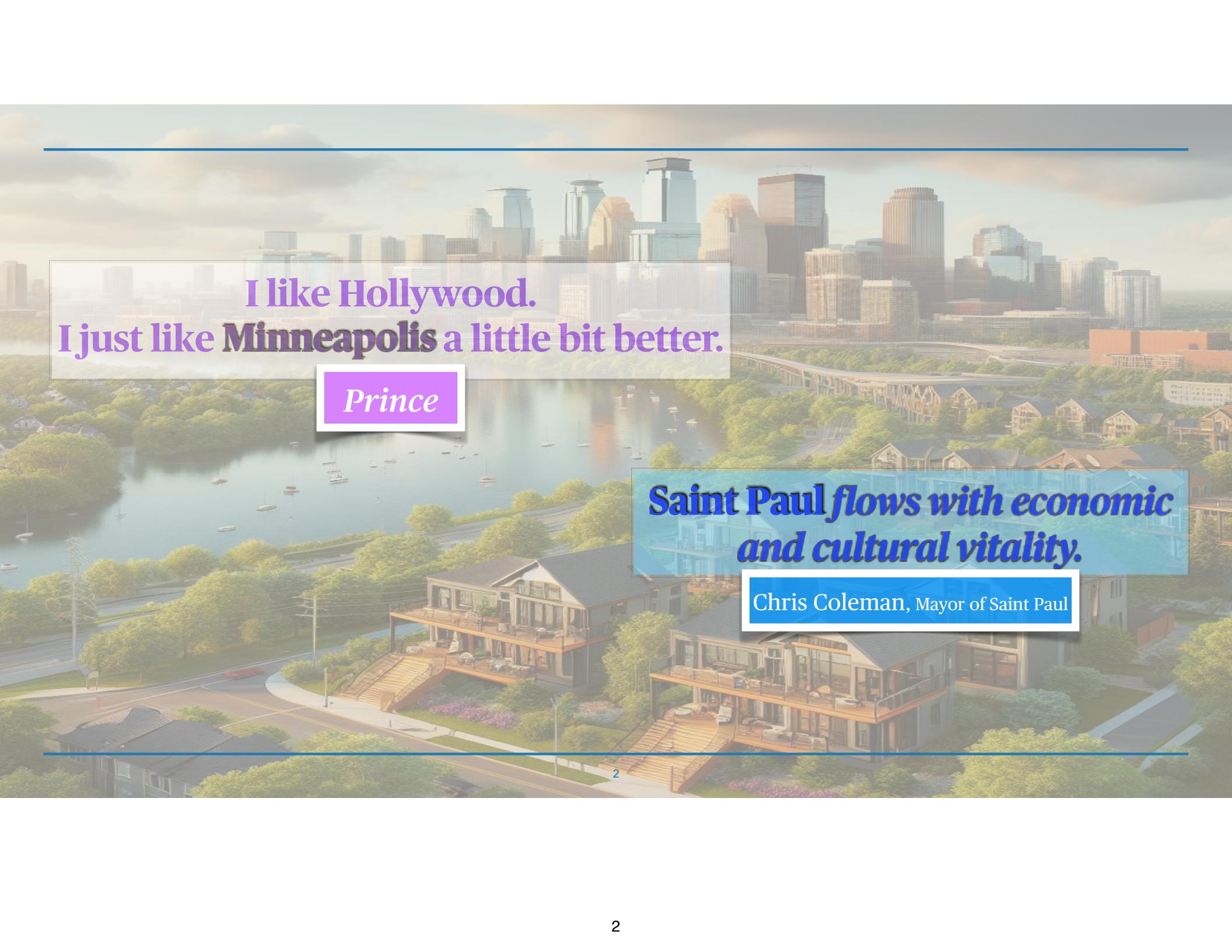


# Residential Real Estate Investing



**Market Analysis  
Price Prediction Models for:  
Minneapolis & Saint Paul, Minnesota**



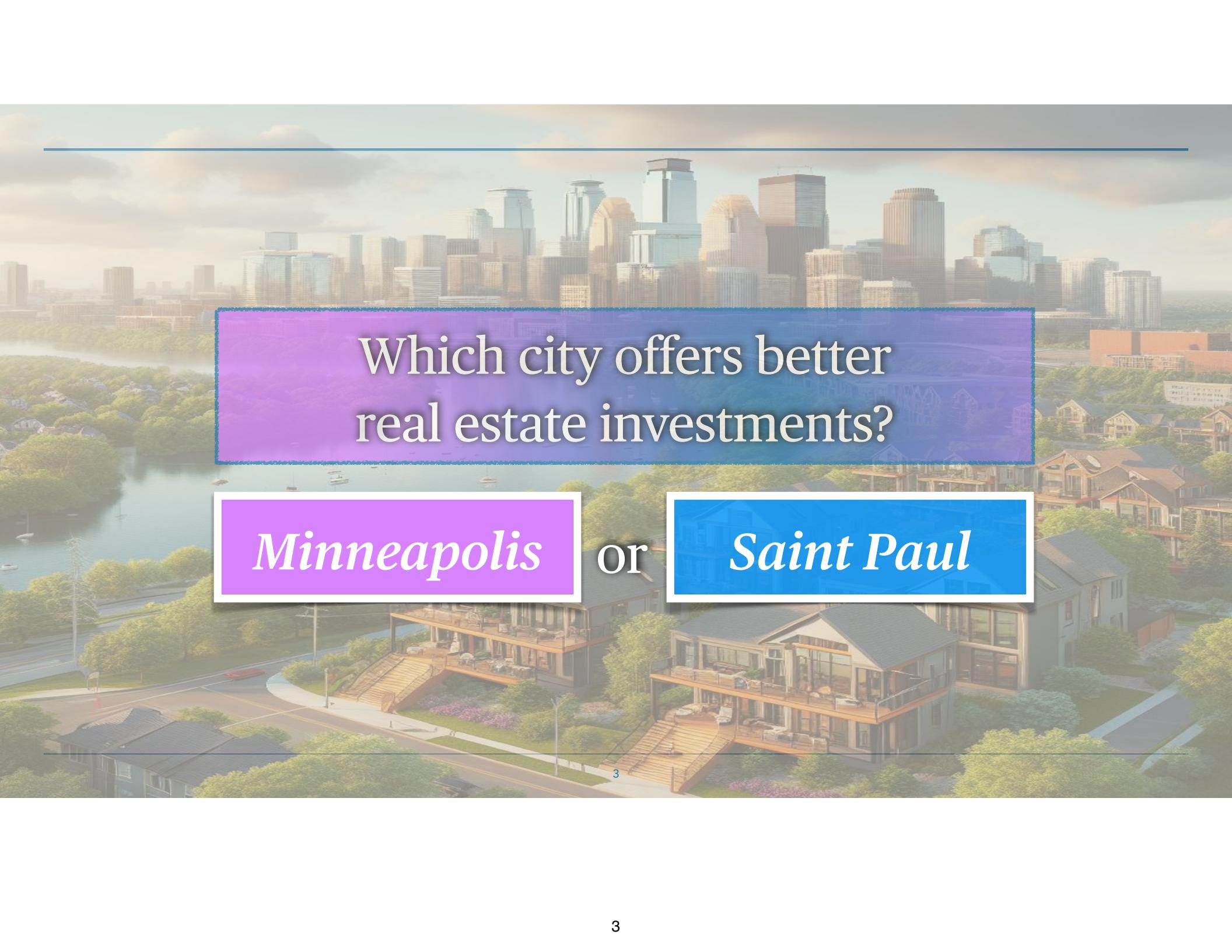


I like Hollywood.  
I just like Minneapolis a little bit better.

Prince

Saint Paul flows with economic  
and cultural vitality.

Chris Coleman, Mayor of Saint Paul

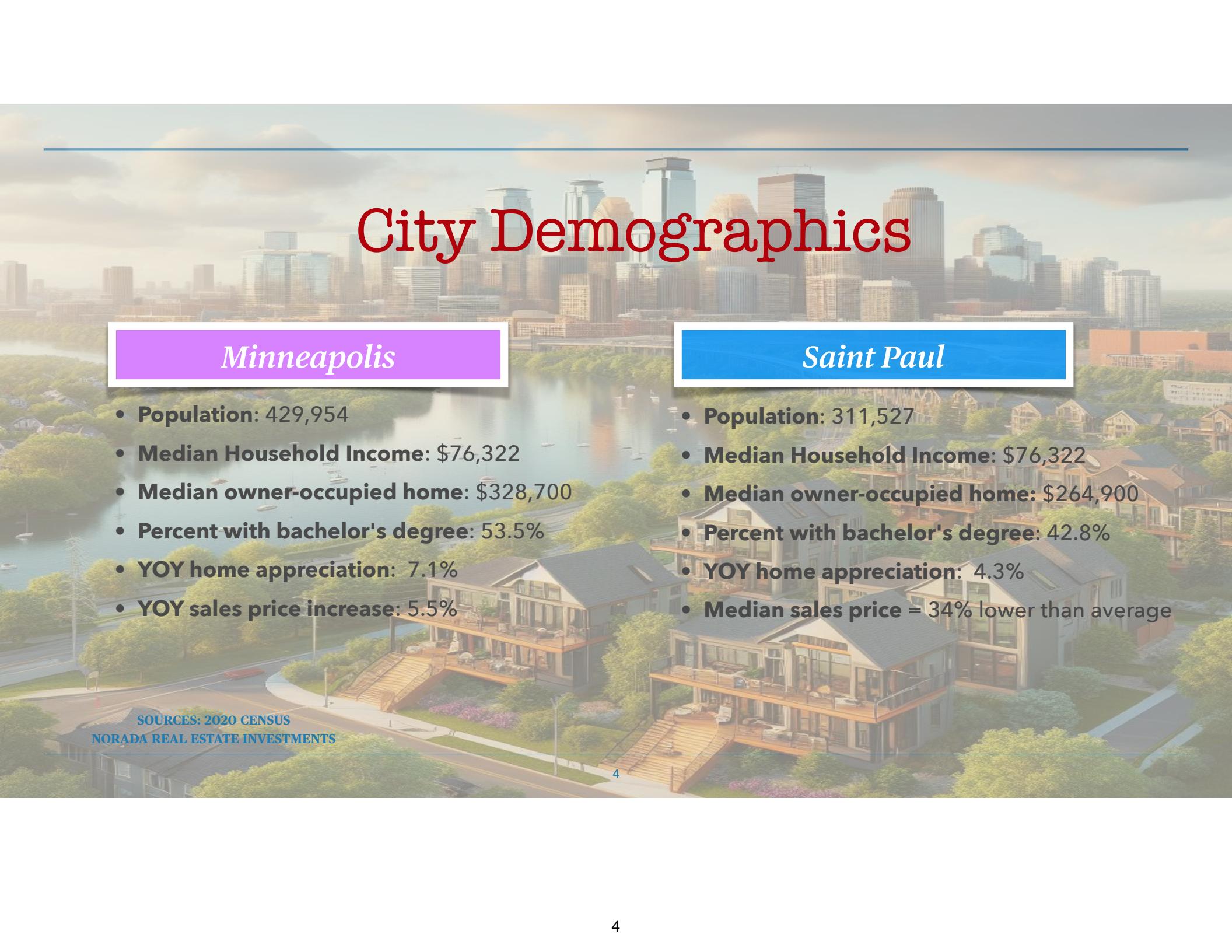


Which city offers better  
real estate investments?

*Minneapolis*

or

*Saint Paul*



# City Demographics

## Minneapolis

- **Population:** 429,954
- **Median Household Income:** \$76,322
- **Median owner-occupied home:** \$328,700
- **Percent with bachelor's degree:** 53.5%
- **YOY home appreciation:** 7.1%
- **YOY sales price increase:** 5.5%

## Saint Paul

- **Population:** 311,527
- **Median Household Income:** \$76,322
- **Median owner-occupied home:** \$264,900
- **Percent with bachelor's degree:** 42.8%
- **YOY home appreciation:** 4.3%
- **Median sales price** = 34% lower than average

SOURCES: 2020 CENSUS  
NORADA REAL ESTATE INVESTMENTS

# Define Search Criteria

## Zillow Search Parametres

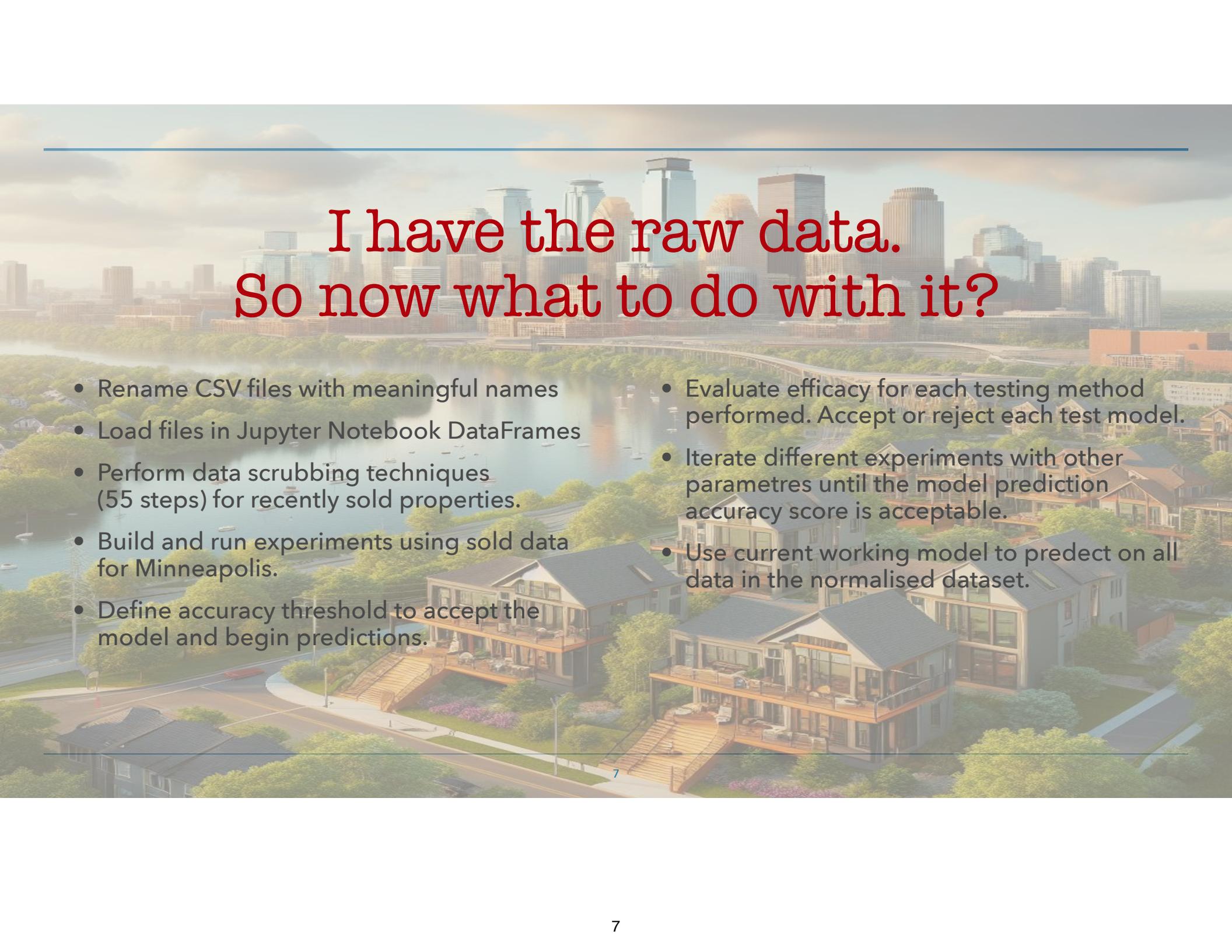
- **Type:** Single-Family home
- **Bedrooms:** 3+
- **Bathrooms:** 2+
- **Price:** \$250,000 - \$750,000
- **Home Size:** minimum 2000 square feet
- **Lot Size:** minimum 5000 square feet
- **Sold Date:** Within last 12 months.
- **Must have garage**
- **No HOA fees**

## Rationale for Selections

1. **Straight-Forward Transaction**
2. **Decent-sized House**
3. **Decent-sized Lot**
4. **Garage for Parking / Storage**
5. **Affordable Price Range, near Median**
6. **No HOA**
7. **No HOA Fees**

# How did I get data?

- Use Zillow.com to select specific search criteria, as outlined in previous slide, and copy URL. It's used by the data extractor tool to extract the correct dataset.
- Use Scrapeak to get API Key. Procedural step for use in two extraction tools.
- Property Search & Details tool extracts and downloads data files for both cities.



# I have the raw data. So now what to do with it?

- Rename CSV files with meaningful names
- Load files in Jupyter Notebook DataFrames
- Perform data scrubbing techniques (55 steps) for recently sold properties.
- Build and run experiments using sold data for Minneapolis.
- Define accuracy threshold to accept the model and begin predictions.
- Evaluate efficacy for each testing method performed. Accept or reject each test model.
- Iterate different experiments with other parametres until the model prediction accuracy score is acceptable.
- Use current working model to predict on all data in the normalised dataset.

# OK... a working model is good... but what's next??

- Predict the price for all sold properties.
- Perform additional ETL steps on the dataset containing the prediction prices.
- Replicate above steps to create a model for Saint Paul, using the same methodology.
- Predict the price of properties for sale, using the model built for respective markets.
- Perform **different** ETL steps on properties for sale, and make sales price predictions.
- Reshape DataFrames.  
Ensure same columns for merging four files.
- Restore data elements removed during model creation and experimentation stages.
- Consolidate individual files into one.
- Export cleaned CSV file that contain data for:
  - Houses sold in the past 12 months, &
  - Houses for sale today.

# How to Identify Under-Valued Properties:

**Identify & rank properties that are the most under-valued by:**

- **Comparing differences in predicted prices vs. for-sale prices.**  
This metric determines the under-valuation for each property.
- **Comparing price deltas above to prices for-sale price.**  
This metric determines the ratio of the under-valuation of each property, compared to its for sale or predicted price.
- **Comparing different annual rentZestimate income.**
- **Comparing annual rentZestimate to price offered for sale, and predicted price.**  
This metric determines which properties are most profitable when compared to their purchase price.

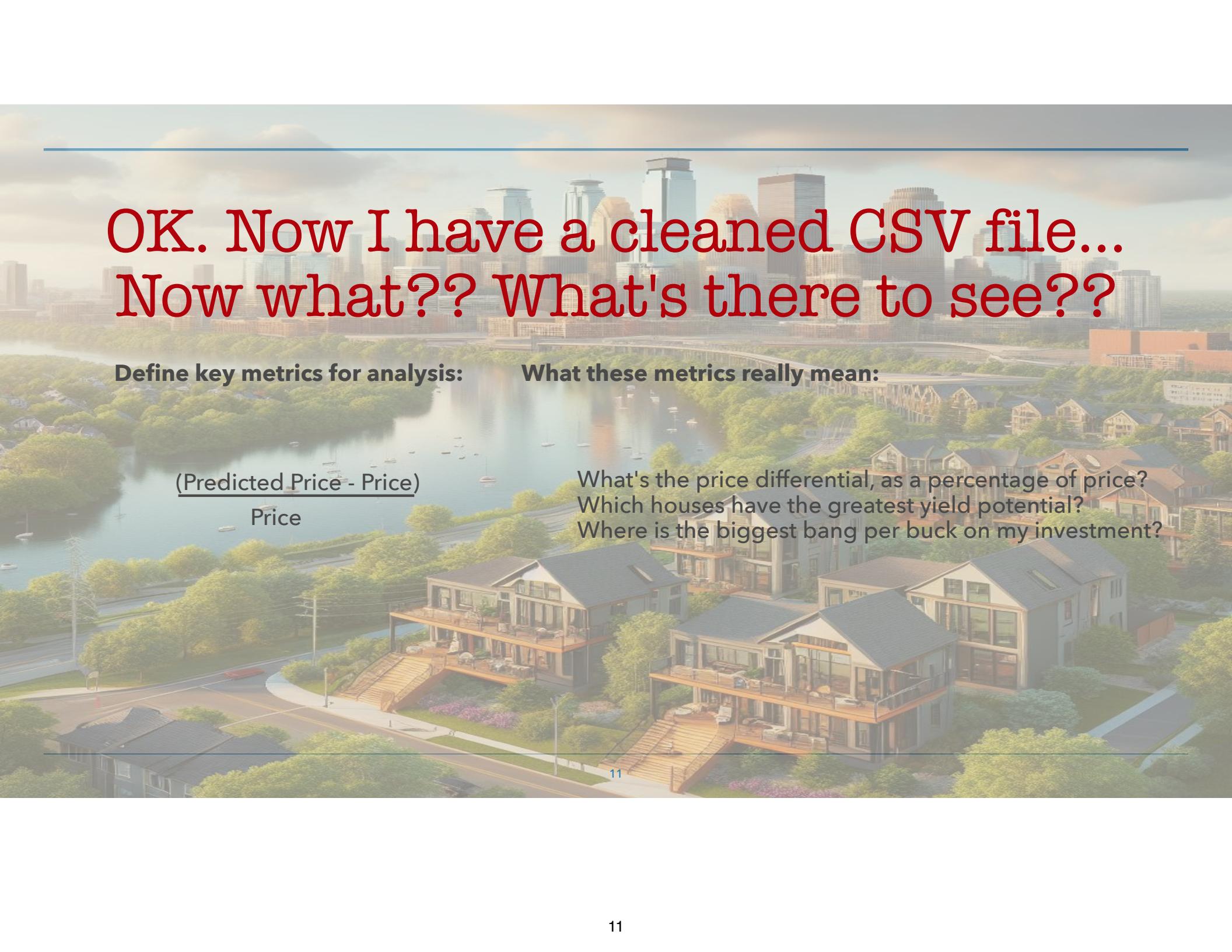
# OK. Got it. But, what am I looking at??

Define key metrics for analysis:

Predicted Price - Price

What these metrics really mean:

How much is this property undervalued?  
How much money could I make here?



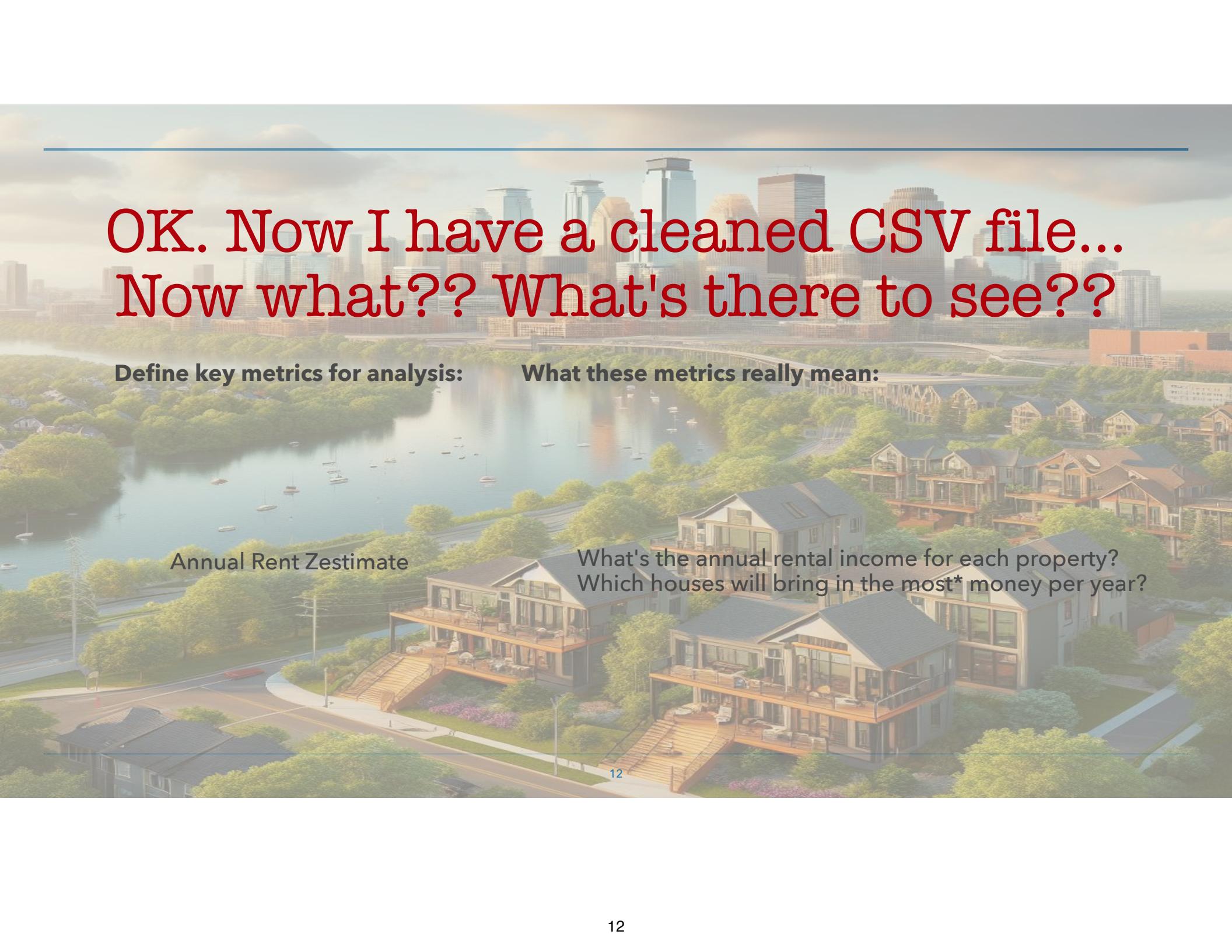
# OK. Now I have a cleaned CSV file... Now what?? What's there to see??

Define key metrics for analysis:

$$\frac{(\text{Predicted Price} - \text{Price})}{\text{Price}}$$

What these metrics really mean:

What's the price differential, as a percentage of price?  
Which houses have the greatest yield potential?  
Where is the biggest bang per buck on my investment?



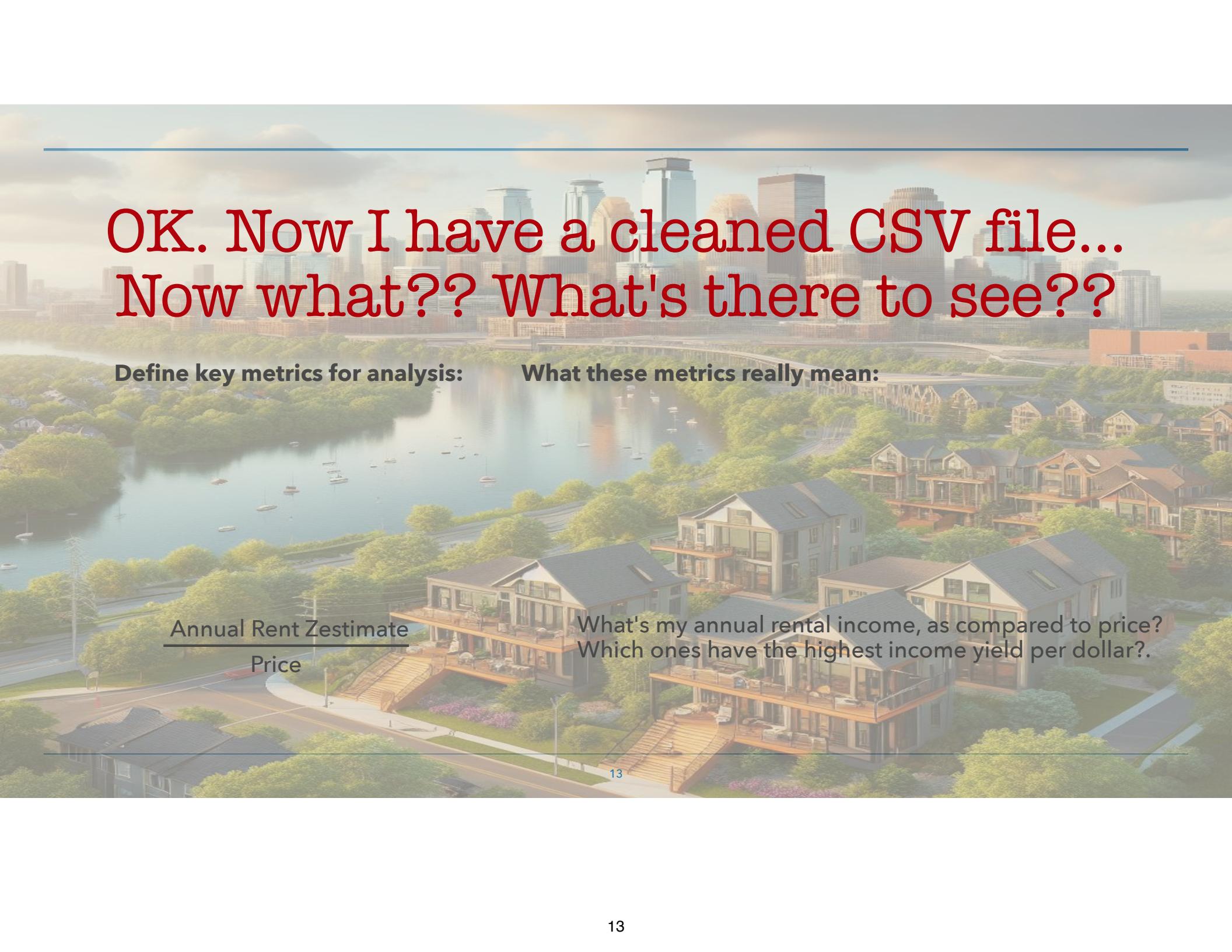
# OK. Now I have a cleaned CSV file... Now what?? What's there to see??

Define key metrics for analysis:

Annual Rent Zestimate

What these metrics really mean:

What's the annual rental income for each property?  
Which houses will bring in the most\* money per year?



# OK. Now I have a cleaned CSV file... Now what?? What's there to see??

Define key metrics for analysis:

What these metrics really mean:

$$\frac{\text{Annual Rent Zestimate}}{\text{Price}}$$

What's my annual rental income, as compared to price?  
Which ones have the highest income yield per dollar?.

# OK. Now I have a cleaned CSV file... Now what?? What's there to see??

Define key metrics for analysis:

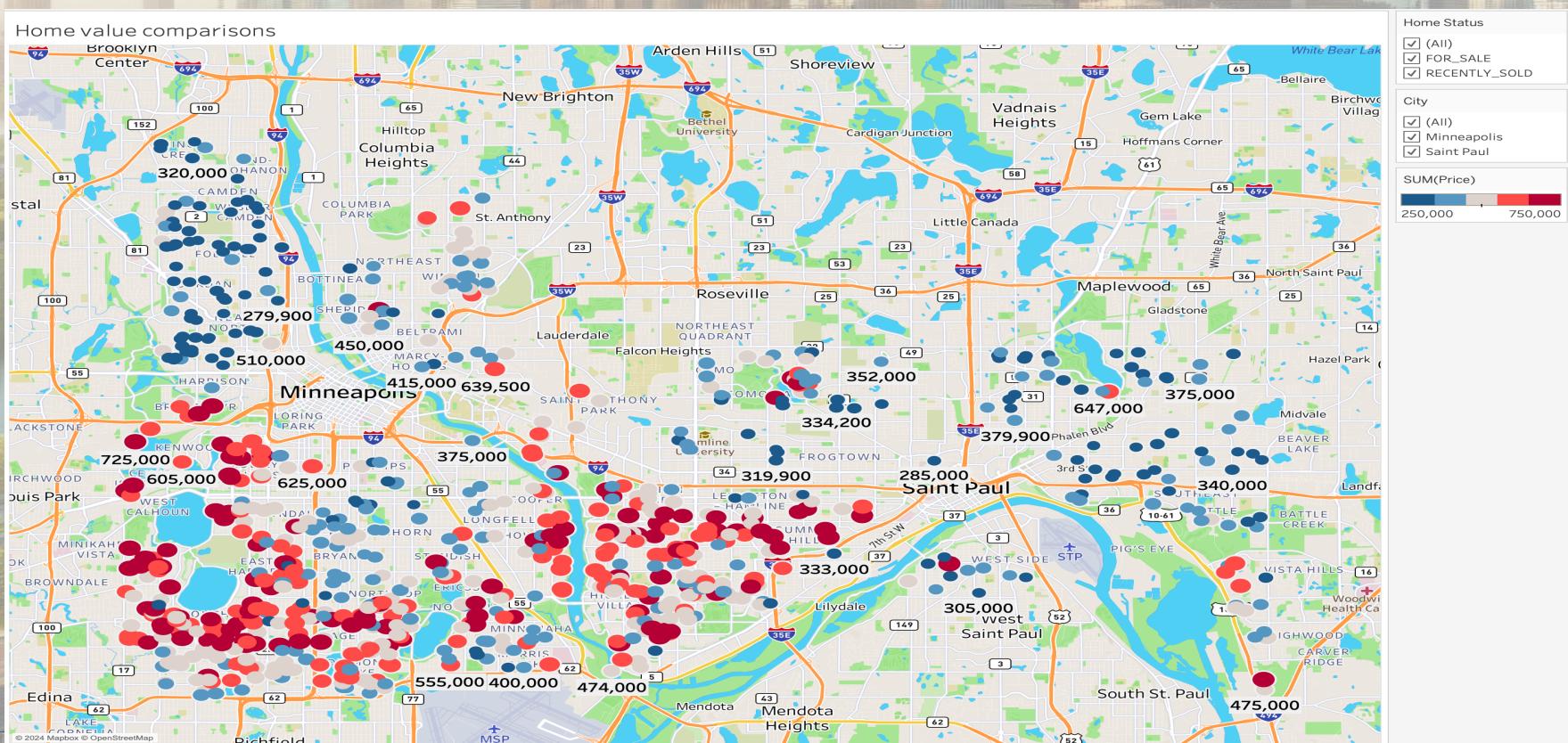
1. Predicted Price - Price
2.  $\frac{\text{Predicted Price} - \text{Price}}{\text{Price}}$
3. Annual Rent Zestimate
4.  $\frac{\text{Annual Rent Zestimate}}{\text{Price}}$

What these metrics really mean:

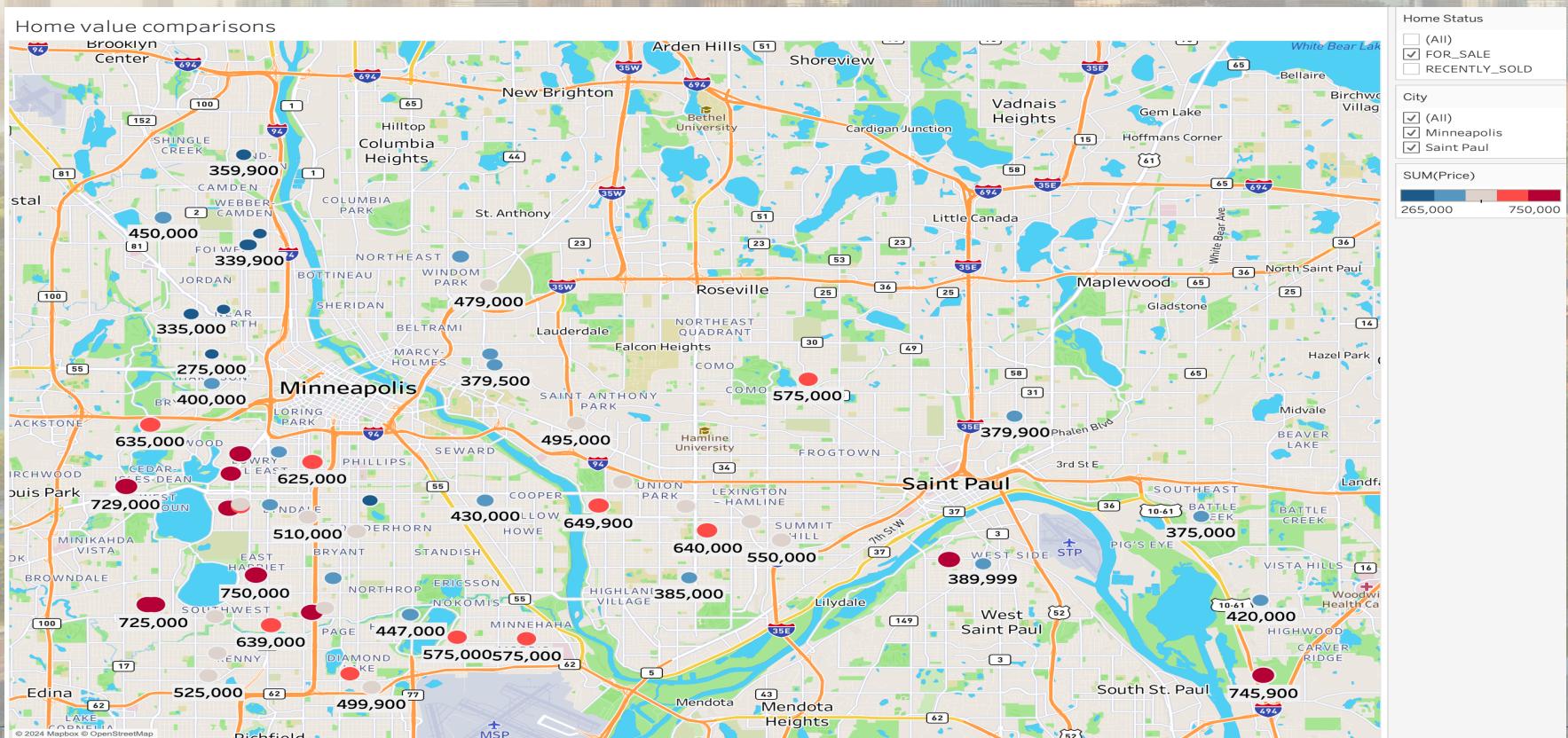
1. How much is this property undervalued?  
How much money could I make here?
2. What's the price differential, as a percentage of price?  
Which houses have the greatest yield potential?  
Where is the biggest bang per buck on my investment?
3. What's the annual rental income for each property?  
Which houses will bring in the most money per year?
4. What's my annual rental income, as compared to price?  
Which ones have the highest income yield per dollar?.

# All properties: Sold & For Sale

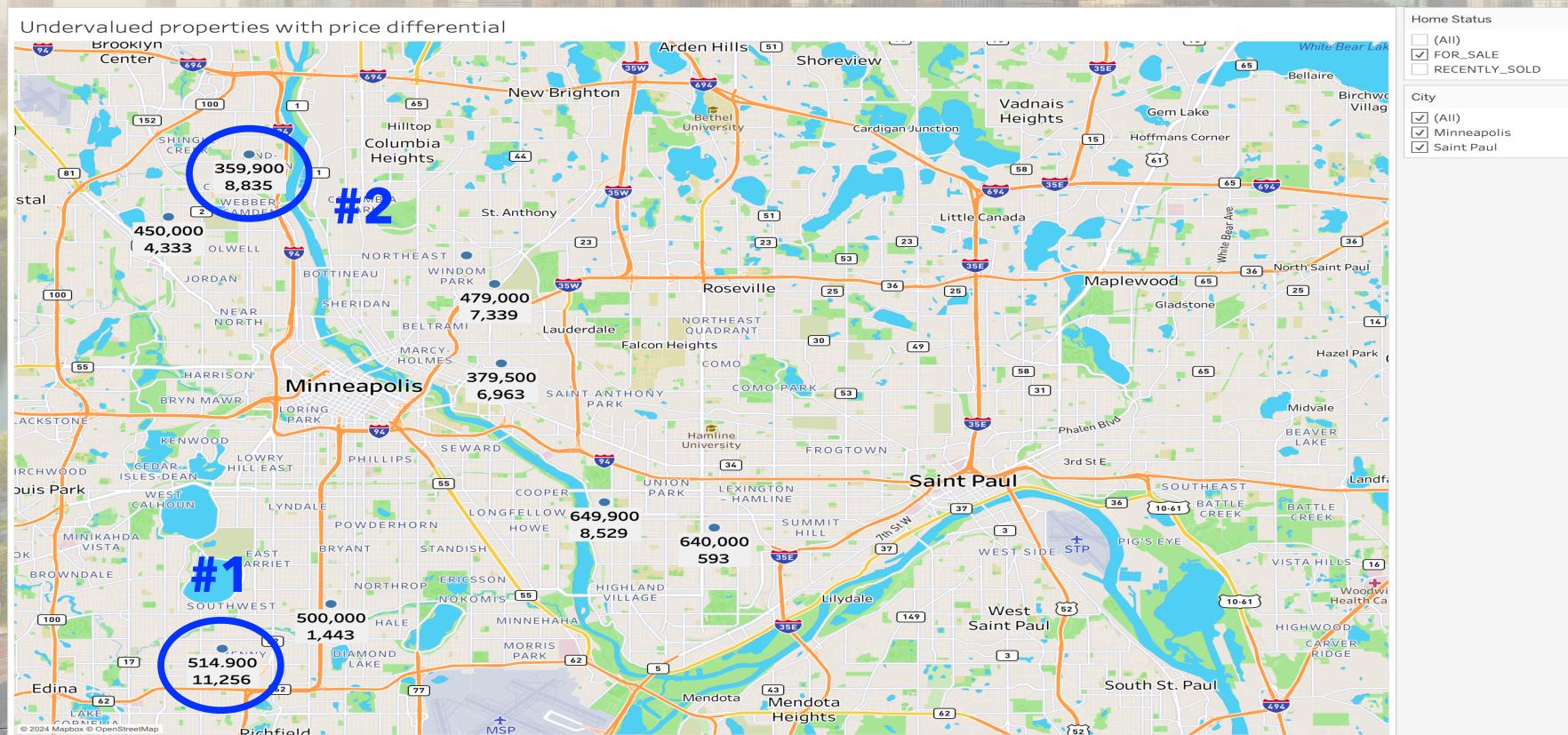
Note: Colour & Size change, based on price



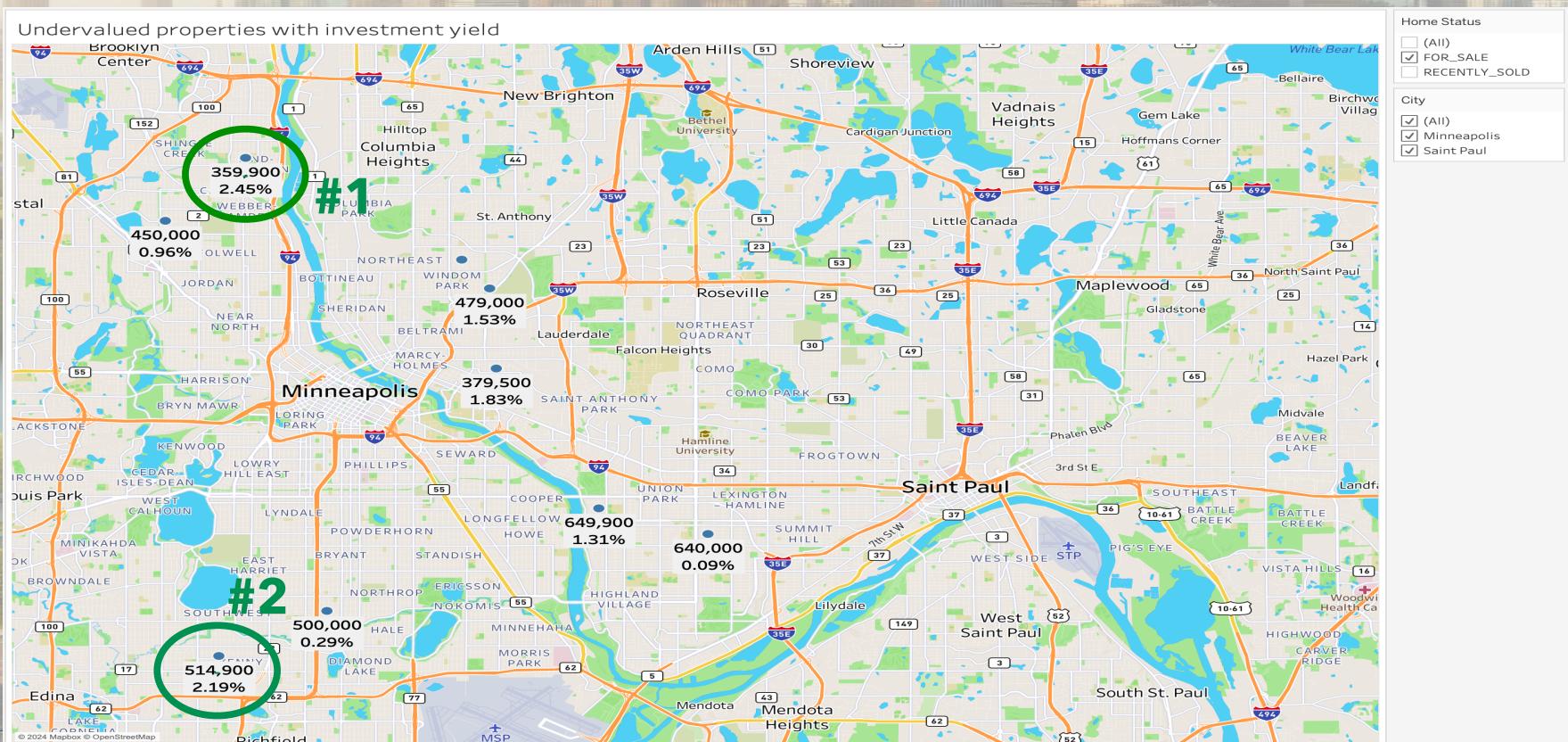
# For Sale Properties



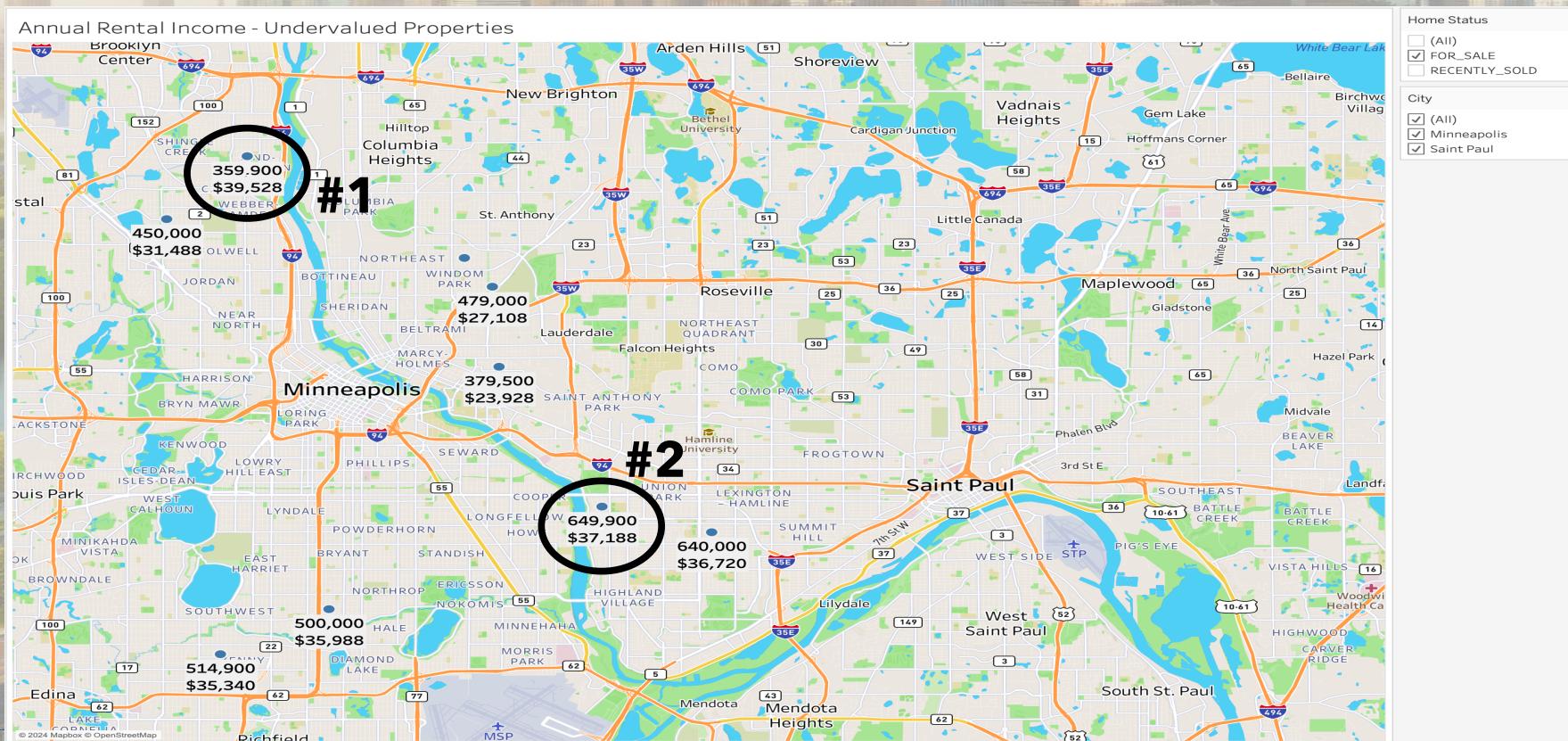
# Undervalued Homes For Sale



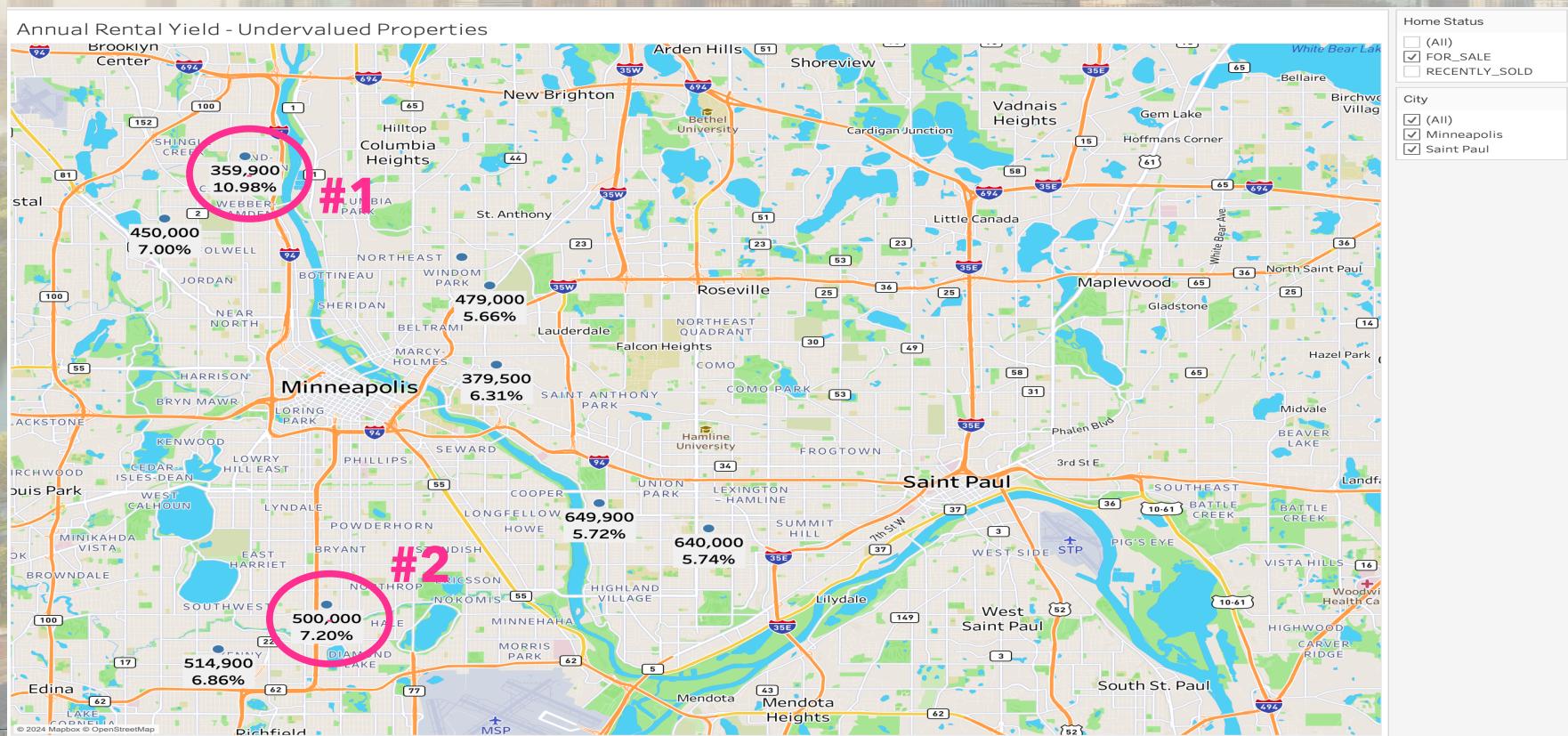
# Undervalued Yield on Investment



# Annual Rental Income



# Annual Rental Yield on Investment



# Short List Comparisons

## Minneapolis

- Number of Properties: 6
- Average For Sale Price: \$447,217
- Average Undervaluation: \$6,695
- Average Undervaluation Yield: 1.54%
- Average Annual Rent: \$32,230
- Average Annual Rent Yield: 7.34%

## Saint Paul

- Number of Properties: 2
- Average For Sale Price: \$644,950
- Average Undervaluation: \$4,561
- Average Undervaluation Yield: 0.70%
- Average Annual Rent: \$36,454
- Average Annual Rent Yield: 5.73%

# So which city is a better investment opportunity?

*Minneapolis*

**Highest dollar opportunity: 2-0**

**Highest rental income: 1-1**

**Yield on Investment: 2-0**

**Yield on income: 2-0**

# Observations

- It took a long while to determine the method to extract the data from Zillow, without an expensive subscription.
- There was a lengthy learning curve in building models.
- Most models had a low or zero accuracy.
- ,The accepted working model predicts with an 85% accuracy rate.
- Providing the machine with relationships of elements in the data, are created using ratios.  
**Example:**Average square feet per room & location data.
- It took 189 cells to process all necessary steps to extract, transform ,and load this data.

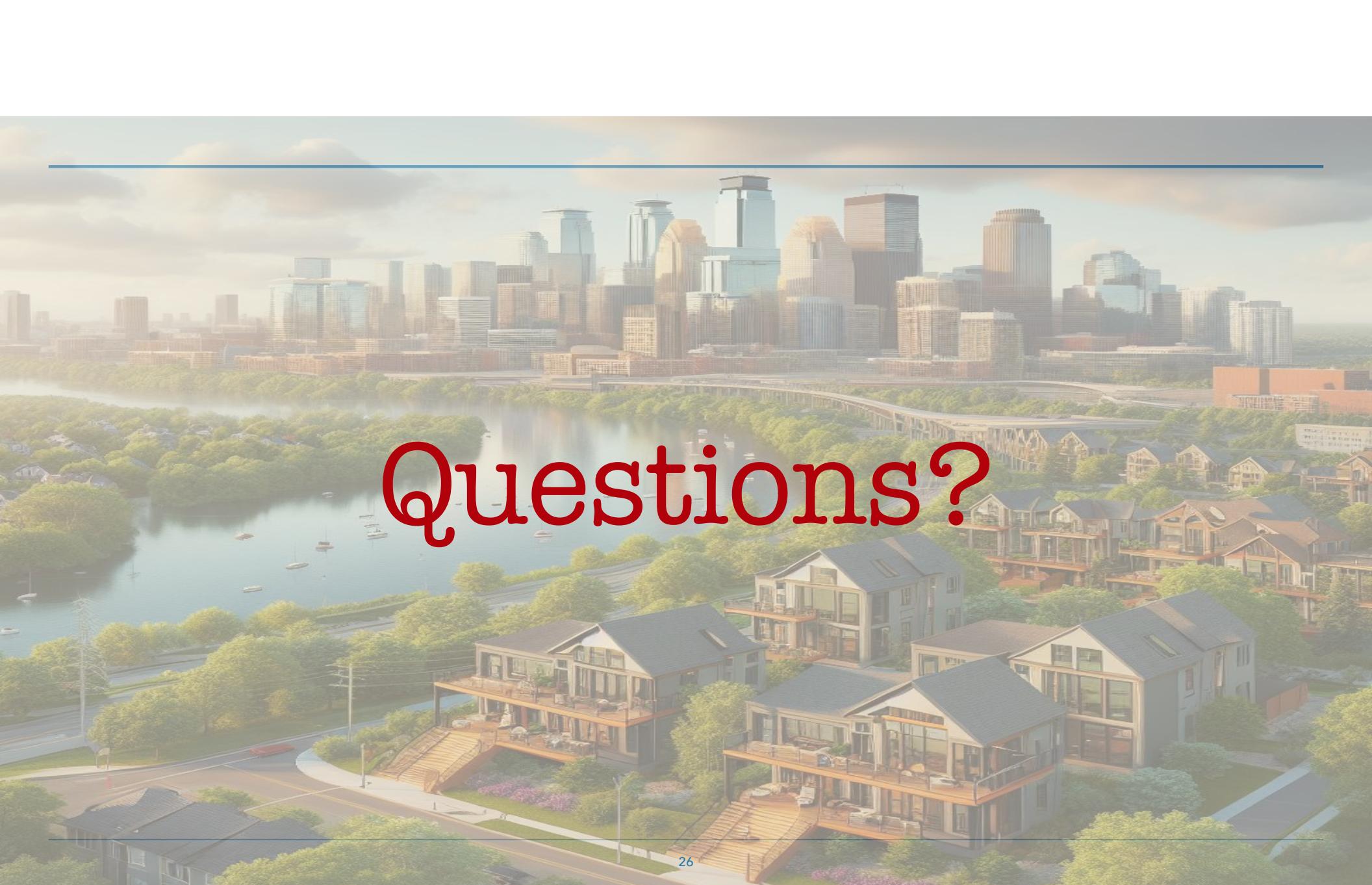
# Next Steps / Further Analysis

- Get better at understanding the markets by following them over time.
- Perform weekly snapshots with updated data for time series analysis.
- Follow pricing patterns for each property `for sale` to `sold`.analysis
- Analysis by zip codes and/or Demographic data.
- Build a model for the rental market.
- Investigate other cities & markets.
- Perform exploratory analyses on additional property types or sizes: Maybe small 1 or 2 bedroom houses, or the commercial market.

# More Reading / References

- **Interact with this data using Tableau Public**

- Minneapolis Housing Market Trends and Forecast for 2024
- Zillow Housing Data
- Zillow Scraper, Scrapeak
- Property Search and Details Tool



Questions?