Introduction

An economic bubble occurs when a commodity (such as housing) is traded in high volumes at prices that exceed its intrinsic value. Prices and volume eventually rise to unsustainable levels and the bubble "bursts," with a sharp decline in both. The US housing bubble began to develop in 2000, peaked in 2005, and declined over the next three years. Currently, the market is recovering, but not at the growth rates of the early 2000's when the bubble was forming. With data from the National Association of Realtors (www.realtor.org) we explore the bubble and the burst, considering sales and median sale price of preexisting single family homes in four quadrants of the US from 2000 to 2013.

Sales

1. In the February 2014 Marketplace Money podcast, "This won't make you feel better about the housing recovery, " reporter Sarah Gardner offers the following:

   Big picture: The U.S. housing market is recovering, but that recovery is weakening.

   PodCast (2 minutes) http://www.marketplace.org/topics/economy/wont-make-you-feel-better-about-housing-recovery

a. Let \( S(t) \) represents the number of houses sold as a function of the year \( t \). (Circle one)

   According to Gardner's report, in February 2014, \( S(t) \) is increasing / decreasing, and \( S'(t) \) is increasing / decreasing.

b. Add points to the graph for 2014 and 2015 to show a recovering market for which the recovery is weakening.

c. To check that the sales levels you chose do show a weakening recovery, estimate the average rates of change in sales for each interval below. To show a weakening recovery, the average rates of change should be positive / negative and should increase / decrease.

   between 2012 and 2013 | between 2013 and 2014 | between 2014 and 2015
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Prices
2. In the January 2014 Marketplace Money podcast entitled, "What will the housing market look like in 2014?" Economist Svenja Gudell, director of economic research at Zillow, says she does not expect another housing crash. She says, "You have more banks selling their foreclosures and you have more people freed from being underwater [allowing them to sell without remaining in debt], so supply will increase."

Gudell says as housing supply increases, growth in home prices will slow. She predicts a 3% to 5 percent growth in 2014.


<table>
<thead>
<tr>
<th>Year</th>
<th>Median sale price of preexisting homes in the US</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>$166,100</td>
</tr>
<tr>
<td>2012</td>
<td>$176,800</td>
</tr>
<tr>
<td>2013</td>
<td>$197,100</td>
</tr>
<tr>
<td>2014</td>
<td></td>
</tr>
</tbody>
</table>

a. Let $P(t)$ represents the median home price as a function of the year $t$. (Circle one) When Gurdell asserts that growth in home prices will slow, she says $P(t)$ will be increasing / decreasing, and $P'(t)$ will be increasing / decreasing.

b. Find the percentage increase in median home prices in the US between 2011 and 2012, and between 2012 and 2013.

c. Give an example of a median price for 2014 that is consistent with Gudell's predicted 3 to 5 percent increase. Add your value to the table above. What is the percent increase for your prediction?

Reading the charts
3. Excel allows you to display two different vertical axes in the same chart. For example, the chart below shows the number of homes sold, plotted against the scale on the left, and the median sale price, plotted against the scale on the right.

**Check your understanding:**
Estimate the median sale price of existing homes in 2010 from the graph.

Estimate the number of sales of existing homes in 2010 from the graph.

What does the intersection of these two graphs (between 2003 and 2004) represent?
Data and Sample Calculations
The file Excel Project 2 Data.xlsx includes three tabs.
- The first tab contains data on existing home sales by region.
- The second tab contains sample calculations for the Group Component.
- The third tab contains sample calculations for the Individual Component.

Rubric
This assignment includes a Group Component (50%) and an Individual Component (50%). The requirements summarized here are described in detail in the pages that follow.

<table>
<thead>
<tr>
<th>Group Component (submit 1 report per group)</th>
<th>40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typed report with correct grammar and spelling, and all required content (see Step 6)</td>
<td></td>
</tr>
<tr>
<td>In-Class Worksheet (must attend to obtain credit)</td>
<td>10%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual Component (submit 1 report and 1 worksheet per group member)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Typed report with correct grammar and spelling, and all required content (see Step 10)</td>
<td>45%</td>
</tr>
<tr>
<td>An acknowledgement of participation (see Step 11)</td>
<td>5%</td>
</tr>
</tbody>
</table>

You can do this before getting together with your group:

Step 1: Read and listen to news from the housing sector
The two podcasts discuss predictions for the 2014 real estate market. These were discussed in the Worksheet. The newspaper article has a similar theme.
- February 2014 podcast, "This won't make you feel better about the housing recovery" (2 minutes) [http://www.marketplace.org/topics/economy/wont-make-you-feel-better-about-housing-recovery](http://www.marketplace.org/topics/economy/wont-make-you-feel-better-about-housing-recovery)

This podcast and newspaper article discuss what is causing the recovery of the housing market, after the bubble burst around 2005. Individuals are still having a difficult time getting loans. Do you know who is buying all those houses? Take a look.
- January 2014 podcast, "Blackstone-backed real estate firm learns how to be a landlord" (4 minutes 7 seconds) [http://www.marketplace.org/topics/business/blackstone-backed-real-estate-firm-learns-how-be-landlord](http://www.marketplace.org/topics/business/blackstone-backed-real-estate-firm-learns-how-be-landlord)
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Data for this assignment comes from the National Association of Realtors, (http://www.Realtor.org).

- Background about how the NAR collects its data: http://www.realtor.org/topics/existing-home-sales/background
- The NAR publishes reports released on a monthly basis describing the data. Here is the most recent report: http://www.realtor.org/topics/existing-home-sales

Group component

Work as a group to complete the following analysis and report.

Step 2: Create a chart to help relate trends in price to trends in sales

- Open the spreadsheet ExcelProject2Data.xlsx.

  Because the median price is in dollars and the sales is in number of homes sold, it does not make sense to graph them on the same axes. However it is informative to see how these values change with time relative to each other. To facilitate this, Excel allows you to display two different vertical axes in the same chart. See for example, the chart in problem (3) of the Worksheet.

- Create a scatter chart (use a Straight Lined Scatter Chart) including the sales and median prices of existing homes in your region of the United States from 2000 to 2013. Create the chart, including both series. Initially, only one vertical axis will appear. Double click on the data series showing median price, to reveal the formatting menu. Select "Secondary Axis" from the Axes options.

  Tip: Microsoft offers online support materials for Excel and the other Office components. Go to http://office.microsoft.com/ and click Support. Choose Excel in the dropdown menu, and search for, for example, "secondary axis."

- Include labels for both vertical axes, and title the chart appropriately. Include a legend. Tip: The series names that appear in the legend can be entered in the "Select Data" dialog box. Right click on the chart, and choose Select Data to reveal the dialog box. The "Name" field is what appears in the legend.

- Format the chart as you wish, to make it easy to read. If you wish, you could use color-coded axes as in the sample (sheet 2 of the data file).

Step 3: Compare trends in price to trends in sales

Use the chart you created in Step 2 to answer the following questions:

- What year had the greatest number of sales in your region? What year had the least? How many preexisting homes were sold in those years?
- What year had the highest median sale price? What year had the lowest? What were the prices in those years?
- What is the current number of sales and median price (2013) for your region?

Make a timeline, in the form of a table, organizing these key features in order by date. In the Feature column, say what feature occurred in that year and the relevant numerical data. Use complete sentences. (An example follows on the next page.)
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For example, in 2005, the number of preexisting homes sold in the US was at its highest with 7,050,000 homes sold. Also the median price in the US stayed at a maximum of about $220,000 for three years, 2005-2007. The corresponding rows in the table could say

<table>
<thead>
<tr>
<th>Year(s)</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>The number of preexisting homes sold in the US was at its highest ever, with 7,050,000 homes sold.</td>
</tr>
<tr>
<td>2005, 2006, and 2007</td>
<td>The US median sale price was at its highest at about $220,000.</td>
</tr>
</tbody>
</table>

When you complete this step, your timeline table should have 5 rows, answering all of the questions above. You will add rows to your table in the next steps.

Step 4: Approximate the derivative

Since we do not have a model approximating this data, we cannot calculate the derivative analytically (using the formulas). Instead, we approximate the derivatives, using average rates of change. To approximate the derivative in a given year, we use the average rate of change between the previous year and the subsequent year.

- In the ExcelProject2Data.xlsx file, the data lies in columns A-F. You will do your calculations beginning in column G.
- In column G, to the right of the median price data, calculate the approximate values of the derivative of the median price in your region. For example, in cell G6, put the formula for the average rate of change of median home price between 1999 and 2001 in your region, approximating the derivative of the median price in 2000.

\[
\text{Derivative of median home prices in 2000} \approx \frac{\text{Median price in 2001} - \text{Median price in 1999}}{2001 - 1999}
\]

Since you do not have data for 2014 or 1998, you will not make an approximation for 1999 or 2013. Type your formula in cell G6 and fill down to cell G18.

- What are the units on the derivative of the median home prices? Type a column header in cell G4 that includes the correct units.

  Economists describe growth and decline using the percentage rate of change, because percentages give a clearer picture of the impact of the change. For example, a price changing by $2 per year, when the price is $20 is a 10% change, indicating a significant impact on business, but a price changing by $2 per year when the price is $2000 is only a 0.1% change, which is not as likely to be significant.

- In column H, compute the percent rate of change in median price for your region, by dividing the derivative in column G by your region's median price that year. For example, in cell H6, put the formula for the percentage rate of change in median price in 2000.

\[
\text{Percent rate of change of median home prices in 2000} \approx \frac{\text{Derivative of median price in 2000}}{\text{median price in 2000}}
\]

Change the format of the cell H6 to percentage. (Tip: There are many ways to get to the controls for formatting a cell; one is to right click on the cell and select Format Cell from the menu. Look under he "Number" in the dialog box.) Then fill down to cell H18.
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• The units on the percent rate of change are percent per year. Type a column header in cell H4 that includes the correct units.
• Consider letting different group members drive the mouse as you repeat this process to make your spreadsheet include:
  o The approximate derivative of the number of sales in your region in cells G25:G37.
  o The percent rate of change of the number of sales in your region in cells H25:H37.
• Create a scatter plot showing both the percent rate of change in price and the percent rate of change in number of sales. Since the units on both of these are percent per year, you only need one vertical axis scale (unlike the chart you made in Step 2).

Step 5: Organize the features of the data
Use the chart you created in Step 4 to answer the following questions:
• What year did the number of sales grow the fastest in your region? What year did the number of sales decline the fastest in your region? At what percent rate was the number of sales changing in those years?
• What year did the median price grow the fastest in your region? What year did the median price decline the fastest in your region? At what percent rate was the median price changing in those years?
• Add rows to the timeline you created in Step 3, organizing these key features in order by date. In the Feature column, say what feature occurred in that year and the relevant numerical data.
  For example, the median price in the US was increasing the fastest in 2004, at a rate of 10.44% per year. The median price in the US was decreasing the fastest in 2008, when prices fell at a rate of 11.74% per year. The table, with this information added, could look like this:

<table>
<thead>
<tr>
<th>Year(s)</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>The median price rose the fastest, at a rate of 10.44% per year.</td>
</tr>
<tr>
<td>2005</td>
<td>The number of preexisting homes sold in the US was at its highest ever, with 7,050,000 homes sold.</td>
</tr>
<tr>
<td>2005, 2006, and 2007</td>
<td>The US median sale price was at its highest at about $220,000.</td>
</tr>
<tr>
<td>2008</td>
<td>The median price fell the fastest, at a rate 11.74% per year</td>
</tr>
</tbody>
</table>

When completed, your timeline-table should include years with
  o The highest and lowest number of home sales.
  o The highest and lowest median price.
  o The fastest growth in the number of home sales and fastest decline in the number of home sales.
  o The fastest growth in the median price and the fastest decline in the median price.
  o The current sales and median price (2013).
Step 6: Compile a group project report (1 per group)

Work together to create a 1-2 page well organized and well written report showing your group's work. Include the following.

- An introduction saying what data you are studying. Include a brief statement about the location of your region (Here's the map: http://www.realtor.org/research-and-statistics/housing-statistics/map-of-existing-home-sales-regions)

- The charts you created in Steps 2 and 4 (the median price and number of sales on one chart, and the percent rates of change on another chart). Charts should include the following.
  - A title
  - 1000's place commas on the vertical axes labels, if appropriate.
  - A label, including units, on the vertical axes.
  - A legend.

In Excel, you can click on a chart to select it, and then copy and paste it directly into a word file. Within the word file, you can still change the formatting (colors, fonts labels, line thickness and so on) of your charts to your liking.

- A paragraph or two describing the real estate bubble and the burst in your region.
  - Begin with a thesis sentence that accurately describes the report's content, and end with a conclusion that summarizes your findings.
  - Write the story in chronological order using your timeline-table as a guide.
  - Include descriptions of both the median prices and the number of houses sold.
  - Include at least 5 of the 10 features listed in your timeline-table. Include numerical values to substantiate each of your claims. For example if you say prices were at their highest, say how high they were, or if you say the number of houses sold was falling at its fastest rate, give the rate. Include correct units on all numerical values.

Use appropriate language. The articles listed in Step 1 include good examples of technical writing describing data. Here is another example of such writing. Notice the use of specific numerical values. http://economistsoutlook.blogs.realtor.org/2014/02/03/a-deeper-look-at-the-latest-existing-home-sales-data/

- At the end of your report, place the complete timeline table, including all of the features described in Step 5. Highlight or bold face those that you chose to use for your paragraph. Make sure you use complete sentences in the table when describing the features.

Step 7: Choice for individual portion

In your individual component, you will compare your region to one of the other regions. Agree who will do what. For example if your group is studying the Northeast, then one group member will compare the Northeast to the South in his or her individual component, one will compare the Northeast to the West and the third will compare the Northeast to the Midwest.
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Individual Component
Each group member completes a report comparing the real estate bubble in the group's region to that in another region of the United States. In the individual component you will concentrate only on the number of sales; you do not need to analyze the median prices for this portion. Your grade does not depend on the Individual Components of your group members.

Step 8: Analyze your second region
Begin with the spreadsheet that you completed with your group, which has the derivative and percent rate of change of median prices and number of homes solid in your group's region in columns G and H.
- You will add calculations in columns I and J. Since you are studying the sales data, you will only work with the data in rows 25 to 37.
- Each group member chose a second region to study in Step 7. Calculate the derivatives of the number of homes sold for your second region in column I. Calculate the percent rate of change in the sales for your second region in column J. See Step 4 for a description of these calculations.
- Create two scatter charts:
  o The number of homes sold for your group's region and your second region (on a single chart)
  o The percent rate of change in number of sales of your group's region and your second region (on a single chart)
Include a title, axes labels (with units), and a legend on each chart.

Step 9: Organize the features of the data
- Create a table comparing the two regions, including the following rows.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greatest percent rate of growth of sales</td>
<td></td>
</tr>
<tr>
<td>Highest number of homes sold</td>
<td></td>
</tr>
<tr>
<td>Greatest percent rate of decline of sales</td>
<td></td>
</tr>
<tr>
<td>Lowest number of houses sold</td>
<td></td>
</tr>
<tr>
<td>Current sales level (2013)</td>
<td></td>
</tr>
</tbody>
</table>

Here is an example of what goes in the Comparison column. In this example, we compare the median prices in the US to those in the Northeast. This is not a comparison that you will do, since you are studying the number of sales not the median prices.

The median price in the US reached a maximum in 2006, at $221,900, while the median prices in the Northeast reached its highest in 2007 at $279,000. The first row of the table with this information added could look like this:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greatest median price</td>
<td>The maximum median price in the Northeast was $279,000, higher by $57,900 than the maximum median price in the US. The maximum occurred in the US in 2006, one year sooner than the Northeast's peak in 2007.</td>
</tr>
</tbody>
</table>

Since details lend validity to writing, it is good practice to include numerical values to substantiate claims. If you say, by way of comparison, that one value is higher than another, then say by how much, or name the values.
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Step 10: Compile an individual report (1 report per group member)

- Title your report saying which two regions you compare.
- Display the two charts you created in Step 8. The charts should meet the specifications described in the group report (Step 5).
- Write a paragraph comparing the sales levels in your group's region and your second region. Address all five comparisons in your table (Step 9). As in Step 6, include numerical values to substantiate each of your claims.
- At the end of your report, include the table you created in Step 9.

Step 11: Acknowledgement of participation

At the end of your individual report, write a sentence or two saying what contribution you made to the group's part of the project.