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How do consumer sentiment and other selected variables affect consumption from 1952 to 2013? An investigation of the United States

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HOW DO CONSUMER SENTIMENT AND OTHER SELECTED VARIABLES AFFECT CONSUMPTION FROM 1952 TO 2013? AN INVESTIGATION OF THE UNITED STATES

HONORS THESIS SUBMITTED TO
DR. BERNICE SCOTT
IN CANDIDACY FOR THE DEGREE OF
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BY:
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Abstract

The purpose of the research was to investigate consumption in the United States from 1952 to 2013. Consumer sentiment was the main explanatory variable, along with Real Gross Domestic Product, prime interest rate, unemployment rate, and recession. Consumption was measured in personal consumption expenditures. Consumer sentiment was measured with the University of Michigan Consumer Sentiment Index survey. The research used Ordinary Least Squares as the methodology of estimating the parameters in the regression.

The results revealed that when consumer sentiment increased by one point, personal consumption expenditures decreased, suggesting some predictive abilities in the consumer sentiment measure. The consumer sentiment variable was negative and significant in all of the regressions completed. The Real Gross Domestic Product variable was positive and significant at all levels each of the regressions. Contrary to economic theory, the log of the unemployment rate variable was positive in the regressions run. However, it was remained insignificant in each regression.

It was recommended that the government lower taxes when consumer sentiment is low to prevent impending consumption expenditure declines that could lead to recession. An implication of this fiscal policy was that it would increase disposable income, which could
increase aggregate consumption. A negative implication of this policy was a potential overheating of the economy.

Suggestions for further research were adding a race variable to investigate consumption patterns between races. Another suggestion for additional research is to split the time periods into two separate regressions: one examining consumption from 1952 to 1982 and a second regression from 1983 to 2013. The research concludes that consumption expenditures are a central component in the economy. Intervention, through fiscal or monetary policy, is needed to influence changes in consumption during periods of economic disequilibrium.
Chapter I.

Introduction

Before the Industrial Revolution, consumption was nothing like it is today. The United States was a “primitive” economy in that people consumed only the goods they could make themselves (Goodfriend and McDermott 1991). Farming was a popular occupation (economywatch.com 2010). The Industrial Revolution completely shifted the American culture of consumption, as well as the overall economy.

The Industrial Revolution began in Great Britain in the late eighteenth century (economywatch.com 2010). The invention of the steam engine acted as a catalyst in the development of improved transportation and communication (Hudson 2011). The engine launched the use of ships and trains as major methods of moving people and information at higher speeds. Mining areas and port locations quickly became industrialized due to technological advancements created to exploit the natural resources of those environments. People from rural areas migrated to these growing urban cities to work in factories, shipyards, and mines. With the massive population increase, factories hired cheap labor to operate the new machinery used in the equally new production processes of formerly hand made products. Though the manufacturing process was still labor intensive at this time, production increased
exponentially. The large population shift from the rural areas to urban centers also increased the demand for these newly factory manufactured products (Hudson 2011).

The Industrial Revolution in the United States began after the economic modernization in Great Britain. With Britain’s newfound transportation improvements, they were able to export goods to America in exchange for crops such as tobacco and indigo (Breen 1988). The demand for British goods during the eighteenth century and early nineteenth century fueled the British Industrial Revolution further, as well as generated the manufacturing spirit in the American society. The American Industrial Revolution began with the first wave of technological advances. Technological advancement resulted in an increase of population and consequently an increase in the labor force (Goodfriend and McDermott 1991). The “primitive” economy became less efficient for the larger labor force, and the economy was forced to move towards a “modern economy.” The factory-manufacturing model worked better on a larger scale than the former economy of independently producing goods. The first technological advances that affected the manufacturing process were steam and water power (Atkeson and Kehoe 2001). The rise in electricity and its application launched a second Industrial Revolution, lasting from 1860 to 1900, with indirect effects lasting until the 1960s. The transition to electric power took many years, but the impact of this innovation changed production output and consumption immensely.

At the turn of the twentieth century, items like iron, steel, lumber, and textiles were the most manufactured items (Lasch). These industries laid the foundation for modern consumption. These industries employed many people in factories across the country, as well as provided the materials for railroads, buildings, and other infrastructure. These items also prepared the United States for their involvement in World War I. In the 1920s, the advertising Industry blossomed
and constructed the idea of “artificial obsolescence”. This term, coined by Earnest Elmo Calkins, is defined as “entirely apart from any mechanical improvement, to make [products] markedly new, and encourage new buying” (Lasch). Americans were buying cars, houses, clothes, jewelry, cigarettes, and more as quickly as they were being produced. New trends and models of consumer goods were released frequently, and consumers continued to follow the principles of “artificial obsolescence” (Lasch).

The Great Depression of the 1930s greatly impacted the consumption expenditures of the United States (Lasch). However, the desire to possess material wealth and the ability to buy newly released products still appealed to the masses, and lead to the post-World War II idea of the “American Dream”- a standard of living focused on consumerism. During the 1950s, products like showers, bathtubs, and televisions, that were previously considered luxuries, had become staples in American homes. Leisure became a consumer item, as workers averaged more vacation days than ever before (Lasch).

Today, the United States and many other developed countries are spending more than ever. The United States’ consumption expenditure for 2012 was over $11 trillion dollars (data.worldbank.org). The United States’ consumption expenditures are almost $8 trillion dollars ahead China, the world’s most populated country (data.worldbank.org). The consumption of the two countries is compared using the consumption factor, a measure of product and resource consumption as well as waste production. The consumption factor of the United States of America is thirty-two, indicating a very large product consumption and waste production in their economy. However, the consumption factor of many developing nations is close to one (Diamond 2008). Americans do not only consume more than every other country in the world, but the country is by far the most wasteful. All of the western European countries
have a consumption factor of thirty-two, like the United States. However, these countries possess more accessible healthcare, better education systems, lower infant mortality rates, lower obesity rates, and more financial security after retirement.

The availability of credit cards and omnipresence of advertisements increased the insatiable appetite for consumer products in the United States (Novotney 2008). Even in their own homes, Americans see advertisements for a wide range of products. Psychologists see correlation between consumption habits and unhappiness, stress, and depression. However, data from the World Bank displays that in the most recent global recession of 2008, consumption expenditures in the United States decreased at a smaller percentage than the decrease in global consumption expenditures (data.worldbank.org). In studying the history of consumption in America, it seems that there are few factors to deter the people from spending money.

The purpose of the research is to investigate consumption, measured in personal consumption expenditures, in the United States from 1952 to 2013. Consumption is the dependent variable. The main explanatory variable is consumer sentiment, measured with the University of Michigan Consumer Sentiment Index. The other selected independent variables of the proposed research are consumer sentiment, measured by the University of Michigan Consumer Sentiment Index; Gross Domestic Product, interest rate, unemployment rate, and recession years, presented as a binary variable. The research uses time-series data from 1952 to 2013. The functional model will be as follows:

\[ C = f(S, Y, r, U, R) \]

Where:

- \( C \) = Consumption
- \( S \) = Consumer Sentiment
The functional model displays some of the various factors that are predicted to affect personal consumption expenditures in the United States. According to the functional model, consumption depends on consumer sentiment, Gross Domestic Product, the prime interest rate, the unemployment rate, and the years in which the economy was in a recession.

The regression model will be as follows:

\[ C = \beta_0 + \beta_1 \text{S} + \beta_2 \text{RGDP} - \beta_3 \text{LIR} - \beta_4 \text{LUER} - \beta_5 \text{Rec} + \epsilon \]

Where:

- \( C \): US Personal Consumption Expenditures 1952-2013 (billions of dollars)
- \( S \): University of Michigan Consumer Sentiment measure 1952-2013
- \( \text{RGDP} \): Real Gross Domestic Product in United States 1952-2013 (billions of dollars)
- \( \text{LIR} \): Log of Prime Interest rate 1952-2013
- \( \text{LUER} \): Log of United States Unemployment rate 1952-2013
- \( \text{Rec} \): United States Recession years (binary variable)
- \( \beta_0 \): Constant term
- \( \beta_1 - \beta_5 \): Coefficients
- \( \epsilon \): Error term (assumed to be zero)

The main explanatory variable in the proposed model is consumer sentiment. This variable is used to extract people’s perception of the economy. The other selected variables; Real Gross
Domestic Product, the prime interest rate, the unemployment rate, and recession years; are used as actual measures of how the overall economy is performing. It is expected that consumption and consumer sentiment will be positively related, as people want to spend more if they feel better about the economy. It is hypothesized that the consumption variable and Gross Domestic Product will be positively related because of the consumption model of calculating Gross Domestic Product. The prime interest rate variable and consumption are expected to have a negative relationship because people borrow less money when the price of borrowing money from banks increases. When people borrow less money, they have less money to spend, therefore decreasing their personal consumption expenditures. The unemployment rate and recession variables are predicted to negatively relate to consumption as well. Unemployed people have less disposable income from which to consume. Years where the United States experiences a recession are expected to yield lower personal consumption expenditures. The empirical method used to estimate the coefficients is Ordinary Least Squares (OLS).

The theories underlying the research are Keynes (1936) absolute income hypothesis, Dusenberry’s (1949) relative income hypothesis, Modigliani and Brumberg’s (1950) life cycle hypothesis, Friedman’s (1957) permanent income hypothesis, and Veblen’s (1902) theory of conspicuous consumption. These theories predict how consumption reacts to a multitude of variables.

The research begins with Chapter I, Introduction, which provides the research question, background information regarding the subject, the purpose of the research, the variables to be investigated in the research and how they relate to the topic, and the organization of the research. Chapter II, Literature Review, examines previous research pertaining to consumption. Chapter III, Theoretical Framework, presents the economic theory and the econometric model underlying
the research. Chapter IV, *Methodology and Sources of Data*, provides information on the methodology used in the research, and identifies the sources of data for the variables used in the research. Chapter V, *Empirical Results*, delivers the empirical results of the econometric model and analysis of these results. Chapter VI, *Policy Recommendations and Implications*, considers how the research applies to society. Chapter VII, *Summary and Conclusions*, summarizes the research and suggests future research on consumption.
Chapter II

Literature Review

The assessed literature provides a broad scope of consumption and the multiple variables that affect its fluctuations. In the conclusion of this chapter, differing perspectives of the forecasting abilities of consumer sentiment on consumption expenditures are analyzed.


Kamakura and Du (2012) consider the relationship between consumption and expenditure patterns by posing the research question, “For any given level of consumption budget, how would a household’s expenditure pattern differ depending on whether the economy is in a recession or not?” (230). The purpose of the study was to examine an alternative to the standard economic assumption that utilities derived for different levels of consumptions are independent
of economic conditions. This assumption came from the relative income hypothesis that states that people consume relative to their peers’ consumption habits. Kamakura and Du (2012) disputed the assumption by claiming that the utility gained from consuming certain commodities depends on whether the economy is in a recession or not. With this new idea, the research hypothesized that people spend less on certain positional items during a recession because the amount needed to maintain a certain standing has also decreased due to a widespread decrease in consumption by all participants of the economy.

Kamakura and Du (2012) used data on various commodities from a sample of United States households to construct Engel curves that shift vertically depending on economic conditions, and then compared the Engel curves derived from the data collected to the theoretical fixed Engel curves that only show movement along the curve during times of recession. With the Engel curves, Kamakura and Du (2012) hypothesized that nonessential items created positively sloped Engel curves when graphed against budget constraints because during economic booms, budgets increased, and people could afford to buy more nonessential items. During recessions, hypotheses predicted the positively sloped Engel curve to shift downwards. The curve derived from the data confirmed the predictions for nonessential goods. The curve for nonessential goods shifted downwards during recessions because people chose to save more money. Kamakura and Du (2012) predicted that the Engel curve for essential items would shift upwards during recessions. All of the essential categories but two (home/gas/coal, electricity) shifted upwards as expected during recessional periods.

Kamakura and Du (2012) concluded that consumer preferences shift as a result of Gross Domestic Product growth and contraction. Kamakura and Du (2012) also concluded that the
consumption of certain goods that are visible and display social standing is more affected by the spending decisions of others than nonessential goods.

Kamakura and Du (2012) concluded that consumer preferences play an essential role in an economy. Consumer preferences can reflect consumer sentiment. Like consumer sentiment, consumer preferences also relate to Gross Domestic Product growth and contractions. The changes in consumer preferences, like the hypothesis involving consumer sentiment, caused changes in the consumption of non-essential goods because the demand for non-essential goods is highly elastic (Kamakura and Du 2012). When consumer preferences move in favor of nonessential goods, these goods will be consumed more. When consumer preferences move to negatively affect the demands of nonessential goods, these goods are consumed in significantly lower amounts. Essential goods, such as food staples, water, and gasoline, are inelastic.

Consumer preferences minimally affect these types of goods. Consumer preference may affect the brand or type of essential good purchased, but because these goods are critical to living, they will always be constantly demanded.

Consumer preference changes are usually a result of recessions. When the economy contracts, consumer preferences shift to negatively affect the consumption of nonessential goods, and less expensive brands or types of essential goods will be consumed more. Crossley et.al (2013) investigated how recessions affect changes in consumption expenditures.

Crossley et. al (2013) researched the changes in consumption expenditures resulting from the most recent global recessions in the United Kingdom economy. They examined the recessional effects on household spending because consumption is the largest portion of Gross Domestic Product, as well as the most relevant measure of the country’s welfare.
Crossley et. al (2013) encompassed micro and macro economic data in their analysis of household spending during recessions. They defined a recessionary period as two successive quarters of negative Gross Domestic Product growth. They also defined a recessionary year as twelve-month period with at least one quarter of negative Gross Domestic Product growth. The researchers looked at aggregate expenditure fluctuations over a period of time. The micro data allowed for analysis of specific household spending on durables and nondurables on an annual basis, while the macro data permitted analysis of aggregate spending on a quarterly basis for a more readily available time frame.

Crossley et. al (2013) results displayed that in the 2008 recession, the durable goods and nondurable goods sectors experienced declines of similar magnitudes, as opposed to past recessions where nondurable goods consumption declined at a lower rate than durable goods. However, in all three recessions examined, total consumption expenditures decreased more than disposable income decreased as people increased their savings.

Crossley et. al (2013) concluded that the recession in 2008 was different than past recessions that occurred in the 1980s and 1990s. They discovered that household consumption declined the greatest amount, durable goods and nondurable goods expenditures decreased in similar amounts, and that homeowners cut their expenditures by a larger amount than non-homeowners. Other recessional consumption behavior patterns seen in the 2008 recession were savings increases and cutbacks on superfluous goods and services.

Crossley et. al (2013) research relates to Kamakura and Du (2008) research on considering expenditures based on type of good. The results of Crossley et. al (2013) slightly contradicted the findings of Kamakura and Du (2012) regarding expenditures of nondurable or non essential goods compared to durable or essential goods. If nondurable and nonessential are
synonymous, then according to Crossley et al. (2013), the results of the regression would have displayed a greater decrease in spending on nonessential or nondurable goods than the essential or durable goods. The results of Crossley et al. (2013) were that the two types of goods decreased in similar magnitudes. The disparity in findings on expenditures could stem from the differences in definitions of nonessential compared to nondurable, as well as essential compared to durable.

If these definitions were interchangeable, conclusions could be drawn from both studies. It could be inferred that during recessions, consumers usually change their preferences of non-durable, or non-essential goods, to less expensive products (Kamakura and Du 2012). During recessions, people may also delay purchases of durable goods, and focus on elongating their useful lives to save money. The change in consumer preferences affects the consumption expenditures, because consumers are willingly choosing to spend less on certain products. The changes in consumer preferences may be a result of increased unemployment, leading to rising income uncertainty. Malley and Moutos (1996) examined the effects on unemployment on consumption.

Malley and Moutos (1996) assessed the effects of increased income uncertainty on consumption patterns. They specifically examined unemployment as a measure of income uncertainty, and its role in affecting consumption. Income uncertainty is how consistently a person receives income, whether from a job or government aid. Malley and Moutos (1996) look at the implicit contract theory to explain consumption patterns and unemployment. The implicit contract theory states that the economy will perform as an “insurance” to all of the workers by acting as consumption smoother, thus assuming identical consumption levels between employed
and unemployed workers (584). The researchers studied the validity of the implicit contract theory. They supported the idea that as unemployment increases consumption decreases.

Malley and Moutos (1996) used a vector error correction model to estimate the co-integration coefficients. The equation incorporated per capita motor vehicle sales as a measure of consumption, per capita personal disposable income, the real interest rate, the relative price of motor vehicles, and the unemployment rate. The results of the regression displayed that the unemployment rate significantly impacts consumption levels, and that the two variables are negatively related. Malley and Moutos (1996) generated three explanations for the discovered relationship. One reason for the negative relationship is the precautionary savings motive: that as unemployment increases, income uncertainty also increases, and people save more money. An alternative explanation is that the unemployment rate predicts future income, so people begin saving as unemployment increases. A third explanation is that unemployed people cannot obtain credit, making it difficult for them to consume durable goods.

Malley and Moutos (1996) concluded that the precautionary savings motive explains why consumption decreases when the unemployment rate increases. Unemployment rate increases trigger income uncertainty, therefore increasing workers’ desire to save. The researchers address certain policy implications; such as current tax cuts only increase current consumption, also relating to the precautionary savings motive.

Income uncertainty is a result of increasing unemployment (Malley and Moutos 1996). Even if a person is in a fairly stable job, when the unemployment rate of the entire economy increases, that person can also be affected. In the situation of income uncertainty and consumption, the relative income hypothesis can be used with the precautionary savings motive. Part of the relative income hypothesis is that when a person’s peers change their spending habits,
that person also changes their spending habits, due to social psychology. In relation to the precautionary savings motive, when unemployment increases, income uncertainty increases more for those in certain industries or companies, and people begin saving more. When others in industries that are more stable observe the consumption habit changes of others, they also increase their savings.

The economy is considerably affected by social interactions (Cotsomitis and Kwan 2006). The changes in consumption habits of others signals people to also change their spending habits. Even the mere observation of a changing in attitude towards the economy can affect the spending habits of its participants.

Cotsomitis and Kwan (2006) inspected consumer attitude effects on household spending. It is critical to study the effect of consumer attitudes on the economy because consumer spending counts between 60% and 70% of the Gross Domestic Product of industrialized economies, such as the United States and Great Britain. The researchers used the results of two surveys in the regression- the Consumer Confidence Indicator (CCI) and the Economic Sentiment Indicator (ESI). Participants of 15 European Union countries took the survey, which has been tested as valid and representative. Cotsomitis and Kwan (2006) used prediction equations by Carroll, Fuhrer, and Wilcox (1994), Bram and Ludvigson (1998), and Ludvigson (2004). The first equation assessed the ability of the consumer confidence variable to predict changes in total personal consumption expenditures using sample data. The second equation observed the predictive abilities of past survey responses ($S_t$) on household spending while incorporating control variables using real data. In the sample, six of the nine countries had positively related coefficients between consumer sentiment and household spending that were statistically
significant. The results from the real data implied that the consumer confidence index had little predictive abilities in forecasting consumption expenditures.

Cotsomitis and Kwan (2006) concluded that the Consumer Confidence Indicator and Economic Sentiment Indicator have little value in forecasting consumption for large-scale economies. The researchers suggested that economists and government should be careful in using these indicators when creating policy around consumption, and that they may only be able to predict other macroeconomic indicators.

The economic indicators may not be valuable when predicting household spending because the surveys used to gather the data on sentiment are subjective (Cotsomitis and Kwan 2006). Factors unrelated to the economy that cannot be controlled, such as the person’s mood or their general disposition, affect the participants’ sentiment towards the economy when taking the survey. Though these indices measuring sentiment are tested for validity, it must be considered that sentiment is a very subjective measure to use in constructing policies around consumption. Howrey (2001) also questioned the ability of various sentiment indices on predicting consumption expenditures. Howrey (2001) found that these indices based on “feelings” of the economy’s participants are not statistically significant enough to be the foundations of policy creation. He further investigated the predictive capabilities of various indices and how these indices can predict recessions and personal consumption expenditures.

Howrey (2001) examined the predictive abilities of the University of Michigan Consumer Sentiment Index, in conjunction with other indicators, within two realms: as a predictor of recessions and recovery periods, and as a predictor of personal consumption expenditures. The researcher used the National Bureau of Economic Research’s definition of recession; “two or more successive quarters in which a weighted average of the current and immediately preceding
and following GDP growth rates is negative" (175). Howrey (2001) used a vector autoregressive model to assess the predictive abilities in terms of estimating recession and recoveries. The results from the model revealed that the University of Michigan Consumer Sentiment Index was statistically significant in predicting recessions using real quarterly Gross Domestic Product growth data. Specifically, the results from the regression displayed that the predictive abilities of this index are more accurate are higher before the recession begins, and become less accurate in the last quarter of the recession.

The purpose of examining the abilities of the University of Michigan Consumer Sentiment Index in predicting total personal consumption expenditures is because the University of Michigan Consumer Sentiment measurement is released before the total personal consumption expenditure number. Howrey (2001) used an error-correcting model to estimate the forecasting abilities of the Index of Consumer Sentiment in this capacity. From the results of the regression, the University of Michigan Consumer Sentiment Index is statistically significant and meaningful. However, the standard error was very large when monthly personal consumption expenditure data was used, as compared to quarterly personal consumption expenditure data. Howrey (2001) concludes that the University of Michigan Consumer Sentiment Index is accurate in predicting recessions using data from Gross Domestic Product growth rate measurements. In terms of forecasting personal expenditure amounts, the this consumer sentiment index is more precise using quarterly data than monthly data, but the standard errors for both regressions are above average.

Compared to the conclusions of Cotsomitis and Kwan (2006), Howrey (2001) found some use in a consumer sentiment index for predicting recessions or personal consumption expenditures. One difference in the two studies is that Cotsomitis and Kwan (2006) collected
their data in the United Kingdom, while Howrey (2001) collected data in the United States. The studies also used different surveys. The surveys may have been similar, but because they have different questions and are given to a completely different group of people in a comparable, but not identical, economy, neither conclusion holds more weight than the other. Further investigation by Al-Eyd et. al (2009) uncover whether consumer confidence can forecast consumption in the short term.

Al-Eyd et. al (2009) contributed to existing studies about the link between indicators of consumer sentiment and actual consumption in the economy. The researchers also considered how consumer sentiment extends itself to examining whether these consumer sentiment surveys affect actual economic activity. Though these indicators have proven faulty in the long run, Al-Eyd et. al (2009) hypothesized that these sentiment indices can be used to forecast short-term consumption patterns.

Al-Eyd et. al (2009) used quarterly data from five countries over a period of 33 years on consumption expenditures and consumer confidence levels. The researchers used Granger causality tests to evaluate the relationships between consumer sentiment and consumption expenditures. The consumption variable was measured in two ways: as real personal disposable income and real net financial wealth, which includes equities and bonds. To assess whether consumer sentiment and consumption expenditures change with the inclusion of other variables, they conducted redundancy tests through the use of multivariate autoregressive moving average specifications.

The results exposed a lack of forecasting abilities of consumer sentiment when trying to predict short-term consumption. Al-Eyd et. al (2009) concluded that consumer sentiment indicators are weak in their predictive abilities when used with other measures of consumption.
They also concluded that policy makers should not depend on consumer sentiment solely when attempting to predict economic activity, but should use consumer sentiment as a very rough, initial estimate of consumption expenditures.

Al-Eyd et. al (2009) supported Cotsomitis and Kwan (2006) and Howrey (2001) in concluding that consumer sentiment is not an accurate predictor of consumption expenditures. The consumer confidence index is a different survey measuring the outlook of an economy’s participants than the survey used in Cotsomitis and Kwan (2006). Another divergence in the research of Cotsomitis and Kwan (2006) and Howrey (2001) is that they used total personal expenditures in their regressions, while Al-Eyd et. al (2009) also considered net financial wealth of individuals, which includes equities and bonds. Consumer sentiment may affect the purchases of securities more than the purchases of bonds due to their volatile nature. If people are feeling negatively toward the market, they are less likely to consume or purchase securities, so expenditures on stocks will fall. However, people may be interested in buying bonds during these periods of low consumer sentiment because of their long-term and stable benefits. A study completed by Palumbo et. al (2006) examines the interrelationship of consumption, income, and wealth.

The relationship between consumption and income is often used in creating predictions about the economy and policy creation. Palumbo et. al (2006) challenged the assumption that a change in the aggregate price index will affect real consumption of non-durable goods and services by the same amount without regard to whether the change in the aggregate price index resulted from a price change of non-durables or durables. The research exhibited the errors of this assumption using data from the United States of America after World War II. Palumbo et. al (2006) analyzed the data with a Hall-Flavin formulation of the permanent income hypothesis.
Palumbo et. al (2006) provided an alternative to the traditional approach of estimating changes in real consumption through the deflation the nominal prices of consumption of non-durable goods and services.

Palumbo et. al (2006) results displayed that the traditional approach to estimating consumption coefficients in relation to income created a poor line of best fit due to large approximation errors. The traditional approach also underestimated the wealth effect on the consumption-income relationship, and showed the wealth effect declining over time. The data regressed using the new approach with nominal measurements provided more accurate estimates of the wealth effect and a better fitting regression line. Palumbo et. al (2006) concluded that the methodology of examining consumer behavior must be altered when including durable goods in the analysis. When durable goods were included, the traditional approach caused large errors in estimation, provided a poor fitting regression line, and underestimated the wealth effect over time. The researchers also found a need for models of durable and non-durable goods separately in estimating consumption expenditures due to the frequency of use of nondurable goods. Nondurable goods, such as food, clothing, and gasoline, are bought much more often than durable goods, such as houses, cars, and appliances.

Crossley et. al (2013) also compared expenditures between nondurable goods and durable goods. Their research supported Palumbo et. al (2006) in that the spending on durable goods decreases by a different amount than the spending on nondurable goods. Combining the two types of goods in a regression model distorts the consumption expenditures of a person (Palumbo et. al 2006). The misrepresentation occurs when a major purchase is made in one quarter, inflating the personal consumption expenditures number for that period. In the successive period, when the person does not make a nondurable purchase, their expenditures seem to have
declined, when in actuality, the expenditures are at a similar level to when the participant did not make any large durable purchases.

Parker and Preston (2005) investigated the causes of changes in aggregate consumption growth, and the extent to which precautionary saving affects aggregate consumption fluctuations. The researchers used data on consumption expenditures at the household level to determine whether changes in consumption growth could be attributed to new information, the real interest rate, consumption preferences, and precautionary saving. Their methodology was a consumption Euler equation that separated consumption growth into its four approximate causes. They used the Family and Detailed Interview files from the Consumer Expenditures Survey from 1981 to 1998. In focusing on attributing a portion of consumption growth to precautionary saving, measurement and misspecification errors affected the determination of this amount.

Parker and Preston (2005) used aggregate rolling regressions to estimate the parameters of the aggregate consumption expenditure variable and time period variable. The results from the empirical analysis displayed incomplete markets as a major cause of consumption fluctuations during the time period examined. However, in the regression, a large percentage of the negative parameter of incomplete markets on consumption fluctuation was attributed to misspecification. Parker and Preston (2005) determined that incomplete markets are a larger factor than precautionary saving in consumption growth fluctuation. They also found that precautionary savings may affect the consumption growth fluctuation of those not in the liquidity constrained group, though the regression did not estimate these results as precisely.

Parker and Preston (2005) introduced new variables into the examination of sentiment as an indicator of future consumption expenditures. They used new information, interest rate, and precautionary savings as variables that fluctuate consumption. New information could directly
affect consumer sentiment. For example, if the news reports positively on the economy, participants will increase their consumer sentiment measurement with regards to the new information. Parker and Preston (2005) also considered incomplete markets as an important factor in consumption fluctuation. An incomplete market implies an excess of demand over supply in a market with not enough suppliers (http://www.economicsonline.co.uk). When demand is greater than supply, prices are driven upwards. The upward movement in prices could be a signal to the economy’s participants to begin saving more, therefore decreasing consumption expenditures, if using the Keynesian disposable income equation. This equation states that disposable income equals consumption plus savings for all of an economy’s participants. Consumption can be investigated using all four of the income hypotheses. Erlandsen and Nymoen (2008) examine consumption with the life cycle hypothesis.

Erlandsen and Nymoen (2008) tested Modigliani’s life cycle hypothesis while taking into account the changing age distribution of a population. Modigliani’s life cycle hypothesis predicts that consumption levels fluctuate over the life of a person so that people in their working years are able to consume from retirement to the end of their lives. The researchers strived to test whether aggregate consumption is dependent on the overall age structure of the population, as well as whether demographic information that can be modeled with macroeconomic relationships.

Erlandsen and Nymoen (2008) used Norwegian aggregate consumption time series data from 1968 to 2004. They estimated the parameters of the consumption function with a log-linear model that includes total private consumption expenditures, real disposable income, and real net household wealth. The results displayed that aggregate consumption is significantly affected by age structure. Specifically, when the middle age population in Norway increased, aggregate
consumption decreased, supporting Modigliani’s life cycle hypothesis. Marginal propensity to consume is lowest during the middle years of life; yet marginal propensity to save is highest. Erlandsen and Nymoen (2008) conclude that the age structure of the population is a viable factor affecting aggregate consumption in an economy, and can therefore affect private saving as well.

Erlandsen and Nymoen (2008) presented results that showed economies with larger middle classes should have lower aggregate consumption expenditures because of the life cycle hypothesis. The age variable is a noneconomic factor affecting consumption, such as Parker and Preston’s (2005) new information variable in their model. Noneconomic variables prove to be critical in determining consumption from Erlandsen and Nymoen (2008) and Parker and Preston (2005). Consumption is an all-encompassing measurement in that it is affected by economic variables, such as interest rate, unemployment rate, and recession years. However, the studies can expand their investigation on noneconomic variables by incorporating how age, race, geographical location, new information, and peer group also affect consumption. Howrey (2001), Crossley et. al (2013), and Al-Eyd (2009) use the noneconomic variable of consumer sentiment in their studies of consumption. They showed that consumer sentiment was not an accurate indicator of future consumption, but consumer sentiment still can affect consumption expenditures. The effect of consumer sentiment on consumption can be used with Parker and Preston (2005) and Erlandsen and Nymoen (2008) to support those noneconomic variables of age, status, and new information are important. Arrow and Dasgupta (2009) test the relative income hypothesis, which states that people spend relative to their peer group.

Arrow and Dasgupta (2009) explored the “demonstration effect,” or the idea that consumers’ utility is affected by the income and consumption of others. Arrow and Dasgupta
(2009) hypothesized that consumers lose utility when their peers’ consumption increases because their own consumption is now relatively lower.

Arrow and Dasgupta (2009) utility model predicted that a person’s utility increases proportionately as other people’s consumption increase. However, according to the model, a person’s utility only increases by two-thirds the amount when their own consumption increases by the same percentage. The results showed status is a commodity, and to increase status, one must increase their “conspicuous consumption” to signal greater wealth, as Veblen’s conspicuous consumption theory predicted. In discussing the topic further, many empirical studies are mentioned that consider variables like leisure, aspirations, and happiness as consumption goods.

Arrow and Dasgupta (2009) found that the consumption of others does affect the utility of people, and think that this “status” variable should be considered a good when studying consumption. Because the model used displayed that the “status”, or societal well being, is a good to be consumed, people want others to observe their relative their consumption of this commodity, as well as the consumption of other goods that display their well being.

Like Kamakura and Du (2012), Arrow and Dasgupta (2009) used status as a commodity to support the idea of noneconomic variables affecting consumption. Social status is a psychological variable that greatly affects how people spend, according to the relative income hypothesis. Kamakura and Du (2012) also explored how people use their consumption habits as a way to show social status, and categorizes social status as a commodity. Social status as a commodity could be a third category of goods studied in personal consumption expenditure models, such as Crossley et. al (2013) and Howrey (2001). The social status commodity could be represented as a subcategory of nonessential goods. The demand for nonessential goods, such
as luxury items, would positively correlate social status commodity consumption. Social status as a commodity is a noneconomic variable that can affect consumption, such as the other variables mentioned in the previous literature.

Relevant literature exhibited the importance of investigating noneconomic variables when considering consumption expenditures. In addition to unemployment rates, recessions, expansions, and aggregate savings, factors such as age, new information, and other people’s consumption habits affect an economy’s consumption expenditures. The literature on consumption also reveals various consumer sentiment indicators’ inability to predict future household consumption. Given these results from multiple regressions, the literature concluded that these indices should not be the foundation of economic policy creation.

The research explores how consumer sentiment and other selected variables affect consumption expenditures in the United States from 1952 to 2013. Though much of the previous literature discredits consumer sentiment indices’ ability to forecast future consumption expenditures, it supports that there is a significant correlation between consumer sentiment and consumption.
Chapter III

Theoretical Framework

The underlying model uses the four consumption hypotheses to investigate consumption. The first consumption hypothesis is the absolute income hypothesis. The absolute income hypothesis theorizes that people consume out of their disposable income. It originates from Keynesian theory. The equation for absolute income hypothesis is:

\[ C = C_0 + b(Y - T) \]

Where:

- \( C \): aggregate consumption expenditures in an economy
- \( C_0 \): Constant
- \( b \): Marginal Propensity to Consume
- \( Y \): income
- \( T \): taxes

The equation explicitly states the first assertion of Keynes' theory: consumption is a function of disposable income. The second assumption of the absolute income theory is that the marginal propensity to consume is between zero and one, meaning that consumption is only a fraction of disposable income. The third proposition of the absolute income theory is that the
average propensity to consume decreases as disposable income increases. The last assertion of
the absolute income hypothesis is that the marginal propensity to consume decreases as the
disposable income increases. The marginal propensity to consume is less than the average
propensity to consume.

Economists used this equation to predict consumer demand after World War II, but found
that they underestimated the amount due to failing to take into account additional variables that
affect consumption. The underestimate led to the conception of more theories to explain
consumer demand, specifically the relationship between income and consumption. These
theories also seek to explain the difference in consumption when graphed from cross sectional
data versus time series data.

Duesenberry’s relative income hypothesis states that consumption depends on their
absolute income as well as their income relative to their peers. The demonstration effect is the
need for households to maintain a consumption level relative to their peers. When a peer
consumes a good and increases their utility, the household’s utility decreases. The second part of
the relative income hypothesis is that when income increases or decreases, households will
consume at the same level for some time after the change in attempt to stay in the same social
class. Their consumption level changes once the income change proves permanent. Because of
the lagging income change, marginal propensity to consume is lower in the short run than in the
long run. Figure 1 displays the difference in marginal propensity to consume between the short
run and the long run.
The relative income theory explains the gap in consumption from cross-sectional data (represented by the $C_{xs}$ line in Figure 1) and time series data (represented as the $C_{ts}$ line in Figure 1) as attributable to changes in relative income. Individual households with recently increased or decreased incomes at a certain point in time make up the cross-sectional data, and produce a flatter marginal propensity to consume. According to the relative income hypothesis, their marginal propensity to consume is lower because they have not yet changed their consumption patterns. The time series data consists of an aggregated consumption number over time. The marginal propensity to consume is steeper for the time series data because it reflects an overall change in income, as opposed to the new relative income change expressed with the cross-sectional data.

Modigliani and Brumberg’s life cycle hypothesis predicts consumption over a life cycle given fluctuating income over the same period. Though income rises then falls at retirement age, households typically smooth their consumption so that they will have enough savings to sustain
retired living. The theory predicts that consumption rises gradually over the course of the lifetime, while income increases, peaks, and decreases over the life cycle, as shown in Figure 2.

Figure 2. Consumption Expenditures and Income over Time

The life cycle hypothesis states that income rises in the beginning and middle years of life due to employment. Income peaks around fifty to sixty years of age, just before retirement. The difference between the income and consumption curves is saving. As shown in Figure 1, dissaving occurs at the beginning and ends of the life cycle, or childhood and retirement, because people are not working at these times. In retirement, people are paying for their living expenses from the savings accumulated over their working years. The amount of saving is greatest when income peaks, just before the point of retirement. The life cycle hypothesis saving pattern can be seen in national savings rates. Countries with a large middle-aged population experience a high average savings rate, while countries with a large elderly population have a lower average savings rate.

Friedman’s permanent income hypothesis states that consumption is a proportion of permanent income. The permanent income model is stated as:

\[ PI = r * A \]
Where:

\[ PI = \text{Permanent Income} \]

\[ r = \text{any percentage rate of return} \]

\[ A = \text{Wealth} \]

The equation defines permanent income as wealth multiplied by a rate of return. The consumption from permanent income is defined as:

\[ PC = p \times PI \]

Where:

\[ PC = \text{Permanent Consumption} \]

\[ p = \text{Marginal propensity to consume out of permanent income} \]

\[ PI = \text{Permanent Income} \]

Permanent income is measured as the sum of all future earnings and wealth. The theory states that people mainly spend out of their permanent income, despite random events that may briefly increase or decrease their current income. For example, winning the lottery (a temporary increase in income) would affect saving, while a raise in salary (a permanent income increase) would affect consumption. Transitory income is the difference between permanent income and current income. The permanent income hypothesis only applies to services, and nondurable goods.

Because an increase in current income could eventually change into an increase in permanent income, there are a number of propositions associated with the permanent income hypothesis. First, the marginal propensity to consume is smaller for current income than for permanent income because current income is only partially represented in permanent income. Secondly, changes in consumer demand due to changes in current income are inconsistent
because the point at which current income becomes permanent income is unclear. Changes in consumer demand are heavily dependent on exogenous factors, such as consumer sentiment. Next, when current income sustains an increase or decrease to become permanent income, consumption will also change similarly, therefore making the long run marginal propensity to consume higher than the short run marginal propensity to consume. Lastly, long run marginal propensity to consume is most closely related to time series data, while short run marginal propensity to consume is most closely related to cross-sectional data.

Lastly, Veblen's theory of conspicuous consumption is an important concept in the examination of aggregate consumption. This sociological theory of consumption is that people consume superfluous goods to display their wealth. The people that have the means to consume conspicuously are part of the leisure class, meaning they can afford to waste time and money. The ability to spend money on unnecessary items exhibits high social standing, from which people gain utility. According to this theory, people strive to consume more than their peers so that their peers and people of lower social status will desire to imitate their consumption habits.

The purpose of the research is to examine consumption in the United States from 1952 to 2013. The main explanatory variable is consumer sentiment, and the additional selected variables of the research are Gross Domestic Product, interest rate, unemployment rate, and recession years, presented as a binary variable. The functional model is:

\[ C = f(S, Y, r, U, R) \]

Where:

- \( C \) = Consumption
- \( S \) = Consumer Sentiment
- \( Y \) = GDP
The functional model displays some of the factors that are predicted to affect personal consumption expenditures in the United States. According to the functional model, consumption depends on consumer sentiment, Gross Domestic Product, the prime interest rate, the unemployment rate, and the years in which the economy was in a recession.

The regression model is:

\[ C = \beta_0 + \beta_1 N + \beta_2 RGDP - \beta_3 LIR - \beta_4 LUE + \beta_5 Rec + \epsilon \]

Where:

- \( C \)=US Personal Consumption Expenditures 1952-2013 (billions of dollars)
- \( N \)=University of Michigan Consumer Sentiment measure 1952-2013
- \( RGDP \)= Real Gross Domestic Product in United States 1952-2013 (billions of dollars)
- \( LIR \)= Log of United States Prime Interest rate 1952-2013
- \( LUE \)= Log of United States Unemployment rate 1952-2013
- \( Rec \)=United States Recession years (binary variable)
- \( \beta_0 \)= Constant term
- \( \beta_1 - \beta_5 \)=Coefficients
- \( \epsilon \)= error term (assumed to be zero)

The dependent variable in the model is consumption, \( C \), measured using personal consumption expenditure data. Personal consumption expenditures encompass spending on durable and nondurable goods from households. The number is an accurate representation of all consumption in the United States economy.
The main explanatory variable in the model is consumer sentiment. Consumer sentiment is important to the model because it subjectively captures people’s perceptions of the economy. It is an all-inclusive variable of individual household situations that may affect personal consumption expenditures. The research expects consumption and consumer sentiment to be positively related, as people spend more if they feel better about the economy. People with a positive outlook on the economy perceive their disposable income to be higher. Consumer sentiment is a subjective measure related solely to how people feel about the economy at a certain point in time. The $\beta_1$ for the consumer sentiment variable is the coefficient. It is predicted to have a positive value because the relationship between consumption and consumer sentiment is expected to be positive. The $\beta_1$ value will be how much personal consumption expenditures change when the consumer sentiment index increases or decreases by 1 point.

Real Gross Domestic Product is critical in examining consumption because household consumption expenditures are a major factor in the calculation of Real Gross Domestic Product. The research hypothesizes that the consumption variable and Real Gross Domestic Product will be positively related because of the expenditures model calculation of Real Gross Domestic Product. The expenditures model of Gross Domestic Product is:

$$Y = C + I + G + (X - M)$$

Where:

- $C$ = Aggregate Consumption expenditures
- $I$ = Aggregate Investment expenditures
- $G$ = Government expenditures
- $X$ = Exports
- $M$ = Imports
When rearranging the expenditures model of Gross Domestic Product to solve for the consumption variable, the equation becomes \( C = Y - I - G - (X - M) \). Using this equation, an increase in Gross Domestic Product (\( Y \)) increases consumption when all other variables are held constant. The \( \beta_2 \) is the coefficient for Real Gross Domestic Product. This coefficient is also the marginal propensity to consume, or how much consumption increases for each additional dollar earned. Theory predicts a positive \( \beta_2 \) coefficient because theory also predicts the relationship between Real Gross Domestic Product and personal consumption expenditures to be positive. \( \beta_2 \) is the change in personal consumption expenditures when Real Gross Domestic Product increases by $1 billion.

Prime interest rate is important to the regression model examining consumption because it is the cost of borrowing money. The personal consumption expenditure value includes spending on durable goods, which people may have to borrow money to purchase. Borrowing money often includes paying interest, so it is necessary to include the cost of borrowing money or prime interest rate, in the consumption model. The prime interest rate variable is the logarithm of the prime interest rate, and is expected to have a negative relationship with the consumption variable. The prime interest rate is the cost of borrowing money, and affects present and future consumption. When interest rates increase, people borrow less money. The decrease in borrowing decreases money available to spend, and thus decreasing consumption. \( \beta_3 \) is the coefficient of the prime interest rate variable. \( \beta_3 \) is specifically the change in personal consumption expenditures when the prime interest rate changes by 1%.

Unemployment rate is an important aspect in investigating consumption because it directly affects the income of individual households. Having a consistent inflow of income results in a more consistent, and increased, spending pattern than an unemployed person with an
erratic income stream. The unemployment rate and consumption variable are predicted to negatively relate. When someone becomes unemployed, his or her income decreases to zero. Upon unemployment, people begin consuming out of their savings. Using Keynes absolute income equation \( C = C_0 + b(Y-T) \), when income \( Y \) decreases to zero, the consumption expenditures variable declines. Unemployed people have less disposable income from which to consume. Also, Okun’s law predicts a 2% decline in Gross Domestic Product for each 1% increase in unemployment. The decline in Gross Domestic Product is a result of a decline in consumption expenditures. The unemployment variable in the regression model is the logarithm of the unemployment rate from 1952 to 2013. \( \beta_4 \) is the unemployment rate variable coefficient. Economic theory predicts that \( \beta_4 \) will be negative because the relationship between consumption and unemployment rate is also predicted to be negative. \( \beta_4 \) represents the change in personal consumption expenditures when the unemployment rate fluctuates by 1%.

The recession variable is in the regression model is binary. A value of zero represents a non-recessionary year and a value of one represents a recessionary year. A recession variable is necessary in the regression model because they are fairly rare occurrences that can severely affect Real Gross Domestic Product. A recession year is a twelve-month period where the Gross Domestic Product declined in at least one quarter (Crossley et. al 2013). Significant decreases in Real Gross Domestic Product result in large decreases in consumption. Years where the United States experiences a recession are expected to yield lower personal consumption expenditures, resulting in a negative relationship between consumption and the recessionary variable. Using the algebraically manipulated expenditures model of Gross Domestic Product \( C = Y-I-G-(X-M) \), the equation exhibits that a decrease in Gross Domestic Product directly decreases the consumption expenditures variable. \( \beta_5 \) is the coefficient for the recession variable. Economic
theory suggests that $\beta_5$ will be negative because the relationship between recession years and consumption is expected to be negative. In the regression model, $\beta_5$ represents the difference in personal consumption expenditures between recessionary years and non-recessionary years.

$\beta_0$ is the constant term in the regression model. It represents the value for personal consumption expenditures when all other variables are held constant. The error term, $e$, represents the variation in the dependent variable, consumption, which was not explained by the independent variables in the model.

Consumer sentiment is a subjective measure that encompasses the additional economic variables in the research model, as well as other factors. The theory displays an array of variables that affect consumption expenditures, and is used to form hypotheses about how consumer sentiment and other selected variables will affect consumption expenditures.
Chapter IV

Methodology and Sources of Data

The purpose of the research is to investigate consumer spending in the United States from 1952 to 2013. The main explanatory variable is consumer sentiment. The other selected variables are Real Gross Domestic Product, prime interest rate, unemployment rate, and recession. After analyzing previous literature, the hypothesis is that consumer sentiment is positively related to personal consumption expenditures. The regression model for the research is:

\[ C = \beta_0 + \beta_1 N + \beta_2 \text{RGDP} - \beta_3 \text{LIR} - \beta_4 \text{LUER} - \beta_5 \text{Rec} + \epsilon \]

Where:

- \( C \) = US Personal Consumption Expenditures 1952-2013 (billions of dollars)
- \( N \) = University of Michigan Consumer Sentiment measure 1952-2013
- \( \text{RGDP} \) = Real Gross Domestic Product in United States 1952-2013 (billions of dollars)
- \( \text{LIR} \) = Log of Prime Interest rate in the United States 1952-2013
- \( \text{LUER} \) = Log of Unemployment rate in the United States 1952-2013
- \( \text{Rec} \) = United States Recession years (binary variable)
- \( \beta_0 \) = Constant term
\( \beta_1 - \beta_5 = \text{Coefficients} \)

\( e = \text{error term (assumed to be zero)} \)

The regression function above is linear, and follows the multiple regression model. A multiple regression model expresses how the dependent variable changes with more than one independent variable changes and is expressed in the following format (Kennedy 1998):

\[
y = \beta_1 + \beta_2 x_2 + \ldots + \beta_k x_k + e
\]

Where:

\( y = \) dependent variable

\( \beta_k = \) estimated coefficient

\( x_k = \) independent variable

\( e = \) error term

Each beta in the multiple regression model is the change in the dependent variable resulting from a measured change in the particular independent variable with all other independent variables held constant (Kennedy 1998). Because the coefficients are estimates, an error term is included at the end of the regression. The error term represents the infinite independent variables that could not be included in the multiple regression, any measurement errors of the data, or human behavior that may not be predictable by an econometric model.

The method of estimating coefficients in the regression model is Ordinary Least Squares. This method estimates the parameters of any linear regression by minimizing the sum of squared residuals between observations (Woolridge 2003). The equation for the estimation of parameters with Ordinary Least Squares is:

\[
\beta^{OLS} = \sum (\hat{y} - y)^2
\]

Where:
$$\beta^{OLS} = \text{Coefficient of independent variable estimated by Ordinary Least Squares}$$

$$\hat{y} = \text{Estimated values of the dependent variable as independent variable values changes}$$

$$y = \text{Actual values of dependent variable as independent variable values change}$$

A residual is the difference between the estimated value (\(\hat{y}\)) and the actual value (\(y\)) (Kennedy 1998). Ordinary Least Squares is the best linear unbiased estimator under the Classic Linear Regression model. Unbiasedness refers to the sampling distribution of the dependent variable. Being the best unbiased estimator means that if the independent variables of the regression are held constant and the dependent variable is estimated repeatedly by Ordinary Least Squares, the mean, or expected value, of the estimated dependent variable values should equal the actual value of dependent variable. Ordinary Least Squares is also an efficient estimator among unbiased estimators. Efficiency occurs when the estimator generates estimates with minimal variances (Kennedy 1998). However, this criterion is only important when paired with unbiasedness. BLUE estimators are estimators that use linear functions to estimate the dependent variable, have minimal variances, and are unbiased.

The Classic Linear Regression model estimates parameters based on five assumptions. The Ordinary Least Squares estimator also holds these characteristics. The five characteristics are the Gauss-Markov assumptions. The first assumption is that the dependent and independent variables are linearly related (Kennedy 1998). The coefficients generated from the Classic Linear Regression model are constants, and include an error term. This assumption can be violated through nonlinearity, where the independent and dependent variables are not related linearly, the exclusion of significant independent variables or inclusion of unrelated independent variables, and by having parameters that are not constant within the time period. The second assumption is conditional mean of the error term is zero. This assumption means that the
average found from the error term distribution is zero. The third assumption is that the error terms must be homoskedastic, or have constant variances, and that the error terms are non-correlated. This assumption can be violated with heteroskedasticity, meaning the error terms’ variances change depending on the observation. Another violation of the third assumption occurs when the error terms correlate with each other. The fourth assumption is that random sampling should cause the estimated parameters to have the same values when the regression is repeated across samples. The fourth assumption is violated when certain observations are incorrect. The fifth assumption of the Classic Linear Regression model is that the number of observations exceeds the number of independent variables, and that the independent variables are not correlated. The violation of the fifth assumption is multicollinearity, or the existence of a linear relationship between two or more independent variables in a regression.

As an estimator under the Classical Linear Regression model, Ordinary Least Squares has some additional qualities that make it the best linear unbiased estimator as well. Because OLS minimizes the sum of squared residuals, it creates high $R^2$ value of the regression (Kennedy 1998). The $R^2$, or coefficient of determination, measures the percentage of the dependent variable that is explained by variation in the independent variables. The $R^2$ is also square of the correlation coefficient between the dependent variable actual value and dependent variable value estimated by Ordinary Least Squares. The $R^2$ equation is:

$$R^2 = \frac{SSR}{SST}$$

Where:

$R^2$= Percentage of the dependent variable explained by variation in independent variables of a regression

$SSR$= Regression Sum of Squares
The Regression Sum of Squares is the variation in the dependent variable that is attributed to the independent variables (Kennedy 1998). The Regression Sum of Squares is the explained variation in the dependent variable, and is calculated as:

$$SSR = \sum (\hat{y} - \bar{y})^2$$

Where:

SSR = Regression Sum of Squares

$\hat{y}$ = Ordinary Least Squares estimate of the dependent variable

$\bar{y}$ = Average of Ordinary Least Squares estimate of dependent variable

The total sum of squares is the sum of the variances of the actual dependent variable values (Kennedy 1998). The total sum of squares expresses the total variation in the dependent variable. The equation for the total sum of squares is:

$$SST = \sum (y - \bar{y})^2$$

Where:

SST = Total Sum of Squares

$y$ = Actual value of dependent variable

$\bar{y}$ = Average of actual dependent variable values

Ordinary Least Squares maximizes $R^2$ values through the minimization of squared residuals (Kennedy 1998). However, the $R^2$ value is only useful in linear regressions with y-intercepts that use the Ordinary Least Squares estimator.

Because Ordinary Least Squares generates estimates that are normally distributed across samples, hypotheses can be tested (Kennedy 1998). A hypothesis test is a statistical test of the null hypothesis against an alternative hypothesis (Woolridge 2003). Hypothesis testing is used to
construct confidence intervals, or a random interval in which the population value is contained. The null hypothesis is the prediction assumed to be true, and the data is analyzed to find evidence proving the prediction false. The alternative hypothesis is the hypothesis against which the null is tested. Hypothesis tests are used to test single hypothesis using a t-statistic, or joint hypothesis using an F-statistic (Kennedy 1998). Two types of errors occur in hypothesis testing. Type I errors occur when the research is used to conclude the null hypothesis to be true when it is false. Type II errors occur when the research is used to conclude the null hypothesis is false when it is true. The significance level is the probability of a Type I error. Significance levels are usually compared at 1%, 5%, and 10%. Smaller significance levels indicate a smaller probability of a Type I error occurring.

Hypothesis testing uses t-tests to accept or reject a single null hypothesis (Kennedy 1998). The individual null hypothesis involves individual independent variables, so each parameter in the regression must be tested separately. T-tests compare the t-statistic to a critical value in the t-statistic table. These critical values change depending on the significance level and the calculated t-statistic from the parameter estimates. T-statistics are computed by dividing an independent variable's coefficient by the standard error for the same variable. The standard error is an estimate of an estimator's standard deviation. If the absolute value of the calculated t-statistic is greater than its found critical value, the null hypothesis is rejected, and the variable is concluded to be significant.

Hypothesis testing uses F-tests to accept or reject a joint null hypothesis (Kennedy 1998). The joint null hypothesis includes all of the coefficients of the independent variables in the regression. Calculating an F-statistic includes the R² value of the restricted regression, the R² value of the unrestricted regression, and the degrees of freedom. The restricted regression is a
simple regression of the main explanatory variables on the dependent variable. The restricted regression is the multiple regressions including all of the independent variables. The degrees of freedom are the number of observations in the sample minus the number of parameters in the unrestricted regression. The F-test formula is:

\[
F = \frac{\text{restricted } R^2 - \text{unrestricted } R^2}{\frac{(1 - \text{unrestricted } R^2)}{n-k-1}}
\]

Where:

- \( n \) = number of observations in the sample
- \( k \) = number of parameters in the unrestricted regression
- \( R^2 \) = how much of the dependent variable’s variance is explained by the independent variables

The F-statistic is then compared to a table of critical values at differing significance levels. The most common significance levels are 1%, 5%, and 10%. If the F-statistic is greater than the critical value at a specific significant level, than the null joint hypothesis can rejected, and the regression is concluded as significant.

The time series data used spans from 1952 to 2013. Each observation is the mean of the variable’s values for the particular year being observed. The main explanatory variable is the University of Michigan Consumer Sentiment Index. The University of Michigan Consumer Sentiment Index data is from the St. Louis Federal Reserve database (research.stlouisfed.org). The University of Michigan Consumer Sentiment Index was initially created in the 1940s as an annual survey, and developed over time into a monthly survey (Ludvigson 2004). The index results come from five specific questions of equal weight that are part of a larger survey. The answers to the set of questions are recorded as positive, neutral, or negative. The University of Michigan Consumer Sentiment Index uses a sample of 500 participants, which greatly affects the
survey’s sampling error. The Consumer Sentiment Index consists of a present situation component and an expectations component. The University of Michigan’s Consumer Sentiment Index’s present situation component is two questions focusing on personal financial situations as a way to represent the participants’ outlook on the economy. Trends of the index display peaks in consumer attitudes during high growth periods, such as the beginning of economic recovery after a recession. The expectations component of the Consumer Sentiment Index inquires about the perceived unemployment rate, their personal current financial situation, and a general economic outlook.

The first step in calculating the University of Michigan Consumer Sentiment Index number for a month is to find the percent of positive responses and negative responses for each of the five questions, disregarding the neutral responses (Ludvigson 2004). Secondly, multiplying the difference between the positive response percentage and negative response percentage by 100 finds the diffusion measure. This diffusion number for the particular month is then divided by a base period diffusion number and multiplied by 100. Relatively higher numbers portray more positive consumer sentiment, while relatively lower numbers exhibit the opposite.

The additional variables come from a variety of sources. The data for the dependent variable, personal consumption expenditures, comes from the Bureau of Economic Analysis (bea.gov). It is measured in billions of dollars. The Gross Domestic Product variable is from the Bureau of Economic Analysis and is also measured in billions of dollars (bea.gov). Gross Domestic Product is the market value of all final goods and services newly produced within a nation during a fixed time period. The unemployment rate variable information is from the U.S Department of Labor: Bureau of Labor Statistics (bls.gov). Unemployment rate is a percentage
of the labor force that is not working. The labor force includes people with jobs and people that are not employed but looking for jobs. The prime interest rate variable comes from the St. Louis Federal Reserve database (research.stlouisfed.org). The prime interest rate is the interest rate that banks use when making loans to customers (investopedia.com). The recession year binary variable comes from the St. Louis Federal Reserve database. A recession year is a twelve-month period in which two successive quarters experienced a decline in Gross Domestic Product. In the data, observations of 0 are years that are not in a recession, and observations of 1 are years that are in a recession.
Chapter V

Empirical Results

The purpose of the research is to investigate consumption from 1952 to 2013 in the United States. The main explanatory variable in the research is consumer sentiment, and the other independent variables used to examine consumption are Real Gross Domestic Product, prime interest rate, unemployment rate, and recession. Ordinary Least Squares is used to estimate the parameters of the regression. The regression model is:

\[
C = \beta_0 + \beta_1 N + \beta_2 \text{RGDP} - \beta_3 \text{LIR} - \beta_4 \text{LUER} - \beta_5 \text{Rec} + \varepsilon
\]

Where:

- \(C\) = US Personal Consumption Expenditures 1952-2013 (billions of dollars)
- \(N\) = University of Michigan Consumer Sentiment measure 1952-2013
- \(\text{RGDP}\) = Real Gross Domestic Product in United States 1952-2013 (billions of dollars)
- \(\text{LIR}\) = Log of the Prime Interest rate in the United States 1952-2013
- \(\text{LUER}\) = Log of the Unemployment rate in the United States 1952-2013
- \(\text{Rec}\) = United States Recession years (binary variable)
- \(\beta_0\) = Constant term
- \(\beta_1, \beta_2, \beta_3, \beta_4, \beta_5\) = Coefficients
The results of this regression model are:

\[ C = 189.6582 - 2.823754N + 0.689442RGDP - 492.9986LIR + 125.2818LUER + 51.88156Rec \]

\[ \text{se} = (151.816) \hspace{0.5cm} (1.062636) \hspace{0.5cm} (0.0021198) \hspace{0.5cm} (43.26843) \hspace{0.5cm} (90.2027) \hspace{0.5cm} (26.84607) \]

\[ t = (1.25) \hspace{0.5cm} (-2.66) \hspace{0.5cm} (325.24) \hspace{0.5cm} (-11.39) \hspace{0.5cm} (1.39) \hspace{0.5cm} (1.93) \]

\[ R^2 = 0.9995 \hspace{0.5cm} F = 24385.53 \]

The constant term is 189.6582. The constant term, \( \beta_0 \), explains that when the independent variables of consumer sentiment, Real Gross Domestic Product, interest rate, unemployment rate, and recession variables are not changed, personal consumption expenditures in the United States are around $190 billion. The standard error of the constant term is 151.816. The t-statistic of the constant term is 1.25. The t-statistic is relatively low, indicating that the constant term is insignificant at all significance levels.

The consumer sentiment coefficient (\( \beta_1 \)) is -2.823754. All other variables constant, when consumer sentiment increases by 1 point, personal consumption expenditures decrease by $2.82 billion. Consumption theories hypothesize a positive relationship between personal consumption expenditures and consumer sentiment. When disposable income increases, the general outlook of the economy increases. Higher disposable incomes lead to increases personal consumption expenditures. However, the consumer sentiment coefficient has a negative sign. The standard error of the consumer sentiment variable is 1.062636, meaning that the variable has minimal variation. The value of the t-statistic for consumer sentiment is -2.66, making the consumer sentiment variable significant at almost all significance levels.

The coefficient for Real Gross Domestic Product (\( \beta_2 \)) is 0.689442. The coefficient displays that when Real Gross Domestic Product increases by $1 billion, personal consumption
expenditures increase by $0.69 billion, ceteris paribus. The marginal propensity to consume in
the United States economy during this time period is 69%. The expenditures model of Gross
Domestic Product hypothesizes a positive relationship between consumption and Gross
Domestic Product, when other variables are constant. The regression yields a positive sign for
the Real Gross Domestic Product coefficient, supporting the predicted positive relationship. The
standard error of the Real Gross Domestic Product coefficient is 0.0021198. The low standard
error denotes low variation within the variation of the Real Gross Domestic Product variable.
The t-statistic is 325.24. The very high t-statistic value indicates that the Real Gross Domestic
Product coefficient is significant at all levels.

The coefficient for the log of the interest rate variable (β3) is -492.9986. The regression
estimates that when interest rates increase by 1%, personal consumption expenditures decrease
by about $492 billion. Economic theory predicts a negative relationship between interest rate
and consumption. Higher interest rates discourage people from borrowing money. A decrease in
borrowing decreases the amount of money available for spending. The decrease in the supply of
money decreases consumption expenditures. The standard error of the prime interest rate
coefficient is 43.26843. The t-statistic for the prime interest rate coefficient is -11.39. The t-
statistic is greater than the critical value at every significance level, making the log of the prime
interest rate variable coefficient significant at all levels.

The coefficient of the log of the unemployment rate variable (β4) is 125.2818. When the
unemployment rate increases by 1%, personal consumption expenditures increase by $125
billion. Consumption theory states that consumption is a function of disposable income.
Unemployment is a factor that decreases disposable income, so the theory predicts a negative
relationship between consumption and unemployment rate. However, the coefficient of the
unemployment rate variable is positive in the regression. The standard error of the log of the unemployment rate variable is 90.2027. The t-statistic for this variable is 1.39. The log of the unemployment rate variable is not significant in the regression. The variable’s insignificance is not surprising; due to its unusual positive sign that contradicts economic theory. Additional testing is needed to see why the log of the unemployment rate variable is positive.

The recession variable ($\beta_3$) is binary; 0 represents a non-recession year, and 1 represents a recessionary year. The coefficient of the recession variable is 51.88156. When there is a recession, personal consumption expenditures are about $52 billion higher than during non-recessionary periods. The expenditures model of Real Gross Domestic Product suggests that the recession variable should be negative in the regression model because output decreases during recessionary periods. The regression does not support the hypothesized relationship; the coefficient on the recession binary variable is positive. The standard error of the recession binary variable is 26.84607. The t-statistic of the recession binary variable is 1.93. The recession variable is only significant at the 10% significance level. Additional testing is needed to see why the recession variable coefficient is positive.

The F-statistic is the overall significance of the regression. The F-statistic of the above regression is 24385.53. The high value indicates that the regression is significant at all significance levels. The $R^2$, a measure of how well the independent variables explain the variation in the dependent variable, is 0.9995. The $R^2$ value is very high, signaling that the independent variables explain more than 99% of the deviation of the dependent variable. However, the recession variable, log of the unemployment rate variable, and consumer sentiment variable are not significant at all levels. Also, the log of the unemployment rate and recession variables have positive signs in the regression, but are predicted to relate negatively with
personal consumption expenditures. Consumer sentiment has a negative coefficient in the regression, but it is predicted to relate positively. Additional examination of the regression model is necessary because the signs for three of the variables are different than predicted and are not all significant, yet the overall regression is significant and $R^2$ value is high.

A correlation matrix was run, and is presented in Figure 2 below.

Figure 2. Correlation Matrix of Independent Variables

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<thead>
<tr>
<th></th>
<th>umcsent</th>
<th>rgdp</th>
<th>lir</th>
<th>luerate</th>
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<td>umcsent</td>
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<tr>
<td>rgdp</td>
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<td>1.0000</td>
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<tr>
<td>lir</td>
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<td>0.0324</td>
<td>1.0000</td>
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<td>luerate</td>
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<td>0.1620</td>
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</tr>
<tr>
<td>rec</td>
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<td>0.0540</td>
<td>0.1517</td>
<td>0.1568</td>
<td>1.0000</td>
</tr>
</tbody>
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The matrix shows the percentage of correlation among the independent variables. Correlation percentages above 50% suggest multicollinearity. This trait can skew the t-statistics and the signs of the coefficients in the regression (Kennedy 1998). Multicollinearity is a violation of fifth assumption in the Classic Linear Regression model. It occurs when independent variables in the regression are linearly related (Kennedy 1998). In the regression, the only pair of variables that have a correlation percentage above 50% is consumer sentiment and log of the unemployment rate. Their correlation is -63.87%. The second highest correlation rate is between the consumer sentiment variable and the regression variable, at -35.81%. A third notably correlated pair of independent variables is consumer sentiment and Real Gross Domestic Product variable. Their correlation percentage is -33.32%. To reduce the effect of multicollinearity, variables are dropped and additional regressions are run.
The first additional regression omits the log of the unemployment rate variable due to high correlation with the consumer sentiment variable. The results for the first additional regression are:

\[ C = \beta_0 + \beta_1 N + \beta_2 \text{RGDP} - \beta_3 \text{LIR} - \beta_5 \text{Rec} + e \]

\[ C = 354.8506 - 3.693171N + 0.6897192\text{RGDP} - 487.0114\text{LIR} + 48.01383\text{Rec} \]

\[ \text{se} = (95.11507) (0.865658) (0.0021275) (43.40259) (26.91796) \]

\[ t = (3.73) (-4.27) (314.71) (-11.22) (1.78) \]

\[ R^2 = 0.9995 \quad F = 29992.59 \]

The constant term is 354.8506. In this regression, when all other independent variables are held constant, personal consumption expenditures are $354.85 billion. The standard error is 95.11507. The t-statistic is 3.73. The constant term is significant at all significance levels, contrasting to the insignificant constant term in the first regression that included all of the independent variables.

The coefficient of the consumer sentiment variable is -3.693171. Because the coefficient is negative, it implies that when consumer sentiment decreases by one point, personal consumption expenditures will increase by $3.69 billion. The standard error is 0.865658 and the t-statistic is -4.27. The coefficient is significant at all levels. This regression without the log of the unemployment rate variable has increased the value of the t-statistic for the consumer sentiment variable. In the previous regression, the consumer sentiment variable was not significant at all levels. By eliminating some of the multicollinearity in the regression, the consumer sentiment variable becomes more significant. However, the sign of the consumer sentiment variable is still negative, differing from economic theory.
The Real Gross Domestic Product variable has a positive sign, indicating a positive relationship between Real Gross Domestic Product and personal consumption expenditures. The coefficient on the Real Gross Domestic Product variable is 0.6897192. The marginal propensity to consume remains 69%, the same percentage it was in the original regression including all of the independent variables. The regression estimates that when the Real Gross Domestic Product increases by $1 billion, personal consumption expenditures will increase by $0.69 billion. The standard error of the coefficient on the Real Gross Domestic Product variable is 0.0021275. The standard error of the coefficient in the second regression is very close to the standard error in the original regression. Because the coefficient and standard error values for the Real Gross Domestic Product coefficient are almost identical to their values in the original regression, the t-statistic also changed very little, at 324.19. The large t-statistic indicates that the Real Gross Domestic Product variable is significant at all significance levels.

The log of the real interest rate variable coefficient is -487.0114. This negative sign signals a negative relationship between interest rate and consumption expenditures. When interest rates increase by 1%, personal consumption expenditures decrease by $487 billion. The standard error of the log of the interest rate variable is 43.40259. These two values generate a t-statistic of -11.22. The high t-statistic makes the log of the interest rate variable significant at all significance levels. The negative relationship between interest rate and consumption expenditures found in the original regression and second regression support predictions from economic theory.

The binary recession variable is 48.01383. It is positively related to personal consumption expenditures. The coefficient value expresses that during recessions; personal consumption expenditures are $48.01 billion higher than non-recessionary years. The standard
error of the recession coefficient is 26.91796 and the t-statistic is 1.78. The recession variable is only significant at the 10% significance level. The moderate insignificance of the recession variable is expected because it differs from economic theory's prediction of negative relationships between recession and personal consumption expenditures. The recession variable was also positive and insignificant in the original regression. The elimination of the log of the unemployment rate variable did not affect the sign or significance of the recession variable.

In examining the second regression in its totality, the F-statistic is 29992.59. The value is still high, and greater than its critical value, denoting significance at all levels for the overall regression. The second regression excluding the log of the employment rate variable has a higher F-statistic than the original regression. It is inferred that the omission of this variable decreased the multicollinearity in the regression. The $R^2$ for the second regression is 0.9995, meaning that the independent variables explain 99.95% of the variation in the dependent variable. The $R^2$ remains constant, despite the absence of the log of unemployment rate variable in the new regression.

The next additional regression omits the recession variable because of its high collinearity occurring with the consumer sentiment variable. The results are:

$$C = \beta_0 + \beta_1 N + \beta_2 RGDP - \beta_3 LIR + \beta_4 LUE + e$$

$$C = 266.2019 - 3.521413 N + 0.6891877 RGDP - 483.4659 LIR + 107.1993 LUE$$

<table>
<thead>
<tr>
<th>se</th>
<th>t</th>
<th>R²</th>
<th>F</th>
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<tbody>
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<td>(150.0329)</td>
<td>(1.77)</td>
<td>(1.17)</td>
<td>(29085.50)</td>
</tr>
<tr>
<td>(1.023131)</td>
<td>(-3.44)</td>
<td>(-318.21)</td>
<td>(-10.99)</td>
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<tr>
<td>(0.0021659)</td>
<td>(318.21)</td>
<td>(91.8431)</td>
<td>(1.17)</td>
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<tr>
<td>(44.00547)</td>
<td>(-10.99)</td>
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<tr>
<td>(91.8431)</td>
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The constant term in this regression is 266.2019, signifying that when all other variables are constant, personal consumption expenditures are $266 billion. The standard error is
150.0329. The t-statistic is 1.77. The variable is significant at the 10% significance level. In the original regression, the constant is insignificant, and in the second regression without the log of the unemployment rate variable, the constant is significant at all levels.

The coefficient of consumer sentiment is $-3.521413$. The value of the coefficient changed minimally from the original regression and from the second regression that excluded the log of the unemployment rate variable. When consumer sentiment increases by 1 point, consumption expenditures decrease by $3.52$ billion. Despite consumption theories suggesting a positive relationship between consumer sentiment and personal consumption theories, the consumer sentiment variable has a negative sign in this regression as well. The standard error of the consumer sentiment variable is 1.023131 and the t-statistic is -3.44. The variable is significant at all levels. Removing the recession variable from the regression does not affect the sign or significance of the consumer sentiment variable.

The coefficient of the Real Gross Domestic Product variable is 0.6891877. This value is almost the same as the Real Gross Domestic Product variable coefficients in the original regression and the regression without the log of the unemployment rate variable. The coefficient conveys the marginal propensity to consume of 69% in the economy. The standard error is 0.0021659. The t-statistic is 318.21. The high t-statistic expresses significance at all levels for the Real Gross Domestic Product variable in this regression. The Real Gross Domestic Product variable is also significant and positive in the original regression and regression without the log of the unemployment rate variable.

The log of unemployment rate is included in this regression. The coefficient of this variable is 107.1993. The sign on the coefficient is positive once again, providing evidence of a positive relationship between the unemployment rate and consumption expenditures. Economic
theory predicts a negative relationship because increased unemployment decreases average disposable income in an economy. With lower levels of disposable income, households are expected to decrease their expenditures. The standard error of the log of the unemployment rate variable is 91.8432 and the t-statistic is 1.17. The variable is not significant. This variable was also insignificant in the original regression that included all of the independent variables.

The log of the interest rate variable coefficient is -483.4659. The value of the coefficient is similar to the values of the coefficient in the regression that excluded the log of the unemployment rate variable and the original regression. This variable is also negative in the other regressions. The negative sign indicates that when the interest rate increases by 1%, consumption spending will decrease by $483 billion. Economic theories predicted a negative relationship between consumption and interest rates because of the discouraging effect on borrowing money. The standard error for the log of the interest rate variable is 44.00547 and the t-statistic is -10.99. The variable is significant at all significance levels, like in the other regressions ran.

The F-statistic for the second additional regression omitting the recession variable is 29085.50. The high F-statistic reveals that the overall regression remains highly significant, even with the elimination of the recession variable. The F-statistic increased from the original regression, and decreased from the first additional regression without the log of the unemployment rate variable. The $R^2$ is 0.9995. It is constant among the original regression and the two additional regressions that dropped variables.

A third additional regression is completed to control for the high collinearity between consumer sentiment and Real Gross Domestic Product. The variable Real Gross Domestic Product was deleted in this regression. The results are
\[ C = \beta_0 + \beta_1 N - \beta_3 LIR - \beta_4 LUER - \beta_5 \text{Rec} + e \]

\[ C = 10445.28 - 77.06642N - 782.7816LIR + 2887.553LUER - 490.0752\text{Rec} \]

\[ \text{se} = (6399.195) (44.7208) (1864.072) (3869.631) (1154.586) \]

\[ t = (1.63) (-1.72) (-0.42) (0.75) (-0.42) \]

\[ R^2 = 0.1324 \quad F = 2.17 \]

The constant coefficient is 10445.28, signaling that when all independent variables are constant, personal consumption expenditures are $10.445 trillion. The standard error for the constant is 6399.195. The high standard error results in a lower t-statistic of 1.63. The constant coefficient is insignificant at all levels. The constant term had the highest t-statistic, and is therefore significant in the second regression, where the log of unemployment rate variable was dropped. In the first regression, the constant variable was insignificant at all levels.

The coefficient on the consumer sentiment variable is -77.06642. The coefficient implies that when consumer sentiment increases by 1 point, personal consumption expenditures decrease by $77.07 billion. The disposable income theory predicts a positive relationship between consumer sentiment and personal consumption expenditures. The standard error for the consumer sentiment variable is 44.7208, and the t-statistic is -1.72. The t-statistic is very low, denoting significance of the consumer sentiment variable at only the 10% level. In the two previous regressions, the consumer sentiment variable was significant at all levels. The omission of the Real Gross Domestic Product critically impacted the significance of the main explanatory variable.

The log of interest rate coefficient is -782.7816. The coefficient is highly negative, and indicates that when the interest rate increases by 1%, personal consumption expenditures will decrease by approximately $782.78 billion. The sign on the log of the interest rate variable is
negative, like in the previous two regressions. Economic theory hypothesized a negative relationship between the interest rate and personal consumption expenditures. The three regressions support this prediction. The standard error of the variable is 1864.072. The large standard error creates a very low t-statistic of -0.42. The log of interest rate variable is insignificant at all levels. In the previous three regressions, the log of the interest rate variable is significant at all levels.

The log of unemployment variable coefficient is 2887.553. The sign on this coefficient is positive. The coefficient indicates that a 1% increase in the unemployment rate causes about a $2.8 trillion increase in personal consumption expenditures. Consumption theories predict a negative relationship between unemployment rate and personal consumption expenditures because increase unemployment decreases income. The standard error of the log of the unemployment rate variable is 3869.631. The high standard error generates a small t-statistic of 0.75. The variable is insignificant at all levels. In the original regression including all of the independent variables, the log of the unemployment rate is also insignificant and positive. The continuance of these two exceptional qualities of the log of the unemployment rate variable indicates removing the Real Gross Domestic Product variable from the regression does not solve the issue.

Lastly, the recession binary variable coefficient is -490.0752. The sign on the variable’s coefficient is negative. The negative coefficient means that when the United States economy is in a recession, the personal consumption expenditures will be $490 billion lower than in years when the United States is not in a recession. The standard error of the recession variable is 1154.586. The resulting t-statistic is -0.42, a very low value. The negative sign of the recession binary variable supports economic theory, but it is insignificant at all levels in this regression. In the
first two regressions run, the recession binary variable is positive and insignificant at all levels. The omission of the Real Gross Domestic Product variable affects the sign of the recession binary variable, but the insignificance of the variable remains.

The F-statistic for the regression excluding the Real Gross Domestic Product variable is 2.17. The F-statistic is immensely lower than the F-statistic in the former regressions. The overall regression is significant at the 10% significance level. This change is caused by the elimination of the Real Gross Domestic Product variable in the third regression. The $R^2$ value of the third regression is 0.1324, meaning that the regression explains about 13.2% of the variation in the dependent variable. The $R^2$ value of the third regression is much lower than the $R^2$ values of the first two regressions, where the independent variables explained almost all of the variation in the dependent variable. The decline in explanation of the dependent variable can be attributed to the elimination of the Real Gross Domestic Product variable.

The main explanatory variable, consumer sentiment, is negative in all three of the regressions. The disposable income theory suggests a positive relationship between consumption and consumer sentiment. In the three regressions, the relationship between the dependent variable and consumer sentiment is negative, and the explanatory variable is significant at most levels. To continue the examination of the relationship between consumer sentiment and personal consumption expenditures, a regression is run with only the main explanatory variable, consumer sentiment. The results are:

\[ C = \beta_0 + \beta_1 N \]

\[ C = 13073.14 - 89.8865N \]

\[ se=2839.757 \quad (31.81246) \]

\[ t= \quad (4.60) \quad (-2.83) \]
R^2 = 0.1174  F= 7.98

The constant is 13073.14, indicating that when consumer sentiment is held constant, personal consumption expenditures are $1.3 trillion. The standard error is 2839.757 and the t-statistic is 4.60. The constant variable is significant at all significance levels. Of the three previous regressions, the constant was only significant in the regression where the log of unemployment rate variable was dropped. The constant also had the smallest standard error in the regression where the log of unemployment rate variable was dropped, at 97.32791.

The consumer sentient coefficient is -89.8865. As seen in the previous relationships, the sign on the consumer sentiment coefficient is negative, opposing the predictions of economic theory. The regression predicts that a 1-point increase in consumer sentiment will cause an $89.9 billion decrease in personal consumption expenditures. The standard error of the consumer sentiment variable is 31.81246. The t-statistic of the main explanatory variable is -2.83. The coefficient of the consumer sentiment variable is almost significant at all levels, despite its recurring negative sign.

The F-statistic of the simple regression is 7.98. The F-statistic is significant at almost all significant levels, despite only including one independent variable. The R^2 is 0.1174. The consumer sentiment variable explains almost 12% of the variation in the personal consumption expenditures variable. Even when the consumer sentiment is regressed individually on personal consumption expenditures, the coefficient is negative and significant, indicating that additional information is necessary in researching the relationship between consumer sentiment and consumption.

Some unusual findings from the empirical results were the sign of the log of the unemployment rate variable and the recession variable. Economic theory hypothesized negative
relationships between consumption expenditures and unemployment and consumption expenditures and recession. The recession variable was positive and insignificant in the original regression and the regression in which the log of the unemployment rate variable was dropped. The sign issue was resolved in the regression in which the Real Gross Domestic Product variable was eliminated; yet the variable remained insignificant. Because the variable was insignificant in the regressions, no exact conclusions can be drawn from the variable regarding its relationship to consumption expenditures.

The log of the unemployment rate variable was positive and insignificant in every regression. Unemployment is a factor that negatively affects disposable income. When disposable income decreases, consumption expenditures must decrease because the household has less money from which to spend. The positive coefficient on this variable could be attributed to the relative income hypothesis or permanent income hypothesis. When the household sector’s aggregate disposable income decreases due to increased unemployment, people continued to consume at their previous level for some time. An alternative explanation through the permanent income hypothesis is that when unemployment decreased aggregate disposable income, households began consuming out of their savings. No conclusions can be drawn from the log of the unemployment rate coefficient in terms of consumption from the four regression models.

In running the regressions, the most noteworthy finding was the repeating negative sign of the consumer sentiment variable. Despite additional regressions omitting other independent variables to adjust for multicollinearity, the consumer sentiment variable was consistently negative and significant. In looking at the data set used, consumer sentiment seems to begin decreasing in the year or two before the recession starts. In the years before the recession, personal consumption expenditures are not decreasing, but increasing. The increasing in
personal consumption can be explained by the relative income hypothesis. People may have a negative outlook on the economy, but are consuming at their same rate, or a higher rates, to maintain their personal lifestyles, or to keep up with the perceived consumption levels of their peer group.

The findings of the regressions coordinate with Peersman and Pozzi (2008) research on consumption during business cycle fluctuations. They found that household consumption changes are very sensitive to current disposable income changes. In times of recession, the household’s sensitivity to the current disposable income changes increase. Peersman and Pozzi (2008) attribute the sensitivity increase to liquidity constraints and precautionary savings. From their research, it is concluded that on average, when current disposable income decreases at the beginning of a recession, consumption changes sharply. Consumer sentiment also declines at this time; another factor in the decline of consumption. When the recession ends, consumer sentiment and current disposable income begin increasing. However, because consumption changes are less sensitive to changes in disposable income changes in non-recessionary periods, consumption is slowing down its declining pattern before starting to increase again. The liquidity constraints and precautionary spending increases discussed by Peersman and Pozzi (2008) result in the slow shift of consumption spending after a recession.

Another reason for the negative relationship between personal consumption expenditures and consumer sentiment is the way the index questions are framed. Trends in consumer sentiment display the highest scores in years immediately following a recession (Ludvigson 2004). Though consumer outlook is most positive at the end of a recession, the expenditures are at their lowest point before they begin rebounding. The calculation of consumer sentiment includes future outlook on the economy, which causes the numbers to increase during business
cycle troughs and decrease during business cycle peaks. Personal consumption expenditures measure spending in the present period, regardless of the point in the business cycle. Even though the disposable income economic theory originally predicted a positive relationship between the consumption expenditures and consumer sentiment, the calculation of the consumer sentiment index includes future outlook, which is a factor not controlled for in the disposable income theory.

In conclusion, the results from the regression model did not always coincide with the supporting economic theory. The negative sign on the consumer sentiment could not be remedied through the manipulation of the independent variables in the regression. Interestingly, the consumer sentiment variable also remained significant in all of the regressions. The University of Michigan Consumer Sentiment survey measuring consumer sentiment based on future outlook, compared to what personal consumption expenditures measuring present consumption, may cause this unusual finding. Even though the consumer sentiment variable was significant in all of the regressions, the sign prevents any conclusions to be made from the results. Real Gross Domestic Product was significant and positive in each regression. The log of the interest rate variable maintained a negative sign in each regression, though it was not significant in all of the regressions. Despite predictions from economic theory of a negative relationship, the log of the unemployment rate was positive in the regressions ran. However, the coefficients of the log of the unemployment rate variable were insignificant. The recession variable was mostly insignificant and positive as well. Yet, when the Real Gross Domestic Product variable was dropped, the recession variable became negative, like economic theory predicted. Though many of the independent variables were insignificant in the model, consumer sentiment was mostly significant at all significance levels. The empirical results
displaying a negative relationship between consumer sentiment and personal consumption expenditures can be used to affect existing economic policies.
Chapter VI
Policy Recommendations and Implications

The purpose of the research was to investigate consumption in the United States from 1952 to 2013. The main explanatory variable is consumer sentiment, measured using the University of Michigan Consumer Sentiment Index. The other independent variables are Real Gross Domestic Product, prime interest rate, unemployment rate, and recession. The regression model is:

\[ C = \beta_0 + \beta_1 N + \beta_2 RGDP - \beta_3 \text{LIR} - \beta_4 \text{LUER} - \beta_5 \text{Rec} + \varepsilon \]

Where:

- \( C \) = US Personal Consumption Expenditures 1952-2013 (billions of dollars)
- \( N \) = University of Michigan Consumer Sentiment measure 1952-2013
- \( RGDP \) = Real Gross Domestic Product in United States 1952-2013 (billions of dollars)
- \( \text{LIR} \) = Log of the Prime Interest rate in the United States 1952-2013
- \( \text{LUER} \) = Log of the Unemployment rate in the United States 1952-2013
- \( \text{Rec} \) = United States Recession years (binary variable)
- \( \beta_0 \) = Constant term
The most significant variables in the original regression are consumer sentiment, Real Gross Domestic Product, and the log of the interest rate variable. Consumer sentiment and the log of the interest rate variable are negatively related to consumption. Real Gross Domestic Product is positively related to consumption. The insignificant variable in the original regression is the log of the unemployment rate. In this regression, the recession variable is significant at the 10% significance level. These two variables are positively related to personal consumption expenditures in the original regression, despite economic theory predicting otherwise.

Additional regressions were necessary to discover why the sign of the consumer sentiment coefficient was negative, and why the signs of the unemployment rate variable and recession variable coefficients were positive.

Before running the additional regressions, a correlation matrix tested for multicollinearity among the independent variables. The log of the unemployment rate variable is most highly correlated with consumer sentiment. Other independent variables that are highly correlated with consumer sentiment are Real Gross Domestic Product and recession. Each additional regression omitted one of these variables to eliminate multicollinearity. The consumer sentiment variable maintained its negative sign and significance in the further regressions that had various variables omitted. The Real Gross Domestic Product variable remained positive and significant at all levels in the supplementary regressions in which the variable was included. The marginal propensity to consume was constant throughout the regressions at around 69%. The log of the interest rate variable was negative and significant in almost all of the regressions. When the Real Gross Domestic Product variable was eliminated, the log of the interest rate variable became
positive and insignificant. The log of unemployment variable was positive and insignificant at all levels in each additional regression. The recession variable was positive and significant at the 10% significance level when the log of the unemployment variable was omitted, but negative and insignificant in the regression where the Real Gross Domestic Product variable was dropped. The variables that were significant in the regressions and maintained a constantly positive or negative relationship to consumption can be used to recommend policies to help the economy reach equilibrium. The research recommends policies for reaching equilibrium that focus on consumer sentiment, Real Gross Domestic Product, and the prime interest rate.

Fiscal and monetary policies aim to move the economy towards equilibrium, or maintain this stable state. The equilibrium point is the quantity and price level where aggregate expenditures equals aggregate output. Fiscal policy comes from the Keynesian economics belief that the government must help the economy reach the equilibrium point. The government affects the economy by generating revenue through taxes and by spending money on various government purchases that use resources and help produce more output. One important fiscal policy that can positively affect the economy when it is in disequilibrium is decreasing taxes. Tax cuts are expansionary fiscal policy. They are implemented when aggregate output is greater than aggregate expenditures. Though tax cuts decrease revenue for the government, they stimulate spending by increasing disposable income; which produces more available dollars for spending. The increased dollars available to spend create more demand for goods and services in the economy. If the economy is in a recession, the increased dollars from tax cuts stimulate spending and bring the demand for goods and service in the economy closer to the equilibrium quantity and amount. If the economy is already at full employment, the increased demand for goods and services resulting from the tax cuts could lead to inflation.
A current fiscal policy in the United States is the American Taxpayer Relief Act 2012. President Barack Obama signed this current United States tax policy into legislation on January 2, 2013 (Compton 2013). This bipartisan act maintained or decreased current income tax levels for 97% of families and small businesses permanently. The act extended unemployment insurance to continue assisting people looking for work. The act also invested in research and innovation in clean energy to create more jobs and a more sustainable environment through the Production Tax Credit and the Research & Experimentation Tax Credit. The American Taxpayer Relief Act 2012 permanently raised income taxes for the wealthiest individuals of the United States as a way to reduce the federal deficit. The act also reduced certain tax benefits to help reduce the federal deficit.

The American Taxpayer Relief Act 2012 was an appropriate response for stimulating the economy during the recession recovery process. The tax cuts increased disposable income for households and money available for investments for small businesses. The increase in disposable income led to increases in personal consumption expenditures. The data shows that personal consumption expenditures in the United States increased from $10.4 trillion in 2012 to $10.6 trillion in 2013. A portion of the increase in personal consumption expenditures can be attributed to the increase in disposable income resulting from the tax cuts for most of the households in the United States that occurred from the American Taxpayer Relief Act 2012. This act was effective in increasing consumption in the United States, bringing aggregate expenditures closer to the optimal aggregate output point.

Monetary policy is equally as important as fiscal policy in aiding the economy in reaching its equilibrium state. Monetary policy is how the Federal Reserve controls the money supply and interest rates (Weil 2008). The Federal Reserve uses three tools to form monetary...
policy: open market operations, the discount rate, and the reserve requirement. Open market operations are the most prominent policy used.

In open market operations, the Federal Reserve buys and sells government securities. The goal of expansionary monetary policy through open market operations is to decrease the federal funds rate. The federal funds rate is the cost of borrowing short-term funds from another commercial bank. To do so, the Federal Open Market Committee buys government securities by increasing the bank's Federal Reserve accounts, allowing the commercial banks to lend more money (www.stlouisfed.org). Banks are able to loan more funds by lowering the interest rate the federal funds rate. In contractionary monetary policy through open market operations, the Federal Reserve Bank sells government securities to commercial banks, businesses, and other stakeholders. Through the sale of securities to commercial banks, the Federal Reserve decreases the commercial bank's account, resulting in fewer funds for the bank to lend. Because the banks have reduced funds to loan to customers and other banks, the interest rate and federal funds rate increase in response to the decreased cash supply. The increase cost to borrow money decreases the demand for loans. Customers and other commercial banks borrow fewer funds, and the economy reacts negatively.

The second tool of monetary policy is the discount rate. The discount rate is the interest rate commercial banks must pay to the Federal Reserve Bank on short-term loans (www.stlouisfed.org). Contractionary policy through the discount rate tool occurs by increasing the discount rate. When the discount rate is increased, banks pay more to borrow from the Federal Reserve Bank. The banks push this cost increase onto their customers by increasing the interest rate. The higher interest rate decreases the demand for loanable funds. Expansionary monetary policy occurs through the reduction of the discount rate. Reducing the discount rate
decreases the cost of borrowing cash from the Federal Reserve Bank. The lower cost of borrowing from the Federal Reserve provides banks with more funds to lend to customers and to other commercial banks. To attract customers, banks lower their interest rate. Lower interest rates encourage more people to borrow money to invest in businesses and spend on goods and services.

The third tool of monetary policy is manipulating the reserve requirement. The reserve requirement is the amount of cash commercial banks must hold at the Federal Reserve Bank at any given time (www.stlouisfed.org). Expansionary monetary policy occurs when the reserve requirement is decreased. Reducing the reserve requirement increases the supply of cash available at commercial banks to lend to customers. The increase of cash available to loan permits the banks to lower their interest rates to attract borrowers. At lower interest rates, the demand for loans increases. As households borrow more money, aggregate expenditures increase. When businesses borrow more money to purchase resources for their business, aggregate output increases. To implement contractionary monetary policy using the reserve requirement, the Federal Reserve Bank increases the amount of cash that commercial banks must keep in their Federal Reserve Bank account. When the amount required to be held at the Federal Reserve Bank increases, commercial banks have fewer funds to loan. The supply of cash available for loans decreases, causing the price of borrowing the funds to increase. The rising interest rate decreases the demand for funds by households and businesses, thereby decreasing expenditures.

One recent monetary policy for the United States is the large-scale asset purchase program, a type of open market operation. Since the recession in 2009, the Federal Reserve Bank has purchased billions of dollars of mortgage backed and Treasury securities (Potter 2013).
By purchasing these securities, the Federal Reserve Bank deposits money into the accounts of various banks, companies, and investors. The increase of funds available lowered the interest rate, and encouraged borrowing. This current monetary policy was expansionary, implemented in response to the economic downturn in 2008. The increased borrowing reinvigorated household spending and business investments. Because the large-scale asset purchases program by the Federal Reserve Bank was so effective, it ended in October of 2014, and transitioned into a policy of reinvesting the principal payments from the mortgage backed and Treasury securities (www.federalreserve.gov 2015). The goal of reinvesting the principal payments of the mortgage backed and Treasury securities was to increase inflation rate towards the 2% goal.

Another monetary policy in effect is maintaining a low federal funds rate. The federal funds rate is the interest rate commercial banks pay when borrowing overnight funds from other commercial banks (www.stlouisfed.org). In 2008, the Federal Reserve lowered the federal funds rate to nearly zero in effort to reduce the effects of the recession. Currently, expansionary monetary policy focuses on maintaining the federal funds rate between 0% and 0.25% (www.federalreserve.gov 2015). The low federal funds rate encourages commercial banks to borrow more money. When banks have more money to lend, the price of borrowing funds decreases. Because the lowered interest rates stimulated consumers and businesses to borrow more money, aggregate expenditures and aggregate output have increased; improving overall economic conditions in the United States since the financial crisis in in 2008. As a result of the increase in demand for borrowing funds, the overall price level in the economy has increased towards the inflation rate goal of 2%. This policy has slowly been effective in helping the economy recover from the recent financial crisis. The monetary policy of lowering the federal funds rate has stimulated aggregate expenditures without raising inflation excessively.
Some notable findings from the research are that both consumer sentiment and the prime interest rate are negatively related to consumption at most significance levels, and that the marginal propensity to consume was constant at 69% in the regressions. From this research, consumer sentiment and consumption are not positively related because of the time frames of how the two are measured. Consumer sentiment is a forward-looking measure of economic outlook, while personal consumption expenditures are a present measure of economic health. Because of the difference in timing of the two measures, it is recommended that the fiscal policy of tax cuts be implemented at periods when the consumer sentiment is low to prevent recessions before they happen.

The American Taxpayer Relief Act 2012 was an effective response to the 2009 recession. However, the research infers that if tax cuts were implemented as a preventative measure, a decline in consumption could have possibly been prevented. The research displays an inverse relationship between consumption and consumer sentiment, predicting that when consumer sentiment is low, personal consumption expenditures are high. It is recommended that tax cuts be implemented when consumer sentiment is at its lowest point. A positive implication of this action is that the policy could increase the disposable income of households. The increase in disposable income would provide households more money in which to spend on goods and services. The increase in aggregate expenditures would prevent the impending economic decline predicted by the consumer sentiment index. A negative implication of the tax cuts at a time of low consumer sentiment and high personal consumption expenditure is an overheating of the economy. If people have more money to spend on goods and services, the overall price level will increase, even if the economy is already at full employment. If the inflation rate increases
more than the disposable income of aggregate households increases, their dollars will consume less goods. The decline in the value of the dollar negatively impacts aggregate expenditures.

The research uses the prime interest rate, or the cost to borrow money for individuals and businesses at commercial banks as an important factor in determining expenditures. Theory predicted interest rates to have a negative effect on the economy because the increased cost of borrowing money discourages borrowers from taking out loans. The results of the research supported the negative relationship between consumption expenditures and interest rate that economic theory predicted. It is recommended that the Federal Reserve maintain the current monetary policy of a low federal funds rate. A low federal funds rate encourages borrowing among commercial banks, without increasing the money supply through open market operations. When the banks have more funds available to loan, the interest rates decrease. The interest rate decrease is caused by a higher supply of loanable funds in the market.

A positive implication of maintaining a low federal funds rate is that increased availability of loanable funds decreases the interest rate for borrowing. If the interest rate is lower, people are encouraged to borrow more money, thereby increasing disposable income. The increase in disposable income would be used to purchase more goods and services, which would increase aggregate expenditures. Another positive implication of a low federal funds rate is that the resulting lower interest rate increases business investment spending. If businesses invest in their company to expand their operations, they are able to hire more employees to help increase their output. The increased investment spending can decrease unemployment and increase aggregate output. Because the economy has more employed people in the economy, average disposable income increases for households. The increase in disposable income for
households increases the money available to consumer with, shifting aggregate expenditures towards the equilibrium point.

A negative implication of the lower federal funds rate is its effect on holders of fixed income, like retirees. If the lower federal funds rate decreases overall interest rates by increasing the supply of funds available to loan, people living on their retirement savings earn less money on their invested retirement portfolio. If their retirement portfolios earn less money, the retirees receive less disposable income from which to consume. Consumption expenditures for this group of the population could decrease as a result of the lowered federal funds rate. The retired population is steadily increasing in the United States, so their well being and spending power are vital factors to consider in forming policy around consumption.

The research found a positive and significant relationship between Real Gross Domestic Product and consumption. Consumption is a major component of Real Gross Domestic Product. Aggregate expenditures and aggregate output are imperative in maintaining equilibrium in an economy. Because households in the United States affect aggregate expenditures and aggregate output daily, it is important that the citizens learn wise spending, saving, and investment practices. It is recommended that Congress pass a bill that adds a financial literacy class into the curriculum of all schools beginning in the first year of high school.

The United States has a very high marginal propensity to consume, even during recessions. Since the year 2000, the marginal propensity to consume has ranged from 52% to 170%. The consumption culture is not always positive for the economy. The extremely high demand for goods and services drives up the price level, and can create inflation when the economy is in full employment. When people spend more than their disposable income, they spend from their savings or have to borrow money. Dissaving is bad for the economy because it
decreases aggregate savings. In times when people actually need to use their savings, such as during retirement or periods of unemployment, their lack of funds may require them to seek government assistance. Government assistance is a transfer payment that does not directly increase output. It is important for the government to help its people, but high increases in transfer payments can increase the country’s debt without any direct increase in production. Borrowing money increases household disposable income, but that money must be paid back, in addition to interest. If a significant portion of households defaults on their loans, the economy could spiral into recession. For example, the widespread default on mortgage-backed securities caused the housing crisis and the economy to spiral downward in 2008.

There are mainly positive implications of including financial literacy courses in school curriculums. These classes taught in schools would improve financial decision-making among future households. If young people learn how to make budgets, how to apply and pay back their loans, how to invest their money wisely, and how to save money for retirement, the future economy would be more stable and require less government intervention. It is vital to teach these skills early before the students turn into households that get into situations where their lack of financial knowledge poses a problem. Teaching the classes in schools across the country will have a major impact on future spenders. The students learning about financial literacy could encourage the parents to educate themselves on the topic as well, influencing the United States economy more rapidly than originally intended. The financial literacy classes in school would provide information about spending and saving appropriately for future households to maintain equilibrium in the economy.

Consumption is an extremely important aspect of the United States economy. Because household spending is approximately two-thirds of United States Gross Domestic Product, it is
important for Congress and the Federal Reserve to form policies that move the economy towards equilibrium by affecting aggregate expenditures and aggregate output. The statistically significant variables in the regression that were used to form policy recommendations are consumer sentiment and prime interest rate. From the regression results regarding the consumer sentiment variable (N), it was recommended that the fiscal policy instrument of lowering taxes when consumer sentiment is low be implemented to prevent consumption spending from decreasing. Based on the results of the regression regarding prime interest rate, it was recommended that the Federal Reserve continue the monetary policy of lowering the federal funds rate as an indirect way to lower the interest rate and encourage consumption. The research found a positive and significant relationship between Real Gross Domestic Product and consumption. To increase future Real Gross Domestic Product and maintain equilibrium, it was recommended that financial literacy classes be introduced in high schools across the nation to increase knowledge on spending, saving, and investing. These three policies combined have the potential to positively impact the economy in its goal of maintaining equilibrium.
Chapter VII

Summary and Conclusions

The purpose of the research was to investigate consumption in the United States from 1952 to 2013. The main explanatory variable is consumer sentiment, measured using the University of Michigan Consumer Sentiment Index. The other selected independent variables included in the examination of consumption are Real Gross Domestic Product, prime interest rate, unemployment rate, and recession. The regression model for the research is:

\[ C= \beta_0 + \beta_1 N + \beta_2 \text{RGDP} - \beta_3 \text{LIR} - \beta_4 \text{LUER} - \beta_5 \text{Rec} + e \]

Where:

- \( C \) = US Personal Consumption Expenditures 1952-2013 (billions of dollars)
- \( N \) = University of Michigan Consumer Sentiment measure 1952-2013
- \( \text{RGDP} \) = Real Gross Domestic Product in United States 1952-2013 (billions of dollars)
- \( \text{LIR} \) = Log of the Prime Interest rate in the United States 1952-2013
- \( \text{LUER} \) = Log of the Unemployment rate in the United States 1952-2013
- \( \text{Rec} \) = United States Recession years (binary variable)
- \( \beta_0 \) = Constant term
\[ \beta_1 - \beta_3 = \text{Coefficients} \]

\[ e = \text{error term (assumed to be zero)} \]

Chapter I, *Introduction*, recalled the history of consumption in the United States. Heavily influenced by the British Industrial Revolution, consumption has its foundations in a series of inventions created in the 19th century that changed society, such as the steam engine. Steel, iron, lumber, and textiles were the major industries that employed the most people and produced the most output, greatly increasing consumption. World War I and World War II changed the way people consume by fueling the need to display social status through consuming luxurious goods, as opposed to obtaining necessities. In the past twenty years, consumption has changed even further from advances in technologies. Chapter I also presented the functional and econometric models, and objective of the research.

Chapter II, *Literature Review*, discussed previous research related to the dependent variable, consumption. The literature displayed the importance of business cycle fluctuations, economic and social influences, and the predictive powers of consumer sentiment in determining personal consumption expenditures. The researchers assessing how business cycle fluctuations affect consumption expenditures focused on recession. Recessions decrease consumption expenditures due to changing consumer preferences and the precautionary savings motive. The literature discussed economic factors affecting consumption expenditures, such as unemployment, and the calculation of expenditures. Researchers found non-economic factors affecting consumption expenditures as well, such as the age structure of the population, the consumption patterns of peers, and consumer sentiment. The review of the literature explores in-depth the predictive powers of the University of Michigan consumer sentiment index. Multiple researchers found that consumer sentiment was not an accurate predictor of
consumption expenditures. However, consumer sentiment has some accuracy in predicting recessions, which are a major factor in determining personal consumption expenditures.

Chapter III, *Theoretical Framework*, presented relevant economic theory regarding consumption. The four consumption hypotheses provide predictions on how each of the variables in the research will relate to consumption expenditures. Keynes’ disposable income hypothesis states that consumption is a function of disposable income. Disposable income is a household’s income less taxes, from which people spend and save. The second consumption hypothesis is the relative income hypothesis, which predicts that people consume comparably to their peers, and do not change their consumption habits immediately after their disposable income increases or decreases drastically. The permanent income hypothesis predicts that people only spend out of their permanent income, earned from employment. All transitory income is saved. The life cycle hypothesis predicts that people dissave during their youth and retired years. Middle-aged people accumulate their savings while they are working, so their marginal propensity to consume is lower than the marginal propensity to consume for people in their youth or retired years. The last theory is Veblen’s conspicuous consumption hypothesis. Veblen predicts that people consume luxury goods to achieve and display their social status.

Chapter IV, *Methodology and Sources of Data*, presented the methodology for estimating the coefficients of the variables in the regression, descriptions, and data sources for each variable. The research used the Ordinary Least Squares to estimate the parameters of the econometric model. Ordinary Least Squares is the best linear unbiased estimator. The variables expected to positively relate to the consumption variable were consumer sentiment and Real Gross Domestic Product. The variables predicted to negatively relate to the consumption variable are log of unemployment rate, log of interest rate, and recession. The sources of data for
the research were St. Louis Federal Reserve Economic Database, Bureau of Labor Statistics, and the Bureau of Economic Analysis.

Chapter V, *Empirical Results*, displayed and analyzed the results from the regression. In the original regression, consumer sentiment was negatively related to consumption expenditures. This variable was significant at the 1% significance level. Real Gross Domestic was positively related to consumption expenditures, and was significant at all levels. The log of the interest rate variable was negatively related to consumption expenditures and significant at all levels. The log of unemployment rate variable was positive and insignificant at all levels. The recession binary variable was positive and significant at the 10% significant level. Because the consumer sentiment, log of unemployment, and recession variables had signs that contradicted economic theory, the research used a correlation matrix to test for multicollinearity.

The results of the correlation matrix found high collinearity between consumer sentiment and log of unemployment rate, Real Gross Domestic Product, and recession variables. Additional regressions omitted each one of these variables to control for multicollinearity. In the additional regressions, consumer sentiment, Real Gross Domestic Product, and log of the interest rate maintained their signs and significance. The log of unemployment rate remained positive and insignificant. The recession variable was positive and significant at the 10% significance levels in all of the additional regressions, except in the regression omitting the Real Gross Domestic Product variable. In this regression, the recession variable was negative and insignificant.

No conclusions could be made from the log of unemployment variable in the research due to its constant insignificance in the regressions. The theory predicting the negative sign of the log of the unemployment variable is Okun’s law. This theory predicts a 2% decrease in
output for each 1% increase in unemployment. The resulting decrease in Gross Domestic Product should decrease consumption expenditures, but the regression results did not yield this negative relationship. The recession variable also contradicted economic theory in its sign for many of the regressions run. The research suggests the relative income hypothesis explains why the recession variable was positive. This consumption hypothesis predicts that people continue to spend at their habitual levels throughout changes in income, even during periods of Real Gross Domestic Product decline. Veblen's conspicuous consumption theory also supports the positive sign of the regression variable because it states the wealthy people will consume despite business cycle fluctuations.

The main explanatory variable, consumer sentiment, also had a negative sign in all of the regressions, contradictory to economic theory. Even when consumer sentiment was regressed individually on consumption expenditures, the results yielded a negative and significant coefficient. Further investigation into the sign of the consumer sentiment variable showed that consumer sentiment and personal consumption expenditures are measured in terms of different time frames. Personal consumption expenditures are measured presently, while consumer sentiment has a component measuring future outlook. Households may spend at large amounts currently, but if they see economic downturn in the future, their outlook will be negative. The time lapse in the consumer sentiment and consumption expenditures measures makes these two variables move in opposite directions.

Chapter VI, Policy Recommendations and Implications, used the results of the regression to recommend new policies and their repercussions to policymakers. The research recommends three policies based on the significant variables of the regression. The first policy recommendation is to cut taxes when consumer sentiment is low. Because consumer sentiment
and consumption expenditures are negatively related, the positive implication of this recommendation is that the lower tax will prevent economic downturn. A negative implication of this policy recommendation is a possible economic overheating resulting from the increase in demand for goods and services stimulated by the tax cuts. The second policy recommendation is to lower the federal funds rate to encourage borrowing among banks. A positive implication of this policy is that the increased borrowing among banks increases the money supply, which lowers the interest rate and encourages borrowing from households and businesses. The increased spending from the investment and household sector will increase the Real Gross Domestic Product, thereby increasing consumption. A negative implication of this policy is that the lower interest rates will hurt savers and investors. The last policy recommendation is to provide financial literacy classes in school curriculums. A positive implication of these government-funded programs is that they will increase the financial knowledge of the future spenders, making the economy healthier and less volatile. A negative implication of this program is that it creates an additional expense for the government. The program generates more future benefits than present benefits.

One suggestion for further research is adding a race variable to see whether consumption expenditures differ between races. The variable could be binary, where a value of 0 indicates the non-Caucasian portion of the population, and a value of 1 indicates the Caucasian population. The race variable included in the regression would show the differences between the marginal propensities to consume between races. If demographic information could be obtained from the results of the University of Michigan consumer sentiment survey, the race variable would display a difference in economic outlook between the races. If significant, the information could be used to form policy on a state or local level depending on the demographic of the area. If the
University of Michigan Consumer Sentiment Index does not provide the demographic information of the sample, a proxy variable could be used to display consumer sentiment.

Another suggestion for further research is to add another set of data with the same variables for a rapidly developing country, such as China or India. The comparison of the United States expenditures to a fast-growing nation’s expenditures would see if consumption is as central to other nation’s economies as it is in the United States. The comparison of the two regressions would also display differences in the marginal propensity to consume between the United States and the other nation. The regression of the developing nation would exhibit how the factors of consumer sentiment, Real Gross Domestic Product, prime interest rate, unemployment rate, and recession affect the developing nation’s consumption expenditures. If the rapidly growing nation does not have a standardized consumer sentiment index, the consumer sentiment variable could be replaced in both regressions by a proxy variable.

A third suggestion for future research is to separate the time periods from 1952 to 1982 and from 1983 to 2013. In the first time period, the culture of consumption was notably different than in recent years. The marginal propensity to consume was much lower because the post-war society and memories of the Great Depression frightened people into saving more of their income as a precautionary measure. Beginning in the 1980s, consumption became an integral part of the American culture, and the marginal propensity to consume increased greatly. At times, the marginal propensity to consume has been greater than 100%. Between 1983 and 2013, major technological advances occurred that changed how people can consume, such as the Internet. Analyzing the difference between the economies at these two periods may show different results and signs of the variables than the original regression.
The research determines that consumption expenditures are a major component of the United States economy from 1952 to 2013. It is concluded that because a number of variables are used in the investigation of consumption expenditures, that this variable is a central measure in deciding the financial health of the economy. Consumer sentiment, Real Gross Domestic Product, and prime interest rate significantly influence consumption expenditures in the United States from 1952 to 2013.

Consumer sentiment acted as a leading variable in predicting future consumption expenditures because it includes a future outlook component. It moved inversely with consumption expenditures, a present measure, to indicate the direction in which consumption expenditures will move. Real Gross Domestic Product also affected consumption expenditures in the United States during this time period. This variable remained significant and positive in all regressions because consumption expenditures are a major component in the calculation of Real Gross Domestic Product. Consumption expenditures make up approximately 2/3 of Real Gross Domestic Product in the United States. The prime interest rate was also significant in the regressions, and related negatively to consumption expenditures. A lower interest rate encourages people to borrow more money, from which they consume. The combination of results for the Real Gross Domestic Product and prime interest rate variables display the need for intervention to address consumption in periods of disequilibrium. Fiscal policy affects consumption expenditures by altering government spending by a multiplier effect, found through the marginal propensity to consume. Monetary policy affects consumption expenditures through the changing of interest rate levels. The significant selected variables in the research encompass the importance of numerous social and psychological factors that affect consumption in the United States from 1952 to 2013.
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Appendix A.

Regression Tables

Figure 1. Results from Regression Model 1.

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<th>Source</th>
<th>SS</th>
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<td>5</td>
<td>103872827</td>
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<tr>
<td>Residual</td>
<td>238538.112</td>
<td>56</td>
<td>4259.60914</td>
</tr>
<tr>
<td>Total</td>
<td>519602674</td>
<td>61</td>
<td>8518076.62</td>
</tr>
</tbody>
</table>

Number of obs = 62
F( 5,  56) = 24385.53
Prob > F = 0.0000
R-squared = 0.9999
Adj R-squared = 0.9999
Root MSE = 65.266

| pce  | Coef. | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|------|-------|-----------|-------|-----|----------------------|
| umcsent | -2.823754 | 1.062636  | -2.66 | 0.010 | -4.95247 -6.950368 |
| rgdp  | 0.689442  | 0.021198  | 32.524 | 0.000 | 0.6851955 0.6936884 |
| lir   | -492.9986  | 43.26843  | -11.39 | 0.000 | -579.6757 -406.3216 |
| luerate | 125.2818   | 90.2027   | 1.39  | 0.170 | -55.41591 305.9795 |
| rec   | 51.88156   | 26.84607  | 1.93  | 0.058 | -1.897577 105.6607 |
| _cons | 189.6582   | 151.816   | 1.25  | 0.217 | -114.4657 493.7821 |
Figure 2. Correlation Matrix of Independent Variables

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<tr>
<th></th>
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<th>lir</th>
<th>luerate</th>
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<td>umcsent</td>
<td>1.0000</td>
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<td>-0.3332</td>
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<td>rec</td>
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Figure 3. Results from Regression Model 2 (Omission of LUER variable)

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<th>F( 4, 57) = 29992.59</th>
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<td>129838980</td>
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<tr>
<td>Residual</td>
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<td>4329.03488</td>
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<td>Total</td>
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<td>61</td>
<td>8518076.62</td>
<td></td>
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</tr>
</tbody>
</table>

| pce  | Coef.       | Std. Err. | t     | P>|t|    | [95% Conf. Interval] |
|------|-------------|-----------|-------|-------|---------------------|
| umcsent | -3.693171  | .865658  | -4.27 | 0.000 | -5.426622 -1.959721 |
| rgdp  | .6897192   | .0021275 | 324.19| 0.000 | .6854589  .6939794 |
| lir   | -487.0114  | 43.40259 | -11.22| 0.000 | -573.9235 -400.0992 |
| rec   | 48.01383   | 26.91796 | 1.78  | 0.080 | -5.888464 101.9161 |
| _cons | 354.8506   | 95.11507 | 3.73  | 0.000 | 164.3859 545.3152 |
Figure 4. Results from Regression Model 3 (Omission of Rec variable)

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<td>Residual</td>
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Number of obs = 62  
F(4,57) = 2905.50  
Prob > F = 0.0000  
R-squared = 0.9995  
Adj R-squared = 0.9995  
Root MSE = 66.813

Source | Coef. | Std. Err. | t    | P>|t| | [95% Conf. Interval] |
<table>
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<td>0.6848507 to 0.6935248</td>
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<tr>
<td>luerate</td>
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<td>lir</td>
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<td>_cons</td>
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Figure 5. Results from Regression Model 4 (Omission of RGDP variable)

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Number of obs = 62  
F(4,57) = 2.17  
Prob > F = 0.0834  
R-squared = 0.1324  
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Root MSE = 2812.3

Source | Coef. | Std. Err. | t    | P>|t| | [95% Conf. Interval] |
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Figure 6. Results from Simple Regression Model

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R-squared = 0.1174  
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Root MSE = 2764.6

|           | Coef.  | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|-----------|--------|-----------|-------|------|----------------------|
| pce       | -89.8865 | 31.81246 | -2.83 | 0.006 | -153.5209 - 26.25211 |
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### Appendix B

#### Raw Data

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