Evaluating Household Debt

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ABSTRACT

The ability to accurately predict economic expansion or contraction shown to be heavily reliant on household debt. The correlation between economic downturns and high household debt levels is high, with household debt to GDP ratios having slightly higher predictive power. Our household debt dashboard will provide users with the ability to observe the effects that changes in economic factors has on household debt and economic health, by proxy. This approach will differentiate itself by predicting a factor that plays a large role in economic health, rather than attempting to predict economic health as a whole, allowing the model to account for more nuanced prediction factors.

KEYWORDS

Datasets, Household Debt, Economic Visualization, Household Debt to GDP Ratio, GDP Ratio, Interest Rate

1 INTRODUCTION

The field of macroeconomics has produced a wide variety of research into the predictability of economic expansion and contraction. Interest in this research field has increased over the years with many recent recessions providing a swath of data that can be analyzed and evaluated to determine the level of predictive power. The Great Recession of 2008, for instance, highlighted a set of factors that could be used to predict economic fluctuations, including recessions and market corrections. Household debt, for example, was shown to have a negative impact on the GDP despite providing a short-term stimulus[7]. Accurately predicting this value could provide insights into of economic fluctuations and financial instability associated with government policies and consumer spending. Research conducted by Zabai[15] has indicated that there is a direct correlation between the economic health and household debt. Our goal for this project is to provide an interactive dashboard that allows users to observe correlations between household debt and other economic factors, along with predicting household debt given user-determined values for factors like Federal Interest Rates and yields on 10-year US bonds.

Since a large and rapid increase in household debt points to economic slowdown[11], this information can help users understand the impact their spending habits have. Similarly, the ability to adjust values and see outcomes could help legislators better understand the impact their policies have on the economy[6].

2 KEY FEATURES

The Household Debt Dashboard will allow users to observe and quickly discern correlative associations between household debt and major economic factors. Users will have the opportunity to adjust certain factors and observe the consequences of these values through the output of our Machine Learning algorithm that displays the predicted household debt. This information will be coupled with GDP levels to enhance the user's understanding of the macroeconomic effects their proposals have. Lastly, our solution will provide a containerized solution that allows interested parties to load the development environment necessary to create new models and visualization.

3 RISKS, REWARDS, AND COST

3.1 Risks

We need as many input variables added in our model in the short time frame of the project. For each input variable we need a large dataset to maximize the predictive power of the machine learning algorithm. The risk of influencing major decisions based on a poor prediction carries a heavy consequence. While our models might show favorable statistics (e.g. low R2 and Mean Squared Error values), there is always the risk that our models either overfit the data or are biased towards a certain outcome. Since mitigation strategies often include increasing training data observations, we also run the risk of not having a diverse enough set of training data to model against.

3.2 Rewards

The payoff of a model that accurately predicts household debt and presents it in an intuitive dashboard is huge. As Mian et al. observed, "the larger the increase in household leverage prior to the recession, the more severe the subsequent recession."[11]. Providing this information could encourage lawmakers to move beyond hypothetical outcomes and observe data driven predictions of economic responses.

3.3 Costs

We will use open source data and software so the cost will be minimal other than human capital. Depending on the availability and arrangements of Georgia Tech cloud based resources, the cost to host our solution would be the only concern.

4 PLAN OF ACTIVITIES

We plan on achieving success by following the plan below:

Activity	Estimated Completion
Collect Data	03/07/2020
Variable Exploration	03/14/2020
Clean Data	03/21/2020
Variable Selection	03/21/2020
Progress Report	03/27/2020
ML Algorithm Developed	03/31/2020
Front-end Setup	03/31/2020
Back-end Setup	03/31/2020
Final Report/Presentation	03/27/2020

All group members have contributed a similar amount of effort and have completed extensive research on specific topics related to the global economy. The following activities will be led by these teammates: Data Collection: John and Khwala; Variable Exploration: George; Data Cleansing: John and Jason; Variable Selection: Jason and Khwala; ML Algorithm: John and Jason; Front-end Set Up: Bemi and George; Back-end Set Up: Bemi; Progress and Final Report: Jason; Final Presentation: Khwala. As a note, it is expected that all teammates will support and provide input for each activity.

5 RELATED WORK

Our dashboard will leverage several studies performed on the correlative effects of household debt and economic downturns.

Studying The Great Recession

Many studies have been conducted to better understand the factors that lead to the 2008 recession, including Chakrabarti et al.'s evaluation of household debt and savings during the recession[3], Nyman et al.'s Machine Learning approach to understanding the great recession[14], and Mian et al.'s observation of household leverage and the recession[12]. All articles show the high correlation between economic downturns and increased household debt, which we've used to back our belief in the utility of household debt predictions and will leverage to evaluate variable importance.

Macroeconomic effects of Household Debt

General evaluations of the macroeconomic effects have been outlined in great detail in papers like Alter et al.'s global perspective on household debt effects[1], Friedman's theory of the consumption function[5], Kim's empirical analysis of the effects of household debt[7], Lombardi et al.'s evaluation of the real effects of household debt[9], Mian et al.'s observations on household debt and worldwide business cycles[13][11], and Filardo's assessment on the reliability of prediction models[4]. Each of these articles provide a backing for the global reach our proposed predictions can have, and provide a solid background on which correlations should receive particular attention. We'll expand this information by including more concentrated variables that relate specifically to household debt.

Policy Impacts on Economies and Household Debt

If the provided proof of the relation between household debt and economic health have provided justification for our dashboard, studies on legislative effects provide motivation for creating the dashboard. Garber et al.'s study of Brazil's 2014 recession[6] and Guggenheim Investments' look into the effects rate cuts will continue to have in the US economic health[2] provide a basis for which variables our dashboard will allow users to adjust.

Current State of Debt

A major push to produce our dashboard has come from research that reveal household debt is steadily climbing. From Li's evaluation on the economics of student loans[8], to Mian et al.'s study on the household leverage crisis[10] and Zabai's assessment on recent household debt developments[15], we've come to realize how much household debt continues to grow. Leveraging this information, we hope to reveal what factors might be leading to this troubling trend.

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