

## **Descriptive Analysis Report on USA House Price in 2014**

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Date: October 31, 2023

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## Introduction

Descriptive analysis is a process of data analysis that helps businesses to analyze and understand what is happening in the business with real-time data and helps businesses interpret

information in the form of data visualization such as graph, charts, reports, dashboards, etc. In real estate business, understanding the pattern of house pricing is a crucial part and descriptive analysis aids real estate businesses in identifying patterns, trends, and changes in house pricing based on different factors. Descriptive analysis also elevates the marketing and advertising efforts of real estate agents, along with guiding them in accurate market segment positioning. Along with the real estate industry, the other beneficiaries of the descriptive analysis are mortgage and lending sectors, government and urban planning policymakers, etc.

A descriptive analysis of house prices provides significant insights to customers as well. Let alone budgeting, descriptive analysis aids customers with property buying or selling price negotiation and risk assessments. In essence, descriptive analysis of house prices empowers customers with the accurate knowledge needed to make themselves ready to navigate the complex and competitive real estate market to crack a great deal for themselves.

The main objective of this report is to understand the dataset and clean it up if required. Understanding the price disparities of house price accross different cities of USA in 2014 is another objective of this study. Finally, trying to establish the relation and dependencies of several factors that impact the house price differences over time, ultimately providing data-driven knowledge about the real estate market in the USA.

In this study, a background of the main data on which the descriptive analysis will be conducted will be given, along with some literature reviews on the same topics. Also the methodology that was used to do this analysis will be presented. Lastly, the result of the analysis will be discussed with some possible suggestions.

## Background

House price analysis and predicting prices is a crucial part for both the real estate business and the economy of a country. Having substantial economic significance, investing in a home is a major asset for many households. And to understand the impact on the financial economy, understanding the fluctuation in house prices is very important. Since the Global Financial Crisis (GFC) the relationship between house prices and economic activity has created interest among people and economics (Asadov et al., 2023). According to Case and Quigley, any issues in the housing market have significant economic consequences. For example, a decrease in consumer spending, drops in house buildings, and a significant decline in overall residential investment. Declining house price also has a very strong negative impact on household income as well as on the financial industry, including an impact on construction, demand for home financing, and an increase in mortgage and lending defaults (Case et al, 2011). The Federal Housing Financial Finance Agency and USA Census Bureau provide housing price index and house price data monthly, quarterly, and yearly as well. All these historical data help with the analysis and prediction of significant findings.

## Literature Review

To discuss the importance of house price analysis in 2014 the financial crisis of 2008 must be referred to. There was a profound impact of global economic downtown on the U.S. housing market. Understanding the relationship between the increasing price of houses and economic turmoil the necessity of ramifications of house price fluctuations was established (Mian & Sufi, 2011). The U.S. housing market varies from state to state. Researchers such as Coulson & Hutchinson emphasized the importance of understanding and analyzing house price

trends on a state-level basis. Their study also reflects on the fact that different local factors can influence the pricing of houses, thus making house prices differ from each other. On the other hand, the house price gap can keep increasing between cities. As the household financial condition has an impact on house pricing more financially well do families sometimes get ready to pay more higher premiums for houses. Thus, higher income families emphasize the growth in land prices, especially in supply-constrained cities (Gyourko et al., 2006). All the previous study and analysis has been based on multi-faceted characteristics of house prices over time.

## **Methodology**

### **Data Collection**

All the data used for this analysis was provided by the course instructor. So, there was no need to collect data from different sources. It appears that this is the 'House Price Index' for May-July of the year 2014. Apart from price (In USD), other descriptive data were also available. The dataset is for the same year but for different cities across the USA.

### **Data Diagnostics**

As an analytical tool to analyze this house price index data 'Excel v.2016' was used. All the To organize the data in a visually understandable form, Firstly, the 'Sorting' method was used to sort data based on the date column, which represented all the data monthwise. It was also visible that some of the data fields were showing null values stated as 0 for price, which was lately handled for better analyzing outcome.

## **Analytics Strategies**

First of all, to organize the dataset, 'Sort' function were used. After that the next intention was to analyse 'City' wise average house prices. For which 'Pivot Table and chart' were used to exaggerate this large dataset. To find the month-wise house price analysis data, Using 'Filter' function of Excel the data set was separated into three different sheets, and then the 'Center of tendency' method was used where MEAN, MEDIAN and MODE were calculated for each month of data. And then the next target was to analyze the impact of the 'No. of Bedrooms' on the "Average House Price". For which 'Pivot Table' was used. The next intention of this study was to find out how close the data points with the AVERAGE or MEAN. For this study. 'Measure of Variability' has been used as a suitable method. To detect the outliers of house price data, 'Box plotting' method were used in this study. 'Correlation Coefficient' was used as a method of finding out the relation between two different variables such as Price and living area. Percentile function was used to find out the number that represented of the data. Finally, a hypothesis was tested to find out if the Mean/Average of house price is increasing to its precedent month, using the hypothesis testing method for this descriptive report.

## **Results and Discussion**

### **Data sorting**

After using the 'Sort' Excel function by 'Date' and then 'Price' (Ascending order) the updated dataset shows result monthwise in this May->June->July.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	date	price	bedrooms	bathro	sqft_livn	sqft_lc	floors	waterfr	view	coaditi	sqft_abo	sqft_b	yr_buil	yr_rear	street	city	state	country
2	5/2/2014 0:00	61250	2	1	880	6380	1	0	0	3	880	0	1938	1934	522 NE 88th St	Seattle	WA 9811	USA
3	5/2/2014 0:00	235000	2	1	1210	9400	1	0	0	2	1210	0	1943	0	1542 21st Ave S/W	Seattle	WA 9811	USA
4	5/2/2014 0:00	237227.8571	4	2.5	2200	9397	2	0	0	3	2200	0	1987	2000	5214 S 292nd St	Auburn	WA 980	USA
5	5/2/2014 0:00	242500	3	1.5	1200	9720	1	0	0	4	1200	0	1965	0	14034 SE 201st St	Kent	WA 980	USA
6	5/2/2014 0:00	257950	3	1.75	1370	5858	1	0	0	3	1370	0	1987	2000	1605 S 245th Pl	Des Moines	WA 9811	USA
7	5/2/2014 0:00	260000	4	2	1480	8625	1	0	0	4	1480	0	1974	0	2019 Aberdeen Pl SE	Renton	WA 980	USA
8	5/2/2014 0:00	264000	3	1.75	1800	23103	1	0	0	3	1800	0	1968	1997	32418 NE 50th St	Carnation	WA 980	USA
9	5/2/2014 0:00	285000	3	2.5	2090	10834	1	0	0	4	1360	730	1987	0	27736 23rd Avenue S	Federal Way	WA 980	USA
10	5/2/2014 0:00	287200	3	3	1850	19966	1	0	0	4	1090	760	1992	0	23011 SE 281st Ct	Maple Valley	WA 980	USA
11	5/2/2014 0:00	300000	3	2.5	2540	5050	2	0	0	3	2540	0	2006	0	29734 215th Terrace	Kent	WA 980	USA
12	5/2/2014 0:00	308500	2	1	850	6174	1	0	0	4	850	0	1950	1963	121 NE 147th St	Shoreline	WA 9815	USA
13	5/2/2014 0:00	313000	3	1.5	1340	7912	1.5	0	0	3	1340	0	1955	2005	18810 Densmore Ave	Shoreline	WA 9811	USA
14	5/2/2014 0:00	315000	3	1	1160	3180	1	0	0	3	1160	0	1968	1997	15804 198th Pl NE	Woodinville	WA 980	USA
15	5/2/2014 0:00	335000	3	2.25	1580	16215	1	0	0	4	1580	0	1978	2000	4460 332nd Ave SE	Fall City	WA 980	USA
16	5/2/2014 0:00	335000	2	2	1350	2560	1	0	0	3	1350	0	1976	0	2616 174th Ave NE	Redmond	WA 980	USA
17	5/2/2014 0:00	342000	3	2	1930	11947	1	0	0	4	1930	0	1966	0	26206-26214 143rd	Kent	WA 980	USA
18	5/2/2014 0:00	365000	3	1	1090	6435	1	0	0	4	1090	0	1955	2009	2504 S/W Portland C	Seattle	WA 9811	USA
19	5/2/2014 0:00	367500	4	3	3110	7231	2	0	0	3	3110	0	1997	0	11224 SE 306th Pl	Auburn	WA 980	USA
20	5/2/2014 0:00	385000	3	3.25	1320	1327	2	0	0	3	1040	280	2008	0	3400 21st Ave W	Seattle	WA 9811	USA
21	5/2/2014 0:00	400000	4	2.5	3630	42884	1.5	0	0	3	2300	1330	1979	2014	5172-5198 Heather Av	Auburn	WA 980	USA
22	5/2/2014 0:00	403000	3	2	1360	13100	1	0	2	5	1650	310	1957	0	17825 4th Ave S/W	Normandy Park	WA 9811	USA
23	5/2/2014 0:00	407500	3	2.5	1930	10460	2	0	0	3	1930	0	1996	0	4314 NE 6th Pl	Renton	WA 980	USA
24	5/2/2014 0:00	419000	3	1.5	1570	6700	1	0	0	4	1570	0	1956	0	15424 SE 9th St	Bellevue	WA 980	USA
25	5/2/2014 0:00	430000	4	1.5	1920	10000	1	0	0	4	1070	850	1954	1979	4071 156th Ave SE	Bellevue	WA 980	USA
26	5/2/2014 0:00	435000	4	1	1450	8800	1	0	0	4	1450	0	1954	1979	3322 154th Ave SE	Bellevue	WA 980	USA
27	5/2/2014 0:00	436110	3	2.5	1770	1235	3	0	0	3	1600	170	2007	0	1156 N 93rd St	Seattle	WA 9811	USA
28	5/2/2014 0:00	437500	3	2.25	1970	35100	2	0	0	4	1970	0	1977	0	26069 SE 154th St	Issaquah	WA 980	USA

Fig. 1: Updated data after using 'Sort' function

## Citywise Average House Price of USA

To analyze the average house price across different cities 'Pivot' chart and table were used. The table below is showing the average price of cities for May, June and July.

City	May	Jun	Jul
Algona	207288		
Auburn	307361.5411	289036.4129	319410.6813
Beaux Arts Village	93125		
Bellevue	810386.0112	977722.1149	755012.8611
Black Diamond	243975	251833.3333	471666.6667
Bothell	523875	468851.1765	475016.0714
Burien	319287.8261	375609.0278	345555.5556

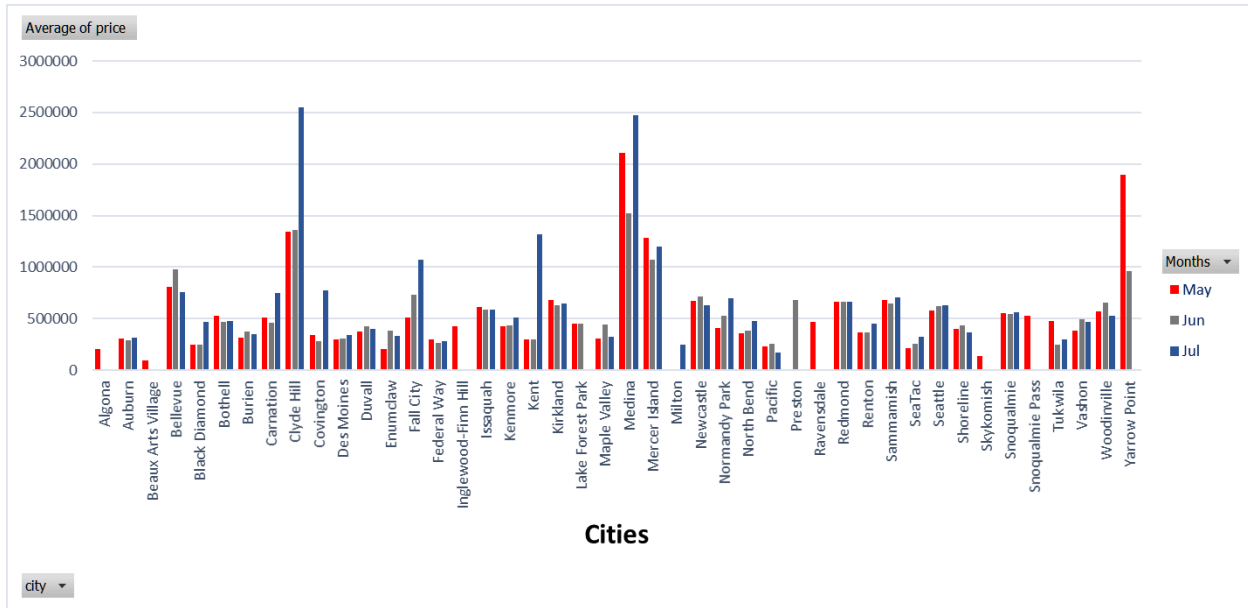


<b>Carnation</b>	<b>508885</b>	<b>461369.3</b>	<b>745000</b>
<b>Clyde Hill</b>	<b>1345680</b>	<b>1356500</b>	<b>2550000</b>
<b>Covington</b>	<b>343035.2941</b>	<b>283925.3571</b>	<b>776183.3333</b>
<b>Des Moines</b>	<b>296096</b>	<b>308545.6044</b>	<b>344875</b>
<b>Duvall</b>	<b>379159.5238</b>	<b>425908.4783</b>	<b>401650</b>
<b>Enumclaw</b>	<b>202785.7143</b>	<b>379767.3611</b>	<b>334833.3333</b>
<b>Fall City</b>	<b>511200</b>	<b>728375</b>	<b>1075000</b>
<b>Federal Way</b>	<b>299060.071</b>	<b>264966.739</b>	<b>278051.9524</b>
<b>Inglewood-Finn Hill</b>	<b>425000</b>		
<b>Issaquah</b>	<b>616279.3443</b>	<b>590256.6533</b>	<b>584470.5808</b>
<b>Kenmore</b>	<b>428411.4943</b>	<b>438669.5</b>	<b>508214.2857</b>
<b>Kent</b>	<b>299240.7024</b>	<b>302396.3502</b>	<b>1318573.468</b>
<b>Kirkland</b>	<b>677636.7377</b>	<b>627369.7432</b>	<b>650498.4091</b>
<b>Lake Forest Park</b>	<b>452600</b>	<b>448587.5</b>	
<b>Maple Valley</b>	<b>304288.4615</b>	<b>444379.1746</b>	<b>326369.2727</b>
<b>Medina</b>	<b>2109600</b>	<b>1518333.333</b>	<b>2469716.667</b>
<b>Mercer Island</b>	<b>1286839.583</b>	<b>1075346.198</b>	<b>1203125.429</b>
<b>Milton</b>			<b>250000</b>
<b>Newcastle</b>	<b>668504.5556</b>	<b>712358.8235</b>	<b>633250</b>
<b>Normandy Park</b>	<b>407916.6667</b>	<b>524346.875</b>	<b>701666.6667</b>
<b>North Bend</b>	<b>362054.8889</b>	<b>383465.05</b>	<b>473898</b>
<b>Pacific</b>	<b>231666.6667</b>	<b>260000</b>	<b>174000</b>
<b>Preston</b>		<b>685000</b>	
<b>Ravensdale</b>	<b>467666.6667</b>		

<b>Redmond</b>	<b>662882.5682</b>	<b>665208.0645</b>	<b>660628.8889</b>
<b>Renton</b>	<b>365192.5323</b>	<b>367863.8988</b>	<b>450224.3921</b>
<b>Sammamish</b>	<b>684174.4413</b>	<b>646348.4754</b>	<b>709101.3834</b>
<b>SeaTac</b>	<b>212553.8462</b>	<b>257790.6154</b>	<b>324500</b>
<b>Seattle</b>	<b>579254.5904</b>	<b>625029.8521</b>	<b>630404.4275</b>
<b>Shoreline</b>	<b>396631.2593</b>	<b>432198.69</b>	<b>368762.5593</b>
<b>Skykomish</b>	<b>134000</b>		
<b>Snoqualmie</b>	<b>551128.6923</b>	<b>545361</b>	<b>565000</b>
<b>Snoqualmie Pass</b>	<b>525000</b>		
<b>Tukwila</b>	<b>480107.1429</b>	<b>246517.6667</b>	<b>301750</b>
<b>Vashon</b>	<b>385875</b>	<b>494170.5882</b>	<b>470000</b>
<b>Woodinville</b>	<b>569779.2262</b>	<b>658275.6098</b>	<b>527461.5385</b>
<b>Yarrow Point</b>	<b>1895000</b>	<b>961450</b>	
<b>Grand Total</b>	<b>544493.9869</b>	<b>562825.3183</b>	<b>634548.8469</b>

**Table 1: Average house price for different cities**

The pivot chart is giving the visual overview of average house prices across the cities. Three different colors are indicating data for May (Red), June (Grey) and July (Blue). This chart is giving the comparison of house price in 3 different months. For example, 'Clyde Hill' had the highest average house price on July (\$2550000). On the other hand, for Redmond, the average house price didn't change over the month. Although for some cities, all 3 months' data weren't available, this chart helps to have a clear idea about the price indication citywide.



**Fig1: Pivot chart showing the fluctuation of average house price for three different months ( May-June-July)**

### Center of Tendency

After separating data for three different months center of tendency were calculated and the results are shown in these table below-

Measures of central tendency ( May 2014) for Price Data	
Mean	544493.9869
Median	455500
Mode	0

**Table 2: Measure of central tendency for May 2014 data**

Measures of central tendency (June 2014)	
Mean	562825.3183
Median	455000
Mode	0

**Table 3: Measure of central tendency for June 2014 data**

Measure of central tendency (June 2014)	
Mean	634548.8469
Median	499475
Mode	300000

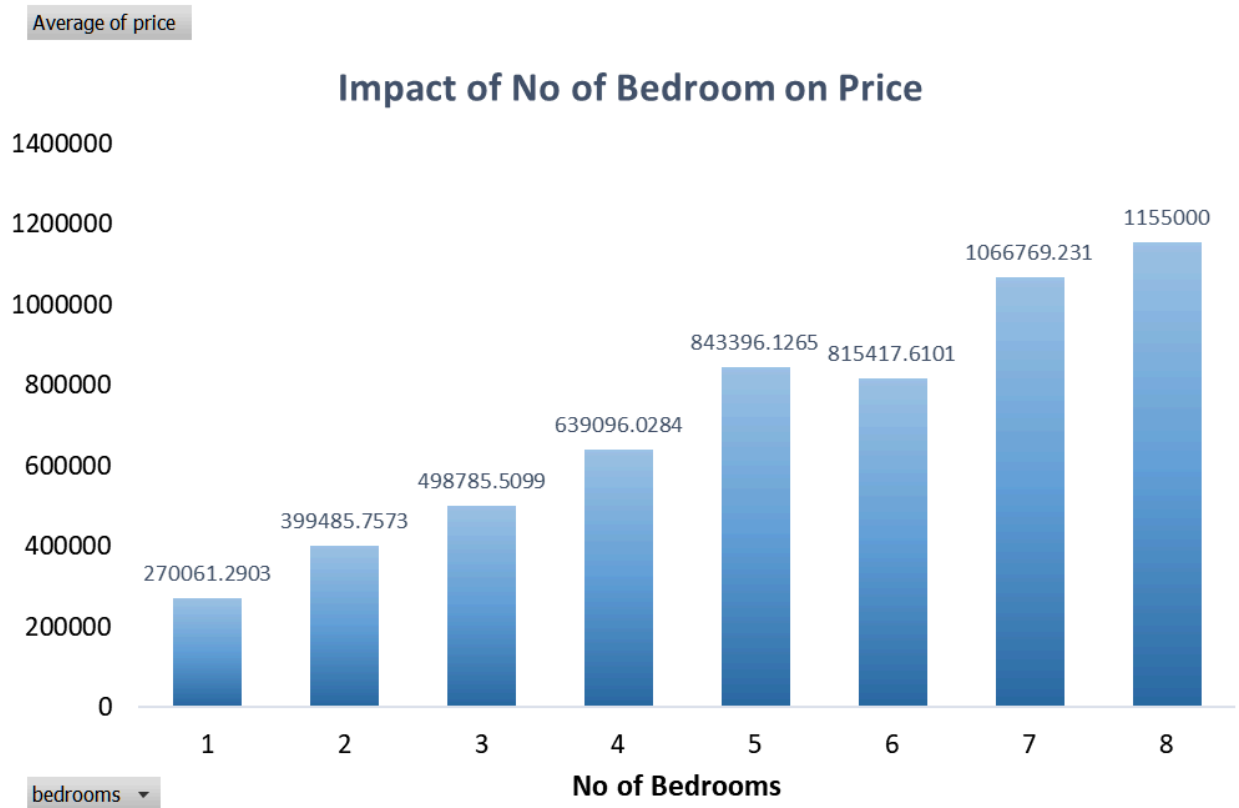
Table 4: Measure of central tendency for July 2014 data

### Impact of No of Bedroom on the Average House Price

The study intends to figure out the impact of increasing number of bedrooms on the average price of the home. For this purpose, the pivot chart and table were used. The below table is showing the average price in respect to bedroom number.

No of Bedrooms	Average of price (2014)
1	270061.2903
2	399485.7573
3	498785.5099
4	639096.0284
5	843396.1265
6	815417.6101
7	1066769.231
8	1155000
Grand Total	565534.5996

Table 5: Average house price with respect to bedroom no.



**Fig 2: Impact of No of Bedrooms on Average House Price**

This pivot table indicates that with the increasing number of bedrooms the average price is also increasing. For example, when for 2 bedrooms, the average price is \$399,485.7573, the average price of 5 bedroom house increased (\$843,396.1265). Although there is an exception for houses with bedroom 6 the other cases show the same result where the average price increases if the house contains more bedrooms.

### Measure of Variability

To understand the difference and distance between the other variabilities with the Mean, Measure of variability was used. The first table shows the measure of the central tendency of the whole

data and the second table shows the result for the measure of variability ( Range, Variance, and Standard Deviation-

Measure of Center Tendancy (Price)	
Mean	565849.4943
Median	460000
Mode	300000

Table 6: Measure of Central Tendancy for House Price

Measure of Variability (Price)		
Range	26590000.0000	Outcome: Difference between the highest and lowest house price
Variance	449622835408.44	Outcome: The variance result indicate the average of squared distance from the Mean Value
Standard Deviation	670539.2124	Outcome: The result of standard deviation is showing the average distance from the mean.

Table 7: Measure of Variability for House Price

### 85% Percentile of data

As apart the analysis, the intention was to find out the 85th percentile of the data. And using the Excel function, the location of the percentile was found which is

$$P= 795000$$

So 795,000 represents the 85th percentile of the data. It means 85% of the observations are less than or equal to 795000. So we can say that the other 15% are greater than this value.

### Outliers Detection for House Price Variable

Using box the outliers for price data was detected where the result shows that the median for the house price was \$46000 and it has multiple outliers that means value much larger than the median value .

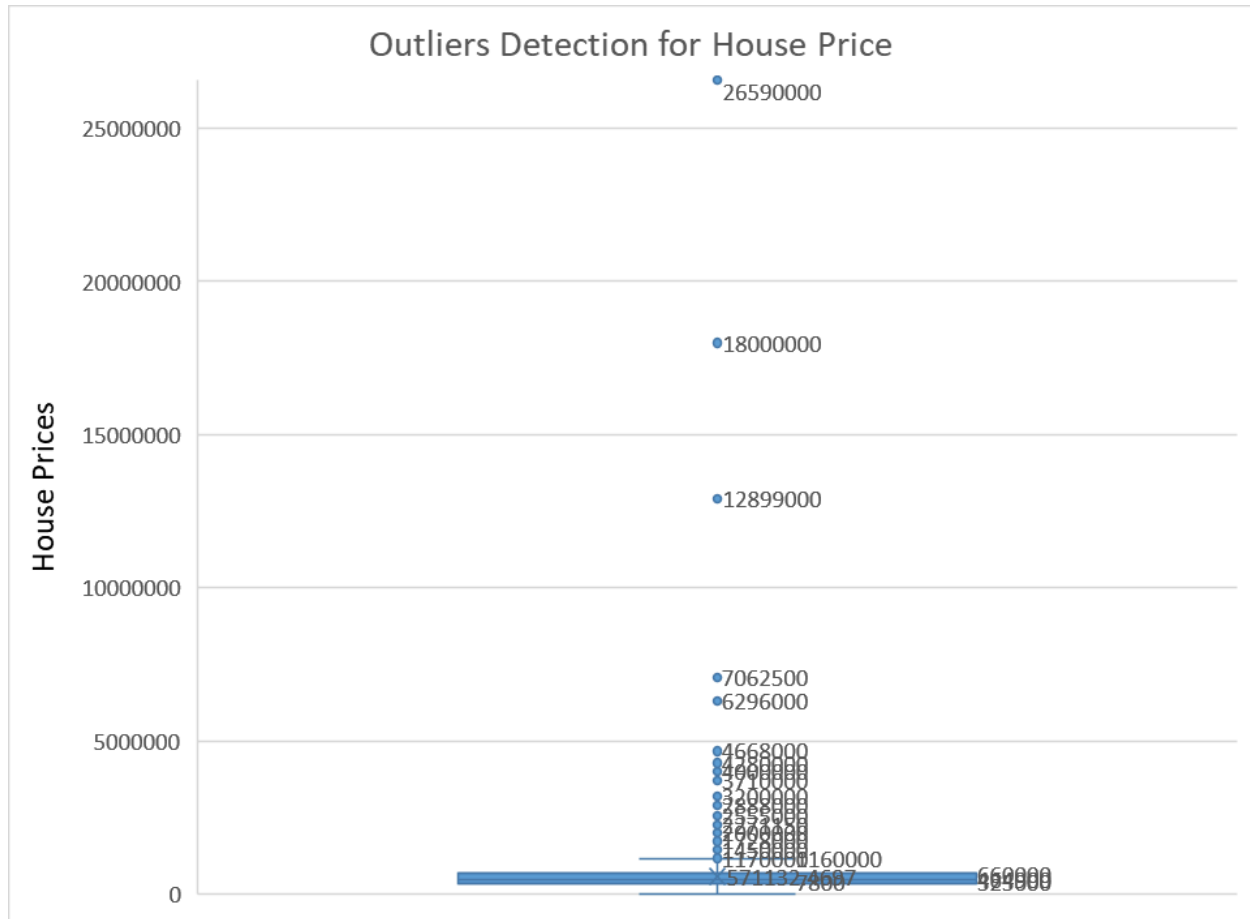


Fig 3: Outliers Detection for House Price

### Relation between Different Variable

The intention was to find the relation between the price and living area. And for this, the correlation coefficient was calculated using Excel formula. And the result was-

$$R_{xy} = 0.386045127$$

The result clearly indicates a negative relationship between these two variables. So, with the increase of living room area the price of the house isn't increasing.

## Hypothesis Testing

A hypothesis case was establish to determine whether the statement about the population statement or Null hypothesis can be rejected or not.

Hypothesis statement: The mean house price for May 2014 is \$ 544493.9869. This test intend to see if the average monthly house prices increase compared to the preceding month over the examined period.

As a sample data, selected 150 price data points for June 2014, to check if the mean price of the house increased or not.

Mean Price for May = \$544493.9869

Step 1:	Null Hypothesis	$H_0: \mu \leq \$544493.9869$
	Alternative Hypothesis	$H_a: \mu > \$544493.9869$
Step 2:	$\alpha$ (assume typical value)	0.1
	n	150
	Standard Deviation, s	270764.2643
	Standard Error, $S_x$	22107.8096
	$\mu_0$	544493.9869



	xbar	497040.0401
Step 3:	Test statistics, t	-2.146478899
Step 4:	P value (Lower Tail)	0.016726838
	P value (Upper Tail)	0.983273162
Step 5:	Reject <b><math>H_0</math></b> if the <b><math>p \leq \alpha</math></b>	P value < $\alpha$ , hence we reject the Null Hypothesis, $H_0$

The above hypothesis reflects that we do have statistical data to prove that the mean house price increased for Jun 2014. From our previous analysis it has been showed as well.

Where-

**Mean House Price for May, 2014 = \$544493.9869**

**Mean House Price for June, 2014 = \$562825.3183**

## Conclusion

To summarize the analyse findings we can say that the average house price for different city of USA increasing. Although for some cities the scenario is different and external factors might impact it. Another outcome of this analysis shows that the no of bedroom plays an important role to raise the house price most of the cases. After doing the measure of variability it shows that the data points has quite high difference from their mean value. Where the percentile analysis indicates that 85th percentile price observation is equal or less than \$795000. Some outliers for

price data has been detected as well and the hypothesis test on the price of house indicates the increase in average price, which was statistically supported as well.

Based on this descriptive report, the real estate business can update their plan to consider price based on the demand or availability of bedrooms and also should try to expand their business in those cities where there is a significant increase in house price as it can be assumed that more customer with higher buying capacity might stay there.

This report's findings can help the customers who are buying or selling house to determine and enhance their negotiation power. Also customers with limited financial capabilities and who are planning to purchase a house can focus on those cities where the house price seems affordable.

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