

MGT 6203 Group Project Proposal Template

Please edit the following template to record your responses and provide details on your project plan.

TEAM INFORMATION (1 point)

Team #: Team 59

Team Members:

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OBJECTIVE/PROBLEM (5 points)

Project Title: Forecasting US Mortgage for 2024 and beyond

Background Information on chosen project topic:

Stagflation was a rampant issue in the 1970s. Interest rates trended upward for several years leading to the all-time high rate of 19.10% in June of 1981. Today as well the question of interest rates is a topic of great concern. Following turbulent financial times spurred by global pandemic and the halt of global economies, and threats to the US dollar, interest rates have risen rapidly from 0.24% in January of 2022 to 5.5% in September of 2023. Many believe the worst is yet to come and we could have a repeat of the 1970s. Others believe that inflation and these interest rates are transitory. Using research, we hope to forecast interest rates for 2024 using financial indicators such as trailing employment rates, consumer price index (CPI), and net deposits.

Sources:

<https://time.com/personal-finance/article/historical-mortgage-rates/#:~:text=Average%2030%2Dyear%20mortgage%20rates,down%20to%20just%20under%2010%25.>

<https://www.treasurydirect.gov/government/interest-rates-and-prices/certified-interest-rates/monthly/fiscal-year-2022/02-2022/>

<https://www.nytimes.com/2023/09/20/business/fed-meeting-september-inflation-economy.html>

<https://www.investopedia.com/mortgage/mortgage-rates/factors-affect-mortgage-rates/>

Problem Statement (clear and concise statement explaining purpose of your analysis and investigation):

Forecasting US Mortgage for 2023 and beyond- Creating a model to forecast Mortgage rate using historical data to study financial indexes, Treasury yield, bonds, house inventories, inflation, Consumer sentiment.

State your Primary Research Question (RQ):

How can we predict future mortgage rates.

Add some possible Supporting Research Questions (2-4 RQs that support problem statement):

1. Can we determine if the mortgage will decrease or increase using certain factors?
2. What factors contribute to changes in mortgage rates?
3. What can we glean from the correlation matrix of the factors from our model?
4. Can our model help explain mortgage rate trends in other countries?

Business Justification: (Why is this problem interesting to solve from a business viewpoint? Try to quantify the financial, marketing or operational aspects and implications of this problem, as if you were running a company, non-profit organization, city or government that is encountering this problem.)

In the past 3 years, interest rates have more than doubled from roughly 3% for a 30-year fixed mortgage to well over 7%. Inflation has been making headlines and at the end of the day interest rates impact the economy in all aspects from consumer spending behaviors to rate of manufacturing. From a more direct perspective a \$400,000 dollar mortgage for 30-years at 7% over the lifetime of the loan costs \$766,428.47 compared to at 3% the totaling amount being \$485,687.85. Compounding interest is considered one of the most powerful forces on earth. It is evident that mortgage rates can impact consumers and businesses greatly when making purchases. Having a model that estimates rate hike or decrease will be beneficial for investors, capitalist firms, government, buyers etc.

DATASET/PLAN FOR DATA (4 points)

Data Sources (links, attachments, etc.):

Historical Mortgage data- <https://fred.stlouisfed.org/series/MORTGAGE30US>

Consumer price index - <https://fred.stlouisfed.org/series/CPALTT01USM657N>

<https://www.bls.gov/cpi/>

<https://tradingeconomics.com/united-states/interest-rate>

Housing Inventory-

Housing Inventory: Active Listing Count in the United States -

<https://fred.stlouisfed.org/series/ACTLISCOUUS>

Federal Debt: Total Public Debt as Percent of Gross Domestic Product-

<https://fred.stlouisfed.org/series/GFDEGDQ188S>

Interest Rates and Price Indexes; 10-Year Treasury Yield, Level

<https://fred.stlouisfed.org/series/BOGZ1FL073161113Q>

Unemployment Rate - <https://fred.stlouisfed.org/series/UNRATE>

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Data Description (describe each of your data sources, include screenshots of a few rows of data):

Unemployment Rate (UNRATE)- The unemployment rate represents the number of unemployed as a percentage of the labor force. Labor force data are restricted to people 16 years of age and older, who currently reside in 1 of the 50 states or the District of Columbia, who do not reside in institutions (e.g., penal and mental facilities, homes for the aged), and who are not on active duty in the Armed Forces.

Ref:- <https://fred.stlouisfed.org/series/UNRATE>

Federal Debt: Total Public Debt as Percent of Gross Domestic Product

	A	B	C	D	E	F
1	FRED Graph Observations					
2	Federal Reserve Economic Data					
3	Link: https://fred.stlouisfed.org					
4	Help: https://fredhelp.stlouisfed.org					
5	Economic Research Division					
6	Federal Reserve Bank of St. Louis					
7						
8	BOGZ1FL073161113Q	Interest Rates and Price Indexes; 10-Year Treasury Yield, Level, Millions of Dollars, Quarterly, Not Seasonally Adjusted				
9						
10	Frequency: Quarterly					
11	observation_date	BOGZ1FL073161113Q				
12	1962-01-01	4016				
13	1962-04-01	3876				
14	1962-07-01	3990				
15	1962-10-01	3902				
16	1963-01-01	3892				
17	1963-04-01	3964				
18	1963-07-01	4032				
19	1963-10-01	4118				
20	1964-01-01	4179				
21	1964-04-01	4201				
22	1964-07-01	4194				
23	1964-10-01	4175				
24	1965-01-01	4204				
25	1965-04-01	4210				
26	1965-07-01	4249				
27	1965-10-01	4476				
28	1966-01-01	4774				
29	1966-04-01	4782				
30	1966-07-01	5146				
31	1966-10-01	4998				
32	1967-01-01	4580				
33	1967-04-01	4828				
34	1967-07-01	5247				

Federal debt: Total Public Debt

The national debt of the United States is the total national debt owed by the federal government of the United States to Treasury security holders. The national debt at any point in time is the face value of the then-outstanding Treasury securities that have been issued by the Treasury and other federal agencies.

Frequency: Quarterly, End of Period	
observation_date	GFDEBTN
1966-01-01	320999
1966-04-01	316097
1966-07-01	324748
1966-10-01	329319
1967-01-01	330947
1967-04-01	322893
1967-07-01	335896
1967-10-01	344663
1968-01-01	349473
1968-04-01	345369

GFDEGDQ188S	Federal Debt: Total Public Deb
Frequency: Quarterly	
observation_date	GFDEGDQ188S
1966-01-01	40.33999
1966-04-01	39.26763
1966-07-01	39.62091
1966-10-01	39.51977
1967-01-01	39.20383
1967-04-01	38.03292
1967-07-01	38.82145
1967-10-01	39.10231
1968-01-01	38.42951
1968-04-01	36.96379

30-Year Fixed Rate Mortgage Average in the United States

<https://fred.stlouisfed.org/series/MORTGAGE30US>

The weekly mortgage rate is now based on applications submitted to Freddie Mac from lenders across the country. For more information regarding Freddie Mac's enhancement, see [their research note](#).

FRED Graph Observations			
Federal Reserve Economic Data			
Link: https://fred.stlouisfed.org			
Help: https://fredhelp.stlouisfed.org			
Economic Research Division			
Federal Reserve Bank of St. Louis			
MORTGAGE30US	30-Year Fixed Rate Mortgage Average in the United States, Percent, Weekly, Not Seasonally Adjusted		
Frequency: Weekly, Ending Thursday			
observation_date	MORTGAGE30US		
1971-04-02	7.33		
1971-04-09	7.31		
1971-04-16	7.31		
1971-04-23	7.31		
1971-04-30	7.29		
1971-05-07	7.38		
1971-05-14	7.42		
1971-05-21	7.44		
1971-05-28	7.46		
1971-06-04	7.52		
1971-06-11	7.52		
1971-06-18	7.54		
1971-06-25	7.54		
1971-07-02	7.54		
1971-07-09	7.54		
1971-07-16	7.60		
1971-07-23	7.65		
1971-07-30	7.69		
1971-08-06	7.66		
1971-08-13	7.73		
1971-08-20	7.71		
1971-08-27	7.69		
1971-09-03	7.71		

Key Variables: (which ones will be considered independent and dependent? Are you going to create new variables? What variables do you hypothesize beforehand to be most important?)

Dependent Variable-Mortgage rate. We plan to create a binary variable that indicates whether the mortgage rate increased or decreased since the last recorded data point and use that in a separate model.

Potential independent Variables that we believe will be significant predictors- Consumer price index, net deposits, trailing employment rates, housing inventories

APPROACH/METHODOLOGY (8 points)

Planned Approach (In paragraph(s), describe the approach you will take and what are the models you will try to use? Mention any data transformations that would need to happen. How do you plan to compare your models? How do you plan to train and optimize your model hyper-parameters?))

Initially we plan to use linear regression to model the mortgage rate using the independent variables listed above. We plan to train this model using k-fold cross validation. To select the best linear model, we will use the r-squared value of these models to determine accuracy of fit, as well as AIC values to ensure the model is streamlined. We will also use P-values to determine which factors are statistically significant in the model.

Additionally, we plan to create a model that uses independent variables to predict whether the mortgage rate will increase or decrease in comparison to the previous period. This model will also be trained with k-fold cross validation and will also be validated using AIC. In addition, we will use an ROC curve to determine the optimal cutoff point for classification.

Anticipated Conclusions/Hypothesis (what results do you expect, how will you approach lead you to determining the final conclusion of your analysis) Note: At the end of the project, you do not have to be correct or have acceptable accuracy, the purpose is to walk us through an analysis that gives the reader insight into the conclusion regarding your objective/problem statement

We are analyzing mortgage rates historically and study various factors that may or may not have contributed to the rate change. We plan to use models like Regression model, Decision Trees model and K- fold cross validation, confusion matrix to analyze accuracy to find the best fit model that can predict mortgage rate.

What business decisions will be impacted by the results of your analysis? What could be some benefits?

Using this model, both individuals and businesses can make more informed decisions about buying and selling property. They can choose to delay purchases until they achieve the conditions of a favorable mortgage rate. In addition, depending on the specific goal of the company, it may inform decisions about demand in the housing market, so for example, a construction company may recognize that the mortgage rate will drop soon, and begin construction on more houses to increase sales.

PROJECT TIMELINE/PLANNING (2 points)

Project Timeline/Mention key dates you hope to achieve certain milestones by:

October 7th – Project Proposal

October 20th - Gather Data, Clean Data

October 31st - Regression Analysis and running models like Decision Tree, Time- series if applicable, Testing, Validation, Interpreting the Model and Drawing Conclusions

November 4th - Progress Report

November 10th - Further regression analysis

November 17th - Further testing and validation

November 20th -Finalize Report

November 30th - Project Completion

Appendix (any preliminary figures or charts that you would like to include)

30-Year Fixed Rate Mortgage Average in the United States (MORTGAGE30US)

DOWNLOAD

Observation:
2023-10-05: **7.49**
(+ more)
Updated: 11:06 AM CDT

Units:
Percent,
Not Seasonally Adjusted

Frequency:
Weekly,
Ending Thursday

1Y | 5Y | 10Y | Max

1971-04-02

to

2023-10-05

EDIT GRAPH

