Do Earthquakes Influence Housing Prices?

Alaska vs. California (1999-2022)

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B.1 Visual Data Exploration

1) National context (Figure 1 - top):
We started with Choropleth maps comparing US states' seismic activity versus housing prices, and we could not find any immediate correlation but it gave us the idea to focus our visual studies on the states displaying extreme and contrasting seismic values, while keeping two states as a control group.

2) State-level temporal dynamics (Figure 2):
We chose to observe in a 4x2 small multiples grid display earthquake and price trends for the following states: Alaska, California, Wyoming, and New Jersey, while marking with a dashed line the event of the 2008's financial crisis. Our key findings: (1) Alaska's earthquakes quintupled in two year (2020-2022) without any impact on the average home prices; (2) California's earthquakes remained relatively stable while prices grew steadily, interrupted only by the 2008 crisis. (3) Wyoming and New Jersey, which we took as a control group, displayed comparatively low and stable earthquake frequencies with volatile, yet uncorrelated, price movements. All of these findings motivated us to examine the states from a different perspective, so we introduced county maps.

3) County-level spatial distribution (Figure 1 - bottom):
Bivariate choropleth maps (County-level) for the selected states compare earthquake density vs. prices. We observed a critical information: California's most seismically active counties (Kern, San Bernardino) are inland with moderate prices, whereas the highest-priced counties (San Francisco, Marin) have lower seismicity and are coastal. This confirms that urbanization, the economy, and geography are most likely the primary price drivers, not earthquakes. To visually confirm our speculation, we decided to draw the last visualization.

4) Annual Frequency and Price Trajectories (Figure 3):
We overlaid annual earthquake frequency (purple bubbles) on average home price trajectories (1999–2022). This view compares the sheer volume of seismic activity against the economic time dimension. The visualization confirms the 2008 Financial Crisis as the dominant disruptor, causing a $\approx$ 30-40% price drop in California ($1.4M $\rightarrow$ $1.05M) and Alaska. This economic shock dwarfs any fluctuation caused by seismic years.

Insight verification: • *Statistical*: Pearson correlation between earthquake frequency and prices reveals no relationship: r=-0.15 for CA (p=0.32, non-significant) and r=-0.03 for AK (non-significant). Conversely, GDP correlates strongly (r=0.68). • *Cross-validation*: Price vs. population density yields r=0.78 (highly significant), confirming urbanization as the driver. **MAUP** was addressed by testing results at both state and county levels, yielding consistent findings. • *Event studies*: Price movements in 90-day windows around 15 major earthquakes (M$\geq$6.5) showed normal volatility (-1.2% to +2.3%), far below the 2008 crisis impact.

Design for B.2 communication: We prioritized focused storytelling by spotlighting the 2008 crisis via a shaded rectangle, utilizing pre-attentive processing to draw the eye to the only real market disruptor. The design leverages Gestalt principles: proximity (placing AK/CA side-by-side for contrast)

and similarity (consistent blue/red encoding). We applied Tufte's principles by eliminating chartjunk and using data-dense visuals.

Conclusion: The visual analysis decisively rejects the earthquake-price influence hypothesis. Despite a huge amount of earthquakes over 33 years, prices diverge significantly and correlate with urbanization, not seismicity. The 2008 Financial Crisis caused massive disruptions that were larger than any seismic event.

Sources: USGS (1990-2023), Zillow ZHVI, Census TIGER (2021)

Exploration Visualizations

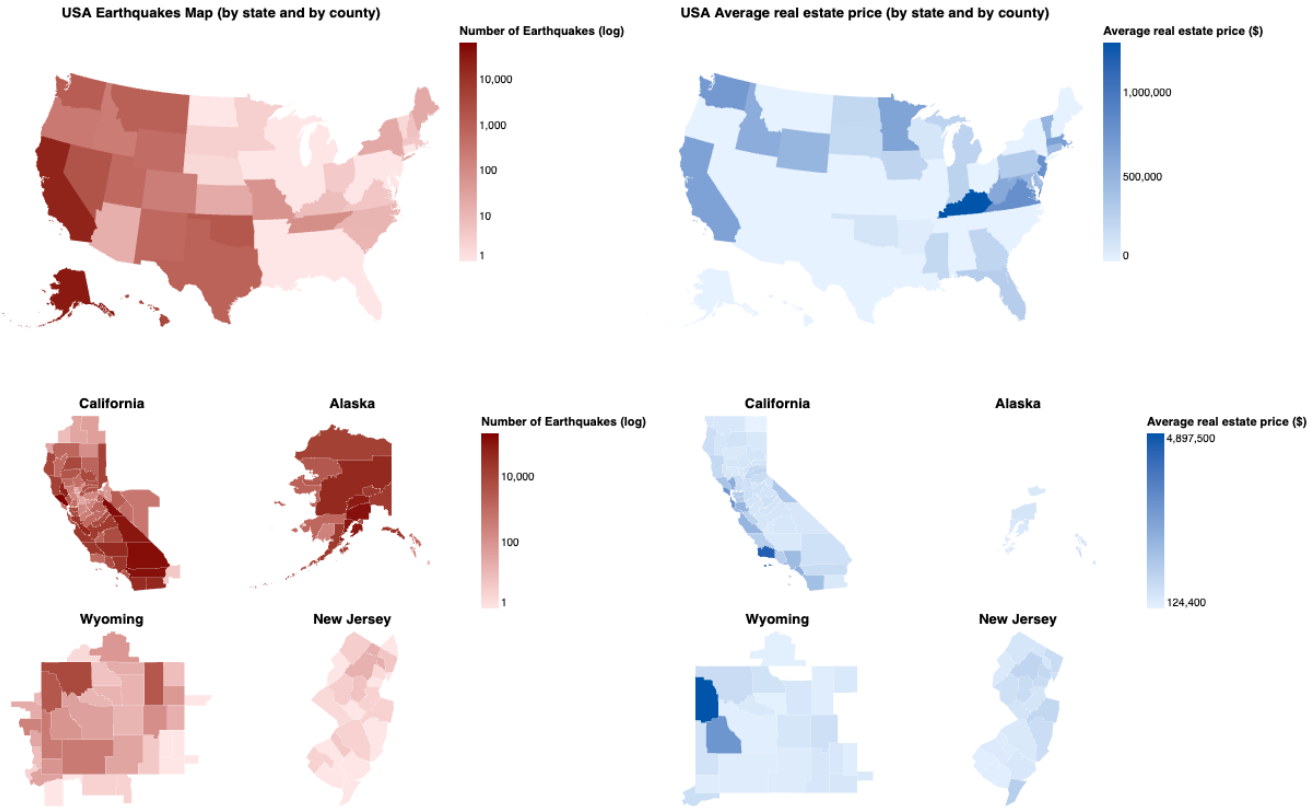

Figure 1: **USA spatial multi-scale earthquake and real-estate comparison**

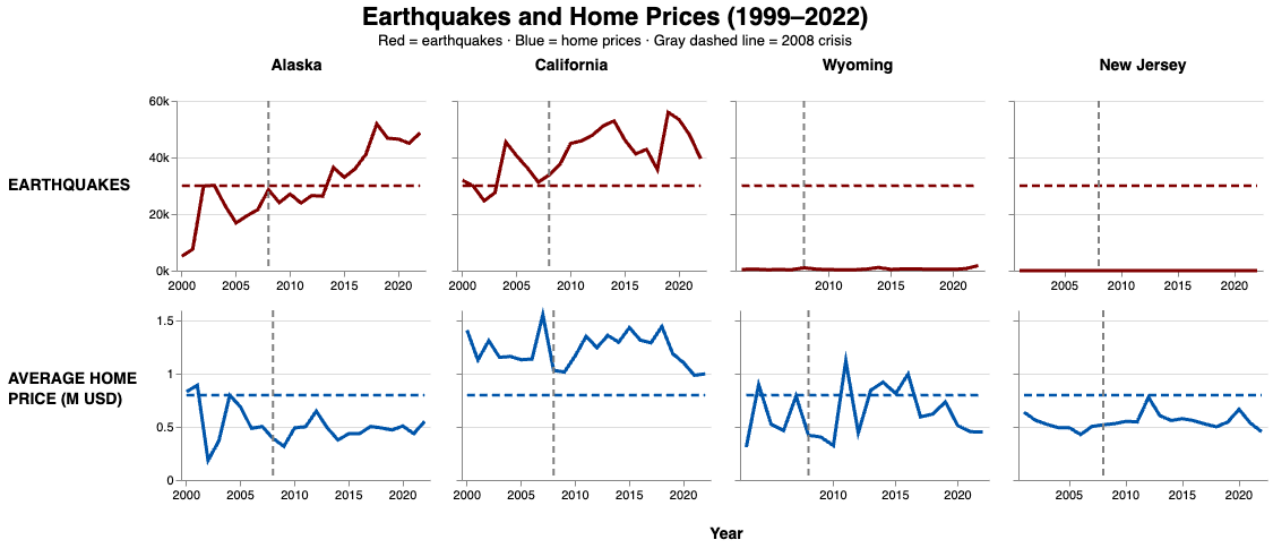

Figure 2: **Temporal trends via small multiples (1999-2022).**

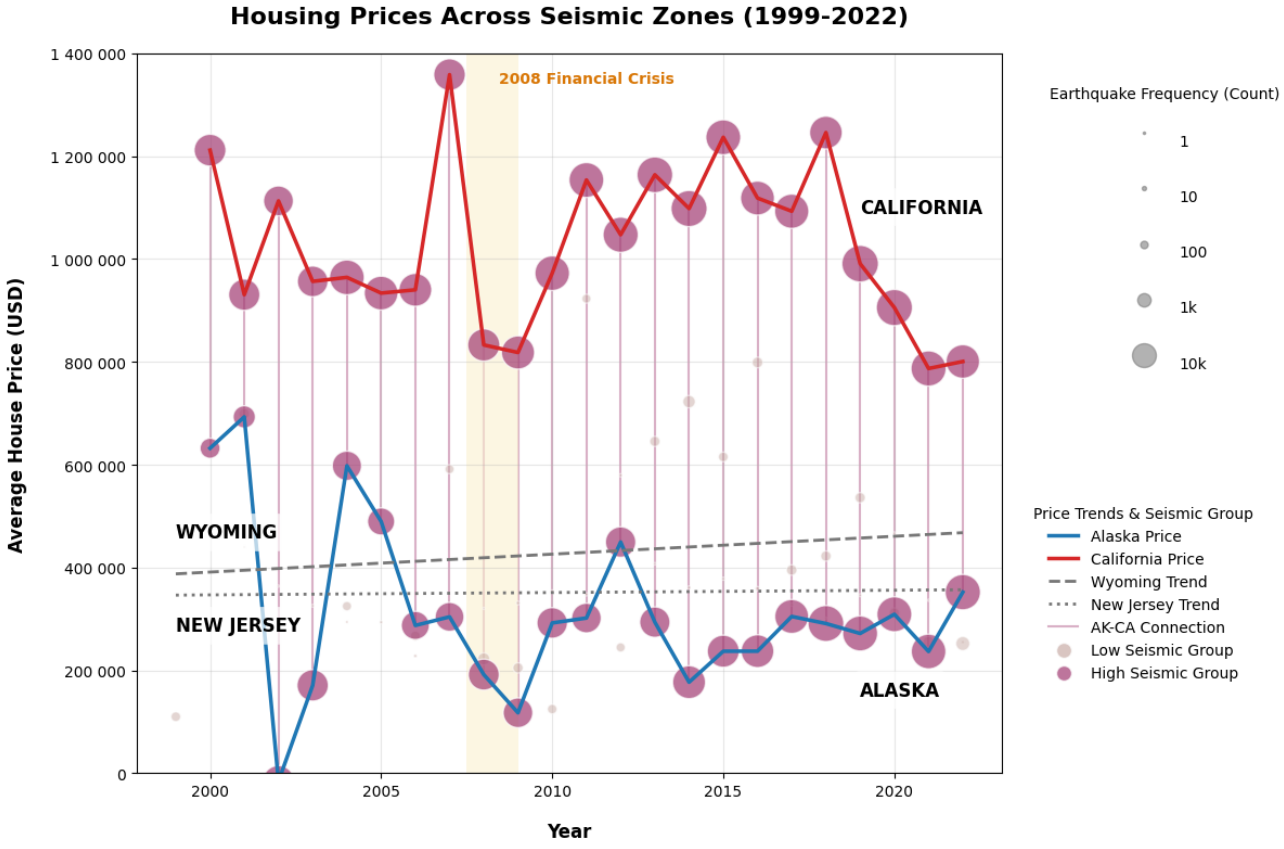

Figure 3: **Individual events overlaid on prices (1999-2023).**