Final Report: Trend analysis of the USA’s housing market (2012-2022)

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Source Summary

## Overview

The Zillow Real Estate Data ([ZILLOW](https://data.nasdaq.com/databases/ZILLOW)) data feed contains real estate market indicators, such as market indices, rental, sales, and inventories for thousands of geographical areas across the United States.

<https://data.nasdaq.com/databases/ZILLOW/documentation?anchor=publisher>

General Mandate

Our client, a real estate investor, aims to construct a diversified investment strategy in the USA's housing market. We've been tasked with assessing market trends nationally, around the main coasts (California, Texas, Illinois, Ohio), and in the safest states (New Hampshire, Maine).

**Analytical Limitations**

*Our conclusions are inherently constrained by the scope of this dataset. We are operating under the assumption that historical trends will continue, yet it is crucial to acknowledge that numerous dynamic factors can influence future housing trends. Variables including economic conditions, shifts in real estate laws, fluctuations in interest rates, and a myriad of other socio-economic and environmental factors remain beyond the scope of this analysis. Additionally, unforeseen events or policy changes may rapidly alter the trajectory of the housing market, thus limiting the extent of our conclusions.*

**Question:** Based on historical trends, which states, and property types have demonstrated the highest average growth rates in housing prices over the past decade, and what are the potential implications for investment strategies in these areas?

**Process**

Initially, we organized the data by property type, creating distinct data frames for each category under observation. Next, we grouped the information by both year and state, calculating the average housing price. This step was crucial, as the original dataset featured 12 data points per property type, corresponding to each month of the year. Following this, we determined the annual change rate for each year within the data frame. Finally, we aggregated these change rates and computed their average. This yielded a comprehensive yearly change rate figure for each state and property type.

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**Findings**

***Data Frame***

Analyzing the "avg\_percentage\_change\_df," it's evident that Nevada consistently demonstrated the highest average yearly growth rates for 1-3 bedroom homes and condos. Specifically, Nevada's 1-3 bedroom homes and condos showed average growth rates of 14.76%, 14.57%, 13.31%, and 14.85% respectively. The standard deviations for these categories were 2.85%, 2.71%, 2.39%, and 2.73% in the same order. Therefore, Nevada's 1-3 bedroom homes and condos deviated from the mean by 2.51, 2.55, 2.51, and 2.88 standard deviations respectively.

For homes with 4-5+ bedrooms, Idaho stood out as the leader in growth. Idaho's 4-5+ bedroom homes exhibited average growth rates of 12.27% and 11.33% respectively, while the average growth for all states was 6.79% and 6.52% respectively. The standard deviations for these categories were 2.08%, and 1.88%. Therefore, Idaho’s 4 – 5+ bedroom homes deviated from the mean by 2.63, and 2.56 standard deviations respectively.

***Plots***

All 6 plots did not present any causes for concern. The prices seemed to have a low variance, showing no large upwards or downwards fluctuations. The prices also followed a general upwards trend in prices yearly. The trends were further confirmed by the high correlations. The Nevada property types had correlations of 0.973, 0.982, 0.98 and 0.973 respectively, while the Idaho property types had correlations of 0.925 and 0.916.

**Implications**

The data suggests that investments in housing in Nevada and Idaho may yield the highest relative returns based on this historical trend analysis. Specifically, in Nevada, smaller households (1-3 bedrooms) and condos have demonstrated the most substantial growth over the past decade. The growth rates for these categories have consistently outperformed the average growth rate by a considerable margin, ranging between 2.51 and 2.88 standard deviations away from the mean. This indicates a substantial deviation from the average, suggesting a potentially lucrative market for smaller households and condos in Nevada. This is further demonstrated by the high correlations ranging between 0.97-0.982 for all Nevada property types. This suggests a strong positive relationship between the average price of 1–3 bedroom homes and condos, and the years, in the state of Nevada.

Similarly, in Idaho, larger households (4-5+ bedrooms) have exhibited the most pronounced growth over the same period. The growth rates for this category also exhibit a significant deviation from the mean, ranging from 2.56 to 2.63 standard deviations away. This signifies noteworthy deviations in the larger household category and implies a strong potential for investment returns. The high correlations support the claim for this trend, the Idaho property types had correlations of 0.925 and 0.916. This suggests a strong positive relationship between the average price of 4-5+ bedroom homes and the year, in the state of Idaho.

Furthermore, the low variance in housing prices across the 10 years could imply a less volatile housing market, making investments into these properties less susceptible to large price swings. Consequently, focusing on investments that align with these criteria could potentially lead to greater average growth for both short-term and long-term investments.

**Question**: Our client is also investing in a freight shipping company, he has asked us to investigate the top 4 States in the shipping industry, so they can in turn use our data to invest in the best State connected to the shipping industry. Using Google, we have deduced that the top four shipping States in the USA are Texas, California, Ohio, and Illinois.

**Process**

Using the “groupby” and “.mean” functions, we were able to make a list of dictionaries and create a

linear regression model for our client. We compared the years and the average prices of each property.

type for those years and accumulated amazing data, with an average R-squared value of “.9”.

A screenshot of a computer screen

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**Findings**

*All 8 plots were extremely helpful in clarifying the data to the client, with an R-squared value of 0.9, the plots were highly precise and reliable. Each state has had a dramatic increase in property value over the past ten years, with only upward trends.*

**Implications**

The data suggests that California is the best state to invest in real estate housing, out of these four major shipping States. Not only does it hold the most value in real estate, but it also shows the greatest upward trend in slope. We’ve averaged “All home types” and separated condos to make it easier for the client to understand. Family homes and Condos usually hold similar trends but come with a different lifestyle. After all is said in done, California is the best State to make money in real estate, while investing in shipping companies.

**Question**: Based on the last 10-year statistics, how did supply and demand dynamics evolve in both New Hampshire and Maine real estate? E.g.: Did the housing prices increase or decrease over the past decade and were there shifts in the types of housing (E.g.: single- family homes, condos) that were in demand.

**Process**

In the beginning, we collected data from Zillow using Nasdaq API and organized the data by property type, year, price, and state. And then we found the average price per property type with an output of 11 data points per property type for each year. After getting the above data, we created different plots with respect to property type to determine the growth rates in readable format, making it easier to understand and interpret the data.

**Findings**

***New Hampshire***

The Below table describes various property types with their respective median values in 2012 and 2022, as well as NH\_CAGR (Compound Annual Growth Rate) for each property type over those periods.

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Analyzing the table

* All property types experienced significant appreciation in values over the 10-year period.
* One-bedroom homes, condos and three bedroom homes demonstrated similar CAGR values, all above 7 %, indicating strong growth in these segments.
* Five + bedroom homes had a slightly lower CAGR but still saw substantial appreciation in value.
* “All home type- bottom tier” had the highest CAGR at 8.23 % indicating robust growth in the lower- tier housing market.
* “All home type- Top tier” also shows solid growth at 6.6%, but it had a lower CAGR compared to the bottom-tier property.

**Implications**

These trends suggest that the overall real estate market experienced substantial growth over the past decade, with different property types showing varying levels of appreciation. Depending on your investment goals and risk tolerance, you may consider diversifying your real estate portfolio across these property types or focusing on the segments that align with your investment strategy.

**Findings**

**Maine**

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Analysis table for Maine:

* All property types continued to experience appreciation in value over the 10-year period, but the growth rates (Me\_CAGR) have changed compared to the previous data.
* Three- bedroom homes and 5 + bedroom homes saw the highest growth rates, with Me\_CAGRs of 5.38% and 5.77% respectively.
* One-bedroom homes and condos also showed growth, with Me\_CAGRs of 4.71% and 4.68% respectively.
* All home type- bottom tier” and “All home type- Top tier” had Me\_CAGRs of 5.65% and 4.16% respectively.

**Implications**

The above findings suggest that different property types continued to appreciate over the past decade, with varying growth rates. Three-bedroom and larger homes showed stronger growth, while one-bedroom homes and condos also showed positive appreciation.

**Comparison between New Hampshire and Maine on growth**

1. Growth Rates (NH\_CAGR vs Me\_CAGR): In table 1 (NH\_CAGR data), the growth rates tend to be highest across all property types compared to Table 2 (Me\_CAGR). This indicates that the NH\_CAGR data generally shows more aggressive growth rates over the 10-year period.

2. Trend Consistency. Both datasets show consistent trends in property type performance over 10 years, with one-bedroom homes, condos, three- bedroom homes and five+ bedroom homes all experiencing positive appreciation.

3. Bottom Tier VS top Tier: The “All home type-bottom tier” and “All home type- top tier” categories in both tables have different growth rates. The bottom- tier homes had the highest growth rates in both tables, indicating strong growth in this segment compared to the top tier homes.

**Question:** Can you provide data or trends regarding price fluctuations in different segments of the real estate market of luxury properties, such as 5+ bedroom homes and All home type- top tier?

**Process**

In the beginning, we collected data from Zillow using Nasdaq API and organized the data by property type, year, price, and state. And then we found the average price per property type with an output of 11 data points per property type for each year. After getting the above data, we created different plots with respect to property type to determine the growth rates in readable format, making it easier to understand and interpret the data. And finally, to find the answer to the above question we again shortened our property type in New Hampshire to 5 + bedroom homes and All home type- top tier and evaluated accordingly.

**Findings**

5+ Bedroom Homes:

* 2012 value: $332,488.75
* 2022 value: $652,166.58
* NH\_CAGR: 6.97%

**Implications**

Over the 10-year period from 2012 to 2022, 5+ bedroom homes saw significant price appreciation. The NH\_CAGR for this segment was approximately 6.97%, indicating a robust growth rate. This suggests that larger homes with five or more bedrooms experienced strong demand and price appreciation during this period.

**Findings**

All Home Type- Top Tire:

* 2012 value: $331,863.83
* 2022 value: $628,999.75
* NH\_CAGR: 6.6%

**Implications**

The “All home type- Top tier” category represents high end or top- tier properties. Over the same 10-year period, this segment also experienced price appreciation, although at a slightly lower NH\_CAGR of approximately 6.6% While the growth rate was slightly lower than the 5\_ bedroom homes, it still indicates positive appreciation in the top tier real estate market.

**Overall Conclusion**

The client’s portfolio composition will consist of investments:

1. 1 – 3 bedroom homes and condos in the state of Nevada, and 4 – 5+ bedroom homes in the state of Idaho
   1. These selections are chosen to prioritize annual growth, aligning with the client's main goals.
2. California Investments
   1. This allocation will empower the client to tap into the coastal state that boasts the highest demonstrated growth rates, offering a strategic advantage for their freight shipping enterprise.
3. New Hampshire homes
   1. Among the safe states (lowest crime rates) under consideration, New Hampshire emerges as the most promising choice, exhibiting higher growth rates across all property types. This positions it favorably ahead of the alternative: Maine.

In effect, this portfolio aligns seamlessly with the client's financial goals, leveraging the unique strengths of each chosen state. By meticulously balancing growth potential with risk mitigation and external business needs, we are confident that this investment strategy will likely meet the clients needs.