

# Statistical Analysis Utilizing STARS

## Market and Assessment Analysis Utilizing STARS

(STARS = DOR **S**tatistical **T**ool for **A**nalytics and **R**atio **S**tudies)



**Relax and enjoy!!**

**No Memorization.**

**NO Test.**

# Statistical Analysis Utilizing STARS

## Examples - Possible Uses or Applications of STARS

- Analysis of assessment levels and uniformity
- Determination of trending factor
- Identification of areas for review, research or attention
  
- Specification and Calibration of your valuation model
- Analysis of markets
- Analysis of appraisal adjustments
- Analysis of appraisals
- Paired Sales Analysis
- Basis for presentations to BOE

Note-

- STARS is useful in analysis of both residential and commercial properties or markets.

# A Quick Note About Modeling

We mentioned modeling on the previous slide so lets address modeling for a moment.

- Don't let modeling "scare" you.
- Every appraiser does modeling. (The factors that you adjust for in an appraisal is a model.)
- "A model is a representation of how something works." (IAAO)
- Modeling is simply a way of reflecting the market and its influences.
- It is a description of observed patterns.
- It can be simple or complex.
- Models are used in all three approaches to value.

# Statistical Analysis Utilizing STARS

## Considerations When Doing Analysis

- Data Quality
- Size of Data Set (Number of Observations)
- Market –vs- Non-Market Sales
- Outliers

# Statistical Analysis Utilizing STARS

## Statistical Overview – General Statistics

- Median - The midpoint value. Is effected less by extreme ratios. Generally preferred measure of central tendency for analysis and trending. Used for the COD.
- Mean - The arithmetic average. Used for the COV.
- Weighted Mean - The weighted average. Used for the PRD
- PRD (Price Related Differential) – Measures uniformity between low and high value properties.

# Statistical Analysis Utilizing Stars

## Statistical Overview - Absolute Dispersion Measures

- Range – measure or difference between lowest and highest values.
- Quartiles / Percentages – Dividing points.
- Deviations
  - Average Absolute Deviation – measures distance between observations and central tendency.
  - Standard Deviation – provides a measure of uniformity but is most useful with (or dependent upon) data that has a normal distribution. Provides a range that you can expect certain percentages of your sample to fall within. ( 1SD=65%, 2SD=95% and 3SD=99%)

# Statistical Analysis Utilizing STARS

## Statistical Overview - Relative Dispersion Measures

- Expressed as percentages.
- Allows comparison between samples.
- COD (Coefficient of Dispersion) – Usually from the median. Good measure of uniformity and indicator of 'confidence level.'
- COV (Coefficient of Variation) – Based on the Standard Deviation and expressed as a percentage. Always calculated on the mean. Useful in measuring uniformity if you have data with a normal distribution.

# Statistical Analysis Utilizing STARS

One aspect of STARS is the automated calculation and identification of outliers. This is based on an IAAO standard.

The procedure identifies Standard Outliers as being outside of a trim point that is one and a half times the Interquartile Range (the range from the First Quartile to the Third Quartile) and Extreme Outliers as being outside of a point that is three times the Interquartile Range.

# Statistical Analysis Utilizing STARS

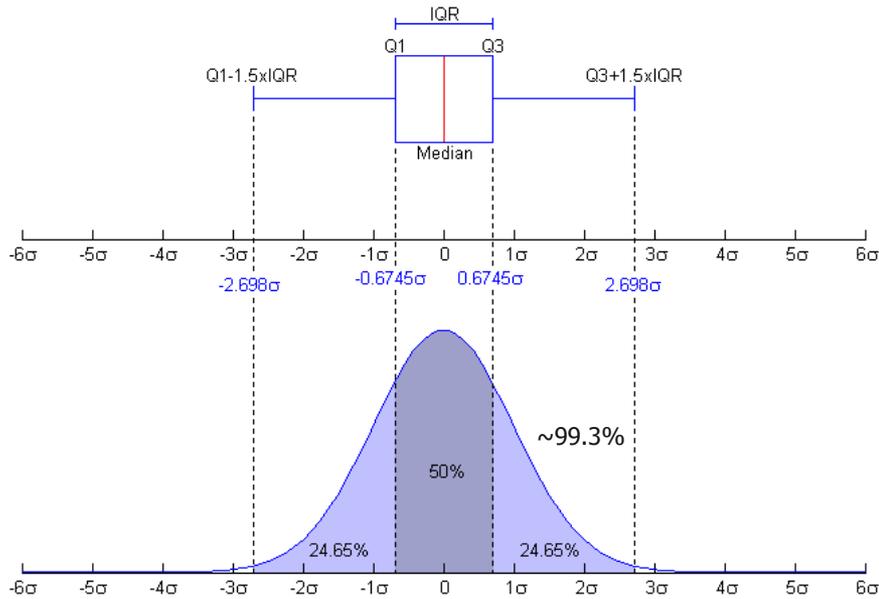
## Handling Outliers:

- Generally, you want to remove as few outliers as possible.
- Only remove outliers if they are likely to skew or distort your statistical measures or analysis results.
- Research the outliers to see if there is an identifiable adjustment that can be made so that they can be included.
- Be uniform in how you handle them.
- Do not trim outliers by arbitrary selection, use an appropriate trim procedure.
- Check for a skewed distribution and make sure any trimming does not shift the statistical measures.

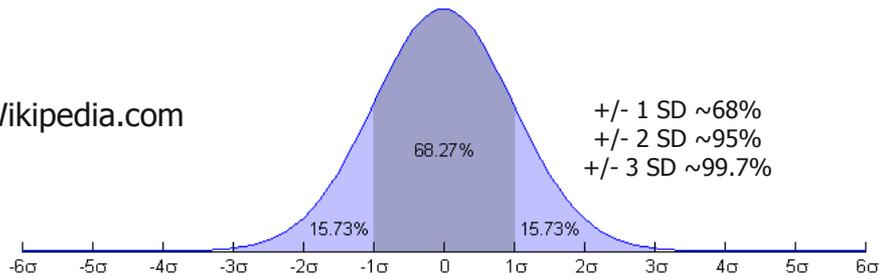
# Statistical Analysis Utilizing STARS

## Handling Outliers:

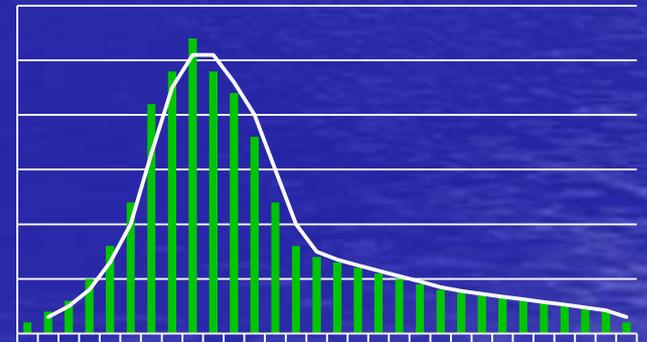
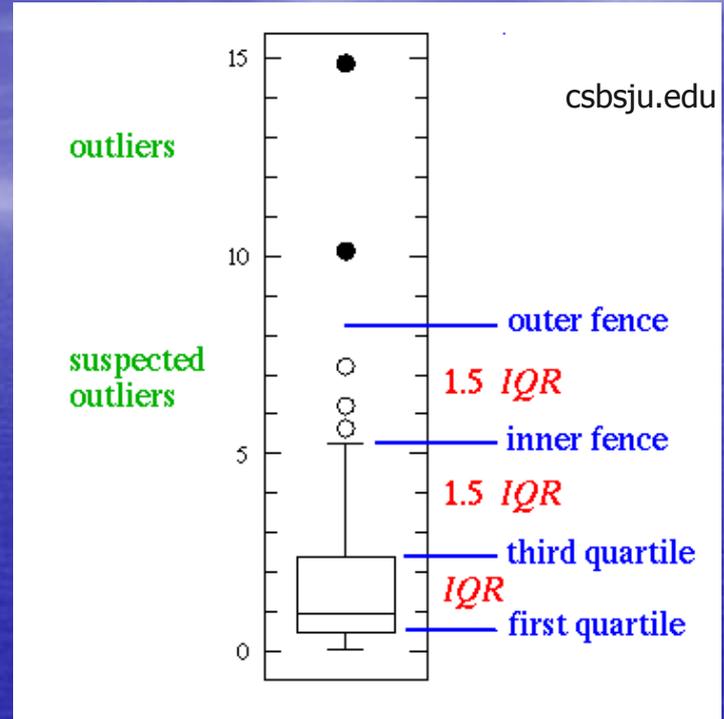
### - Skewed Distributions -



Wikipedia.com



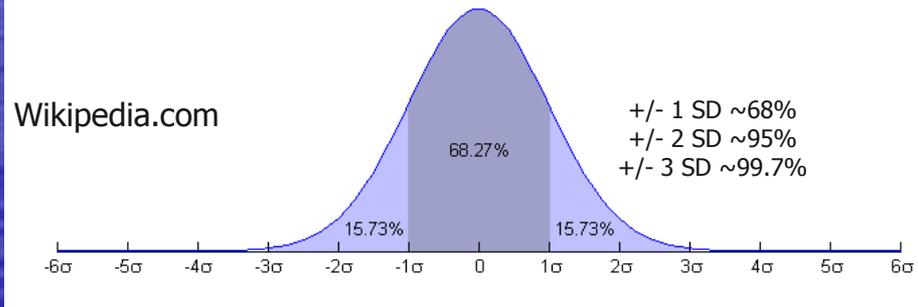
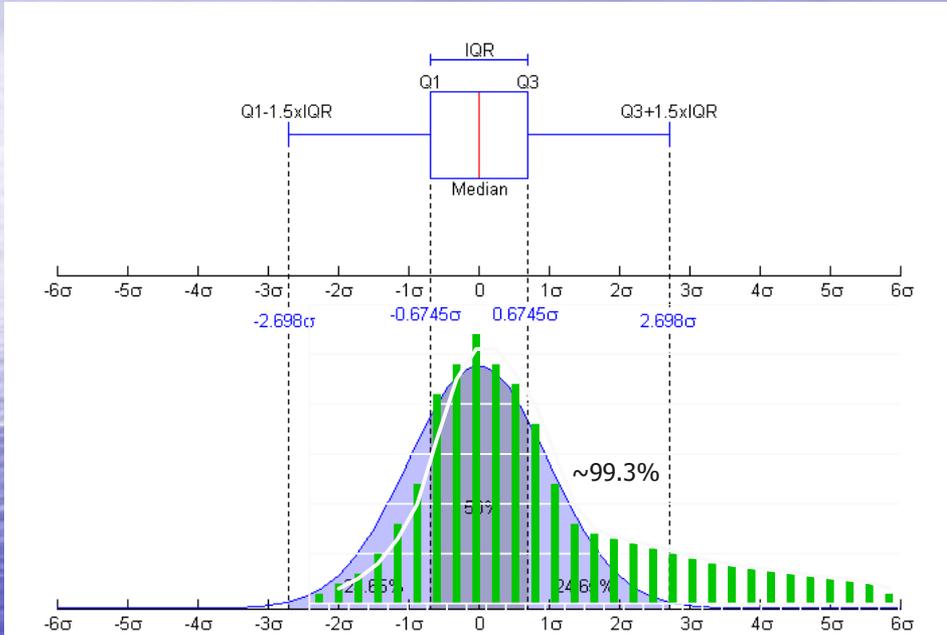
- +/- 1 SD  $\sim 68\%$
- +/- 2 SD  $\sim 95\%$
- +/- 3 SD  $\sim 99.7\%$



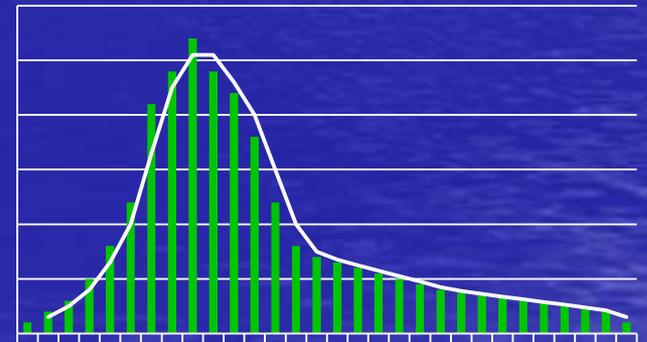
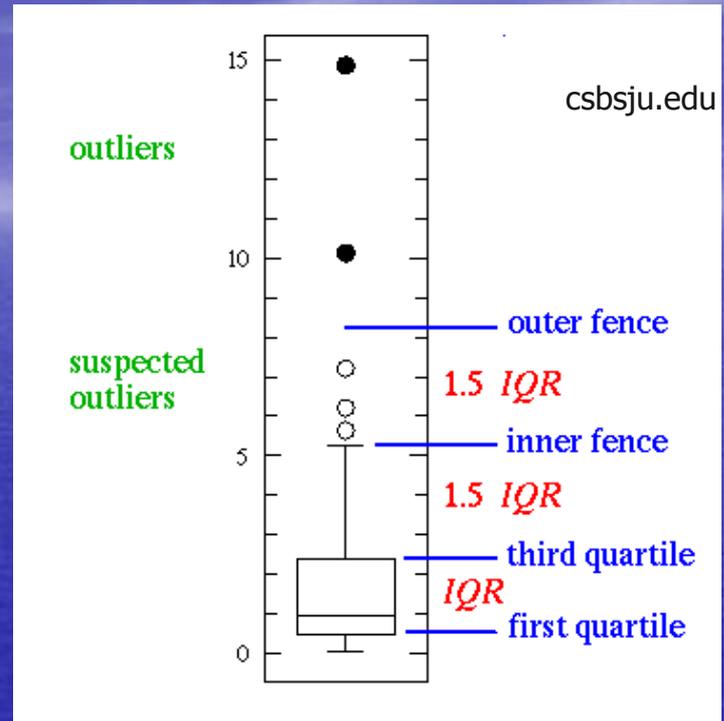
# Statistical Analysis Utilizing STARS

## Handling Outliers:

### - Skewed Distributions -



Wikipedia.com



# Statistical Analysis Utilizing STARS

## Handling Outliers:

Recognize the outliers as important data and a tool.

- They may provide valuable information.
- Consider what they may be telling you about:
  - The Market
  - Your Assessments
  - Your Model
- Use the outliers as a means of testing your model. Do they indicate a systemic problem?
  - For example in a system where you are not adjusting for view, if many of your low outliers are view properties it may indicate that you should be applying a view factor.

# General Comments Regarding Analysis

## Highly Recommend:

- Extensive use of GIS in your analysis – looking at things visually can bring out facts, trends, variations and other items that you would miss just looking at numbers.
- A good and well defined sales validation process.
- A good and well defined sales condition verification process.
- Paired Sales Analysis (analysis of properties that sell more than once in a given time period) is very useful and highly encouraged.
- Determination of and use of Market (Time) Adjustments when appropriate.

# Examples of Use of GIS in Analysis

Here are just a few examples of items that can be mapped, illustrated and represented with GIS.

- **Ratios (Assessed Value to Sales Price)**
- Property Characteristics or Attributes
  - Can be mapped alone such as indicating all view properties
  - Can be highlighted or identified as part of other analysis such as ratios
- Zoning, Land Use, Topography and a Utility (Usability) Rating
- Sales- volume, locations, sales price, price per SF
- Land Values- Price per Acre and Site/Lot Values
- Paired Sales- Percent or rate of change
- Outliers (maybe a pattern emerges)
- Photographic, topographic, flood zones, wetlands and other overlays
- Possible Application: Modeling- using GIS might help identify missed influences or influences that need to be calibrated better
- Note: can use background/fill colors, outline colors and fill patterns.

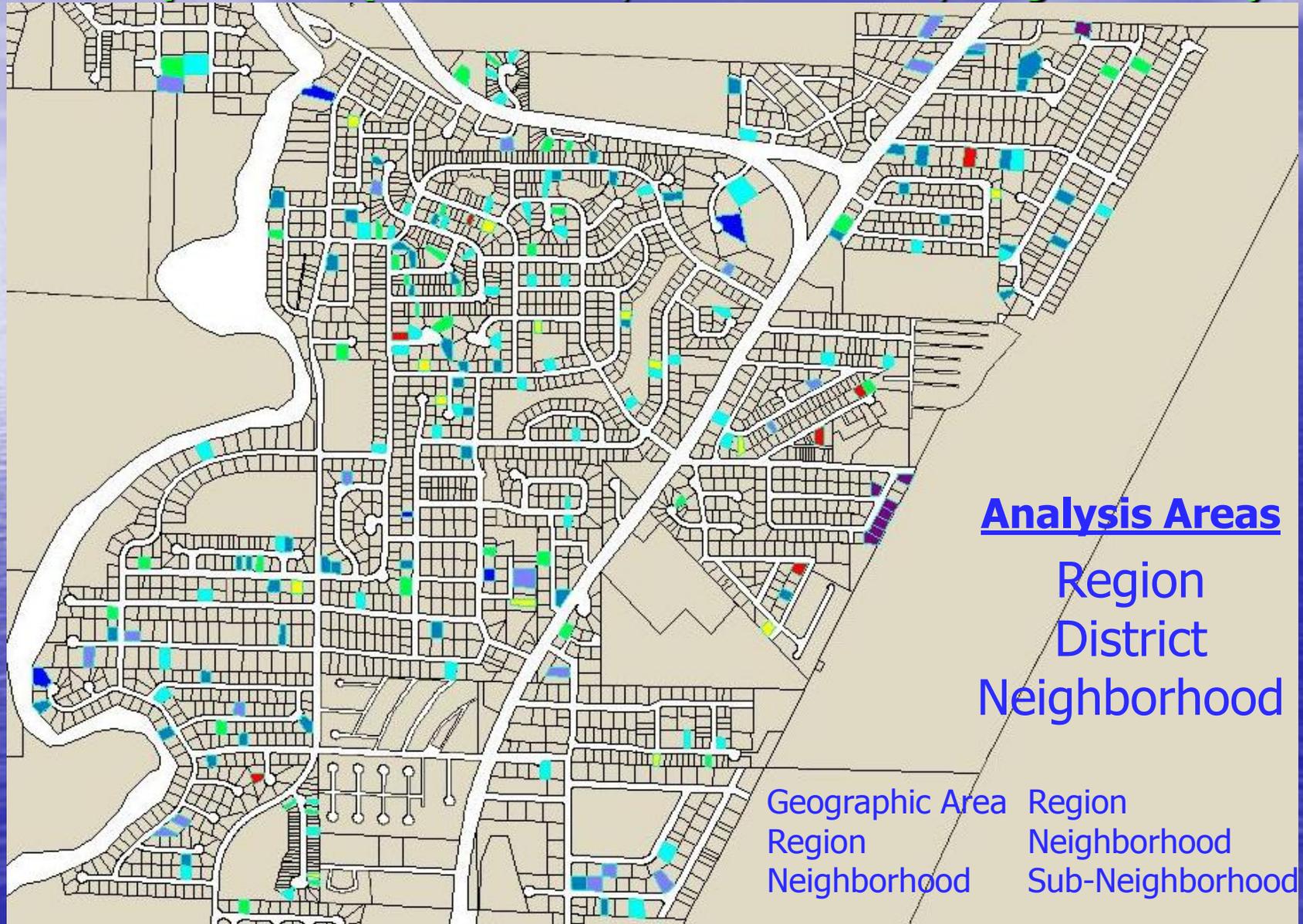


# Examples of Use of GIS in Analysis



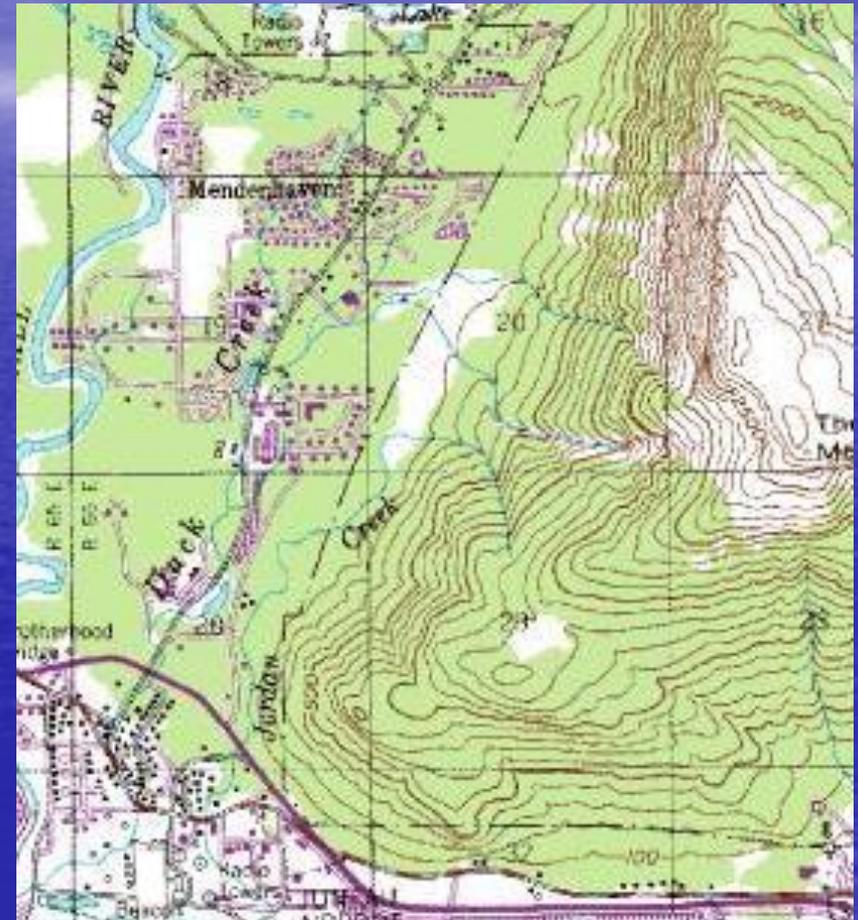
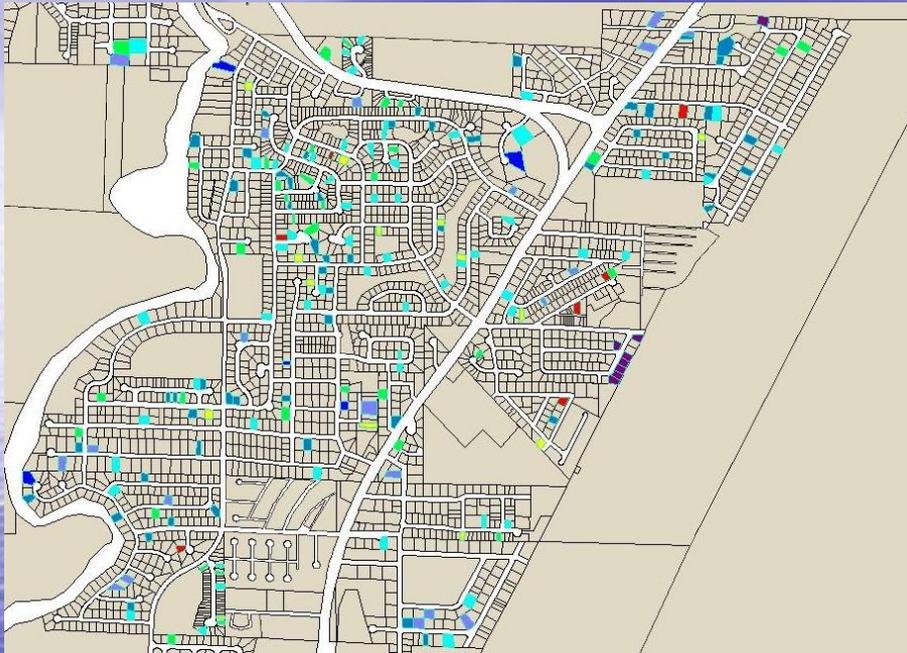
# Examples of Use of GIS in Analysis

- **Analysis Areas (Market Areas, Valuation Areas, Neighborhoods)**



# Examples of Use of GIS in Analysis

- **Layers**

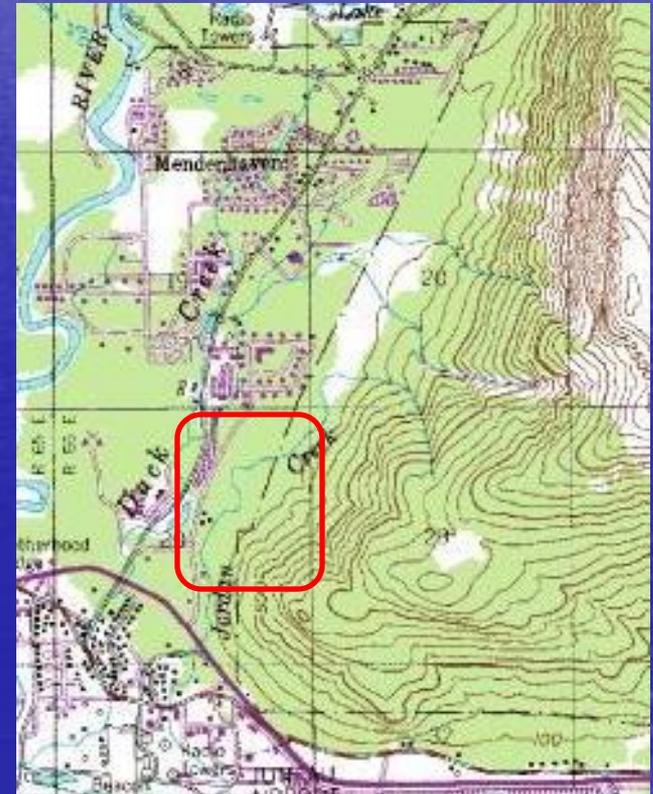
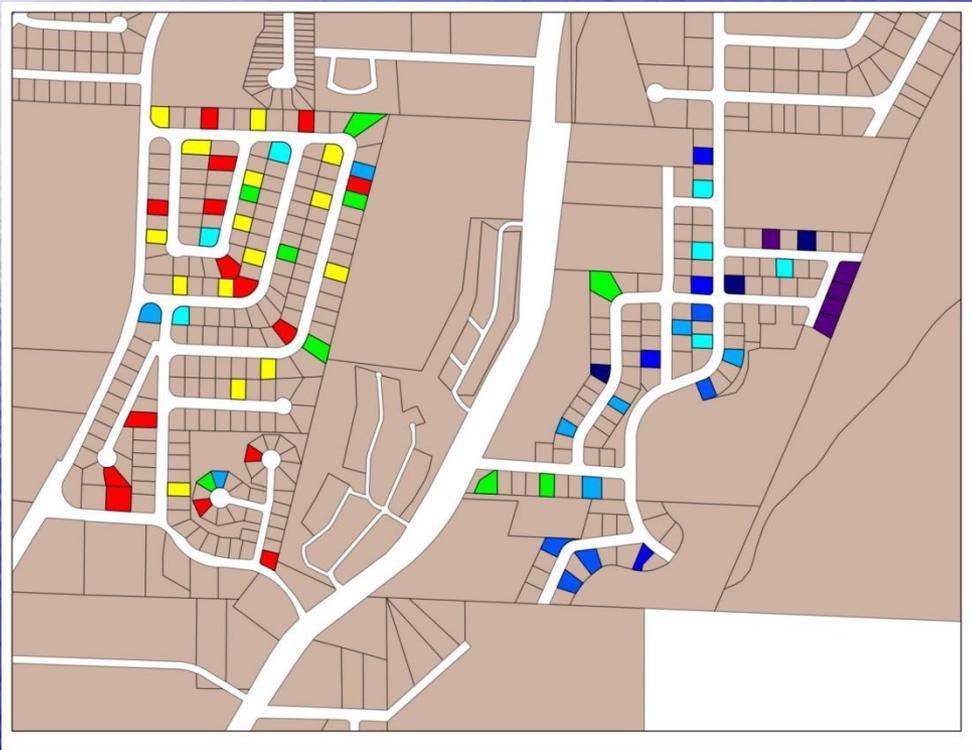


Layers can help in identification of Market Areas/Neighborhoods & in Analysis

- Topographical Lines
- Aerial Photography
- Roads, Railroads, Rivers
- Flood Zones, Wetlands, Climate Maps
- Noise Impacts, Commute Time Maps

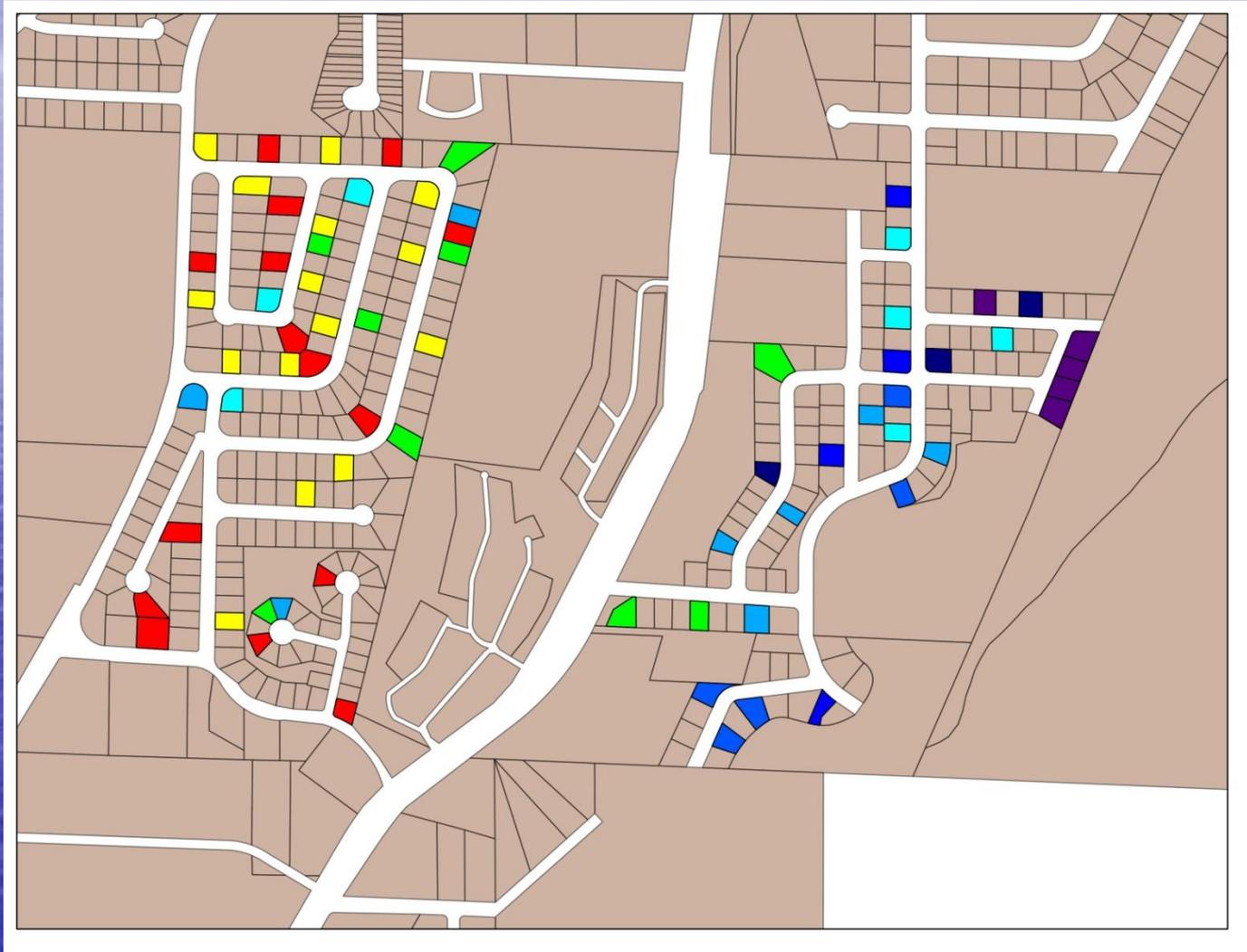
# Examples of Use of GIS in Analysis

- Sample 1: Ratios: 5% steps blue to green to red



# Examples of Use of GIS in Analysis

- Sample 2: Ratios: 5% steps blue to green to red



# Examples of Use of GIS in Analysis

- Sample 3: Land Values: Purple over 60,000 & Lt Blue Under 60,000



# Examples of Use of GIS in Analysis

- Sample 4: Land Values:



# Examples of Use of GIS in Analysis

Now that you have seen a few samples of GIS images lets review the list of examples one more time.

- **Ratios (Assessed Value to Sales Price)**
- Property Characteristics or Attributes (alone)
- Properties with particular characteristics can be highlighted or identified (as part of other analysis such as ratios)
- Zoning, Land Use, Topography and a Utility (Usability) Rating
- Sales- volume, locations, sales price, price per SF
- Land Values- Price per Acre and Site/Lot Values
- Paired Sales- Percent or rate of change
- Outliers (maybe a pattern emerges)
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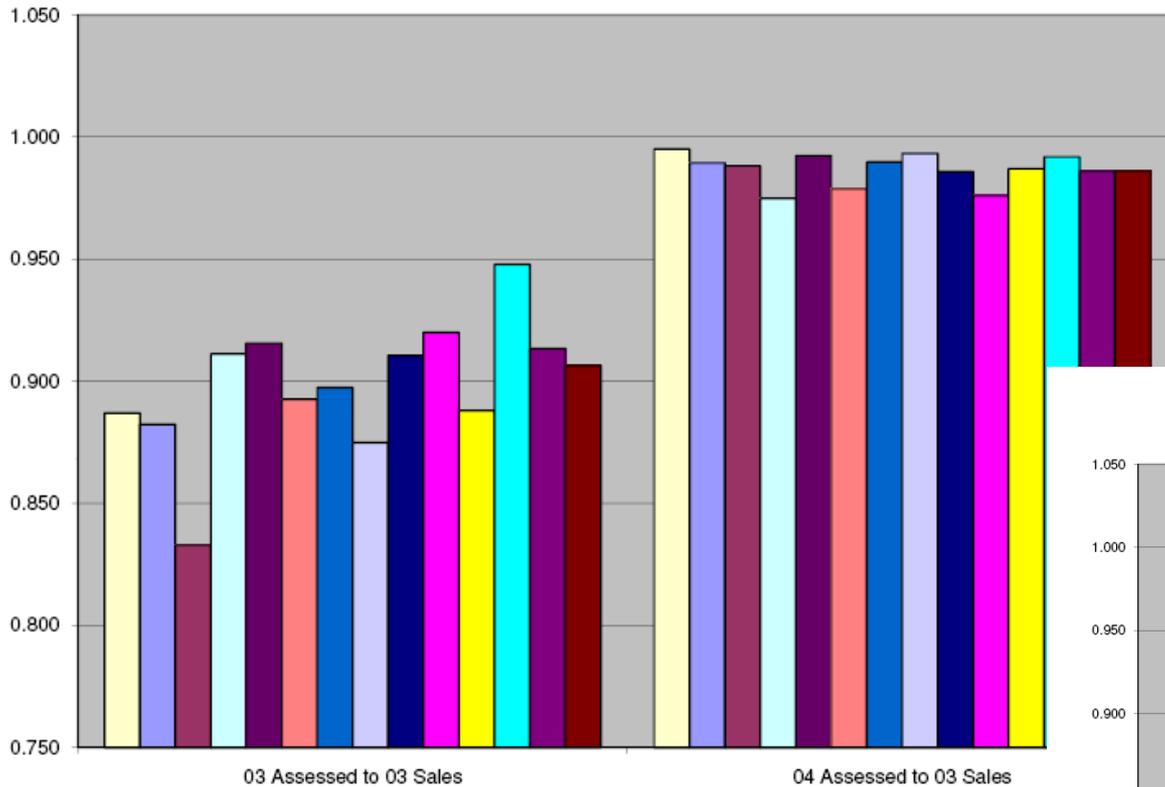
# General Comments Regarding Analysis

## An Example of the importance of Analysis

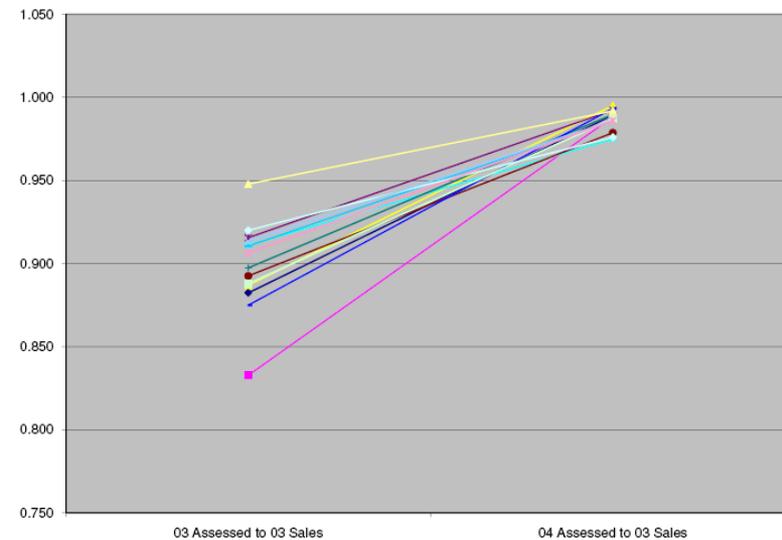
- Analysis is essential to
  - Uniformity,
  - Achieving Proper Assessment Level and
  - Market Knowledge.
- The following slide is an illustration that involves analysis of neighborhood adjustments (factors, multipliers)

# General Comments Regarding Analysis Neighborhood Ratios

Assessed Value to Sales Ratios



Assessed Values to Sales Ratios



# Statistical Analysis Utilizing STARS

## Typical Structures of Studies

- Overall Structure
  - Valuation/Market Areas
  - Use Types
  - Other Attributes or Characteristics

# Statistical Analysis Utilizing STARS

## Typical Structures of Studies

- Valuation/Market Areas
  - (Geographic Areas, Regions, Neighborhoods)
  - Entire County
  - Geographic Areas / Regions
  - Districts
  - Neighborhoods
  - School Districts
  - City Limits

# Statistical Analysis Utilizing STARS

## Typical Structures of Studies

- Use Types
  - All Sales
  - Vacant Land
  - Residential- All
  - Residential- SFR
  - Residential- Condos & Townhouses
  - Commercial- All
  - Commercial- Retail
  - Commercial- Offices

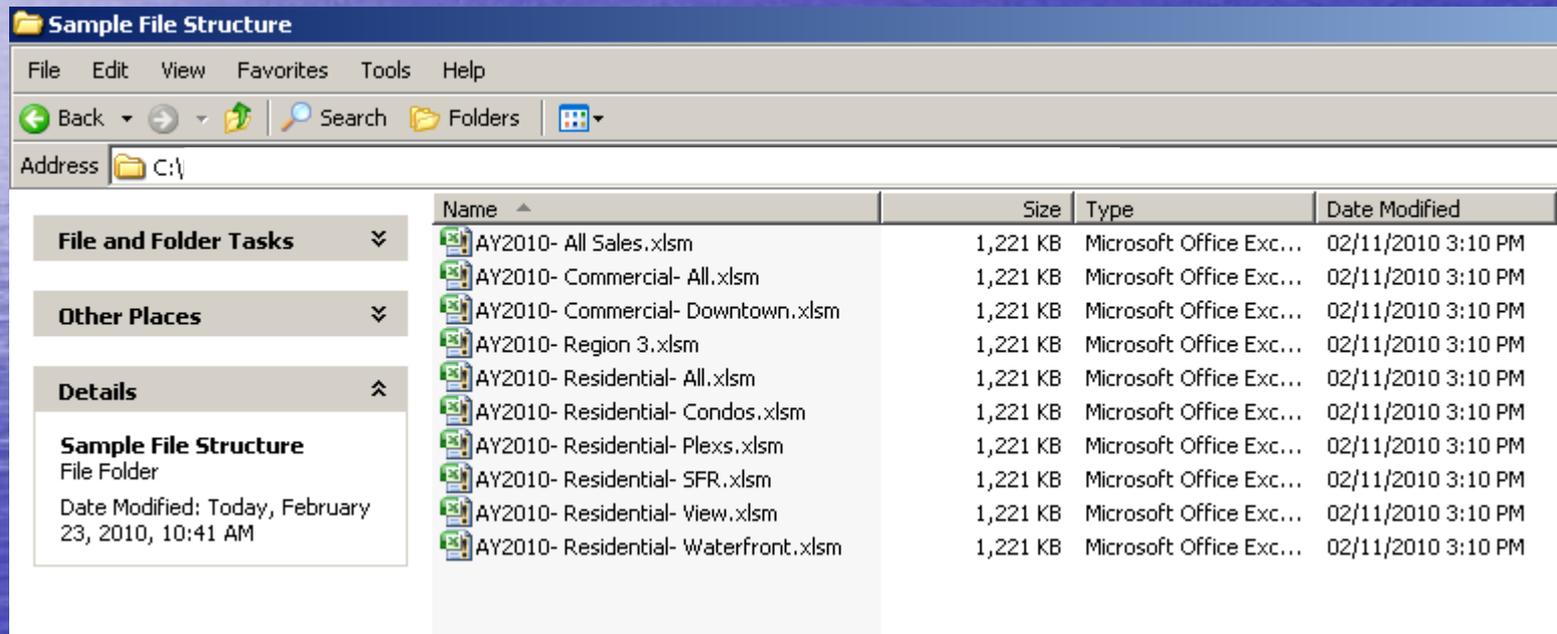
# Statistical Analysis Utilizing STARS

## Typical Structures of Studies

- Other Attributes or Characteristics
  - View Properties
  - Waterfront Properties- Sound, Bay, Tidal, Lake, River
    - No Bank
    - Low Bank
    - Medium Bank
    - High Bank
- Characteristics
  - Individually
  - Mixed
- Within Each Study Structure You Will Utilize Multiple Stratifications

# Statistical Analysis Utilizing STARS

## Typical Structures of Studies



The screenshot displays a Windows Explorer window titled "Sample File Structure" showing a directory of files. The address bar indicates the current location is "C:\". The left sidebar shows "File and Folder Tasks", "Other Places", and "Details". The main pane displays a list of files with columns for Name, Size, Type, and Date Modified.

| Name                                 | Size     | Type                    | Date Modified      |
|--------------------------------------|----------|-------------------------|--------------------|
| AY2010- All Sales.xlsm               | 1,221 KB | Microsoft Office Exc... | 02/11/2010 3:10 PM |
| AY2010- Commercial- All.xlsm         | 1,221 KB | Microsoft Office Exc... | 02/11/2010 3:10 PM |
| AY2010- Commercial- Downtown.xlsm    | 1,221 KB | Microsoft Office Exc... | 02/11/2010 3:10 PM |
| AY2010- Region 3.xlsm                | 1,221 KB | Microsoft Office Exc... | 02/11/2010 3:10 PM |
| AY2010- Residential- All.xlsm        | 1,221 KB | Microsoft Office Exc... | 02/11/2010 3:10 PM |
| AY2010- Residential- Condos.xlsm     | 1,221 KB | Microsoft Office Exc... | 02/11/2010 3:10 PM |
| AY2010- Residential- Plexs.xlsm      | 1,221 KB | Microsoft Office Exc... | 02/11/2010 3:10 PM |
| AY2010- Residential- SFR.xlsm        | 1,221 KB | Microsoft Office Exc... | 02/11/2010 3:10 PM |
| AY2010- Residential- View.xlsm       | 1,221 KB | Microsoft Office Exc... | 02/11/2010 3:10 PM |
| AY2010- Residential- Waterfront.xlsm | 1,221 KB | Microsoft Office Exc... | 02/11/2010 3:10 PM |

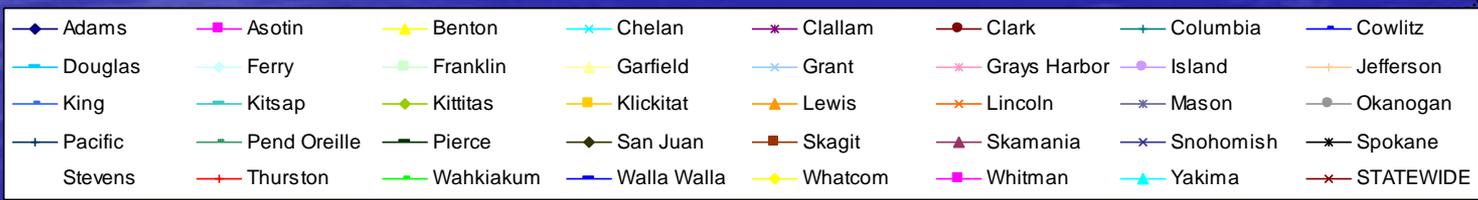
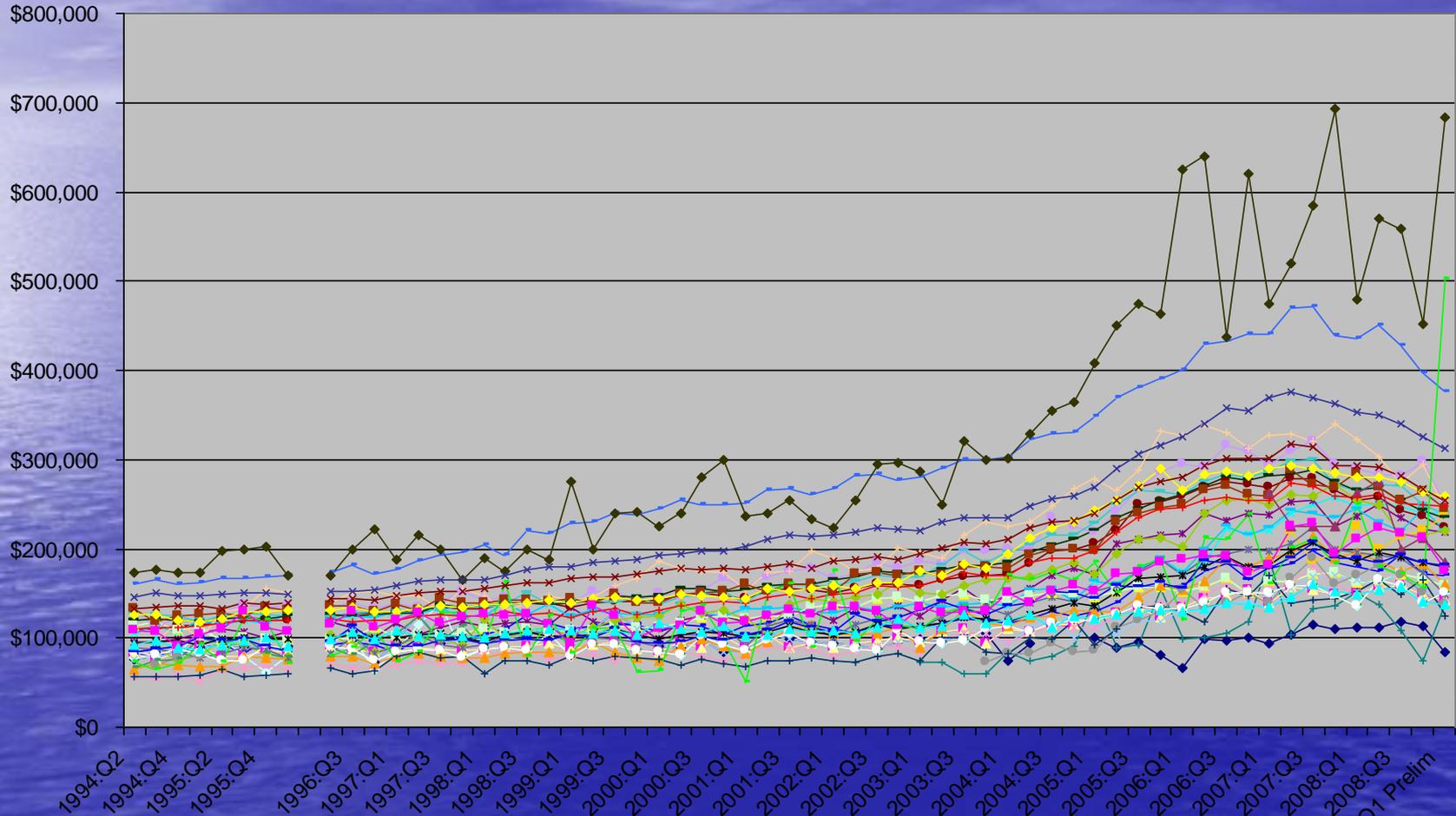
# A General Side Note of Caution

**Ask Questions and Test Your Assumptions !!!**

We would encourage you to be careful in your analysis and the conclusions and statements you make.

# Median Home Prices per the Washington Center for Real Estate Research

Median Home Prices



# Ask Questions and Test Your Assumptions

Let's look more closely at the Median Price as an example:

- Have you corrected for changes in the
  - average size?
  - average quality?
  - average age?
- Is the market shifting such that there are more, or fewer, upper end sales; or that there are more, or fewer, lower end (starter home) sales?

A basic question would be: Is the "Median" home of today the same as the "Median" home of a year ago? Or two years ago? Or, a few more years back? Have you taken changes into consideration?

# Statistical Examples

The next series of slides are example charts.

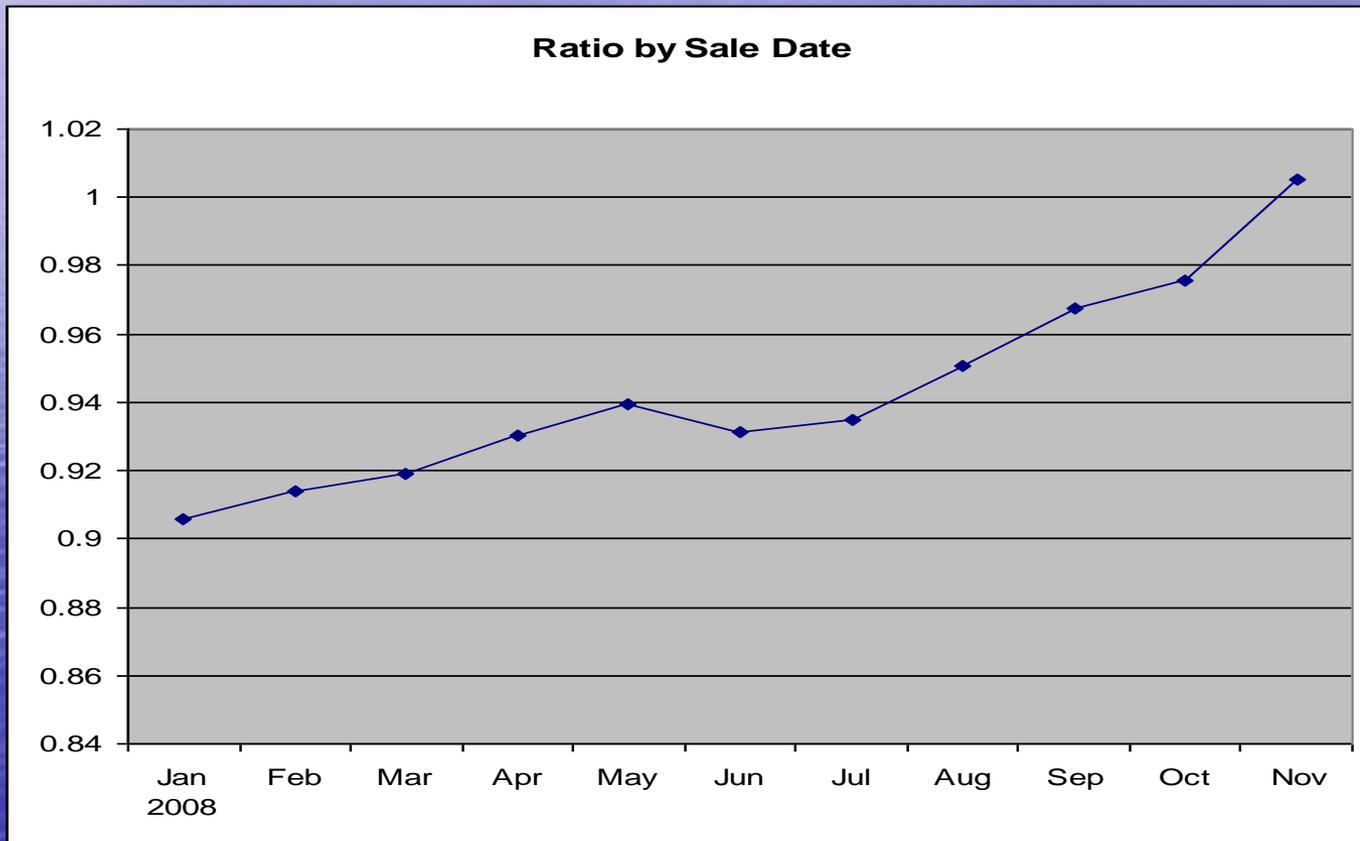
The charts:

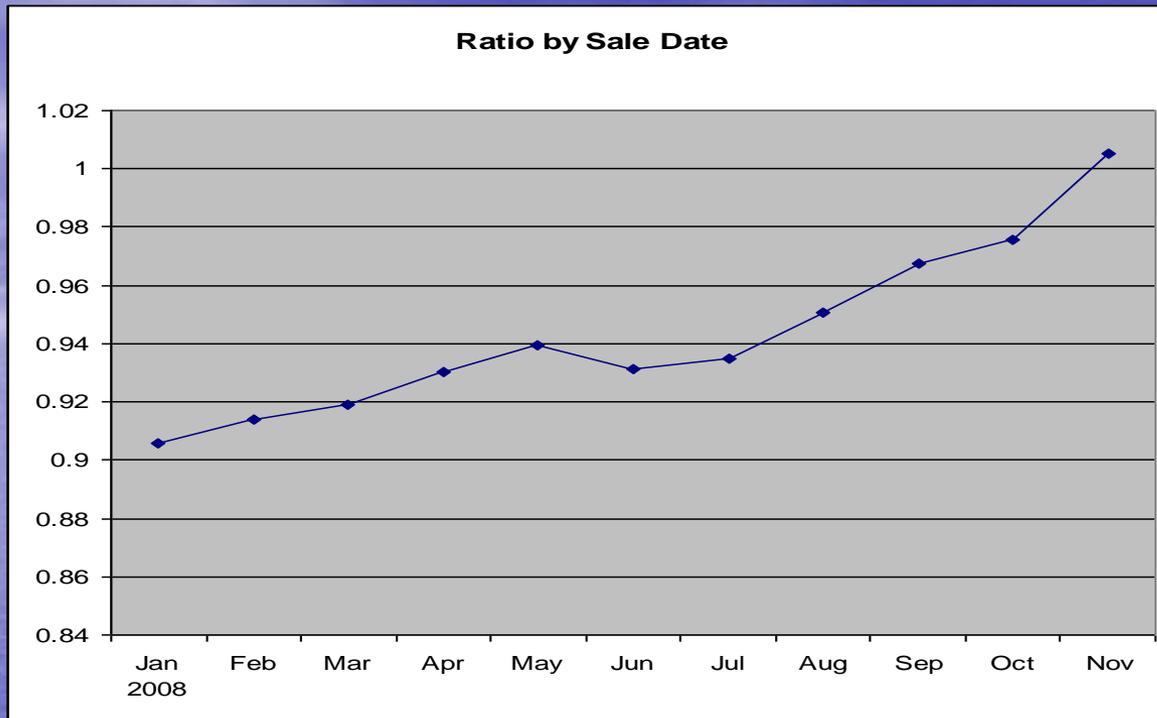
- Are on ratios of Assessed Value to Sales Price.

The Following presumptions apply to all the examples.

- They are from a large enough sample.
- The statistical measures indicate that it is reasonable to draw conclusions from the sample.

# What do these statistics tell you?



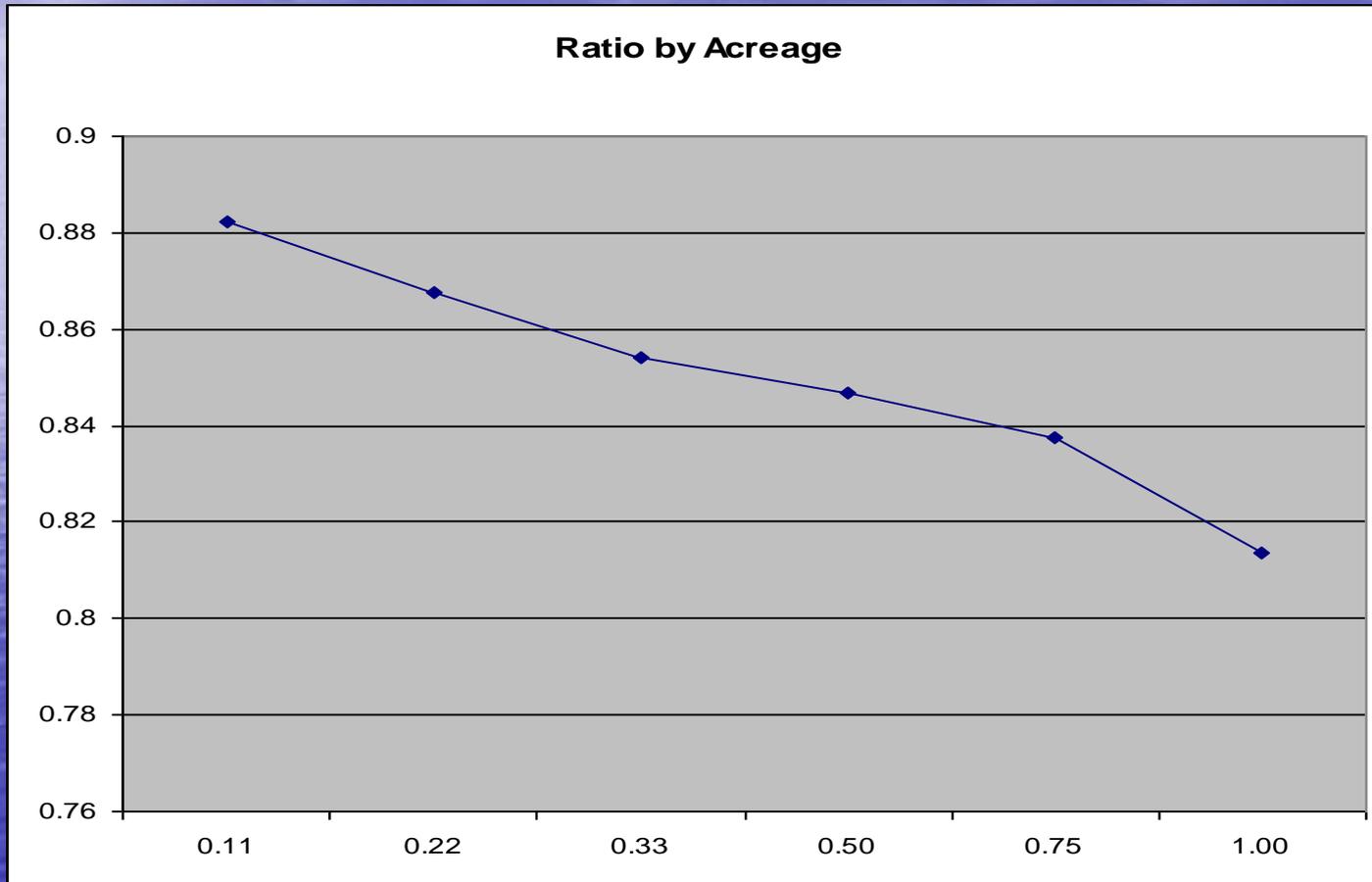


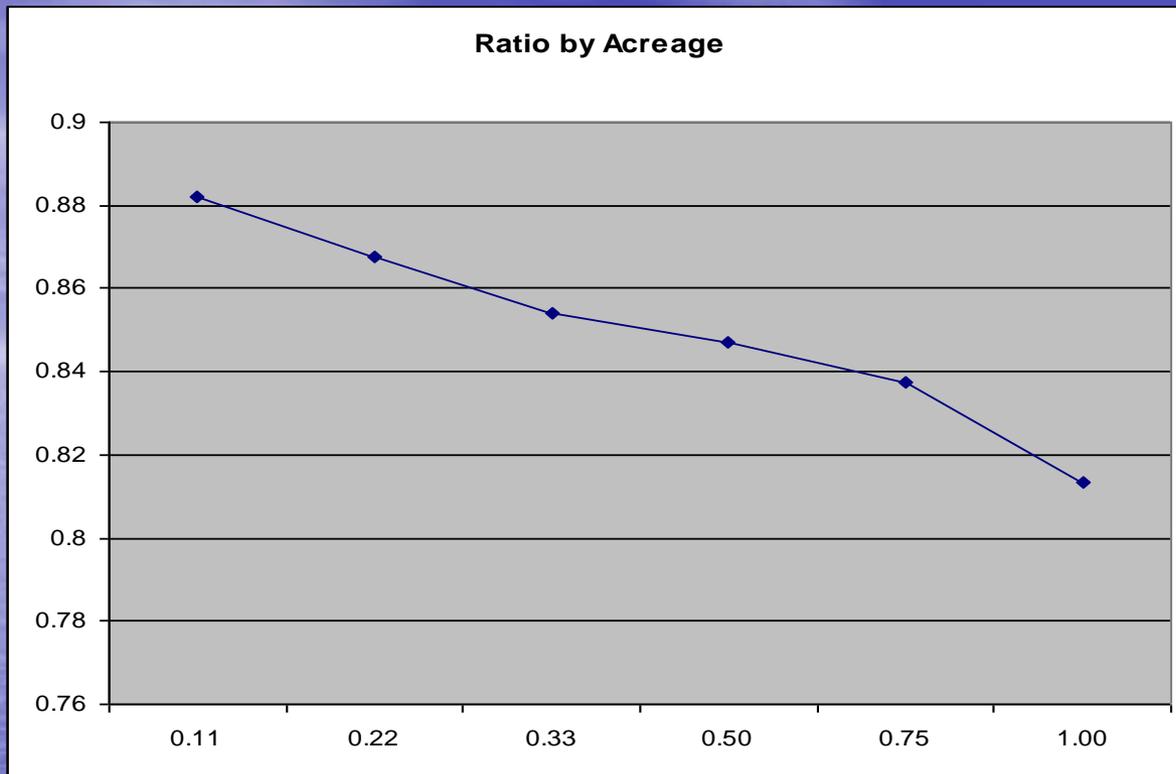
These ratio statistics indicate a possible changing (declining) market.

What might I want to do in this situation when I analyze my assessment level and decide on my trending factor?

- If I have enough sales I might use only 4<sup>th</sup> Quarter sales.
- If through paired sales or other analysis I have determined a market (time) adjustment I could trend all sales to the end of the year or assessment date.

# What do these statistics tell you?





This graph indicates that properties with more land are being undervalued.

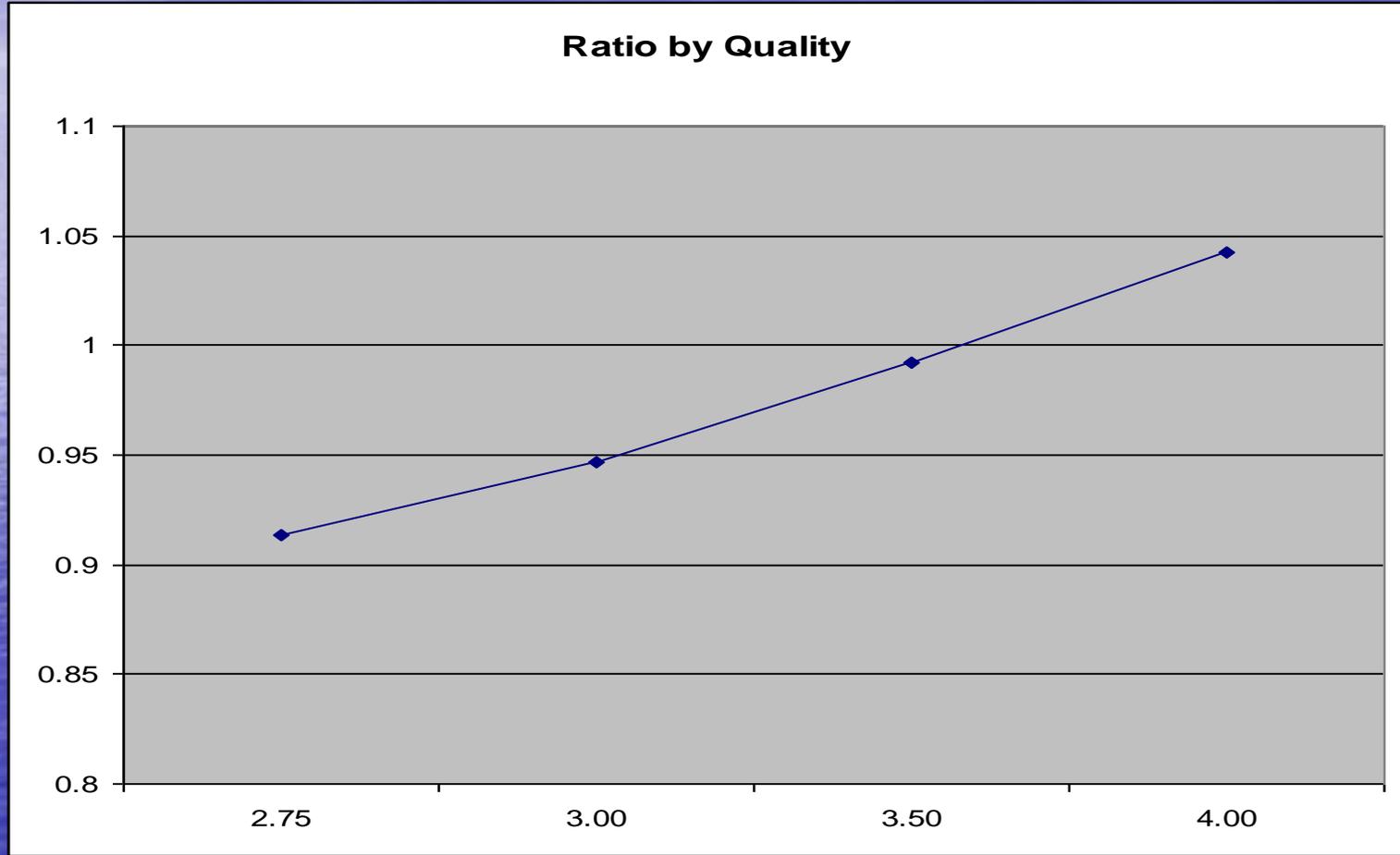
What is a likely area of adjustment to address this?

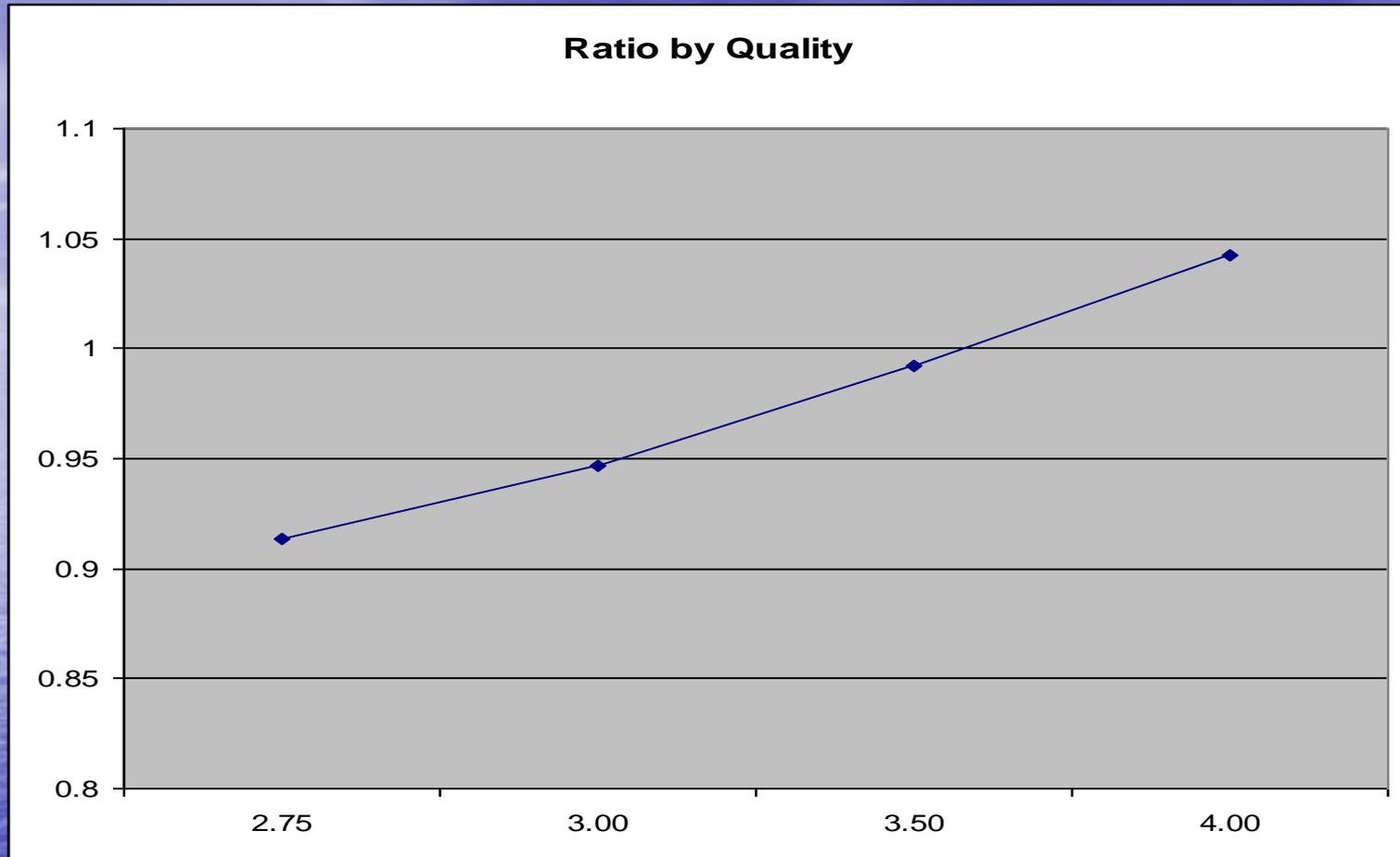
- Maybe the land value?

Are there other possible explanations?

- Outbuildings?
- Related characteristics or attributes like privacy?

# What do these statistics tell you?

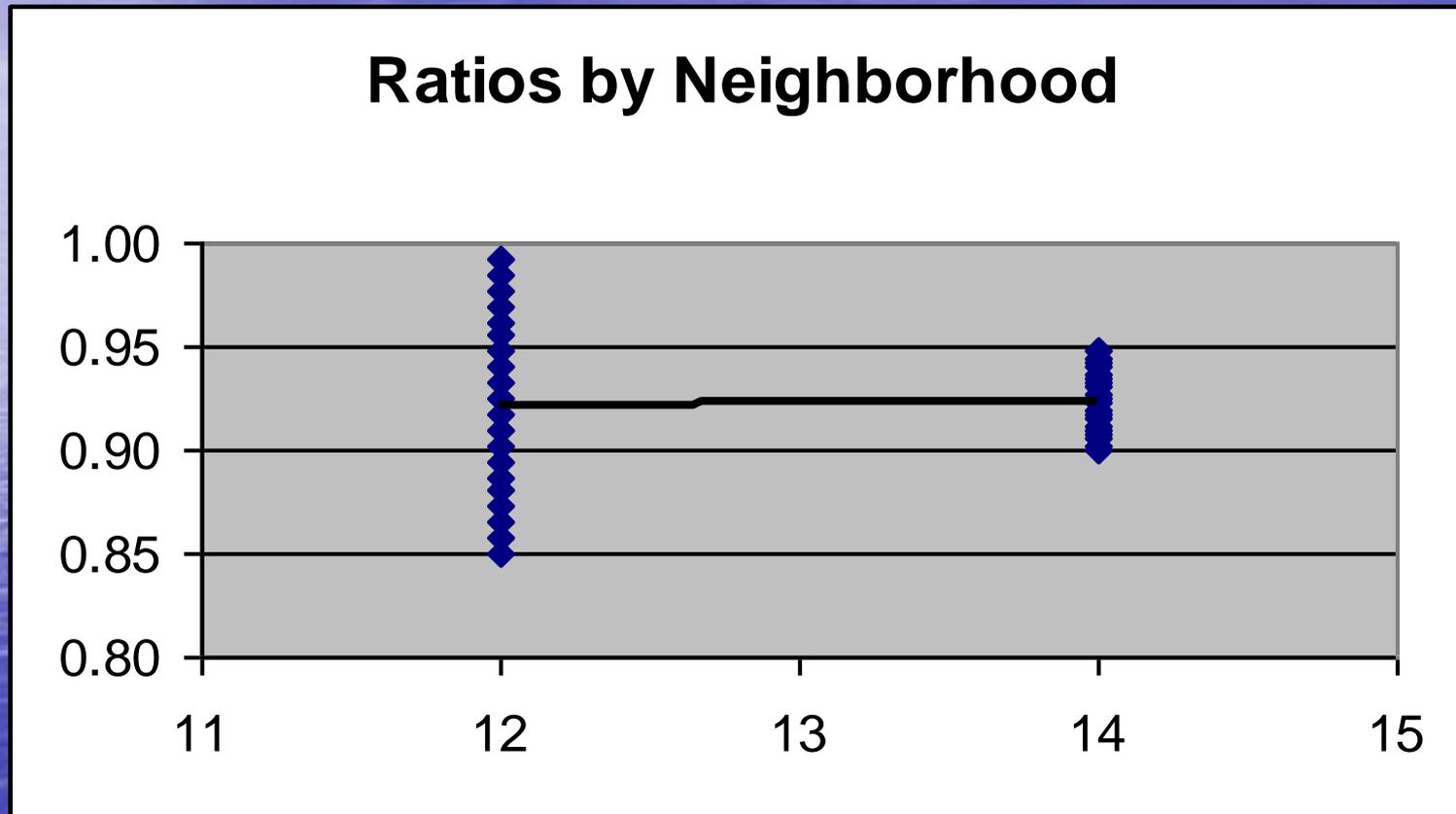




This graph indicates that lower quality homes are being undervalued and higher quality homes overvalued.

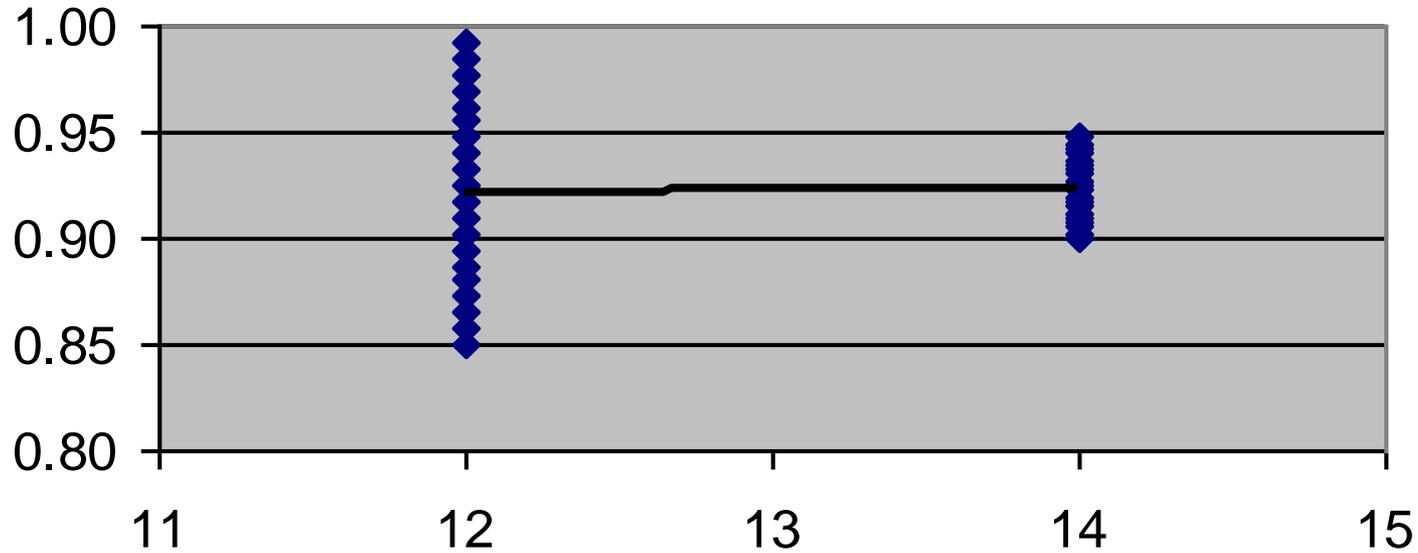
Two possible causes would be that your quality **adjustment** is too aggressive or that your **classification** is too aggressive

# What do these statistics tell you?



Note: These two neighborhoods had the same number of sales.

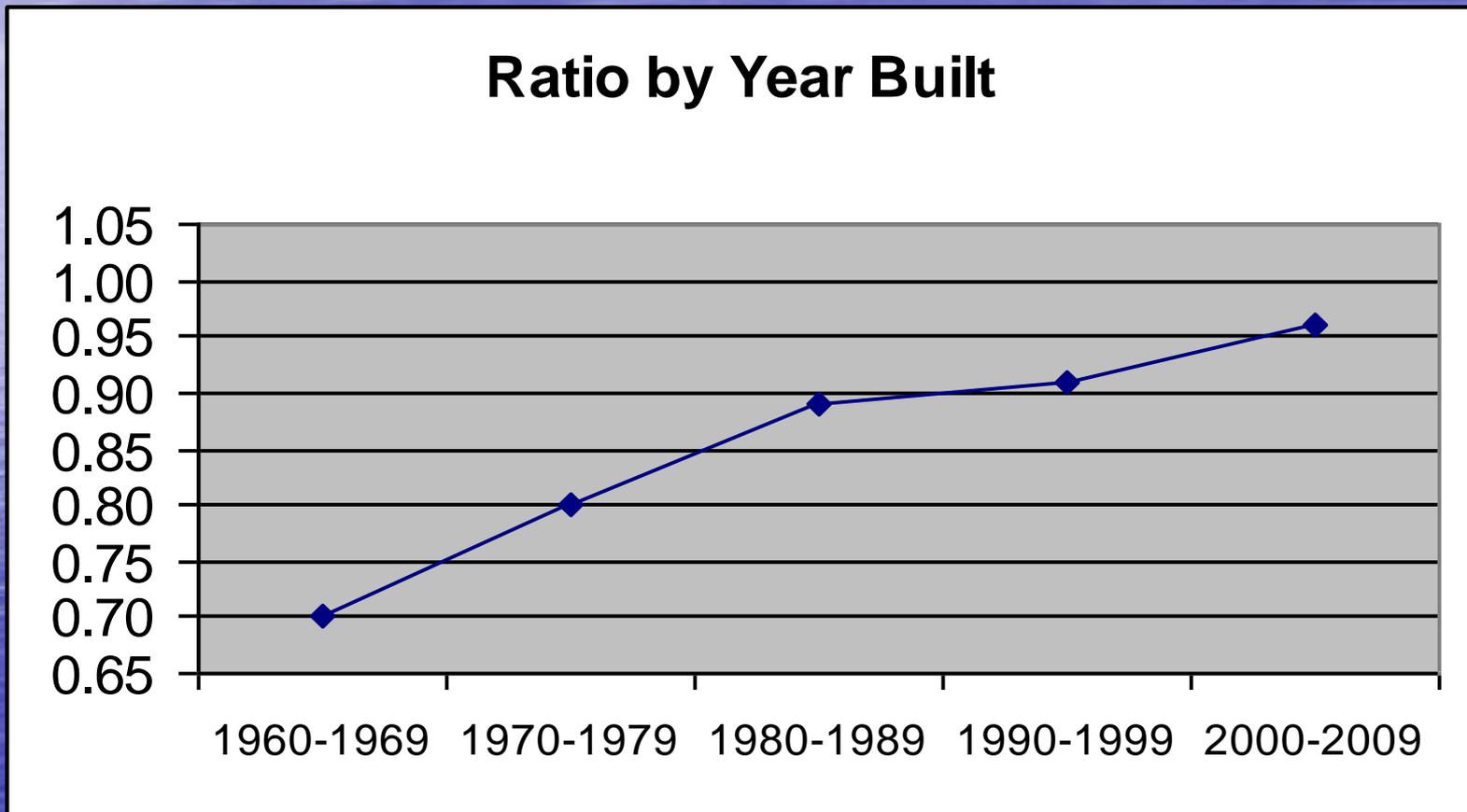
## Ratios by Neighborhood



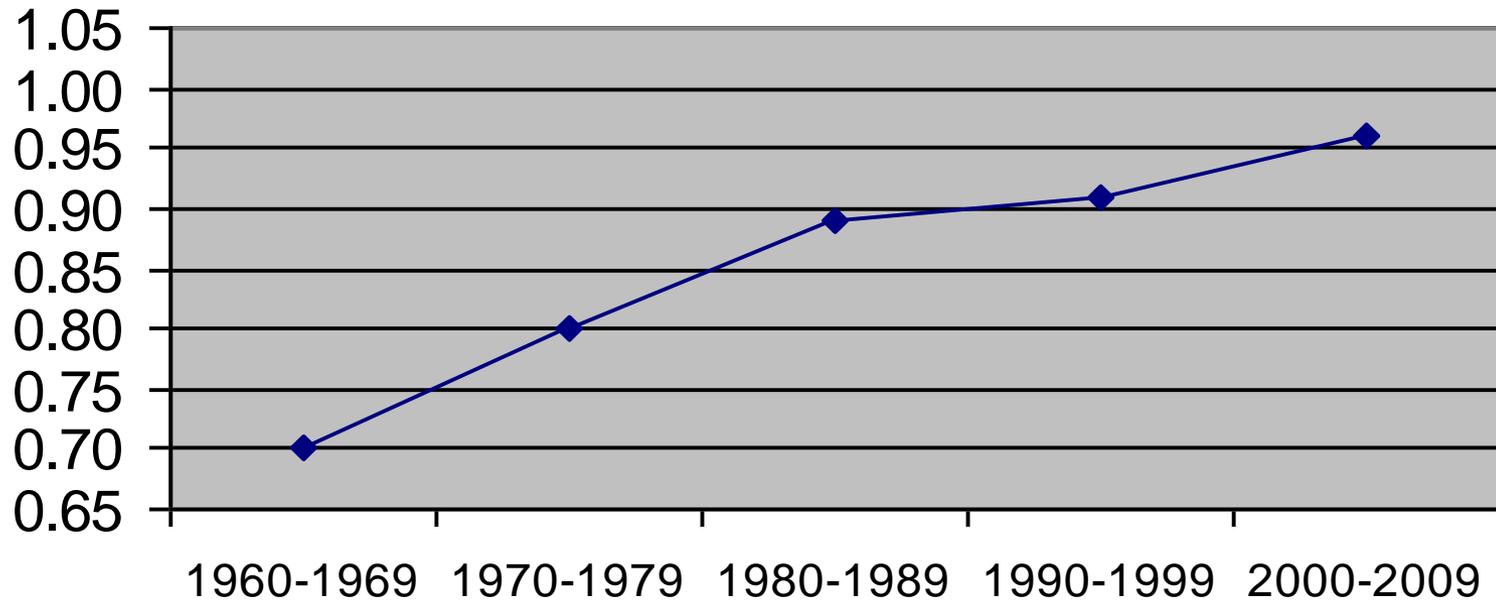
**The ratios for these two neighborhoods indicate equity in the sense of similar median ratios, however, Neighborhood 12 has a much larger range than Neighborhood 14, indicating that it could use some attention.**

Neighborhood 12 @ a range of 15% is 3 times that of Neighborhood 14 @ 5%.

# What do these statistics tell you?



## Ratio by Year Built

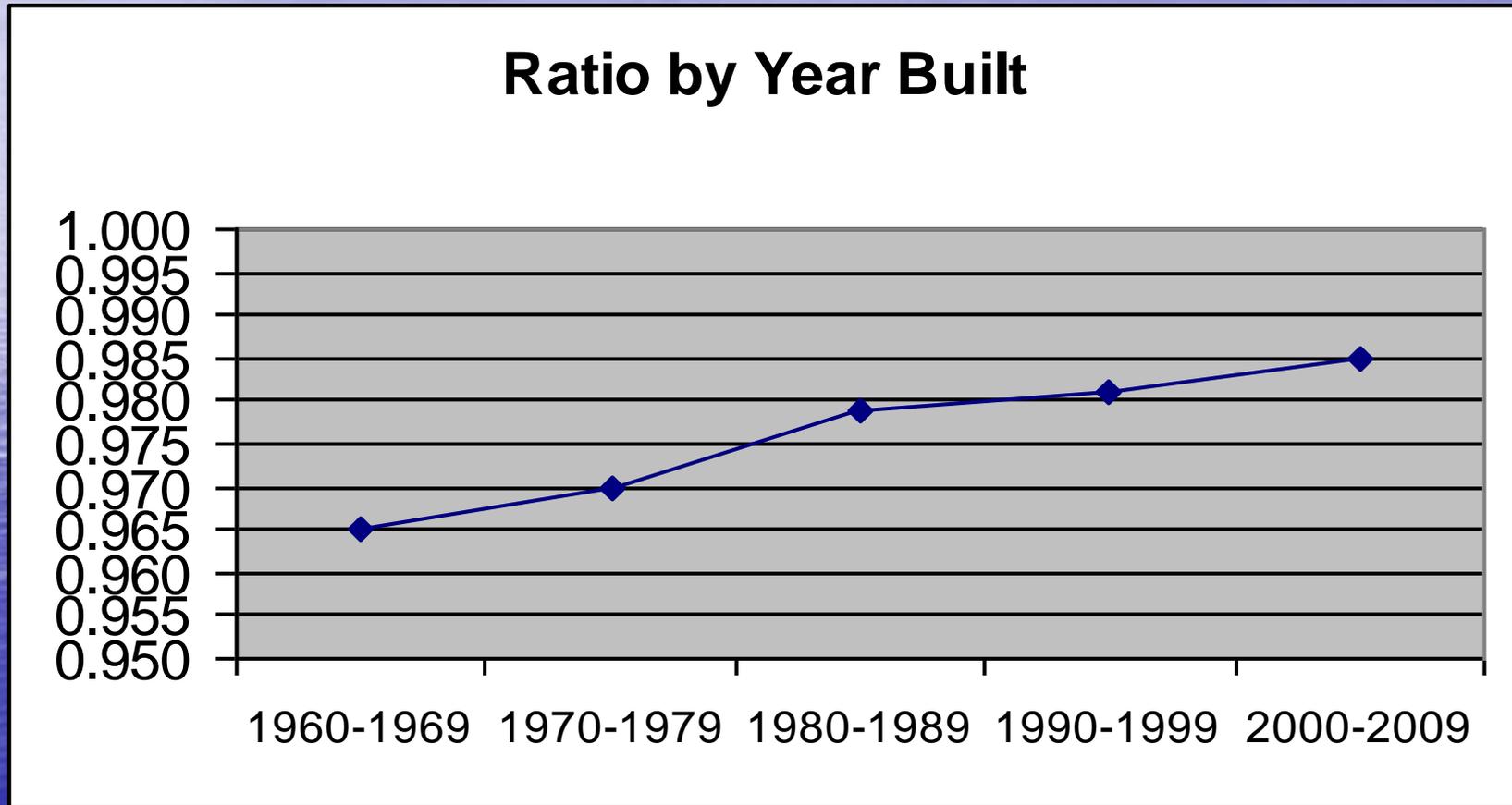


This graph shows how older homes are being valued at a lower level (ratio) than homes that are 10 to 30 years old and homes less than 10 years old are being valued at a higher level.

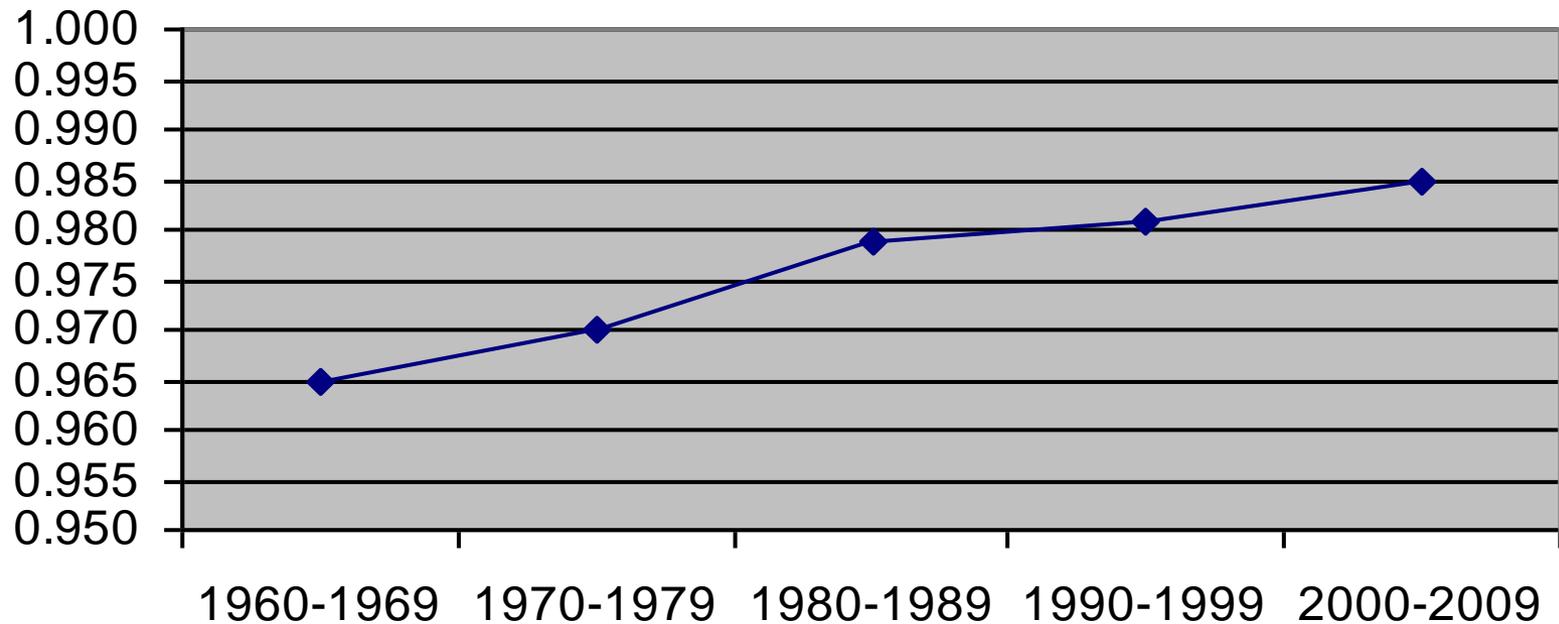
There are numerous possible causes. For example, it could involve one or more valuation issues (like effective age or quality classification) or it could be an issue with not picking up renovations on older homes.

# What do these statistics tell you?

Hint: Different Data, Similar look to chart.

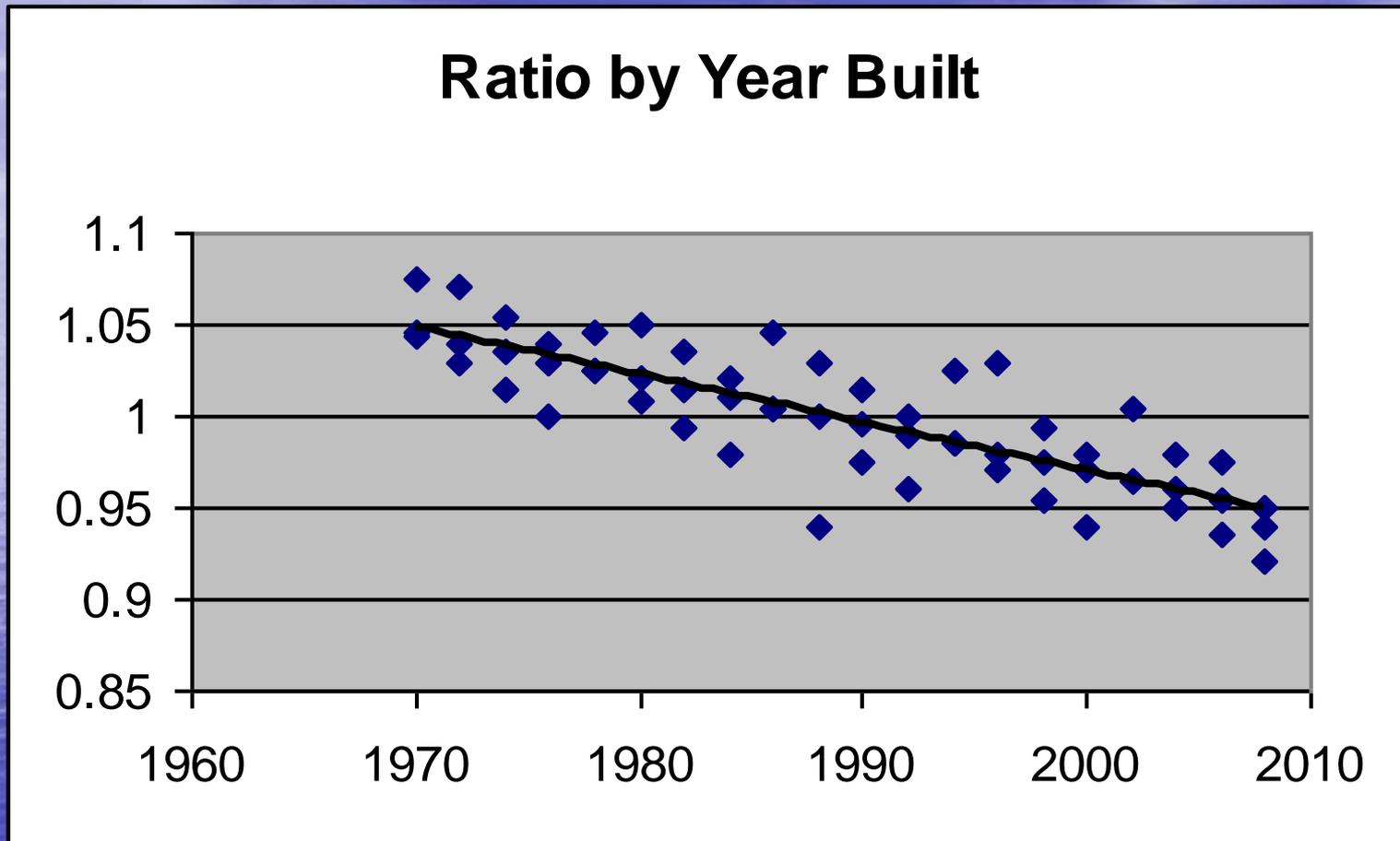


## Ratio by Year Built



Notice the scale on this one. It has the same trend as the previous one except the difference (range) here is only 0.02 (2%) from the lowest to the highest. You still might want to look at it as there appears to be a trend but any adjustment you make is going to be of a much finer nature.

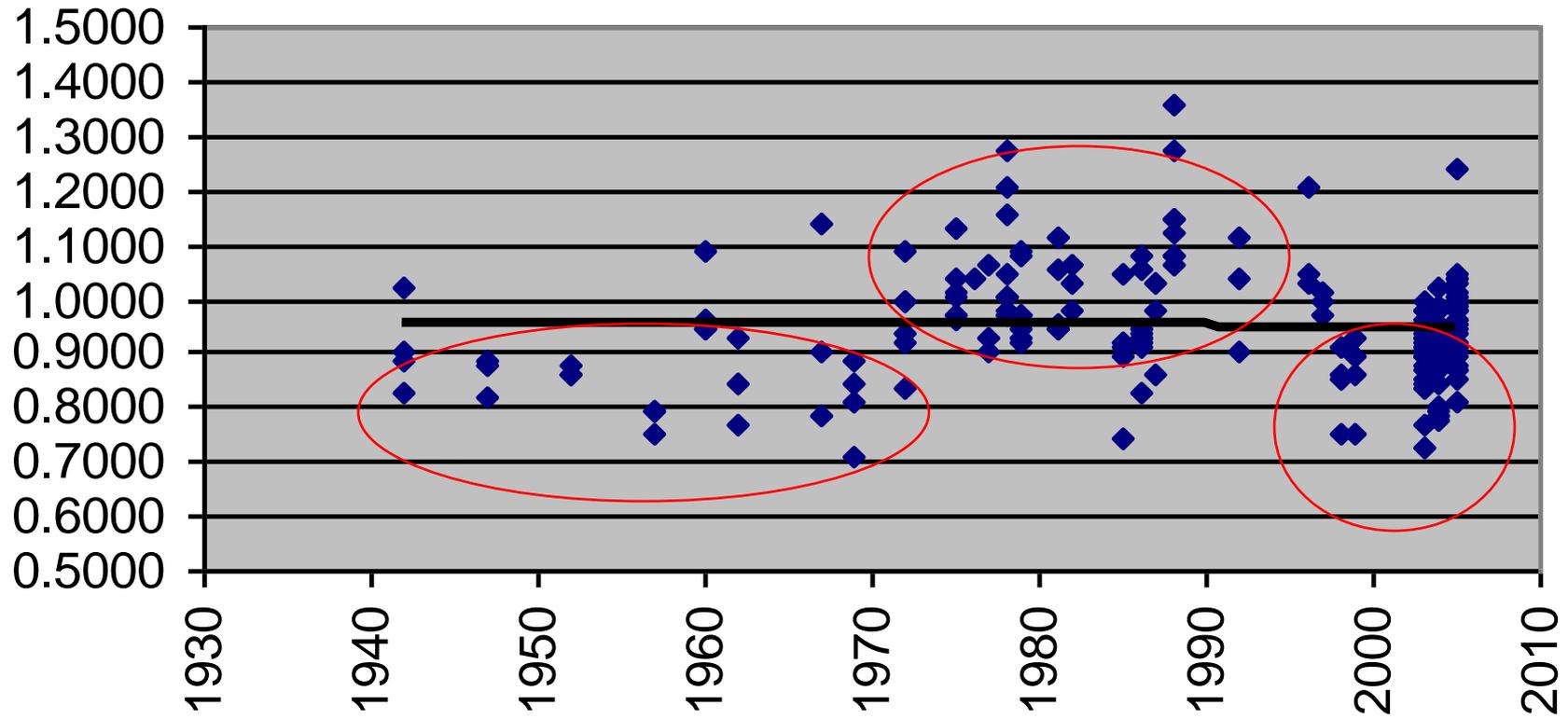
# Another chart by Year Built



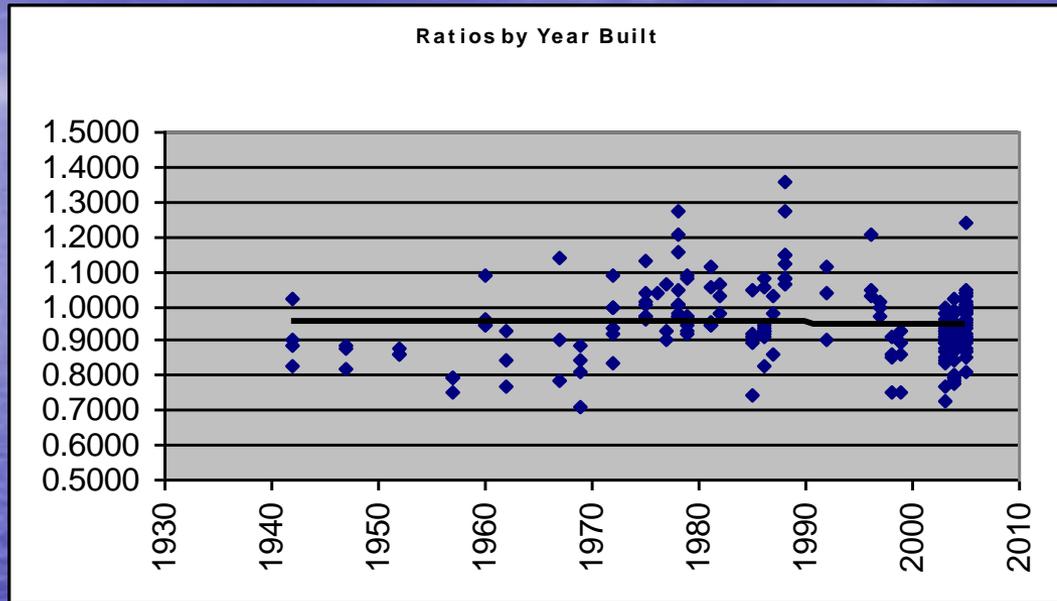
Here is a different example. A consistent pattern such as this one might alert you to issues with your Effective Age or depreciation determination. (Make sure you consider alternate causes.)

# Charts & Scatter Diagrams- Looking Beyond the Trendline

Ratios by Year Built



# Charts & Scatter Diagrams- Looking Beyond the Trendline

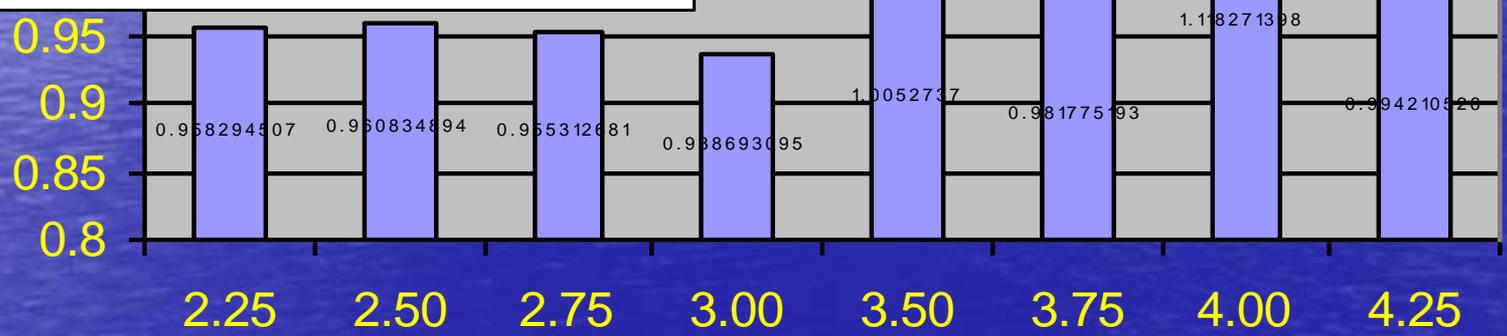
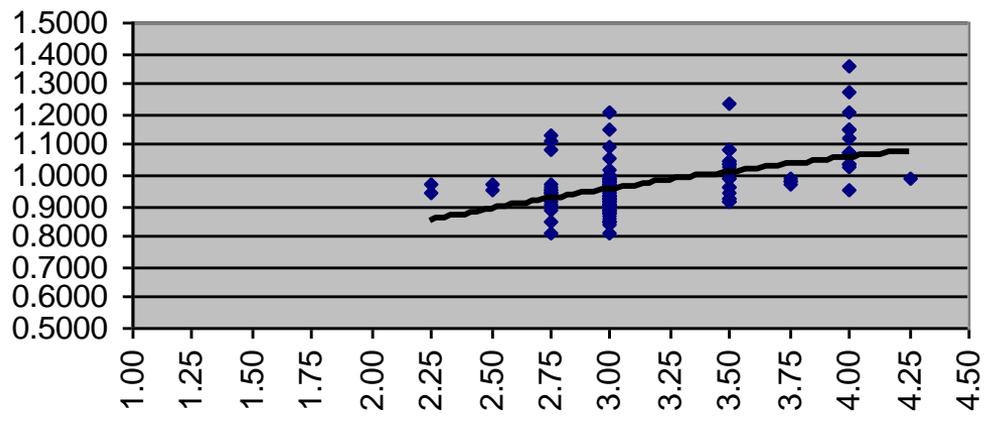


This would lead me to ask questions like:

- Is this reflecting something we are doing?
- Is it a market response to something that we are not picking up?
- Do we need to adjust our depreciation scale?
- Or ????????

# Advantages of Multiple References or Perspectives

Ratios by Improvement Quality



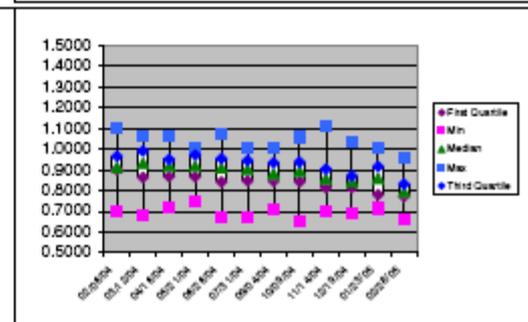
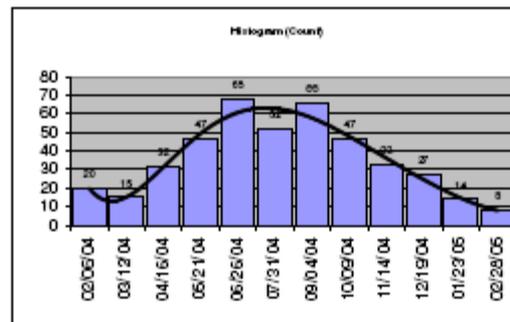
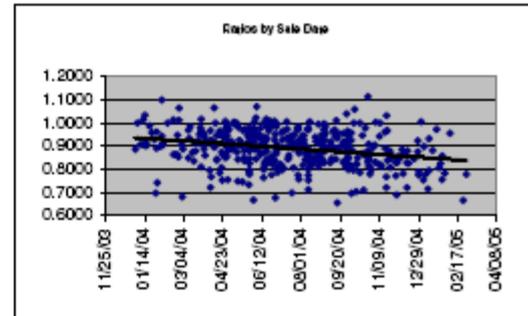
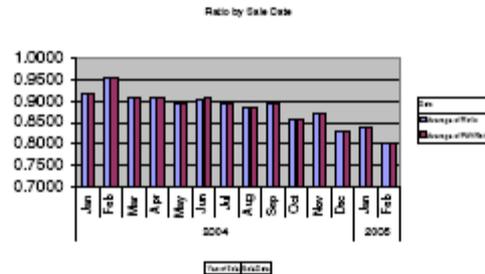
We have a fairly steep trendline (approx. 0.85 to 1.10) that is also fairly straight. However, when you look at the bar chart, while everything from 3.5 up trends higher and you would want to look at that, the 4.0 classification really stands out and begs for closer scrutiny.

# Statistical Analysis Utilizing STARS

## Actual Samples From STARS

Statistical Tables and Charts for Sale Date

| Data        |          | Count 429  |          | Min 01/02/04 | Median 07/20/04 | Max 02/28/05   |        |        |        |                |           |
|-------------|----------|------------|----------|--------------|-----------------|----------------|--------|--------|--------|----------------|-----------|
| Year        | SaleDate | e of Ratio | PAVRatio | Bins/Strats  | Count           | Ratios         |        |        |        |                |           |
| 2004        | Jan      | 0.9149     | 0.9149   | 01/01/04     | 0               | First Quartile | Min    | Median | Max    | Third Quartile | Notations |
|             | Feb      | 0.9516     | 0.9516   | 02/06/04     | 20              | 0.9012         | 0.6968 | 0.9132 | 1.0985 | 0.9672         |           |
|             | Mar      | 0.9087     | 0.9087   | 03/12/04     | 15              | 0.8639         | 0.6803 | 0.9330 | 1.0636 | 0.9914         |           |
|             | Apr      | 0.9065     | 0.9065   | 04/16/04     | 32              | 0.8688         | 0.7212 | 0.9197 | 1.0652 | 0.9513         |           |
|             | May      | 0.8959     | 0.8959   | 05/21/04     | 47              | 0.8684         | 0.7457 | 0.9193 | 1.0068 | 0.9715         |           |
|             | Jun      | 0.9024     | 0.9089   | 06/26/04     | 68              | 0.8432         | 0.6680 | 0.9117 | 1.0691 | 0.9563         |           |
|             | Jul      | 0.8918     | 0.8918   | 07/31/04     | 52              | 0.8477         | 0.6757 | 0.9042 | 1.0080 | 0.9460         |           |
|             | Aug      | 0.8948     | 0.8948   | 09/04/04     | 66              | 0.8451         | 0.7114 | 0.8815 | 1.0044 | 0.9350         |           |
|             | Sep      | 0.8939     | 0.8939   | 10/09/04     | 47              | 0.8446         | 0.6553 | 0.8951 | 1.0584 | 0.9386         |           |
|             | Oct      | 0.8579     | 0.8579   | 11/14/04     | 33              | 0.8157         | 0.7030 | 0.8580 | 1.1134 | 0.9044         |           |
|             | Nov      | 0.8716     | 0.8716   | 12/19/04     | 27              | 0.8164         | 0.6886 | 0.8444 | 1.0308 | 0.8712         |           |
|             | Dec      | 0.8285     | 0.8285   | 01/23/05     | 14              | 0.7816         | 0.7152 | 0.8595 | 1.0053 | 0.9167         |           |
| 2004 Total  |          | 0.8916     | 0.8925   | 02/28/05     | 8               | 0.7722         | 0.6650 | 0.7950 | 0.9550 | 0.8326         |           |
| 2005        | Jan      | 0.8400     | 0.8400   |              |                 |                |        |        |        |                |           |
|             | Feb      | 0.7994     | 0.7994   |              |                 |                |        |        |        |                |           |
| 2005 Total  |          | 0.8328     | 0.8328   |              |                 |                |        |        |        |                |           |
| Grand Total |          | 0.8893     | 0.8902   |              |                 |                |        |        |        |                |           |

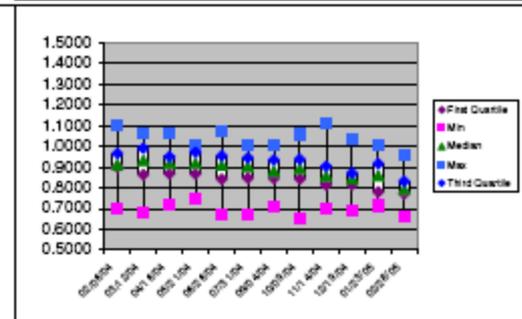
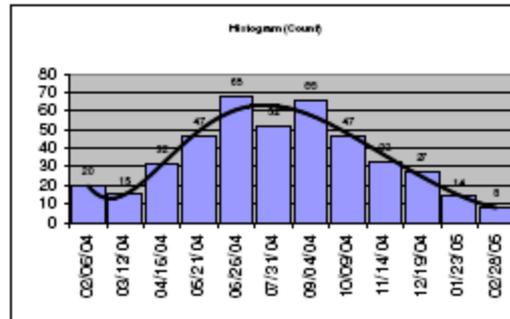
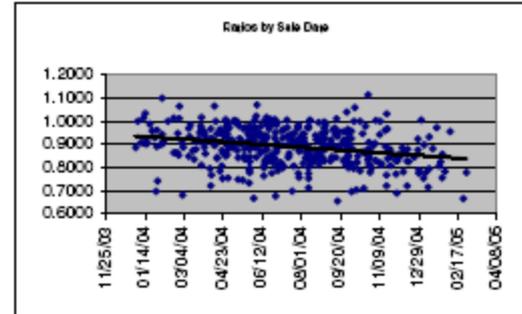
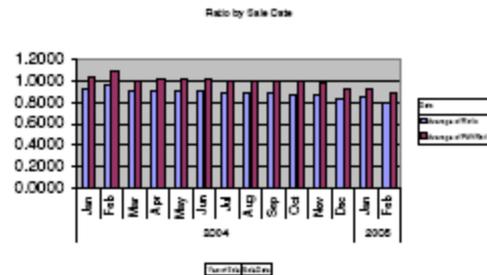


# Statistical Analysis Utilizing STARS

## Actual Samples From STARS

Statistical Tables and Charts for Sale Date

| Data        |          | Count 429 |          | Min 01/02/04 |       | Median 07/20/04 |        | Max 02/28/05 |        |           |          |
|-------------|----------|-----------|----------|--------------|-------|-----------------|--------|--------------|--------|-----------|----------|
| Year        | SaleDate | Ratio     | PAVRatio | Bins/Strats  | Count | Ratios          |        |              |        | Notations |          |
|             |          |           |          |              |       | First           |        |              |        |           | Third    |
|             |          |           |          |              |       | Quartile        | Min    | Median       | Max    |           | Quartile |
| 2004        | Jan      | 0.9149    | 1.0332   | 01/01/04     | 0     |                 |        |              |        |           |          |
|             | Feb      | 0.9516    | 1.0919   | 02/06/04     | 20    | 0.9012          | 0.6968 | 0.9132       | 1.0985 | 0.9672    |          |
|             | Mar      | 0.9087    | 1.0007   | 03/12/04     | 15    | 0.8639          | 0.6803 | 0.9330       | 1.0636 | 0.9914    |          |
|             | Apr      | 0.9065    | 1.0103   | 04/16/04     | 32    | 0.8688          | 0.7212 | 0.9197       | 1.0652 | 0.9513    |          |
|             | May      | 0.8959    | 1.0142   | 05/21/04     | 47    | 0.8684          | 0.7457 | 0.9193       | 1.0068 | 0.9715    |          |
|             | Jun      | 0.9024    | 1.0062   | 06/26/04     | 68    | 0.8432          | 0.6680 | 0.9117       | 1.0691 | 0.9563    |          |
|             | Jul      | 0.8918    | 0.9964   | 07/31/04     | 52    | 0.8477          | 0.6757 | 0.9042       | 1.0080 | 0.9460    |          |
|             | Aug      | 0.8848    | 0.9949   | 09/04/04     | 66    | 0.8451          | 0.7114 | 0.8815       | 1.0044 | 0.9350    |          |
|             | Sep      | 0.8939    | 0.9984   | 10/09/04     | 47    | 0.8446          | 0.6553 | 0.8951       | 1.0584 | 0.9386    |          |
|             | Oct      | 0.8579    | 0.9996   | 11/14/04     | 33    | 0.8157          | 0.7030 | 0.8580       | 1.1134 | 0.9044    |          |
|             | Nov      | 0.8716    | 0.9841   | 12/19/04     | 27    | 0.8164          | 0.6886 | 0.8444       | 1.0308 | 0.8712    |          |
|             | Dec      | 0.8285    | 0.9294   | 01/23/05     | 14    | 0.7816          | 0.7152 | 0.8595       | 1.0053 | 0.9167    |          |
| 2004 Total  |          | 0.8916    | 1.0022   | 02/28/05     | 8     | 0.7722          | 0.6650 | 0.7950       | 0.9550 | 0.8326    |          |
| 2005        | Jan      | 0.8400    | 0.9271   |              |       |                 |        |              |        |           |          |
|             | Feb      | 0.7994    | 0.8915   |              |       |                 |        |              |        |           |          |
| 2005 Total  |          | 0.8328    | 0.9208   |              |       |                 |        |              |        |           |          |
| Grand Total |          | 0.8893    | 0.9990   |              |       |                 |        |              |        |           |          |



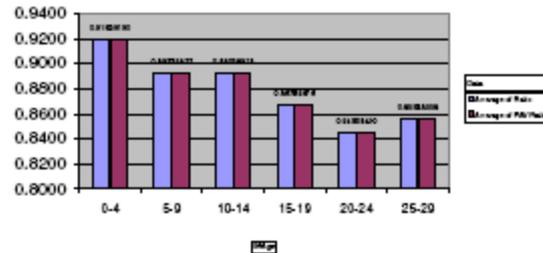
# Statistical Analysis Utilizing STARS

## Actual Samples From STARS

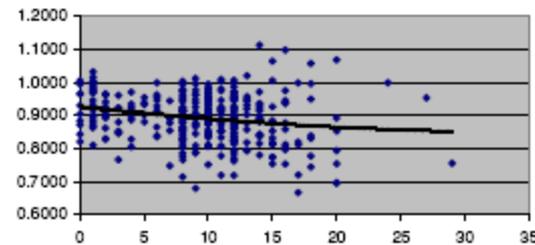
Statistical Tables and Charts for Effective Age

| Data        |        |          | Count 333   | Min 0 | Median 10      | Max 29 |        |        |                |           |
|-------------|--------|----------|-------------|-------|----------------|--------|--------|--------|----------------|-----------|
| EffAge      | Ratio  | PAVRatio | Bins/Strats | Count | Ratios         |        |        |        |                |           |
|             |        |          |             |       | First Quartile | Min    | Median | Max    | Third Quartile | Notations |
| 0-4         | 0.9190 | 0.9190   | 0           | 11    |                |        |        |        |                |           |
| 5-9         | 0.8922 | 0.8922   | 5           | 54    | 0.8814         | 0.7675 | 0.9230 | 1.0333 | 0.9659         |           |
| 10-14       | 0.8923 | 0.8923   | 10          | 121   | 0.8515         | 0.6803 | 0.9031 | 1.0131 | 0.9449         |           |
| 15-19       | 0.8676 | 0.8676   | 15          | 114   | 0.8366         | 0.7200 | 0.8886 | 1.1134 | 0.9340         |           |
| 20-24       | 0.8450 | 0.8450   | 20          | 30    | 0.7826         | 0.6680 | 0.8355 | 1.0985 | 0.9436         |           |
| 25-29       | 0.8558 | 0.8558   | 25          | 1     | 1.0000         | 1.0000 | 1.0000 | 1.0000 | 1.0000         |           |
| Grand Total | 0.8931 | 0.8931   | 30          | 2     | 0.8062         | 0.7567 | 0.8558 | 0.9550 | 0.9054         |           |
|             |        |          | 35          | 0     | #NUM!          | 0.0000 | #NUM!  | 0.0000 | #NUM!          |           |
|             |        |          | 40          | 0     | #NUM!          | 0.0000 | #NUM!  | 0.0000 | #NUM!          |           |
|             |        |          | 45          | 0     | #NUM!          | 0.0000 | #NUM!  | 0.0000 | #NUM!          |           |
|             |        |          | 150         | 0     | #NUM!          | 0.0000 | #NUM!  | 0.0000 | #NUM!          |           |

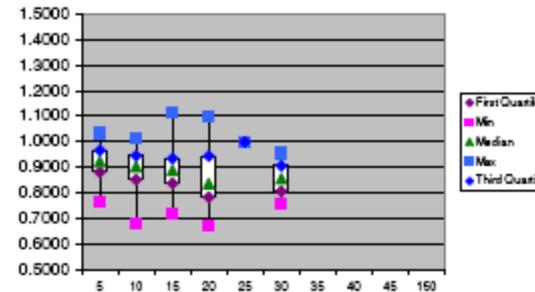
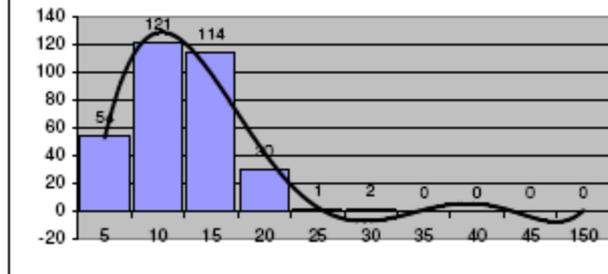
Ratio by Effective Age



Ratios by Effective Age



Histogram (Count)



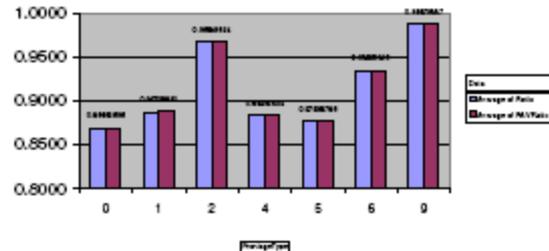
# Statistical Analysis Utilizing STARS

## Actual Samples From STARS

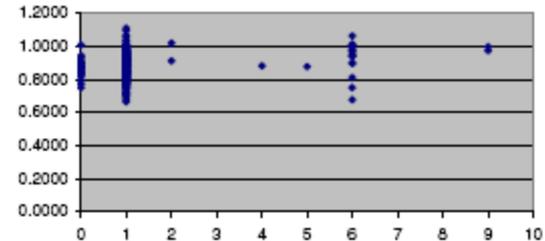
**Statistical Tables and Charts for Frontage Type**

| Data     |                | Count 385   | Min 0 | Median 1       | Max 9  |        |        |                |              |
|----------|----------------|-------------|-------|----------------|--------|--------|--------|----------------|--------------|
| Frontage | Ratio PAVRatio | Bins/Strats | Count | Ratios         |        |        |        |                | Notations    |
|          |                |             |       | First Quartile | Min    | Median | Max    | Third Quartile |              |
| 0        | 0.8696 0.8696  | -0.0001     | 0     |                |        |        |        |                | 0- Condo     |
| 1        | 0.8879 0.8891  | 0.0         | 26    | 0.8391         | 0.7529 | 0.8754 | 1.0112 | 0.8984         | 1- Upland    |
| 2        | 0.9684 0.9684  | 1.0         | 336   | 0.8416         | 0.6680 | 0.8912 | 1.1134 | 0.9437         | 2- River     |
| 4        | 0.8853 0.8853  | 2.0         | 2     | 0.9418         | 0.9153 | 0.9684 | 1.0214 | 0.9949         | 3- Pond      |
| 5        | 0.8786 0.8786  | 3.0         | 0     | #NUM!          | 0.0000 | #NUM!  | 0.0000 | #NUM!          | 4- Lake      |
| 6        | 0.9356 0.9356  | 4.0         | 1     | 0.8853         | 0.8853 | 0.8853 | 0.8853 | 0.8853         | 5- Tidal     |
| 9        | 0.9887 0.9887  | 5.0         | 1     | 0.8786         | 0.8786 | 0.8786 | 0.8786 | 0.8786         | 6- Saltwater |
| Grand T  | 0.8897 0.8907  | 6.0         | 17    | 0.9003         | 0.6803 | 0.9719 | 1.0652 | 1.0000         | 7-           |
|          |                | 7.0         | 0     | #NUM!          | 0.0000 | #NUM!  | 0.0000 | #NUM!          | 8-           |
|          |                | 8.0         | 0     | #NUM!          | 0.0000 | #NUM!  | 0.0000 | #NUM!          | 9- Remote    |
|          |                | 9.0         | 2     | 0.9831         | 0.9774 | 0.9887 | 1.0000 | 0.9944         |              |
|          |                |             |       |                |        |        |        |                |              |

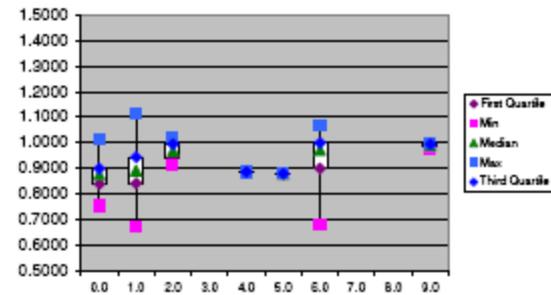
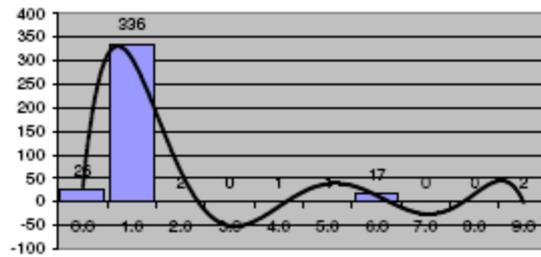
Ratio by Frontage Type



Ratios by Frontage Type



Histogram (Count)



# Statistical Analysis Utilizing STARS

## Actual Samples From STARS

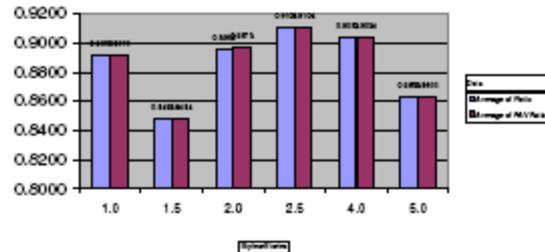
**Statistical Tables and Charts for Style or Stories**

| Data    |             |           | Count 390   | Min 1.00 | Median 2.00    | Max 5.00 |        |        |                |
|---------|-------------|-----------|-------------|----------|----------------|----------|--------|--------|----------------|
| Style   | Se of Ratio | PAV Ratio | Bins/Strats | Count    | Ratios         |          |        |        |                |
|         |             |           |             |          | First Quartile | Min      | Median | Max    | Third Quartile |
| 1.0     | 0.8919      | 0.8919    | 0.9999      | 0        |                |          |        |        |                |
| 1.5     | 0.8484      | 0.8484    | 1.00        | 155      | 0.8404         | 0.6650   | 0.8902 | 1.0985 | 0.9492         |
| 2.0     | 0.8952      | 0.8973    | 1.50        | 22       | 0.7976         | 0.6680   | 0.8515 | 1.0584 | 0.8915         |
| 2.5     | 0.9104      | 0.9104    | 2.00        | 180      | 0.8454         | 0.6553   | 0.9115 | 1.1134 | 0.9477         |
| 4.0     | 0.9034      | 0.9034    | 2.50        | 7        | 0.8374         | 0.7817   | 0.8917 | 1.0160 | 1.0043         |
| 5.0     | 0.8633      | 0.8633    | 3.00        | 0        | #NUM!          | 0.0000   | #NUM!  | 0.0000 | #NUM!          |
| Grand T | 0.8915      | 0.8925    | 4.00        | 21       | 0.8759         | 0.7675   | 0.9016 | 1.0032 | 0.9550         |
|         |             |           | 5.00        | 5        | 0.8458         | 0.8348   | 0.8537 | 0.9060 | 0.8760         |

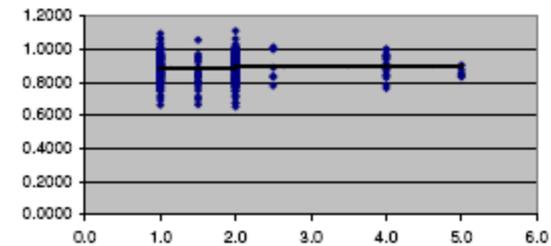
**Notations**

- 1= 1 Story
- 1.5= 1.5 Story
- 2= 2 Story
- 2.5= 2.5 Story
- 3=
- 4= Multi Story
- 5= Split Level

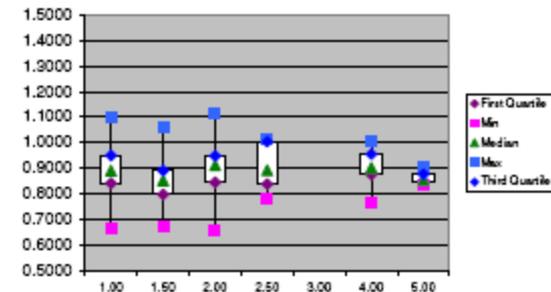
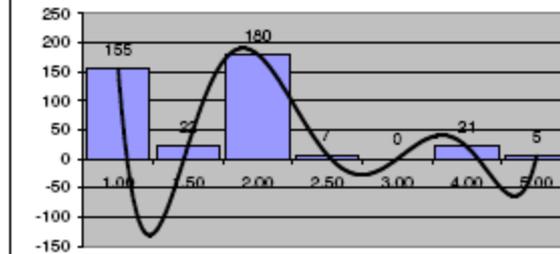
Ratio by Improvement Style



Ratios by Improvement Style or Stories



Histogram (Count)



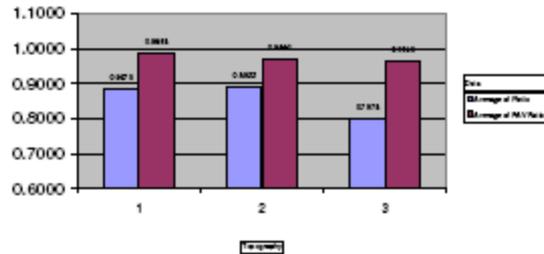
# Statistical Analysis Utilizing STARS

## Actual Samples From STARS

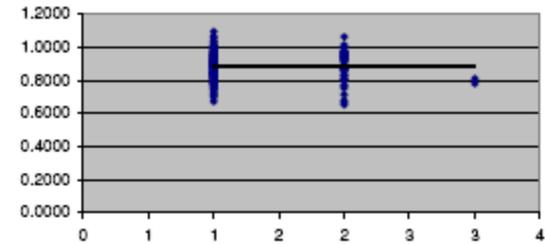
**Statistical Tables and Charts for Topography**

| Data    |                | Count 305   |        | Min 1    |        | Median 1 |        | Max 3    |           |                               |
|---------|----------------|-------------|--------|----------|--------|----------|--------|----------|-----------|-------------------------------|
| Topogra | Ratio PAVRatio | Bins/Strats | Count  | Ratios   |        |          |        |          |           |                               |
|         |                |             |        | First    | Min    | Median   | Max    | Third    | Notations |                               |
|         |                |             |        | Quartile |        |          |        | Quartile |           |                               |
| 1       | 0.8875         | 0.9868      | 0.0000 | 0        | #NUM!  | 0.0000   | #NUM!  | 0.0000   | #NUM!     | 1= Level                      |
| 2       | 0.8922         | 0.9693      | 0.5    | 0        | 0.8420 | 0.6757   | 0.8899 | 1.0985   | 0.9352    | 2= Moderate                   |
| 3       | 0.7978         | 0.9645      | 1.5    | 0        | #NUM!  | 0.0000   | #NUM!  | 0.0000   | #NUM!     | 3= Steep                      |
| Grand T | 0.8876         | 0.9838      | 2.0    | 49       | 0.8395 | 0.6553   | 0.9246 | 1.0652   | 0.9562    | Proposed AV include \$40,000  |
|         |                |             | 2.5    | 0        | #NUM!  | 0.0000   | #NUM!  | 0.0000   | #NUM!     | increase adjustment to Topo 3 |
|         |                |             | 3.0    | 2        | 0.7904 | 0.7829   | 0.7978 | 0.8127   | 0.8052    | (steep) properties.           |
|         |                |             | 3.5    | 0        | #NUM!  | 0.0000   | #NUM!  | 0.0000   | #NUM!     |                               |
|         |                |             | 4.0    | 0        | #NUM!  | 0.0000   | #NUM!  | 0.0000   | #NUM!     |                               |
|         |                |             | 4.5    | 0        | #NUM!  | 0.0000   | #NUM!  | 0.0000   | #NUM!     |                               |
|         |                |             | 5.0    | 0        | #NUM!  | 0.0000   | #NUM!  | 0.0000   | #NUM!     |                               |

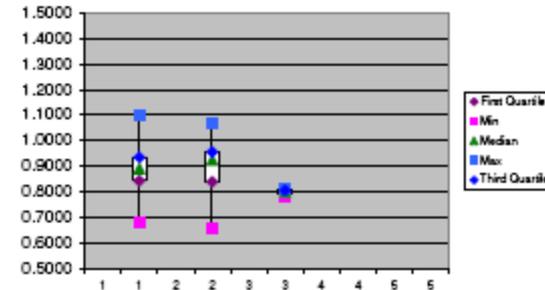
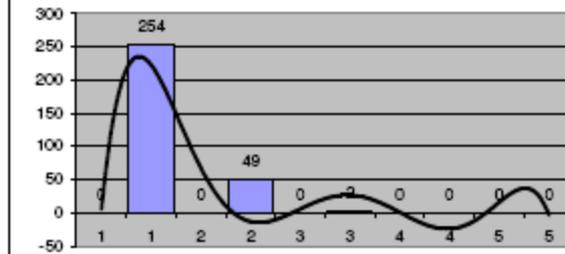
Ratio by Topography



Ratios by Topography



Histogram (Count)



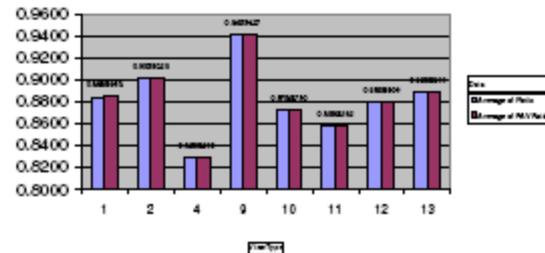
# Statistical Analysis Utilizing STARS

## Actual Samples From STARS

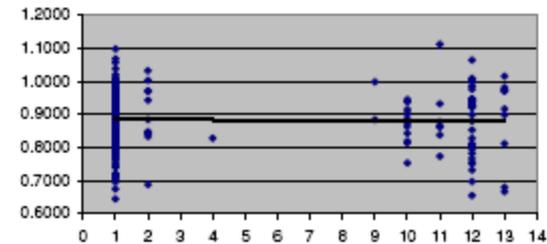
Statistical Tables and Charts for View Type

| Data        |                         | Count 341   |        | Min 1    |        | Median 1 |        | Max 13   |        | Notations<br>1=Territorial, 2=Mt.Distant,<br>3=Mt.Filtered, 4=Mt.Good,<br>5=Mt.Panoramic, 6=Pond,<br>7=Lake/River-Distant, 8=Lake/River-<br>Filtered, 9=Lake/River-Good,<br>10=Saltwater-Distant, 11=Saltwater-<br>Filtered, 12=Saltwater-Good,<br>13=Saltwater-Panoramic |
|-------------|-------------------------|-------------|--------|----------|--------|----------|--------|----------|--------|---|
| ViewType    | Ratio of Ratio PAVRatio | Bins/Strats | Count  | Ratios   |        |          |        |          |        |   |
|             |                         |             |        | First    | Min    | Median   | Max    | Third    |        |   |
|             |                         |             |        | Quartile |        |          |        | Quartile |        |   |
| 1           | 0.8849                  | 0.8863      | 0.9999 | 0        | 0.8394 | 0.6456   | 0.8899 | 1.0985   | 0.9390 |   |
| 2           | 0.9025                  | 0.9025      | 2.2    | 278      | 0.8394 | 0.6456   | 0.8899 | 1.0985   | 0.9390 |   |
| 4           | 0.8290                  | 0.8290      | 3.4    | 0        | #NUM!  | 0.0000   | #NUM!  | 0.0000   | #NUM!  |   |
| 9           | 0.9427                  | 0.9427      | 4.6    | 1        | 0.8290 | 0.8290   | 0.8290 | 0.8290   | 0.8290 |   |
| 10          | 0.8730                  | 0.8730      | 5.8    | 0        | #NUM!  | 0.0000   | #NUM!  | 0.0000   | #NUM!  |   |
| 11          | 0.8592                  | 0.8592      | 7.0    | 0        | #NUM!  | 0.0000   | #NUM!  | 0.0000   | #NUM!  |   |
| 12          | 0.8809                  | 0.8809      | 8.2    | 0        | #NUM!  | 0.0000   | #NUM!  | 0.0000   | #NUM!  |   |
| 13          | 0.8899                  | 0.8899      | 9.4    | 2        | 0.9140 | 0.8853   | 0.9427 | 1.0000   | 0.9713 |   |
| Grand Total | 0.8844                  | 0.8856      | 10.6   | 13       | 0.8442 | 0.7546   | 0.8802 | 0.9467   | 0.9043 |   |
|             |                         |             | 11.8   | 7        | 0.8513 | 0.7747   | 0.8661 | 1.1134   | 0.9059 |   |
|             |                         |             | 13.0   | 40       | 0.8045 | 0.6553   | 0.9239 | 1.0652   | 0.9722 |   |

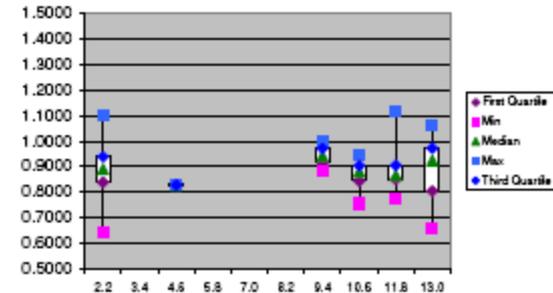
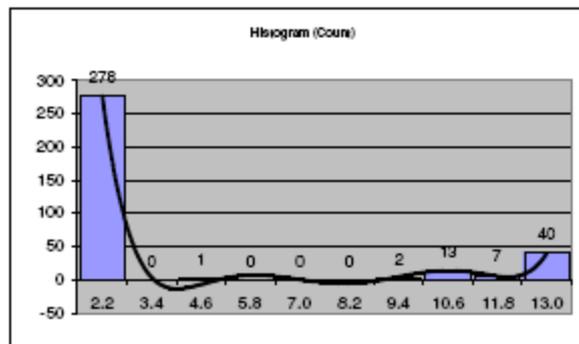
Ratio by View Type



Ratios by View Type



Histogram (Counts)



# Statistical Analysis Utilizing an Excel Template

Now lets take a look at STARS.