

Analyzing Visualizations for Mortgage Rate Trends in the United States from 1999 - 2009

Christian Anastasi, Dean Catello, Danijela Lazarevic, & Lisa Pate

iSchool, Drexel University
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Table of Contents

I. Introduction	3
II. Goal	3
III. Visualization tools	4
3.1 PivotChart	4
3.2 Tableau.....	5
3.3 Many Eyes	5
3.4 TouchGraph	6
IV. Data Collection	7
V. Visualizations.....	7
5.1 PivotChart	7
5.2 Tableau.....	8
5.3 Many Eyes	9
5.4 TouchGraph	11
VI. Results.....	12
VII. Conclusion.....	13
References.....	14

Abstract – This paper visually explores the mortgage rate trends in the United States for the past decade. Using the visualization tools Many Eyes, PivotChart, Tableau, and TouchGraph, the authors explore the visual connections between these visualizations and see which visualization tool best represents the data and is best to work with for representing mortgage rate data. Analysis of the data shows that the one-year adjustable rate mortgage (ARM) remains at the lowest interest rate compared with other mortgage rates. In addition, the visualizations show that fixed mortgage rates (FMRs) are currently floating around their lowest point for the past decade. The visualizations point to the fact that now is the time to secure a mortgage for a new purchase or refinance a current loan before mortgage rates rise again.

Keywords – ARM, FMR, information visualization, Many Eyes, mortgage rates, PivotChart, Tableau, TouchGraph, trend, United States

I. Introduction

Information visualization is a growing field that studies how information is displayed. There are many tools such as Google Earth, Many Eyes, TouchGraph, etc. that display these large amounts of data to find patterns and tendencies in the data and also even outliers. Visual representation of this data can be very helpful in determining these results, especially if the representation model is very effective.

Some additional advantages to using these information visualization tools are their ease of use in uploading large amounts of data and manipulating that data on the fly..Creation of multiple types of graphs on your data set is done instantly. Having these tools and features can be very effective in visualizing the information and drawing conclusions and tracking trends over time easily (and visually).

II. Goal

The goal of this project is to use the visual representation tools including Many Eyes, PivotChart, Tableau, and TouchGraph with data of mortgage rates over the past decade for analysis and conclusions about mortgage rate trends. The first step in accomplishing this goal is to obtain a data set of mortgage rates including: the year, month, 30 year fixed mortgage rate, 15 year fixed mortgage rate, 5 year adjustable rate mortgage and 1 year adjustable rate mortgage. The next steps are to import the information into the first visualization tool, in this case PivotChart, and run analysis on the information.

Once the data has been imported, the objective is to analyze the data graphically and see how many ways there are to represent/interpret the data. This is also to be done with Many Eyes, Tableau and TouchGraph. After the data has been analyzed and all of the visualizations have been created, the objective is to evaluate these visualization tools based on the same data.

III. Visualization tools

The following visualization tools were used in creating visualizations to assist with finding data or creating visualizations that would help us find the information we were seeking. We mainly focused on tools that allowed us to enter our data and create a visualization of that data to show us the mortgage rate trends for the past decade.

3.1 PivotChart

Microsoft Excel's PivotChart report created the beginnings of our visualizations. PivotChart allows you to enter your data into Excel and then create a visualization using that data so the process is made simple for quick productions of visualizations. "A PivotChart report provides a graphical representation of the data in a PivotTable report. You can change the layout and data displayed in a PivotChart report just as you can in a PivotTable report." [1]

Allowing us the freedom to change the representation of the data in the PivotChart allows more freedom for creating a visualization using raw data, such as mortgage rates for each month and year for the past decade. The data in the table is related to the data in the PivotChart report visualization therefore, changes made to either section will reflect changes in the other as seen in the example displayed in Figure 1.

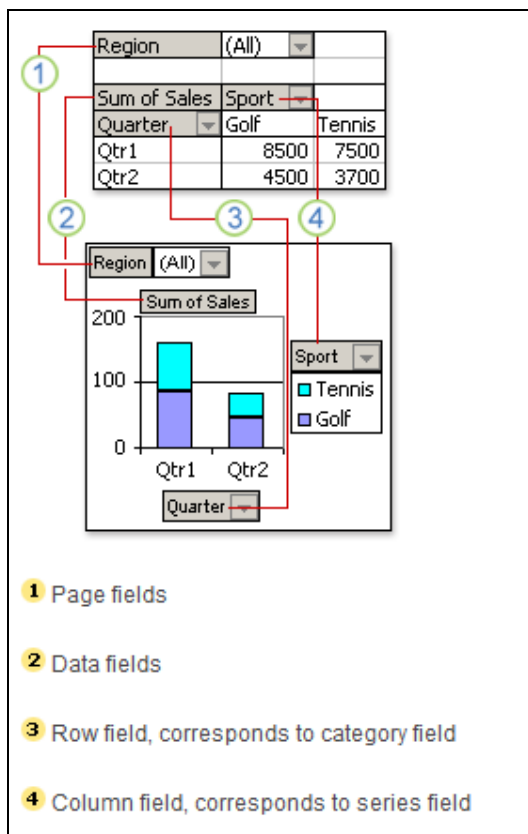


Figure 1: PivotChart & PivotTable correlation [1]

The advantage of using a PivotChart report rather than a standard graph or other type of chart representing raw data, is the way PivotChart allows you to manipulate the data in either the table or the chart to adjust your information and visualization accordingly. This advantage leads more into information visualization territory than standard graphical representations.

3.2 Tableau

Tableau’s whole theory behind providing visualizations of data is that you can process pictures much faster than lists of data [2]. In Tableau, the process of entering data into the software is backed by the fact that you will get a visual representation out of your data. “Tableau Desktop is a software application that enables anyone to analyze any kind of data quickly and easily. With Tableau, you work directly with your data, shifting between views easily and without support from IT.” [2]

Tableau features a drag and drop function for quickly creating visualizations from already formed data. Therefore, using previously gathered data and dragging and dropping it into the Tableau software saves time. In addition, the visualizations of Tableau are easily changed and analyzed or specified according to the user. Instead of having to manually enter the information, the user just selects the portion of the visualization that needs further exploration and can create a dashboard for analyzing the data, like that seen in Figure 2.



Figure 2: Tableau dashboard visualization example [2]

3.3 Many Eyes

Many Eyes is another tool allowing you to enter your data and create a visualization based on that data. In addition to creating visualizations with Many Eyes, you have the ability to view the visualizations of others and to use the data previously uploaded by other members to create visualizations that fit your particular needs.

“Many Eyes is a bet on the power of human visual intelligence to find patterns. Our goal is to ‘democratize’ visualization and to enable a new social kind of data analysis.” [3] Many

Eyes uses Web 2.0 functions and features to create a visualization community, which enables others to learn from previous data sets and visualizations. Many Eyes offers a variety of different visualizations (see Figure 3) so you don't have to rely specifically on bar charts or line graphs but you can sort through the variety of visualizations and choose the one that is best suited for representing your data.

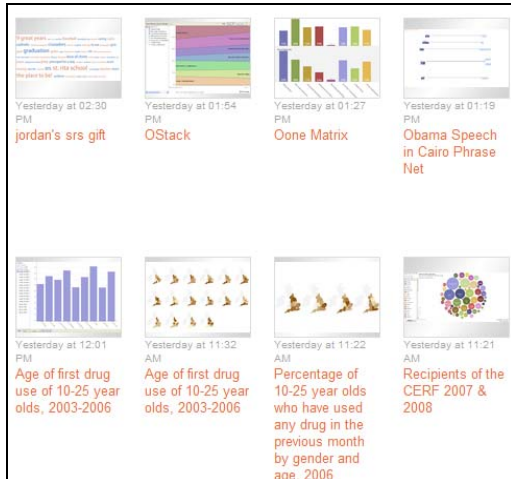


Figure 3: Many Eyes example of visualizations [4]

3.4 TouchGraph

TouchGraph provides a different type of visualization than the other tools in that it shows connections of resources on the Web based on a specific topic. While it does not relate specifically to providing a visual representation of our mortgage rate data, we wanted to see how this visual representation would help us with showing the prime spots for finding mortgage rate trend information.

“Discover clusters and interrelations within your data, and zoom in on whatever catches your interest.” [5] By zooming in on certain information areas within TouchGraph or expanding a search further on a specific cluster (see Figure 4), you can see the important sites with mortgage rate trend information and discover whether or not they have information pertaining to your specific search or not.

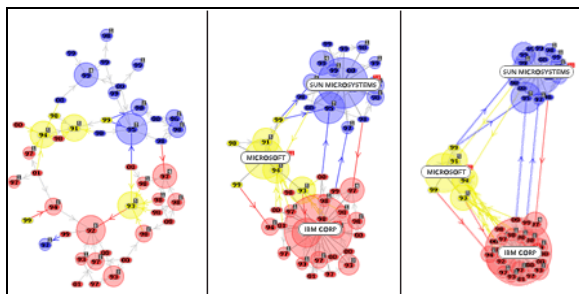


Figure 4: TouchGraph focus example [5]

IV. Data Collection

The data for this research was collected from the Mortgage-X – Mortgage Information Service website. [6] Mortgage-X provides historical data pertaining to mortgage rates beginning from 1990. [6] Therefore, Mortgage-X was an ideal site for providing mortgage rate information on the past decade.

Four different searches were performed using the following parameters:

1. Mortgage rate by type, and
2. 1999-2009 date range.

The data returned was displayed in a tabular format and offered an easy extraction option. This function was used to import data into the Microsoft Excel application. Finally, the data in the Excel sheet was reorganized so it would produce the optimal visual representation.

V. Visualizations

5.1 PivotChart

According to Chi's Data State Model, the numerical and textual data in the Excel sheet gets transformed by the data transformation operator from the view data stage through the analytical and visualization abstraction and into the final data stage, the view. [7] The PivotChart (Figure 5) presents the last data stage and shows historical data on different types of mortgage rates in the USA.

Furthermore, this traditional graphing tool shows historical trends of mortgage rates and their interdependences. For example, from the PivotChart we can see that the 1-year ARMs are significantly lower than others and less prone to fluctuation. At the same time 15 and 30-year FMRs always follow each other's trends with a small actual difference in values. In 2005, 5-year ARM was introduced in the industry following closely the 15-year FMR trends. From this information, knowledge can be gained about close dependences between risk taking on 1-year ARM rates and its lower rates. In 1-year ARM contracts, the mortgage rate stays fixed for one year and then becomes variable depending on market conditions.

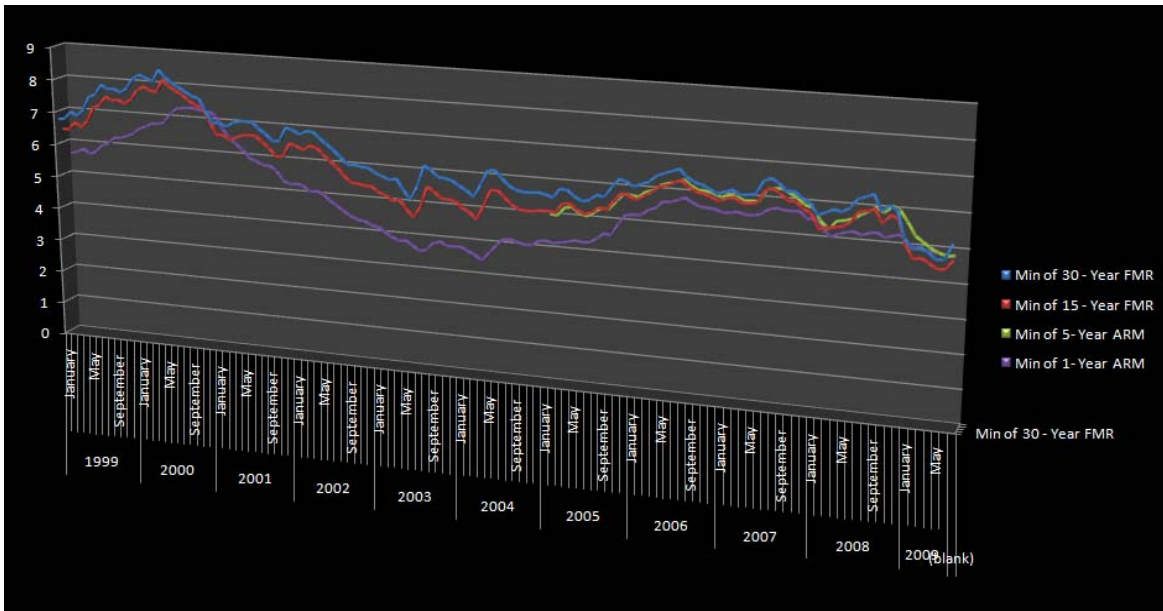


Figure 5: USA mortgage rates 1999 - 2009

5.2 Tableau

When plugging the same tabular data into Tableau visualization tool (Figure 6), new insights about the mortgage market movements had been gained. This visualization tool organizes data by type of rates and then graphs it by the month showing seasonal trends over the period of the last 10 years.

Sorting data by month and comparing it side by side helped us gain two important insights. First, the overall decrease in mortgage rates during the 2000 – 2005 period has been confirmed. Second, a new observation can be made about what months or seasons have historically been offering lower mortgage rates. For example, 30-year FMR had been only slightly affected during spring and early summer seasons, and it has regularly hit its lows in the second half of a year. At the same time, 15-year FMR follows the same seasonal trends whereas 1-year ARM rates stayed steady throughout the year.

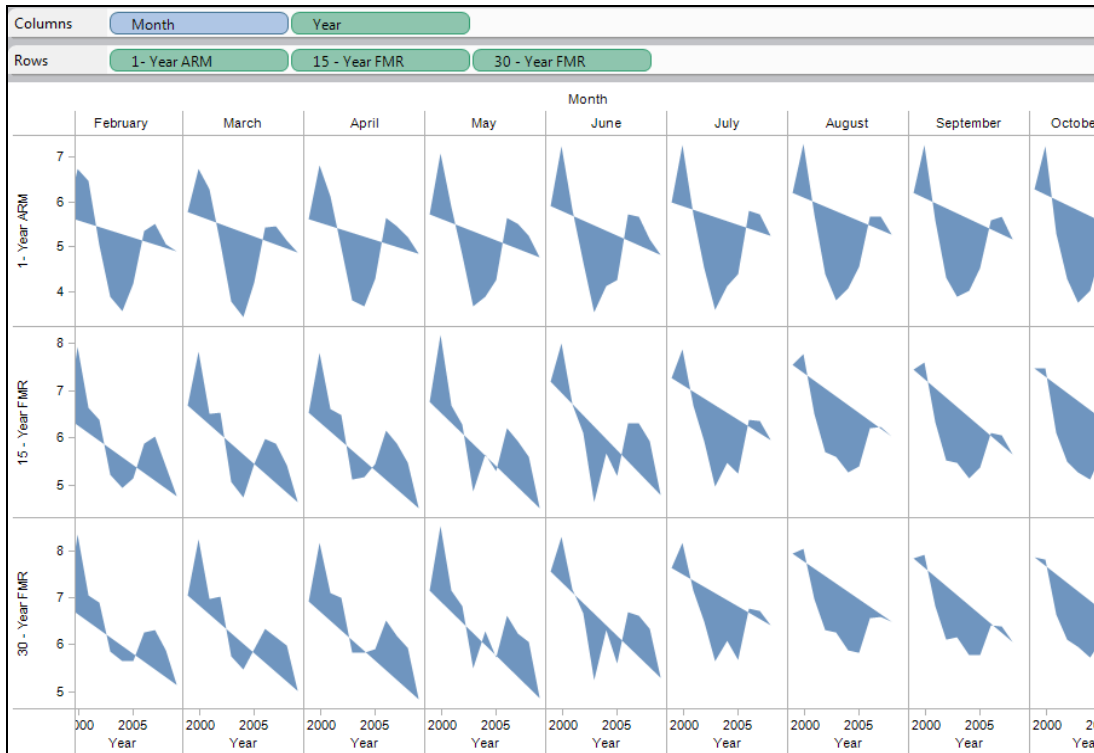


Figure 6: USA mortgage rates 1999 - 2009 by type and month

5.3 Many Eyes

Many Eyes turned out to be a great tool to visualize our data set. [8] The tool allows you to dynamically switch up visualizations and get many different perspectives on the same data set. This helps in identifying trends and gives an overall better perspective on the data.

A variety of visualizations for our data could be produced for Many Eyes. [9] For our data set, the best two visualizations we found were the Bar Chart (Figure 7) and the Stack Graph (Figure 8). The Bar Chart allowed us to see a month-by-month view of the mortgage rates and easily see the trends in visual format. When mousing-over one of the months on the graph Many Eyes will display the data for that particular month. For example, in Figure 7 you will see the 15-year FMR for January 2000 was 7.8%. Also, if you want to change to another type of interest rate, you simply click in the box on the left and the visualization changes instantly to your new selection.

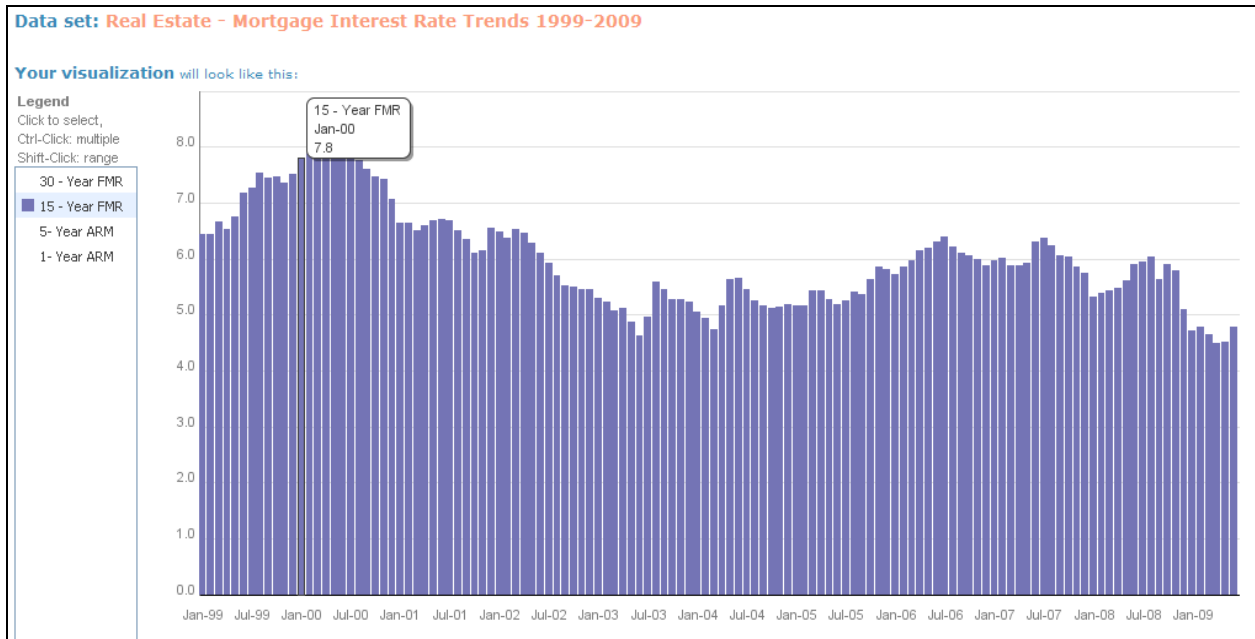


Figure 7: Many Eyes Bar Graph of the 15 year FMR from 1999 - 2009

The Stack Graph in Figure 8 essentially does the same exact thing as the Bar Graph but it gives a different perspective. It is easier to see the sharp increases and decreases and the overall layout is easier to graph and follow the trends. As a note, this graph is also stackable where you can put all of the data on one screen but it becomes a bit cumbersome and not very useful for our purposes. (This is done by holding CTRL and clicking in the left pane for any of the selections.)

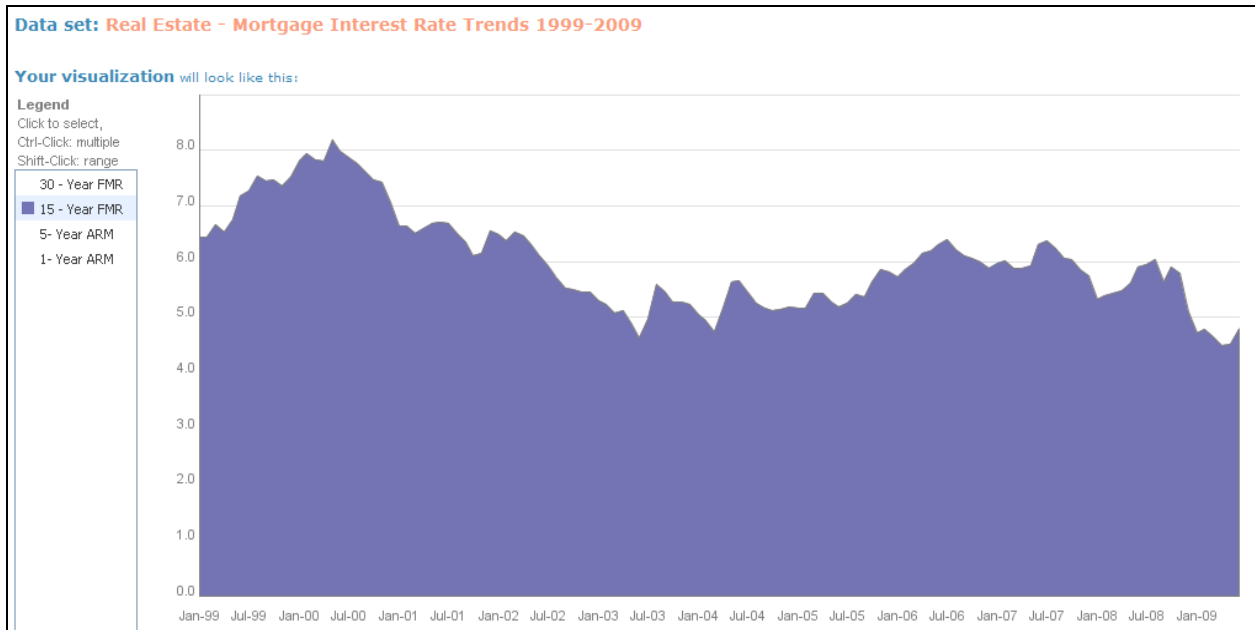


Figure 8: Many Eyes Stack Graph of the 15 year FMR from 1999 - 2009

5.4 TouchGraph

The main hubs shown in TouchGraph for the phrase “mortgage rate trends” show the biggest players in the game. In this particular search the biggest players tracking mortgage rate trends appear to be: Yahoo, Bankrate, E-Loan, hsh.com, and Interest.com. The biggest anchors of the network appear to be Bankrate.com and realesate.yahoo.com.

One of the authors recently went through the process of searching mortgage rates and tracking rates for his home purchase and was not surprised to see Yahoo and Bankrate at the top of this list. These were two of his “go-to” sites for everyday mortgage rate tracking as well as Wells Fargo—which didn’t make this list. Wells Fargo’s exclusion is due to the fact that they aren’t in the business of tracking rates historically.

On the outskirts of the TouchGraph visualization are sources that aren’t the usual mainstream sites, such as blogs and surveys.

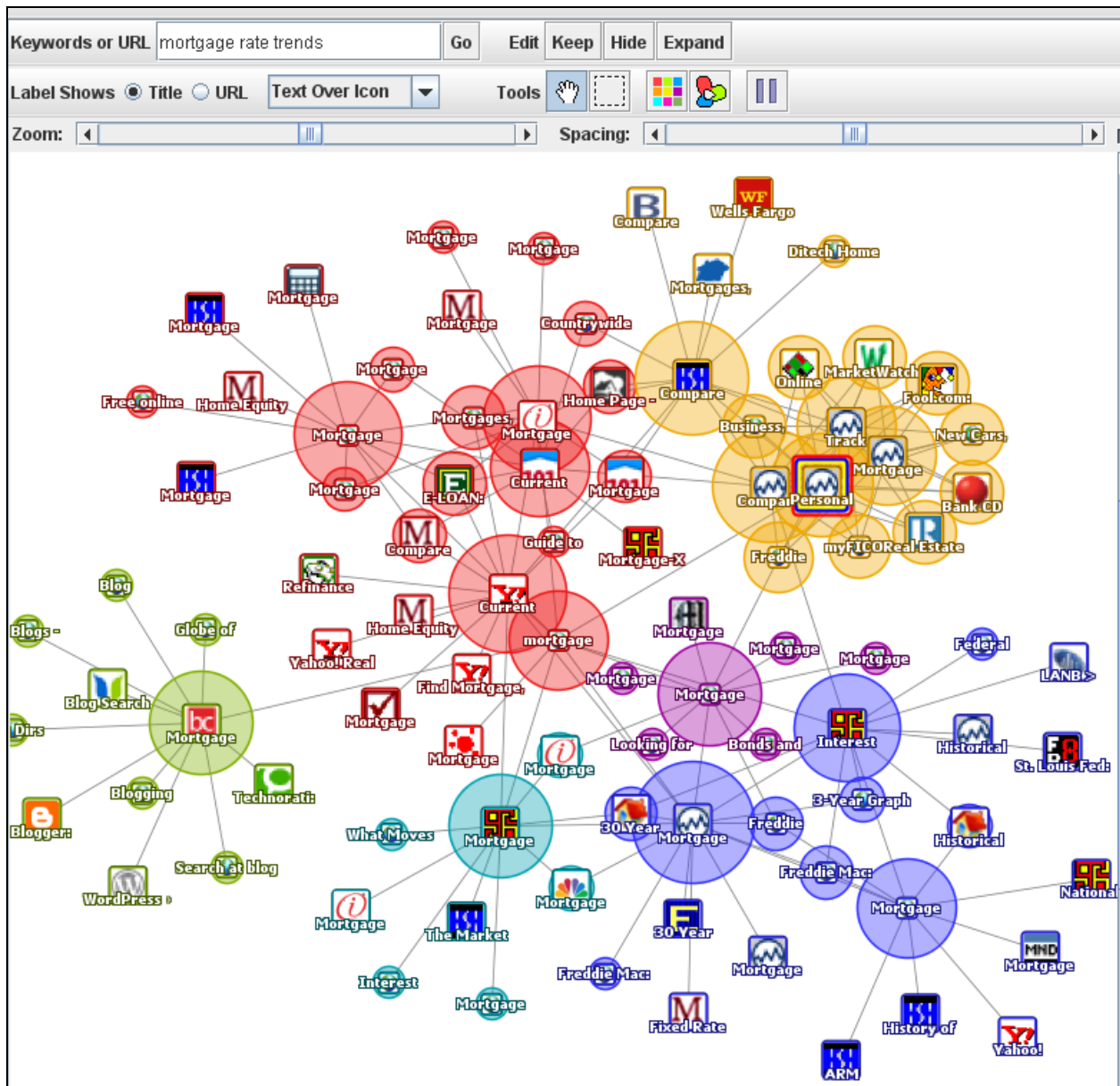


Figure 9: TouchGraph visualization of Google mortgage rate trend

VI. Results

The Excel PivotChart is a solid graphic tool that aids research by organizing and displaying data in a very basic visual manner. The choice of data displayed can be chosen by the user and changed on the spot. However, in order to visualize data in a different manner, for example organize mortgage rates by month and year, the data itself has to be reorganized manually. According to Schneiderman, Excel PivotChart transforms the tabular data into 3-dimensional data types showing mortgage rates changes over time and the relationship to each other. [10]

When the same data was processed in Tableau, the data was organized and displayed in a different way by the tool itself without any need for the manual manipulation of data. The view itself can be changed on the spot by the user depending on the visualization needs. Thus, both visualization tools display 3-dimensional data but the tasks by which the data can be acquired differs. The Excel PivotChart is a less flexible tool while Tableau offers more freedom for visualization creativity. Consequently, the synergies between the two visualization tools resulted in deeper insights by combining knowledge gained from both visualization tools.

The flexibility of Many Eyes with its various visualizations and use of different data sets presented one of our most useful visualizations. The information found in the Many Eyes visualizations showed the dips and peaks of mortgage rates for 1 and 5 year ARMs as well as 15 and 30 year FRMs. Overall, the data showed that the beginning of 2009 was the lowest point for all mortgage rates excluding the 1-year ARM in the past decade.

TouchGraph gave us the base points for searching mortgage rate data, while not contributing to our overall mortgage rate analysis. While the visualization was useful in identifying key contributors for mortgage rate information, the information gained from the visualization did not lead to any conclusions on mortgage rate trends for the past decade.

VII. Conclusion

Throughout the exploration of mortgage rate trends in the past decade, some interesting visualizations were created to depict the high points and low points of mortgage rates for this time period. While TouchGraph presented a visualization for finding data, the rest of the visualization tools – PivotChart, Tableau, and Many Eyes were excellent visualization tools for entering our specific data sets and creating visualizations based on that data.

While mortgage rates will continue to fluctuate over time, the evidence in these visualizations show that now is truly the time to secure a mortgage loan or refinance. While the 1-year ARM is currently not at its lowest point in the past decade, the 15-year and 30-year FRMs, which are usually more desirable than ARMs, are looming under 5 percent. These visualizations show that there may not be a better time to buy a house in the near future.

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