

## An Analysis of Consumer Budgeting and the Great Recession

Robert Garrett\*

Ritu Narahari†

Thomas J. Fisher‡

### Abstract

The Great Recession (2007-2009) created a well-established decline in the U.S. economy. This impact is typically measured with broad summative values, such as Gross Domestic Product and the national unemployment rate. The U.S. Bureau of Labor Statistics Consumer Expenditure data provides a more focused look into the demographics, financial situations and expenditures of U.S. Citizens. We aim to study the effects of the Great Recession on individual economic behavior. First, we visualize notable changes in consumer habits before and after the recession and compare the results to Macroeconomic trends. We then analyze the budgeting habits of US Consumer Units to identify useful information for modeling. Finally, we utilize the CE data to build a predictive model to estimate the continued effects of the Recession on Consumer Units.

**Key Words:** Macroeconomics, Consumer Expenditures, Great Recession.

### 1. Introduction

The Great Recession (2007-2009) was one of the largest economic pitfalls in modern history. The Recession is typically attributed to a decline in the US housing market (REF), leading to a deterioration of major U.S. stock market indexes and financial institutions, a 10% peak in the US unemployment rate, and one of the longer downturns in the growth of the US Gross Domestic Product. However, many of these metrics fail to quantify the effect of the Recession on the individual consumer, and all of these metrics provide one overarching value for the whole US population. In the following pages, we will propose a new metric that is consumer-based and partitionable by demographics to mitigate these issues.

The Bureau of Labor Statistics (BLS) surveys the US population as part of the Consumer Expenditure Survey (CEX). The survey is collected by Consumer Units (CUs), which are families or small groups of people who spend together and share income. A wide variety of information is recorded: The survey starts with a myriad of demographic questions, transitions into financial information and ends with a detailed account of each CU's spending habits.

By aggregating the information found in the CEX survey across the years surrounding the Great Recession, we can create a new metric that tracks consumer habits. We can then compare this value to macroeconomic indicators to see how the economic health of the nation compares to CU habits. Furthermore, we can break the new metric down by demographic factors to see how various groups fared during the recession.

---

\*Corresponding author Robert Garrett is a third year Undergraduate Math & Statistics Major at Miami University, Email: garretc@miamioh.edu

†Ritu is a second year Undergraduate Statistics Major at Miami University

‡Faculty Advisor Thomas J. Fisher is an Associate Professor in the Department of Statistics at Miami University, Email: fishert4@miamioh.edu

## 2. Data

### 2.1 CEX Survey Data

The CEX data are available from the BLS: <https://www.bls.gov/cex/pumd.data.htm>. The survey has been conducted yearly since 1996, and is broken down by quarters each year. We chose to work with data from 2004 until 2014 in order to get a wide range of years surrounding the 2007-2009 Recession. Within each sample year, CUs may respond to the survey for any amount of quarters, meaning that some CUs may be sampled each quarter and some may respond only once and then drop out of the survey. To avoid any response bias, we looked only at the quarter two data. We chose quarter two to avoid any irregularities surrounding end-of-year consumer behavior.

### 2.2 Economic Indicator Data

Now that we have our consumer-level data, we gather sources for our macroeconomic indicators. For our general economic values, we look to the World Bank Group [data.worldbank.org](http://data.worldbank.org). For stock data, we use S&P Dow Jones Indices <http://us.spindices.com/indices/equity>. We end up with a single value for each of these indicators every year. This will allow us to directly compare the trends of each of these indicators before, during, and after the Recession.

## 3. Analysis

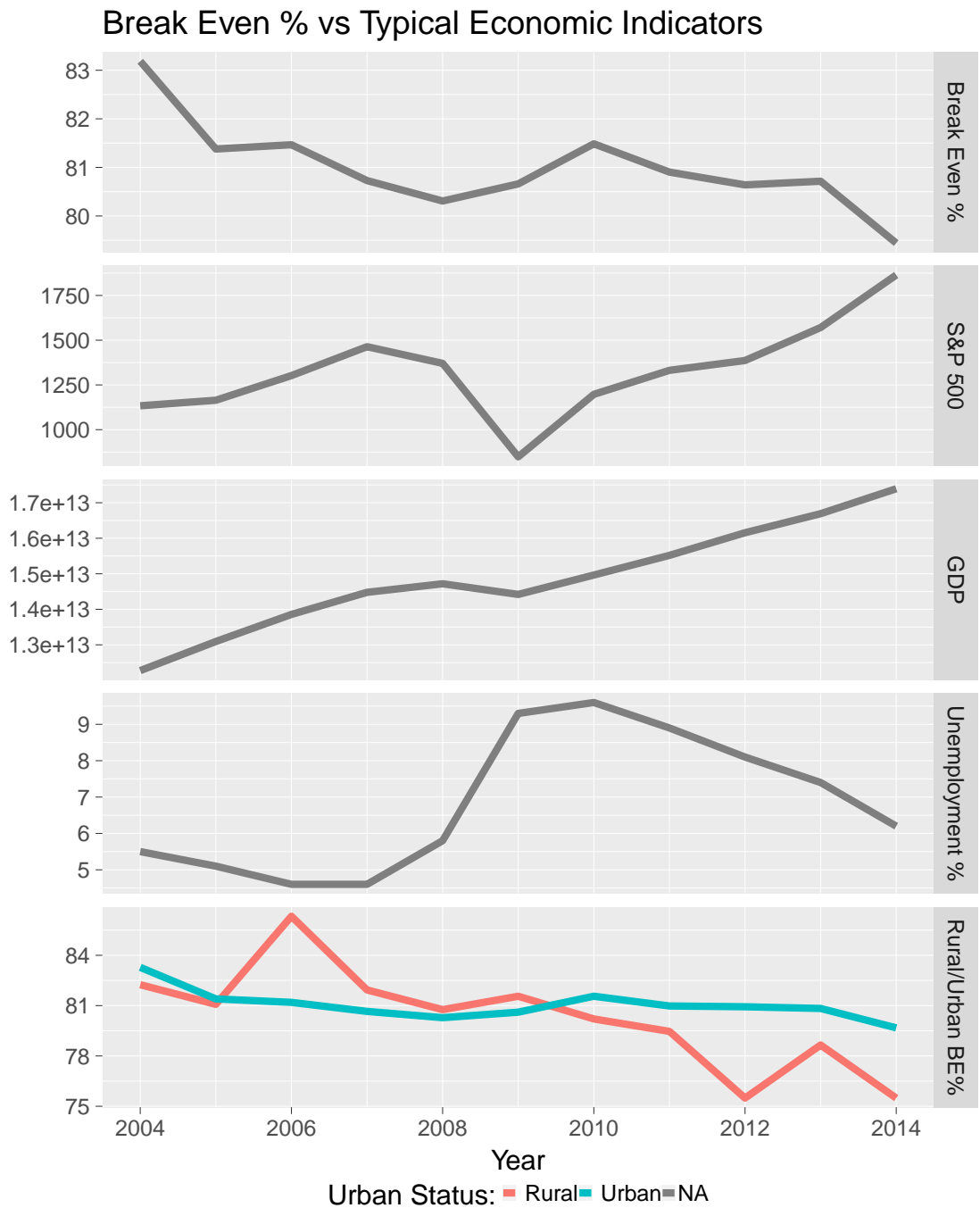
To analyze the effect of the Recession on individual Consumer Units, we must examine the CEX data from multiple perspectives. First, we visualize consumer trends and their interactions with economic indicators during the recession. Next, we investigate the budgeting habits of various demographic groups. Finally, we prepare a predictive model to provide a consumer unit-level look into the post-Recession economy.

### 3.1 Trend Lines

By making a line plot of Break Even Percent over the years surrounding the Great Recession, we can get an idea of how the Recession impacted Consumer Units. Additionally, this allows us to plot the trends of other indicators of economic health to see how they compare to Break Even Percent.

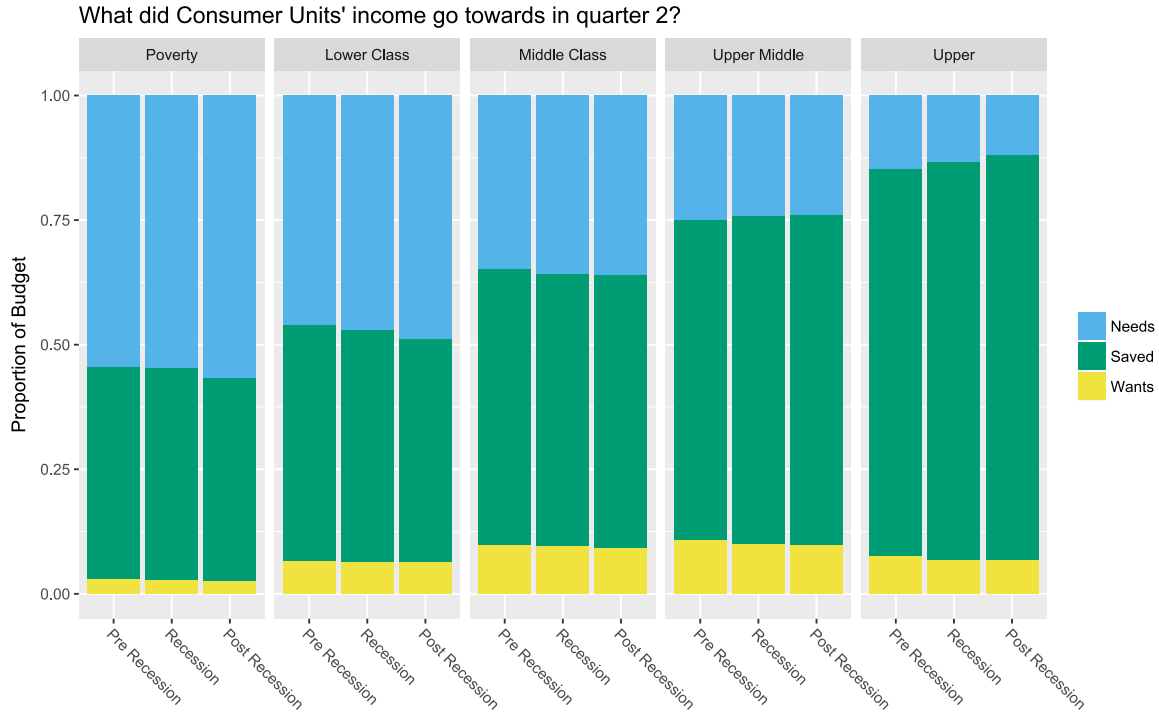
In figure 1 we can compare the proportion of Consumer Units which broke even each quarter against the typical indicators of a recession. We can see that all the trends are similar with majors dips (or in the case of Unemployment %, growth) during the recession. However, once we get past 2010, all of our macroeconomic indicators return to their usual levels or growth, while Break Even Percent continues to decline. This supports the idea that consumers may have not recovered as well as the national economy.

The last thing of note is that Break Even Percent can be broken down into various demographic groups in order to view the effects of the Recession on different sub-populations of the US. For example, in the bottom fact of figure 1, we can see the Break Even Percent of the US broken down by Rural and Urban groupings. Looking below to the bottom panels of figure 1, we see that there may be a stronger association between unemployment and the rural US than there is between unemployment and urban/suburban populations.



Data Source: BLS Consumer Expenditure Survey, World Bank, S&P Dow Jones Indices, ACA Income Limits

**Figure 1:** How does Break Even Percent stack up against other indicators of economic health? In the bottom panel we see that Break Even Percent can be broken down by demographic information.



**Figure 2:** Composition of Consumer Unit expenditures across the Great Recession by economic classes. Data from BLS CEX Survey.

### 3.2 Compositional Data Analysis

Next, we want to investigate which factors are associated with different spending and savings habits, which may have an influence on whether or not a CU breaks even. We want to analyze consumer budgeting, so we need to measure the proportion of income going to different spending categories. So, we take the population of CUs who did break even, and using the CE data split their expenditures into three categories: needs, wants and savings.

The "needs" category is made up of those expenditures which are necessary for survival and work. This includes food, housing, transportation and medical costs. For consumer units with less income, this may make up the majority of annual expenditures!

Next is the "wants" category. This is made up of any expenditures that did not fall into the needs category such as eating out, excess clothing, vacations, alcohol and tobacco. This category makes up a relatively small proportion of each CU's budget.

Finally we have the "saved" category, which is made up of money sent to savings accounts, personal insurance, or that is not accounted for by the CEX survey. This makes up a large proportion of the budgets of consumer units that have a lot of income coming in.

Now, looking at figure 2, we can see how CUs of different income classes spent their money before, during and after the Recession. Of particular note is that the proportional amount of expenditures going to the needs category has increased for each of the Poverty, Lower and Middle economic classes, while for the Upper Middle and Upper economic classes the proportion going towards needs has decreased. Similarly, as we go up the economic classes, we go from a decreasing trend in the proportion saved to an increasing trend in the proportion of income saved. This indicates that some groups were negatively affected by the Recession while some groups may have made it

through they Recession relatively unscathed.

### **3.3 Predictive Model**

Sticking with the sub-population of Consumer Units who did break even, we now want to see if any of the associations we saw in our exploratory analysis can help us to predict the budgeting habits of CUs. Since we are working with compositional data, we must model the proportion of income going into our three categories. There are various methods to achieve this, but since we know that we do not have independence between our responses and are working with a large sample size, we will stick to linear models. First, we take the log ratios for wants/savings and needs/savings, allowing us to boil the three responses down to two. Then, we can fit a bivariate linear model using the log ratios as our responses. Because we use the year and demographic information as our predictors, our model can now give us predictions for how consumer budgeting trends may change over time for the various sub-populations of the US.

## **4. Conclusions**

Break Even Percent leverages the open and accessible CEX data to create a consumer-level economic indicator. Furthermore, Break Even Percent partitions the country into two groups which allow us to explore different aspects of economic health. Knowing the demographic breakdown of the group that did not break even allows us to identify struggling sub-populations of the US. Analyzing the budgeting habits of those who did break even allows us to see the effect of larger economic events on individuals, and among those individuals pick out which were affected positively or negatively.

Our conclusion from our analysis of the Break Even Percent is that different demographic groups were affected by the Great Recession in different ways. However, this is not reflected by typical measures of economic health. This results in the current economic story failing to accurately represent the financial situation of US consumers. By using an indicator that is constructed from consumer-level data and able to be broken down by demographic groups, we can gain more accurate insights into the economic health of consumers in the US.