The Impact of Using

Market-Value to Replacement-Cost

Ratios on Housing Insurance in Toledo Neighborhoods

February 12, 1999

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This report examines the use of guidelines based on a market-value to replacement-cost ratio as criteria to qualify for purchasing replacement-cost housing insurance in White and African American neighborhoods in the City of Toledo. The research question addressed is whether adhering to such guidelines has a disparate impact on, or systematically disadvantages, homeowners in African-American (AA) neighborhoods compared to white (WH) neighborhoods in the City of Toledo?

Definitions

- African-American (AA) neighborhoods consist of all census tracts with black populations over 50 percent.

- White (WH) neighborhoods consist of all census tracts with black populations under 9 percent.

Methodology

The methodology employed to asses the impact of market-value to replacement-cost guidelines was a five step process.

1. A stratified random sample of properties was drawn from the AA and the WH census block groups.

2. An on-site review was completed on each of the properties to determine the construction class categories required to utilize the Boeckh[1] replacement-cost system and a photograph was taken of each property.

3. The data from the field notes were entered into the Boeckh program and the data were reviewed by examining the photographs.

4. The replacement-cost numbers were extracted from the Boeckh program and market-value was added from the auditor's files.

5. An analysis of the data was completed.

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[1] Boeckh Residential Valuation System is a method developed by the E.H. Boeckh company to determine the cost of replacing residential property. It is both a manual system and a computer program.

Sampling

A stratified random sampling procedure was employed which gave every house in the AA neighborhoods an equal chance of being selected, and every house in the WH areas an equal chance of being selected.

First, a random sample of 30 census block groups was drawn from all of the WH census block groups and then the same was done for the AA census block groups. Second, all the houses in the 30 WH census block groups were arrayed in a list and a separate list was prepared for the houses in the 30 AA census block groups. Finally, a selection number for each group was randomly assigned to select a sample of slightly over 350 houses for each group in order to assure a valid sample of approximately 300 houses in each group.

Requirements for using the Boeckh Program

The field staff traveled to each of the 600 plus sites to visually inspect the houses to determine construction class (according to the Boeckh system), and to gather information on a few additional characteristics. The field staff also took photographs of each house. These data were entered into the computer using the Boeckh computer program. At the Urban Affairs Center the field staffs' assignment of class and other characteristics was verified by the Data Manager by examining the photographs and the computer data was updated accordingly. The Data Manager had received training in the use of the Boeckh system from a representative of the company.

The "Basic Boeckh" method was used to calculate replacement-cost for each property. This required determining the Boeckh class of construction, the living area, the number of stories, the exterior wall category, and the zip code. Additional data entered were type and size of porch or stoop, the size and type of garage, if it was an attached garage, and

the type of roofing material. With these data the Boeckh program provided an estimate of the replacement-cost.

Table 1		
Classes of Construction		
for 436xx		
Construction		
Year	Class	Multiplier
1980 to	A	1.10
Present	B	1.45
	C	1.90
	D	2.35
1940 to 1979	AA	1.26
	BB	1.63
	CC	2.04
	DD	2.50
Prior to 1940	X	1.57
	Y	1.89
	Z	2.21
Low End Basic	S	0.97
High End Unique	T	2.81

The construction class of the property is the single largest factor in determining the replacement-cost using the Boeckh program. Boeckh provides classes in three groups based on year of construction. For houses built prior to 1940, there are three classes. For houses built between 1940 and 1979, there are four classes. For houses built from 1980 to present, there are also four classes. There are also two classes that transcend year of construction. "S" is for low end basic houses, and "T" is for very high end unique houses. As shown in Table 1, in addition to the class, the multiplier is specific to each three digit zip code to account for labor and material costs in different parts of the county.

The system works by calculating a base cost for a house of a given square footage with a certain type of roof material and exterior wall material. Then using the class, which is an indicator of style and quality, a multiplier is applied to adjust for class and location.

An estimate may be refined by entering a large number of other factors into the individual property record such as fireplaces, additional bathrooms, data on built-in appliances, etc. However these factors were not used. First, these data were not readily available. More importantly, preliminary testing of the data demonstrated that for the
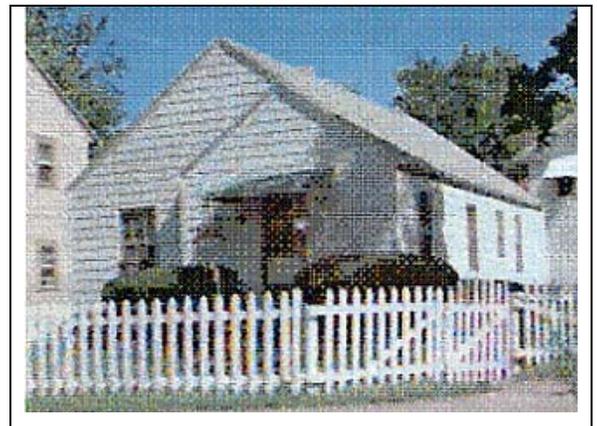
purposes of this study, these factors were not of consequence. In addition, the feature that allowed for the addition of a basement was not used. Again, accurate information on the type and size of basement was not available. There is justification for excluding basement costs since replacement of a property may well not involve replacement of a basement.

Most of the houses in the sample could be readily assigned into one of the classes of construction after carefully considering the factors for assigning class, though some houses did not so easily fall into one of the classes. Table 1 illustrates that miss-classifying a house can result in a significantly different replacement-cost. Consider the house in Figure 1. It would appear to be a class "S" since it is a very simple rectangular structure without roof overhang and no exterior details. Still, on second examination, the roof pitch is higher than for "S" houses; therefore it might be considered an "AA" class.
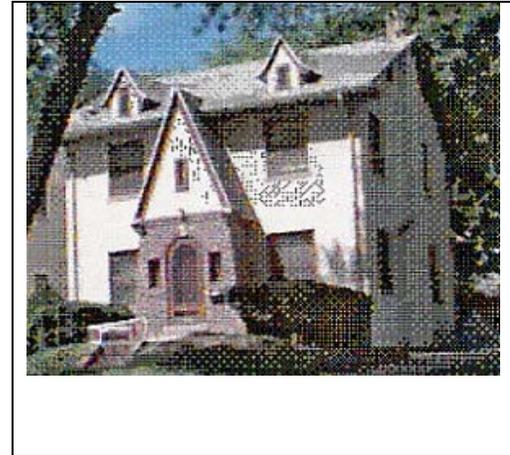
What about the house in Figure 2? Here the determination is more difficult. It could be considered class "X" or class "Y". Two people evaluating this house could well judge it differently. The class selected can have a significant impact on the calculation. A class "X" in the 43606 zip code would have a multiplier of 1.57, while a class "Y" house would have a multiplier of 1.89. Thus, on a house with a base value (determined from the square feet of living space and wall type) of 48,396, the class "X" would have a replacement-cost of $75,982, while the class "Y" would have a replacement-cost of $91,488. Finally, consider Figure 3. Is this a class B, or is it a class C?

The point that needs to be made is that in evaluating an individual property, great care needed to be taken so as not to either over or under estimate the replacement-cost. The results

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of this study will show that even though careful attention was paid to the details, because of the considerable differences in the results between AA and WH areas, the fine distinction proved not to be a factor in the outcome. The map at the end of the Appendix shows the geographical distribution of the sample houses. The clustering of houses in census block groups shows the stratified nature of the sample. Table 2 shows the distribution of houses by class of construction in the sample.

Results

Data were gathered on 607 houses. In the AA census block groups, 310 site visits were completed and in the WH census block groups, 297. Table 3 characterizes the houses by age and size. The median size of the houses in the AA and the WH census block groups is similar though the range is greater in the AA census block groups. This is because there are some large older houses in the central city where the AA census block groups are located. The different location, AA in the central city and WH more to the periphery, accounts for the difference in median year the houses were constructed, 1911 in AA and 1952 in WH.

Table 2			
Number of Houses by Class			
Construction Year	Class	AA	WH
1980 to	A	1	5
Present	B	0	0
	C	3	6
	D	0	0
1940 to 1979	AA	6	69
	BB	2	34
	CC	0	30
	DD	2	2
Prior to 1940	X	191	57
	Y	72	31
	Z	2	0
Low End Basic	S	31	62
High End Unique	T	0	1

Table 3 Houses Analyzed by Age and Size					
	Number of Tract Blocks in Sample	Number of Houses in Sample	Median Year House Built	Median Size (sq ft.)	Range (sq. ft.)
AA	29	310	1911	1393	608-7271
WH	28	297	1952	1340	544-4676

If we look at average replacement-cost, shown in Table 4, it is very similar. It is just over $88,000 in AA census block groups and about $84,000 in WH census block groups. Clearly there are more "X" and "Y" class houses in the AA areas, that is houses built prior to 1940. (See Table 2) In WH areas there are more houses in the "AA", "BB", and "CC" classes, that is houses built between 1940 and 1980. Yet a review of the table of construction classes provided by Boeckh (see Table 1) shows replacement-cost similar for class "X" and for class "AA" and similar for class "Y" and "BB". the fact that class "X" is a bit higher than class "AA" and class "Y" is a bit higher than for "BB" explains the slightly higher average replacement-cost in the AA census block groups than in the WH census block groups.

Table 4 market value and replacement-cost			
	Average Market Values	Average Replacement Cost	Number of Houses
AA	$19,028	$88,422	310
WH	$68,591	$83,828	297

Market value was obtained from a Lucas County Auditor's Office. Every six years the auditor reassesses all of the properties to determine a market value. This 100% value is

recorded in the property record. The last assessment was completed in 1994. The sales price of a house is also recorded, but since only about 5000 houses are sold each year, sales price is not available for each of the sample houses. Only a derived sales price could be obtained, one based on a statistical adjustment to the assessed value. This was not done in this study in order to evaluate market-value to replacement cost at the individual house level. (See note on Market-Value, page 10.)

Table 5 (see next page) shows the number of houses that meet market-value to replacement-cost guidelines at ratios from 30 percent to 80 percent. If the underwriting guideline were at the ratio of 50% (market-value must be equal to or greater than 50% of replacement-cost) then 19 of the houses out of a total of 310, or 6.13% meet the guideline in AA areas. In WH areas 252 of the 297 houses, or 84.85% meet the guideline.

An analysis of the data from the 607 houses in the sample shows a considerable disparate impact at all ratios of market-value to replacement-cost between the AA and WH neighborhoods. There is a 70 percentage point difference between houses qualifying in the AA areas and houses qualifying in the WH areas at the 30 percent level. At the 80 percent level, the difference is 56 percentage points between the AA areas than in the WH areas. As shown in Table 5, the differences between AA and WH areas lessen when the ratio of market-value to replacement-cost is increased in the 30 to 80 percent ratios. Nevertheless, using difference as the measure of impact, the disparate impact is large at all levels.

Statistical Analysis

Chart 1 displays a scatter plot of the number of houses qualifying at the different ratios categorized by AA and WH areas. This chart shows an inverse correlation between number of qualifying properties and qualifying ratio for both the AA and the WH houses. See Tables A1 and A2 in the Appendix. These tables show that the inverse

Table 5				
Percentage of Houses in AA & WH Areas with Market Values Equal to or Greater than Various Percentages of Replacement Cost				
Market Value as a Percentage of Replacement Cost	AA Areas Qualifying Houses		WH Areas Qualifying Houses	
	Number	Percent	Number	Percent
30%	70	22.58	277	93.27
35%	44	14.19	272	91.58
40%	31	10.00	266	89.56
45%	24	7.74	260	87.54
50%	19	6.13	252	84.85
55%	17	5.48	239	80.48
60%	14	4.52	228	76.77
65%	13	4.19	216	72.73
70%	10	3.23	212	71.38
75%	6	1.94	191	64.31
80%	6	1.94	174	58.59
Total Number of Houses	310		297	

correlation for the WH properties is slightly larger than for the AA properties. As the scatter plot shows, at ratios from 45 percent and above, the number of houses qualifying in the AA areas is negligible. The scatter plot also shows an obvious difference in the number of houses that qualify in the AA and the WH areas at all ratios.

Chart 1
Qualifying Level and Properties Qualifying

X^2 significant at .0001 at all levels
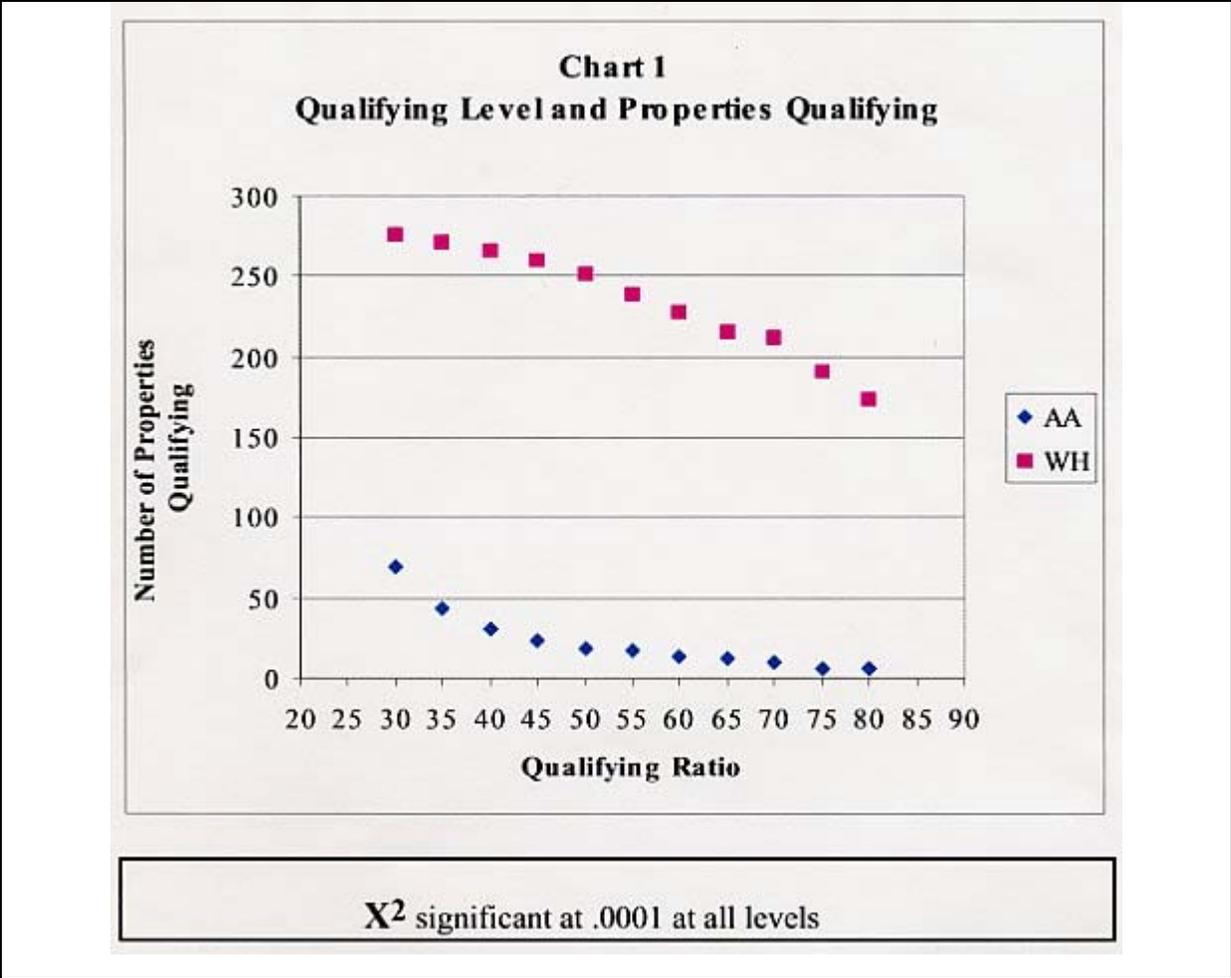
Chart 2 shows a histogram of AA and WH houses qualifying at each ratio. Chi-square analysis of this data was used to evaluate the difference between AA and WH areas at each ratio. The results of the Chi-square tests are provided in the Appendix, Tables A3 through A8. These tables show that at all ratios the difference in the number of properties qualifying in AA and WH areas is statistically significant. (P< .0001)

Chart 2
Number of Houses at Various Ratios of Replacement Cost
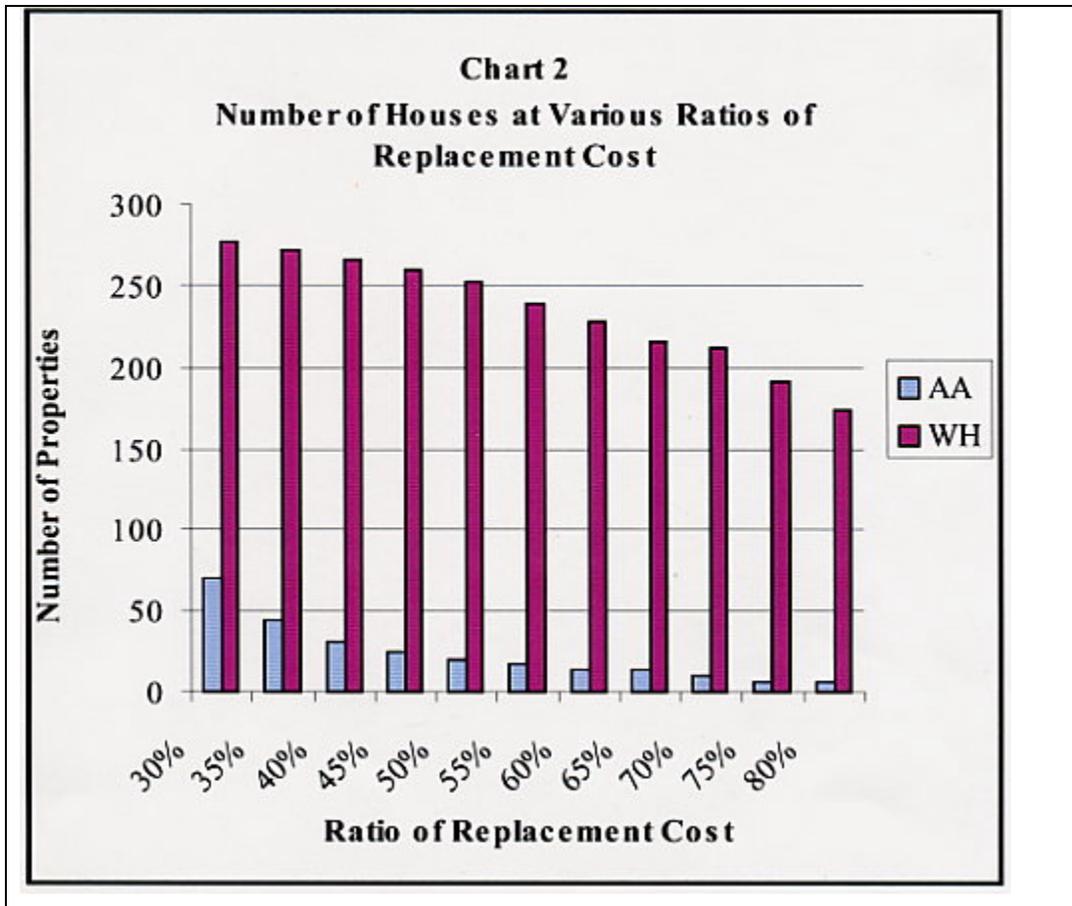
The probability of error is extremely small. For example, at the 30 percent ratio, see Table 6, you would expect a minimum of 127 houses in the AA areas to qualify if location were not a factor. However, the observed number of only 70 qualifying houses in the AA areas demonstrates that the racial composition of the neighborhood is the controlling factor. At the ratio of 80, the expected number of houses qualifying would be 88, while the observed number is 6.

All of the Chi-squares show this same patter and at all ratios between 30 and 80, the differences between AA and WH properties qualifying are highly significant.

Using market-value to replacement-cost as a determinant for insurance qualification systematically disadvantages all property owners in AA neighborhoods in comparison to property owners in WH neighborhoods.

Table 6

RACE * RATIO30 Crosstabulation

Count

		RATIO30		
		Not Qualify	Qualify	Total
RACE	AA	240	70	310
	WH	20	277	297
Total		260	347	607

Chi-Square Test - Ratio30

	Value	df	Exact Sig. (2-sided)
Pearson Chi-Square	309.502	1	
Fisher's Exact Test			.000

0 cells (.0%) have expected count less than 5. The minimum expected count is 127.22.

RACE * RATIO80 Crosstabulation

Count

		RATIO80		
		Not Qualifying	Qualifying	Total
RACE	AA	304	6	310
	WH	123	174	297
Total		427	180	607

Chi-Square Test - Ratio80

	Value	df	Exact Sig. (2-sided)
Pearson Chi-Square	233.352[b]	1	
Fisher's Exact Test			.000

0 cells (.0%) have expected count less than 5. The minimum expected count is 88.07.

Note on Market-Value

Between 1994, when the last auditor's assessment was made, and 1999, there has been an approximately 14% average increase in market values for single family houses in Lucas County as a whole. This average was not a uniform increase. There was a disproportionate increase between property values in the city of Toledo and those outside the city of Toledo. However, even ascribing a 14% increase to all sample properties does not appreciably change the number of properties qualifying at the various ratios. A 14% increase in property values at the 30% ratio would add 15 houses to the number qualifying. This number remains considerably below the 127 houses expected to qualify (Table 6) if location were not a factor. It increases the number of houses qualifying by only 2 at the 80% ratio. Eight qualifying does not appreciably change the results when 88 properties would be expected to qualify if location were not a factor.

Conclusion

The disparity between the number of houses meeting a qualifying ratio, (market-value to replacement-cost), in the AA and the WH census block groups is so great that the subtle

nuances of selecting construction class and refining the input factors to get a more measured replacement-cost, simply disappear. The differences are far too great to be explained by sampling methodology, or by determining replacement-cost, or by the method of analyzing the data.

The analysis of data generated in this scientifically selected sample shows that homeowners in AA neighborhoods are far less likely to qualify at all levels of market-value to replacement-cost than homeowners in WH neighborhoods.