spatial location of foreclosures and subprime lending within cities and regions, studies have similar views. Mayer and Pence (2008), found that foreclosures were overrepresented in suburbs based on the findings that high-risk mortgages were concentrated in rapidly growing suburbs. Other studies found that foreclosures are not spread evenly throughout the metropolitan area but are instead clustered in specific neighborhoods. In their case study of Summit County, Ohio, Kaplan and Sommers (2009), found that inner-city neighborhoods and inner suburbs/commuter cities to be areas most vulnerable to foreclosure and housing market instability.

Race and income are also important neighborhood characteristics of areas impacted by high foreclosure and subprime mortgage rates which tend to be concentrated in low income, larger community of color population areas (Schuetz et al., 2016). Minority populations were disproportionately affected by the housing crisis due to higher levels of subprime lending than other populations (Immergluck, 2008). Much research has been done looking at the racial dynamics of subprime lending. Racial and ethnic composition of neighborhoods have been a persistent determinant of mortgage market behavior throughout history (Bradford, 2002). Black populations are more likely than white populations to receive subprime loans even after controlling for variables such as education level, income, and credit score (Calem et al., 2004). Research focusing on the housing market crash and the foreclosure crisis in the 2000's renewed this look at the segregation of the mortgage market. From 2007-2011, white and Asian families lost approximately 38 percent of their net worth while black, Hispanic, and other non-Asian households of color lost more than 71 percent over the same period (Immergluck, 2008). The differences between demographic groups in loss of household wealth during the foreclosure crisis reflects the disproportionate amount of subprime loans among homeowners of color.

There are many characteristics that factor into foreclosure density in different areas. Research has shown that income and the racial and ethnic composition of neighborhoods is a significant determinantof the pattern of foreclosure throughout a city. With this knowledge, we can apply demographic and socioeconomic characteristics to home value changes to better understand how areas recover from housing market busts.

1.3 Housing Market Instability

In response to the housing crisis, the Housing and Economic Recovery Act (HERA) was passed in 2008. The law was designed primarily to address the subprime mortgage crisis and included housing finance reform, foreclosure prevention tactics, and tax credits for new homebuyers (Niedt and Silver, 2009). Response to the Act was both negative and positive. Some believe that HERA created a long-lasting impact on affordable housing reform, while others believe the act promoted

increased homeownership even in markets where it would be unfeasible and risky (Emerson, 2008). One unarguably positive outcome of the act was provisions that limited the ability for lenders to offer risky loans. Nationwide, new policies and laws were being enacted to ensure another housing crisis would not occur again, but recovery within communities was and still is uneven (Niedt and Silver, 2009).

In a study of neighborhood housing markets in Atlanta, Raymond et al., (2015) used zip-code level data from 2001 - 2014 and performed a cluster analysis that defined three types of neighborhood markets based on their volatility to housing market instability. They found that many black neighborhoods exhibited steep rates of price decline with only little recovery following the crisis while many predominantly white, middle- and upper-income neighborhoods recovered from declines. In another study by Raymond (2018) on negative equity in the Southeast, the author determines that vacancies, unemployment, longer commute times, housing stock quality, and mortgage lending all contribute separately to prolonged negative equity. In turn, prolonged negative equity in predominantly black neighborhoods has created uneven recovery. Ray (2012) argues that understanding an area's vulnerability to housing crisis requires more than basic socio-economic indicators and suggest measuring an area's resiliency at the regional level. This includes understanding workforce diversity, business growth, industrial strength, and unemployment.

Variation of uneven recovery from the housing crisis has been studied at limited spatial levels. This research seeks to deepen the study of positive variance factors of increased foreclosures and recovery rates in the context of a metropolitan area that has been substantially impacted by the housing crisis. Understanding the factors that affect foreclosure rates nationally is essential in understanding where recovery is most uneven in a concentrated area of study.

1.4 Las Vegas Context

The Las Vegas metropolitan area has been one of the top foreclosure markets in the United States and has been heavily impacted by the housing crisis. Sharp patterns of housing price increases and drops have shaped the Las Vegas housing market over the past decade. From July 2003 to July 2006, house prices increased by an average of 22 percent per year, but by the end of 2009, prices were only 42 percent of what they had been in the past 3 years (Mallach, 2014). Drastic housing price decreases along with large amounts of new construction led to Nevada having the largest share of underwater homeowners in the U.S. By the second quarter of 2009, 9 percent of all residential properties were in foreclosure inventory compared to 4 percent nationally (Corelogic, 2012). Over the years since the housing crisis, home prices have increased significantly but have yet to recover to pre-crash highs. Prices are up more than 135 percent in North Las Vegas, a neighborhood considered one of the most overvalued and fastest growing in the country, but one in four homeowners in Las Vegas still owe more than their home is worth (RealtyTrac, 2016).

Las Vegas is also a diverse metropolitan area with over 38 percent of the population being non-white (U.S Census Bureau, 2018). As of 2017, 20.6 percent of Las Vegas, NV residents were born outside of the United States, which is higher than the national average of 13.7 percent (U.S Census Bureau, 2017). Latinos represent the largest minority population in Las Vegas which differs from other areas of similar foreclosure research (Raymond et al., 2015) that focused on Atlanta with a high black population. The region was hit hard by subprime lending and the resulting foreclosure and housing market crisis, especially in heavily minority neighborhoods. The

diverse makeup and distinct housing market patterns in Las Vegas make it an ideal region to study the evenness of housing market recovery over space.

In summary, previous research has explored how housing market instability and resulting foreclosures during the housing crisis of 2006-2009 disproportionately impacted minority populations. Subprime lending and financial institutions characteristics played a large part in fuelling this crisis (Mallach, 2014; Immergluck, 2009). This research extends previous hypotheses by being one of the first studies to use a combination of housing values, demographic, and socioeconomic data as predictive indicators to identify areas of volatility and stability before, during, and after the housing crisis in the context of Las Vegas.

2. Data and Methods

The objectives of this research are to identify different housing price trajectories during the 2001-2018 period and to identify predictors of recovery in the Las Vegas metropolitan area. The dataset used is composed of housing and demographic variables for 50 zip codes in the Las Vegas metropolitan area. Four zip codes in the study area did not have data available and were not included in the analysis. I use Zillow home value index data for single-family homes in the Las Vegas metropolitan area from 2001 to 2018. The Zillow Home Value Index is an index of home sale price estimates created from real estate data records. [See (Zillow, 2019b) for a detailed discussion of the generation of the index.] The index was chosen as the source for single-family home prices because it represents the whole housing stock and not just the homes that list or sell in a given month. This ensures that a bias is not created when properties sold in one time period versus another time period skew median homes values.

In order to understand how different areas (defined by the zip-code boundaries) behaved during housing market boom, bust, and recovery, clusters of markets were identified over the 2001-2018 period. These clusters are defined by most recovery, average recovery, and least recovery during the time period of 2001-2018. This was performed using the Zillow value home index (ZVHI) to identify the average single-family home value for the 50 different zip-codes in and around the Las Vegas metro area, then identifying the peak and the bottom of the housing market during the studied time period. The peak of the market, based on the average home value indices across the 50 zip codes, was determined to be 2006 and the trough in 2012. A cluster analysis was then performed based on the price change between each cluster. Three time periods were used to examine percent change in median home price; growth (2001-2006), decline (2007-2012), and recovery (2012-2018). The percent change in home price is the variable from which the zip codes are clustered.

Understanding the demographic, socio-economic, and geographic characteristic differences between the clusters is another integral part of the research. Using the multitude of variables obtained from the decennial Census, it is possible to perform a focused analysis of demographic characteristics of each zip-code pre-market bust. A variance analysis was performed to determine what commonalities are found within the zip codes in each cluster. Variables used in the variance analysis were median household income, percent Hispanic, percent black, poverty rates, owner occupancy rates, and distance from city center. From this analysis emerged relationships between demographic characteristics and the degree to which houses in each zip-code recovered.

3. Cluster Analysis Results

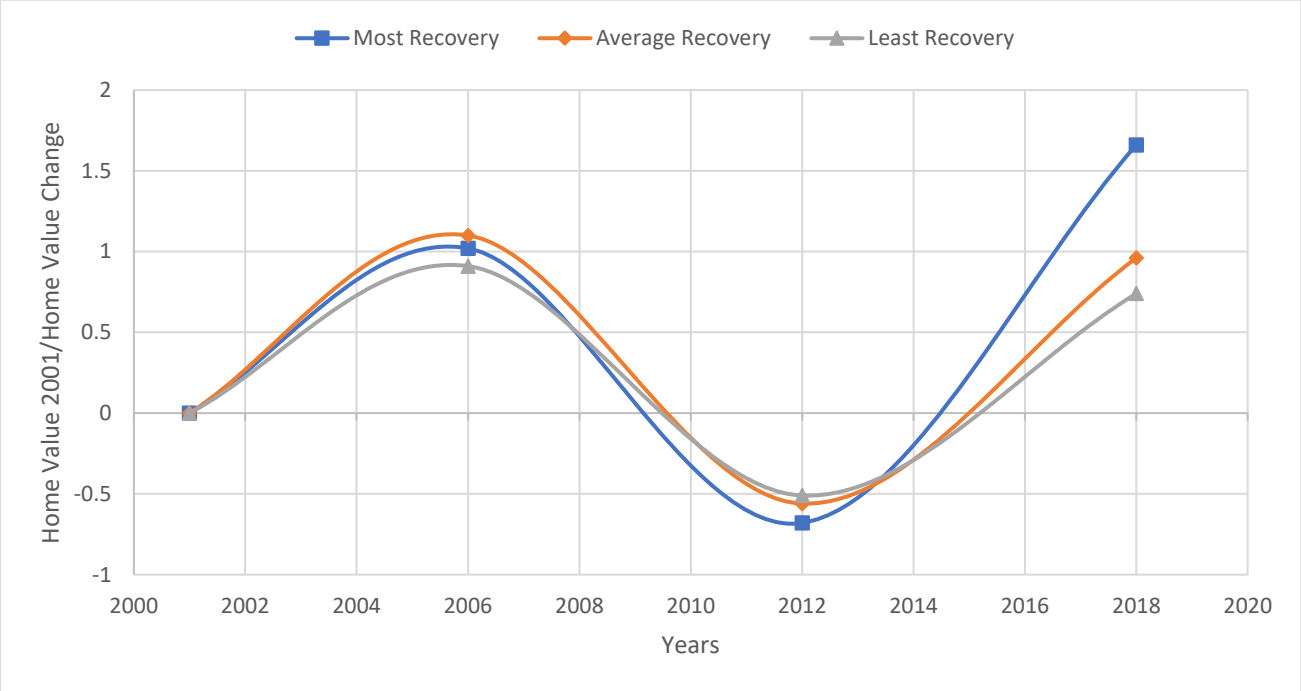
A cluster analysis was used to identify different growth and decline trajectories during the 2001-2018 period. The peak and bottom of the market for this period was found by using the average of Zillow home value indices for the zip codes in the study area. The peak was identified as 2006 and the bottom in 2012. These years were then used to determine periods of growth (2001-2006), decline (2006-2012) and recovery (2012-2018). For each of the zip codes in the study area, percent change in the price index was then measured during each of the three periods. These three variables were used as the clustering variables. A two-step cluster analysis was performed with the maximum number of clusters set to 15.

The cluster analysis resulted in three distinct clusters of zip codes as indicated by a silhouette measure of cohesion and separation above 0.5 (Norusis, 2012) as shown in Table 1. The clustering was driven by minimizing the Akaike information criterion (AIC). Minimizing the Bayes information criterion resulted in the same 3 clusters. Based on the average home-value change within each cluster during growth, decline and recovery periods, the clusters were named Most Recovery, Average Recovery, and Least Recovery. In the Most Recovery Cluster, values rose steadily from 2001 to 2006, but the Average Recovery Cluster saw the most significant value rise during the Growth period. Home values decreased the most in the Most Recovery cluster during the Decline period and the least in the Least Recovery cluster. All the zip codes studied have reached pre-bust home values as of 2016 and vary in level of price appreciation since then as shown in Figure 1. Zip codes that fell into the Most Recovery cluster reached pre-bust home values at a faster pace than those in the Average and Least recovery clusters. These 12 zip codes reached pre-bust home values in the last quarter of 2014 (October-December) whereas zip codes in the Average and Least recovery reached pre-bust values by the first quarter of 2015 (January-March). Zip-codes in the Least Recovery cluster took the longest to reach pre-bust home values with an average of six months difference between those zip-codes in the most recovery cluster.

Table 1. Results of cluster analysis of Las Vegas zip codes by percent changes in housing price index for single-family homes (2001–2006; 2006–2012; 2012–2018).

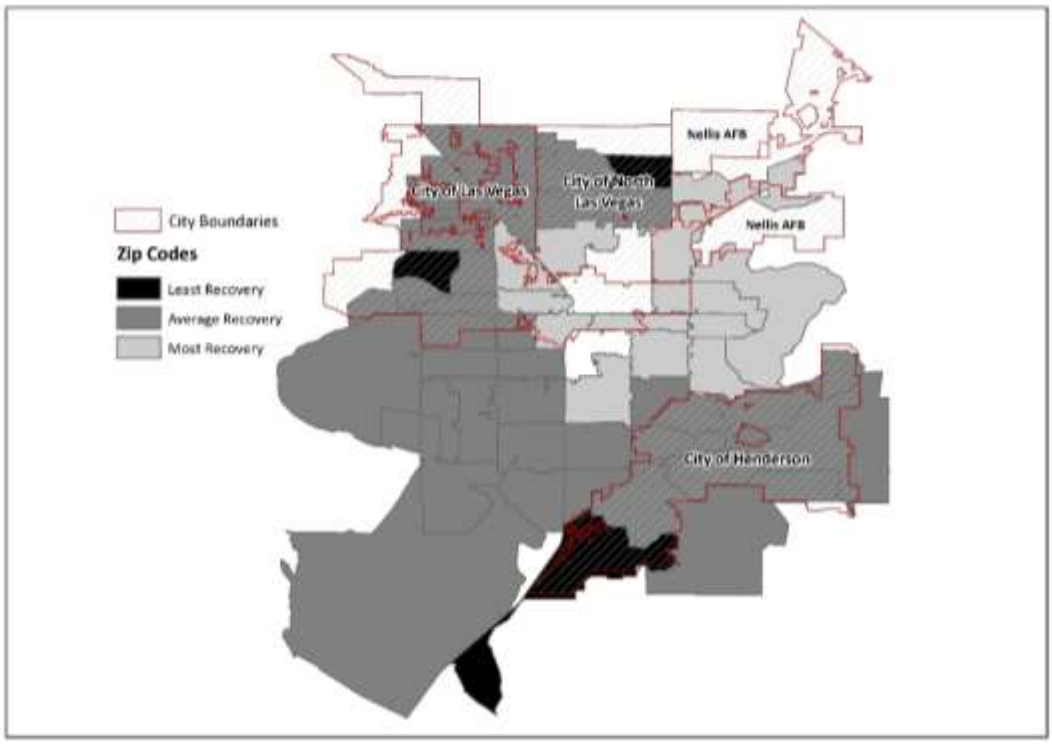
		Growth (2001-2006)		Decline (2006-2012)		Recovery (2012-2018)		% change all years	
Cluster	**# of zip codes**	**Mean (%)**	**Std. Dev (%)**	**Mean (%)**	**Std. Dev (%)**	**Mean (%)**	**Std. Dev (%)**	**Mean (%)**	**Std. Dev (%)**
Most Recovery	12	102.28	3.56	-68.63	2.4	166.32	19.86	68.08	6.67
Average Recovery	35	110.92	11.66	-56.72	5.23	96.04	18.97	77.02	10.59
Least Recovery	3	91.6	14.06	-51.71	5.55	74.47	19.34	59.52	14.17
All Clusters	50	106.62	12.84	-58.42	7.24	107.02	36.31	72.74	12.18

Figure 1. Clusters of home value trajectories



Zip codes in the Most Recovery cluster tended to experience much greater appreciation rates than the typical Las Vegas zip code during the recovery period of 2012 to 2018. These thirteen zip codes saw values rise by an average of 73 percent more than zip codes in the Average and Least Recovery clusters. Similar to the metro areas that saw the fastest appreciation rates during the growth period, this cluster experienced rapid depreciation during the housing bust, with values declining 10 percent more on average over the 2006–2012 period than zip codes in the Average and Least Recovery clusters. Interestingly, zip codes in the Least Recovery cluster had the slowest value recovery but had the highest average home value recovery (measured by percent of initial value) throughout the entire studied time period from 2001-2018. This is because these zip codes grew modestly during the growth period and values declined less than the other clusters during the decline period. The recent trajectories among all zip codes have been dramatically upwards, especially in the Most Recovery cluster, raising concerns of significant depreciation if a market crash were to occur again. Figure 2 shows the spatial distribution of the three clusters across the Las Vegas Metropolitan area.

Figure 2. Distribution of clusters in the Las Vegas metropolitan area



3.1 Demographic, socioeconomic and geographic differences between the three clusters

The three clusters differ among key demographic, socioeconomic, and geographic variables. Before running the one-way ANOVA, the data was tested for normality, homoscedasticity, and linearity. These assumptions were met by the data. The ANOVA results in Table 2 describe the differences between cluster means on these variables. For each of these variables, there is a statistically significant difference among the three clusters with a maximum *p*-value of 0.04 and with eight of nine *p*-values falling below 0.01. The least significant variable is percent black populations with a *p*-value 0.259, well above the maximum *p*-value of 0.04. The most significant variables associated with cluster affiliation are percent Hispanic population, percent of population with bachelors degree, and the home value index. Distance from city center had the highest significant *p*-value at 0.04 which suggest it is significant to cluster affiliation, but not as significant as the other variables with lower *p*-values. This may have to do with the study area being small and the zip codes being generally evenly distributed around the point from which distance was measured.

Least Recovery zip codes had significantly higher initial home values (mean of 197,458) than Average Recovery zip codes (mean of 171,137), with Most Recovery zip codes having the smallest initial value (mean of 128,577). The top three zip codes with the highest average initial home values belong in the Average Recovery cluster. Interestingly, the highest home value zip code in 2018 belongs to the Least Recovery cluster. Most Recovery and Average Recovery neighborhoods

both had lower owner-occupancy rates (approximately 45 to 50 percent), compared to the Least Recovery areas with a mean of 65 percent. Vacancy rates were strikingly different between clusters with the Most Recovery cluster having a mean of 42 percent in comparison to Average and Least Recovery clusters with means of 25 and 16 percent, respectively. Most Recovery zip codes have high Hispanic population percentages (mean of 48 percent) compared to Average Recovery (mean of 20 percent) and Most Recovery (mean of 14 percent) areas. Median income was similar among Average Recovery and Least Recovery clusters (means of 77,352 and 79,148, respectively) but were substantially lower in the Most Recovery cluster (mean of 47,709).

The one geographic characteristic, distance from city center, was calculated as average distance from the Las Vegas Strip, a concentration of hotels and casinos that serves as a main employment and business hub. Distance to city center was calculated using the ArcMap analysis tool "Generate Near Table" which finds distances from input features. Distances were calculated from the center of each zip code to the designated city center. Least Recovery zip codes tend to lie furthest from the city center with an average of 12.1 miles compared to Average and Most Recovery clusters (mean distances of 9.4 and 6.5, respectively). The Most Recovery cluster is concentrated in the Northeastern part of the metro area near Nellis Air Force base and city center. The Average Recovery cluster forms a c-shape around the Most Recovery cluster with the Least Recovery spread out along the very edge of the Average Recovery cluster in the outskirts of the metro area. The city of Henderson and Summerlin, two of the most affluent and less diverse areas in Las Vegas, fall within Average and Least Recovery clusters respectively.

Table 2. ANOVA analysis results of clusters

Characteristics	Cluster	N	Mean	Std. dev	Lower Bound	Upper Bound	*F*	Sig.
Home value index - 2001	Most Recovery	12	128,577	6,626	117,033	137,991	40.53	0.000
	Average Recovery	35	171,137	23,695	135,400	237,191		
	Least Recovery	3	197,458	29,002	168,525	237,100		
Per cent Hispanic - 2000	Most Recovery	12	48.65	7.75	37.75	61.29	91.64	0.000
	Average Recovery	35	20.36	6.42	10.90	35.43		
	Least Recovery	3	14.73	11	6.48	29.96		
Per cent Black - 2000	Most Recovery	12	12.94	5.14	7.42	25.66	1.30	0.259
	Average Recovery	35	9.27	4.51	4.12	25.89		
	Least Recovery	3	12.72	12.12	3.4	29.85		
Per cent white - 2000	Most Recovery	12	34.44	5.22	18.9	66.34	64.56	0.000
	Average Recovery	35	55.87	7.51	26.76	68.94		
	Least Recovery	3	63.45	10.11	30.40	77.00		
Per cent vacant - 2000	Most Recovery	12	42.21	14.56	11.47	62.47	18.68	0.000
	Average Recovery	35	25.68	11.58	0	53.37		
	Least Recovery	3	16.20	4.43	12.41	22.41		

Per cent owner occupied - 2000	Most Recovery	12	45.17	12.59	19.21	58.13	11.61	0.001
	Average Recovery	35	59.61	11.38	33.85	82.96		
	Least Recovery	3	65.07	22.01	34	82.14		
Per cent unemployed - 2000	Most Recovery	12	9.75	1.47	7	13	16.63	0.000
	Average Recovery	35	6.20	2.3	0	13		
	Least Recovery	3	6.33	2.49	3	9		
Per cent population with bachelors degree or higher - 2000	Most Recovery	12	13.26	2.72	7	17.2	39.05	0.000
	Average Recovery	35	29.58	8.5	15.9	55.3		
	Least Recovery	3	35.53	8.29	23.8	41.4		
Distance from city center (miles)	Most Recovery	12	6.5	3	1.4	11.7	9.10	0.004
	Average Recovery	35	9.4	3.6	1.9	18		
	Least Recovery	3	12.1	2.6	8.8	15.4		
Median income ($) - 2000	Most Recovery	12	47,709	6,796	35,777	60,198	30.16	0.000
	Average Recovery	35	77,352	14,910	47,220	118,764		
	Least Recovery	3	79,184	16,149	58,494	97,905		

Discussion

The results of these analyses are important because they differ from other studies on housing recovery that utilized similar analysis techniques (Raymond et al., 2015; Kaplan and Sommers, 2009). In a similar study in the Atlanta metropolitan area by Raymond et al. (2015), results of zip-code level housing and demographic data showed that black neighborhoods exhibited steep rates of price decline with only little recovery while predominantly white, middle- and upper-income neighborhoods generally more than recovered from the housing crisis. The results of the Las Vegas study indicate the opposite; showing that Hispanic or Latinx neighborhoods (the largest population of color in Las Vegas) recovered home values at a significantly higher and faster rate than predominantly non-Hispanic, middle- and upper-income neighborhoods. The results of the Atlanta study and prior literature (Bradford, 2002; Immergluck, 2008; Wyly et al., 2008) suggests that areas of large populations of color and lower incomes would be slower to recover home values after a housing market crash. This is not the case in Las Vegas where areas of large populations of color and lower median incomes showed faster and more extreme increases in home value than clusters of areas with low populations of color, middle- and upper-income neighborhoods. I believe this is a result of two different factors; the drastic demographic and socioeconomic differences in the two studied cities and the current housing market conditions compared to earlier studies.

According to data from the Census bureau, Atlanta's population is 52.3% black or African American and 4.6% Hispanic or Latino (2018). Las Vegas, in comparison, is 12.2% black or African American and 32.7% Hispanic or Latinx (Census, 2018). In comparing the two studies,

the largest populations of color are black or African American and Hispanic or Latinx in Atlanta and Las Vegas, respectively. Though they vary in the dates of data used, both studies show significant impacts to the largest populations of color of each city during the housing market crisis. Further research could be done to determine if the housing price trajectory of Las Vegas would show similar trajectories in Atlanta using data beyond 2014. It is also important to note that Atlanta and Las Vegas have different racial settlement patterns and housing markets and further research should be done to determine how these patterns also shape housing price trajectory. These results are not aimed at showing causation between home value recovery and neighborhood compositions. In fact, these results show that associations between neighborhood composition and home value recovery vary depending on the geographic region being studied.

Another reason these results are significant is that they show housing price volatility as a possible indicator of vulnerability to housing market instability. One aspect of the study by Raymond et al. (2015) that is not addressed is the overall housing volatility that the analyses uncovered. In the study of Las Vegas, the changes in home value between time periods showed similar patterns of growth and decline throughout all clusters from 2000 to 2012 but differ greatly in the years after 2012. In the Raymond et al. (2015) study, the analysis data was only studied up to 2014 which is why the results do not show significant home value growth differences between the clusters from 2012 and on. In this study of Las Vegas, home value data was studied up to 2018 which uncovers significant changes in home value appreciation between clusters. The results of this study show that clusters of neighborhoods that incur significant home value growth also suffer from significant home value depreciation during housing market instability. Zip codes that had more stable home value increases and decreases showed less significant home value changes during housing market instability. This occurred most often in neighborhoods with higher priced homes and higher median incomes. From this, more housing price stability during different housing market conditions could be an indicator of less vulnerability to significant impacts in the case of another housing market crash. The opposite could be said of zip codes that fall within the Most Recovery cluster. These zip codes are likely to be significantly impacted by a future housing market crash because of their extreme patterns of home value growth and decline. Recovery levels should be determined not just on overall recovery of home price value, but also by how much that value changes during different stages of the housing market.

Conclusion

This research indicates three different clusters of housing price trajectories in the Las Vegas metropolitan area areas based upon their volatility before, during, and after the housing crisis. It shows that the neighborhoods that make up each cluster have significant differences in demographic, socioeconomic, and geographic characteristics. A strong correlation between high Hispanic populations with lower median incomes and faster home value recovery was uncovered while areas with higher-income and lower populations of color saw less and slower home value recovery. Although faster home value recovery was indicated, another pattern was revealed that suggests areas with more extreme home value changes throughout the study time periods indicates more housing instability which could mean increased vulnerability in the case if another housing market crash. Although these patterns varied from other studies and literature that suggested different outcomes as explained above, further research must be done in different study areas to better understand the range of outcomes that could occur in this type of analysis of home value

trajectories. The reasons behind these patterns cannot all be addressed in this paper and there is potential for variations in these patterns to occur.

This research contributes to the literature in two important ways. First, it uncovers housing market recovery patterns in a large metropolitan area that has a history of significant impacts from the last housing market crisis. Secondly, it uncovers patterns in the demographic, socioeconomic, and geographic characteristics of these housing recovery trajectories. From the literature, we know that areas of high populations of color were disproportionately impacted by subprime lending and resulting foreclosures, especially during the 2006 housing market crisis (Bradford, 2002; Calem et al., 2004; Immergluck, 2008). With the recent surge in home values in large metropolitan areas (Zillow, 2017), specifically in areas with large populations of color and less household wealth, there is a much higher risk of impacts once again if another housing crisis were to occur. In order to address this, efforts to minimize these impacts and support more housing stability must take into account the patterns of housing instability and the uneven recovery patterns uncovered in this study and other like it.

Acknowledgements

I would like to express my sincere gratitude to my professors, Dr. Emma Slager and Dr. Jim Thatcher, for the continuous support of my study and research. I would also like to thank Dr. Ali Modarres for being my second reader and providing valuable insight and guidance for my capstone project.

References

Bayer, P., Ferreira, F., & Ross, S. (2016). The Vulnerability of Minority Homeowners in the Housing Boom and Bust. American Economic Journal. Economic Policy, 8(1), 1-27.

Bradford, C.B. (2002). Risk or Race? Racial Disparities and the Subprime Refinance Market.

Calem, P.S., Hershaff, J.E. & Wachter, S.M., (2004). Neighborhood patterns of subprime lending: Evidence from disparate cities. Housing Policy Debate, 15(3), 603–622.

CoreLogic. (2012). CoreLogic reports number of residential properties in negative equity decreases again in second quarter of 2012. Santa Ana, CA. Retrieved from https://www.corelogic.com/news/corelogic-reports-negative-equity-decreases-in-first-quarter-of-2012.aspx

De Bruyne, K., & Van Hove, J. (2006). Explaining the spatial variation in housing prices an economic geography approach. Leuven: Centrum voor Economische Studiën.

Emerson, C. (2008). A troubled house of cards: examining how the Housing and Economic Recovery Act of 2008 fails to resolve the foreclosure crisis. Oklahoma Law Review, 61(3), 561–584.

Fischer, M., & Lowe, T. (2015). Homebuyer Neighborhood Attainment in Black and White: Housing Outcomes during the Housing Boom and Bust. *Social Forces, 93*(4), 1481-1512.

Gerardi, K., Ross, S., & Willen, P. (2011). Understanding the Foreclosure Crisis. Journal of Policy Analysis and Management, 30(2), 382-388.

Guerrieri, V., Hartley, D., & Hurst, E. (2013). Endogenous gentrification and housing price dynamics. Journal Of Public Economics, 100(C), 45-60.

Immergluck, D. (2010). Neighborhoods in the Wake of the Debacle: Intrametropolitan Patterns of Foreclosed Properties. Urban Affairs Review, 46(1), 3–36.

Immergluck, D. (2015). Preventing the next mortgage crisis: The meltdown, the federal response, and the future of housing in America. Lanham: Rowman & Littlefield. 33-39.

Kaplan, D. (2008). Foreclosures, predatory lending, and reverse redlining. Urban Geography 29:745–84.

Kaplan, D. & Sommers, G.G. (2009). An Analysis of the Relationship Between Housing Foreclosures, Lending Practices, and Neighborhood Ecology: Evidence from a Distressed County. The Professional Geographer, 61(1), 101–120.

Las Vegas Global Economic Alliance. (2018). Economic Snapshot, April 2018. LVGEA Research Center. Available at https://www.lvgea.org/economic-snapshot-april-2018/

Mayer, C., & Pence, K. (2008). Subprime Mortgages: What, Where and to Whom? Board of Governors of the Federal Reserve System, 2008. Board of Governors of the Federal Reserve System, 2008, 44 pp, 0, 2008.

Mallach, A. (2014). Lessons From Las Vegas: Housing Markets, Neighborhoods, Single-Family Property Investors. Housing Policy Debate, 1-33.

Mian, A. & Sufi, A. (2008). The Consequences of Mortgage Credit Expansion: Evidence from the 2007 Mortgage Default Crisis Working Paper, Washington, DC: National Bureau of Economic Research.

Niedt, C., & Silver, M. (2009). Forging a new housing policy: Opportunity in the wake of crisis. National Centre for Suburban Studies, Hofstra University.

Norusis, M. (2012). IBM SPSS Statistics 19 Statistical Procedures Companion (New York: Pearson).

Ray, I. et al., (2012). Examining the Role of Urban Spatial Structure, Housing Submarkets, and Economic Resiliency in U.S. Residential Foreclosures, 2000–2009, pp.ProQuest Dissertations and Theses.

Raymond, E., Wang, K. & Immergluck, D. (2015). Race and uneven recovery: neighbourhood home value trajectories in Atlanta before and after the housing crisis. Housing Studies, 31(3), 1–16.

Raymond, E. (2018). Race, uneven recovery and persistent negative equity in the southeastern United States. Journal of Urban Affairs,40(6), 824-837.

Schuetz, J., Spader, J, & Cortes, A. (2016). Have distressed neighborhoods recovered? Evidence from the neighborhood stabilization program. Journal of Housing Economics, 34(C), 30-48.

U.S. Census Bureau. 2018. Selected population characteristics, 2000. American Community Survey population estimates. Retrieved from www.census.gov

Wial, H., & Shearer, R. (2011). MetroMonitor: Tracking Economic Recession and Recovery in America's 100 Largest Metropolitan Areas.

Williams, S., Galster, G., & Verma, N. (2013). The Disparate Neighborhood Impacts of the Great Recession: Evidence from Chicago. Urban Geography, 34(6), 737-763.

Wyly, Elvin K., Marcus Moos, Holly Foxcroft, and Emmanuel Kabahizi. 2008. “Subprime Mortgage Segmentation in the American Urban System.” Tijdschrift voor Economische en Sociale Geografie 99(1): 3-23.

Zillow. (2017). Negative Equity Report: Improvement Continues, But at a Much Slower Rate. Available at https://www.zillow.com/research/q4-2017-negative-equity-report-14393/ (accessed 12 July 2019).

Zillow. (2019a). Zillow home value index (ZHVI). Data on single-family homes. Available at http:// www.zillow.com/research/data/ (accessed 30 May 2019).

Zillow. (2019b). Zillow home value index: Methodology. Available at http://www.zillow.com/research/ zhvi-methodology-6032/ (accessed 30 May 2019).