A Potential Crisis Or A Profit Machine

An Analysis Of The Subprime Auto Lending Market

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Abstract

With rising default rates on automobile loans and more specifically subprime auto loans, uncertainty in the market is increasing. Eight-year auto loans are now becoming common in the market and critics are split on whether there is a subprime bubble or there is no reason for concern. This study hypothesizes that there will be a positive correlation between the delinquency rate of automobile loans and market factors, such as fuel costs and loan durations. Panel data was collected from the Bureau of Labor Statistics' annual Consumer Expenditure Survey and Experian's quarterly State of the Automotive Finance Market reports in order to run an econometric analysis. After analyzing the data from 2016 and 2017, the variables of interest were not statistically significant.

Introduction

Looking back a little over 10 years ago, subprime loans were all over the news as the United States was in the middle of a mortgage crisis. The 2008 crisis brought a great deal of attention to subprime loans, their securitization, and the lack of regulation that caused markets to crash in what is now regarded as the worst recession since the Great Depression. By definition, subprime loans are not bad; they are risky loans that offer higher potential returns for lenders and give individuals with low credit scores an option to purchase an automobile and maintain a livelihood. It is estimated that about 91% of American adults commute to work in a personal vehicle while on average, only 27% of American jobs are accessible within a 90 minute commute using public transportation (Kirk 2014). Clearly, vehicle ownership is essential to the American economy. Despite offering many Americans an avenue to purchasing a vehicle, subprime lending is often intertwined with predatory lending because "subprime loans target some of the nation's most desperate and least financially savvy consumers, many of whom have experienced extended periods of dire financial straits, and they are offered at interest rates often bordering on usurious" (Kirk 2014).

In the years leading up to the 2008 mortgage crisis, subprime loans allowed more homes to be sold than ever, and lenders had no problem giving out these loans. The lack of government regulation exacerbated the issue as numerous lenders eventually stop completing their due diligence of traditional credit checks before handing out home loans. Essentially, Americans with poor or no credit scores were easily able to obtain mortgages with prime interest rates. Lenders then bundled these risky loans, many of which were not subprime on paper, into securities to resell

to investors. Selling these risky mortgages was more profitable than the return on a traditional thirty-year, fixed-rate mortgage (Taub 2016). Because the market was stable with low interest rates and rising home prices, investors did not see any need to worry about these risky loans being securitized and sold on the market. Obviously, Wall Street was wrong when the market came crashing down in 2008, sending ripple throughout the world economy.

Since 2008, the mortgage industry has become heavily regulated by the government. The automobile lending industry is still not highly regulated, however. The key distinction between the mortgage industry and the auto loan industry is that the latter operates on a significantly smaller scale. Based on data from 2017, the mortgage debt per capita is more than seven times larger than the auto loan debt per capita (FRBNY 2018). If auto loan backed securities did crash the way mortgage backed securities did in 2008, the impact would be significant but not anywhere near the scale of 2008. The goal of this study is to understand the fragility of the market and determine whether economic conditions have an impact on auto loan default rates. This study aims to show that there is a direct correlation between various market factors and demographic variables and the default rates of automobile loans.

Literature Review

For this study, literature pertaining to the auto lending market as well as the 2008 mortgage crisis will be used to develop a model around subprime auto lending. Literature regarding the current state of the auto lending market as well as current government regulation of the market will be vital to informing the model.

The first question that needs to be answered is why are subprime auto loans so attractive to lenders. "Lenders are more attracted to auto loans rather than other types of consumer subprime loans because they are backed by collateral. The car can be repossessed upon default" (Taub 2016). Auto loans are considered secure in contrast to credit cards and personal loans. In addition, as previously mentioned, over 90% of Americans commute to work in a personal vehicle, so owning a vehicle is technically more vital to earning a livelihood than owning a home. Consumers are more willing to take on the burden of high interest rates with subprime loans if it gives them access to making a living. With the current low interest environment, lenders are seeking profits and subprime auto loans offer the most potential for higher returns.

Since June 2015, the Consumer Financial Protection Bureau has been allowed to regulate subprime auto lenders, but it has not done much to enact strong regulations on the market. The prevalent use of starter interrupter devices (SID) and the existence of buy-here-pay-here dealers (BHPH) are two aspects of subprime auto lending that have not been heavily regulated yet. BHPH dealers are the most notorious for engaging in predatory lending. They continually make profits by selling cars to the least creditworthy Americans with low incomes in anticipation of a default. Once the individual defaults after not being able to afford the absurdly high interest rate, the BHPH

dealer can repossess the car and start the cycle over again (Atta-Krah 2016). Typically with used cars, the loan payments made before default will outweigh the depreciation in value of the car so the dealer can maintain profits and put the car through another cycle of predatory lending.

Usury limits and wage garnishment are another area of regulation that are still too weak to effectively protect consumers. Usury limits are ceilings on interest rates that lenders can charge on loans. In states that impose usury laws, subprime auto lenders have created a workaround by increasing the prices of cars to maintain the same monthly payment with a lower interest rate. Brown and Jansen found that usury limits were associated with higher principal balances on auto loans (2019). Wage garnishment seems be an even larger issue in the subprime auto lending industry. Wage garnishment is a practice by which lenders can recover outstanding debt directly from a borrower's income, and it is currently legal in 44 states. "For every level of creditworthiness, borrowers in states that prohibit wage garnishment default more frequently than their peers in other states. These borrowers carry higher monthly payments and loan-to-value ratios, both associated with an increase in the probability of default on auto loans" (Brown and Jansen 2019). In this case, allowing wage garnishment is actually beneficial to borrowers because it protects them from defaulting, which has long-lasting negative consequences on an individual's credit score and ability to borrow in the future.

Figure 1: Charge-offs on Auto Loans

Charge-Offs on Auto Loans
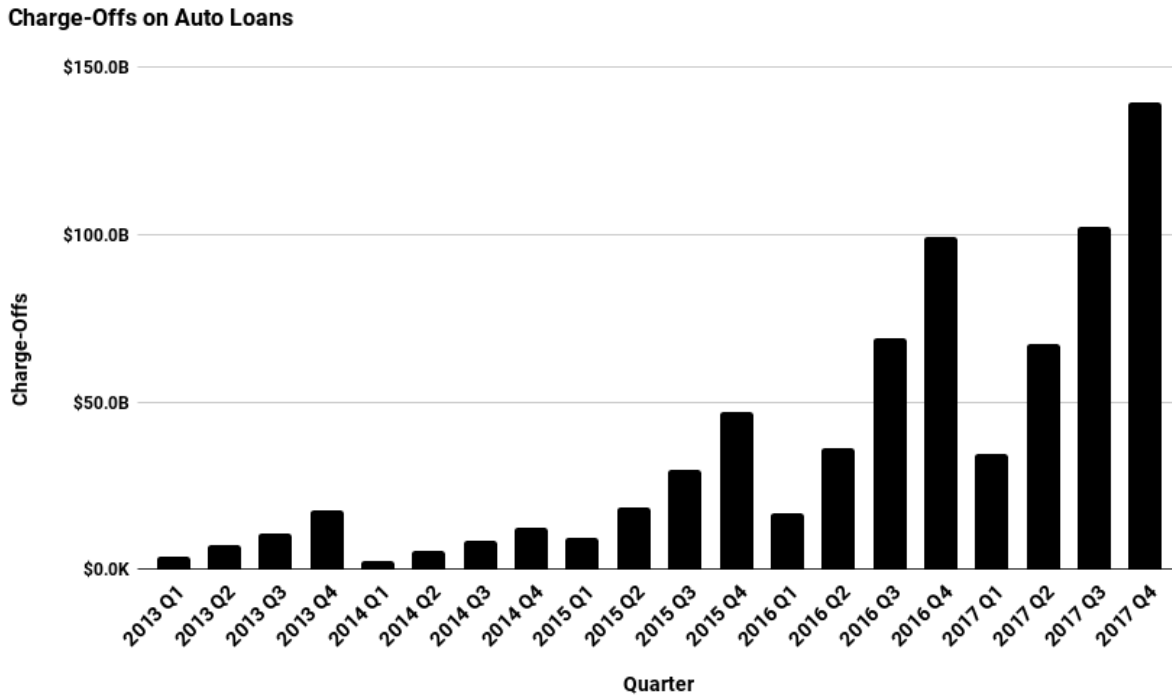
The last vital piece of information for this study is the current state of the market. From Figure 1, an auto loan charge-off is what occurs occurs when a borrower defaults on a car loan, the lender repossesses and sells the car, and the lender removes the balance of the loan off of its books. Figure 1 demonstrates the rising dollar amount of charge-offs in recent years as well as the seasonality of charge-offs, which always peak in the fourth quarter of each year. In recent years there have been conflicting reports on the health of the auto lending industry with much of the recent focus being on subprime auto lending. Based on data from 2013 and 2014, one study found that the data did not show any reason for concern about auto asset backed securities (ABS) because auto ABS investors were seemingly insulated from the heightened risks of expanding subprime auto lending (Culp and Forrester 2015). However, recent trends of offering longer contract lengths on auto loans pose some concerns. A 2018 study led by researchers in the federal government

uncovered an inverted yield curve among auto loans, meaning that the annual percentage rate (APR) on loans with terms of 6 years or longer were significantly lower that those on short-term auto loans with similar levels of credit risk. The concern with this evidence is that it"suggests that a significant proportion of relative credit risks among auto loans are not reflected in pricing, which could generate distortions in the auto loan market" (Guo, Zhang, and Zhao 2018).

There are also concerns with credit ratings on collateralized auto-loan instruments. Credit rating agencies have been giving AAA ratings on auto ABS, and "buyers of such bonds in general have no viable means of vetting the information bond issuers provide them" (Kirk 2014). Similarly to the subprime mortgage boom before the 2008 crisis, there is room for fraud in credit ratings, especially as investors are eager to seek high-yield returns. Lastly, data has shown that delinquency rates are rising during a time of "economic expansion, tighter labor markets, and higher wages," and these rates could rise with an economic downturn (Brown and Tousey 2018). This data points to the fact that the subprime auto lending market is indeed influenced by market conditions.

Theory

Due its relatively small scale in financial markets, the auto lending market is not as heavily analyzed as the mortgage industry. There has never been a crisis with auto loans, and we are barely a decade removed from the 2008 mortgage crisis, so it makes sense that subprime mortgages are studied more often than subprime auto loans. Regardless, the idea of an asset bubble driven by credit cycles is not novel to mortgages. The parallels between mortgages and auto loans have lead to speculation over whether there is a bubble in the auto loan market.

The Minsky Cycle is a model of asset bubbles driven by credit cycles that fit both the commercial real estate crisis of the 1980s as well as the tech bubble of the 1990s (Roubini, 2007). The Minsky Cycle may be able to explain the current state of the auto lending market as well because certain aspects of the the model do align with the auto lending market. A distinction has to be made between homes and automobiles because the Minsky Cycle is based on credit rather than the actual asset. The Minsky Cycle is best summarized in the words of L. Randall Wray: "Stability is destabilizing" (2011).

Minsky's model was developed around the idea that the capitalist economy is contained by "institutional ceilings and floors" that create stability. The problem with this stability is that it causes behaviors to change and gives way for risky behavior through speculation that will inevitably breach the ceiling and cause a crash. If the crash is cushioned by the floor, that risky behavior is rewarded, and the cycle continues until the crashes hit a breaking point and a depression occurs (Wray 2011). In the case of auto loans, the safety cushion for the market is the difference between the loan amount at origination and the expected returns of the loan along with the expected

returns from the potential repossession and resale of the car. As auto loan issuers continue to seek more profit, they could engage in riskier behavior as the Minsky Cycle predicts.

For lenders, the returns on loans are all future cash flows that technically are not guaranteed, especially with subprime loans. To determine the level of risk, lenders will look at a borrower's financial history and credit score to determine their likelihood of receiving all future cash flows. These evaluations are where speculation comes into play, as the future is impossible to fully predict. In this sense, aspects the Minsky Cycle have parallels to the weak from of the Efficient Market Hypothesis, which states that future returns on an asset cannot be predicted based on past returns. For auto loans, lenders can never be certain of returns even after completing the due diligence of inspecting a borrower's financial history. With subprime auto loans, there is always some degree of speculation.

When market conditions are favorable, there is stability and lenders will be more likely to realize full returns on loans. As the cycle progresses, lending standards loosen as lenders engage in progressively riskier behavior. The next step is the loosening of lending practices due to competition in the market. If the market as a whole is profitable, banks will turn to borrowers they had not previously considered as they seek more profits. This expansion of the lending market is highly profitable, but it creates a higher likelihood of overborrowing, overinvesting, and concentrating risk rather than spreading it. (Kregel 2008).

Minsky's original model requires some adjustment to fit the auto lending market. The Minsky Cycle is built around the idea that banks are the only lenders, which clearly was not the case in the 2008 mortgage crisis. Non-bank lending activity also contributed to the market crash,

and with auto lending, non-bank lenders play an even larger role. Financing an auto loan through a

manufacturer is very common, especially with subprime lending where borrowers may not be able

to secure a loan from a bank or credit union.

Figure 2: Auto Loan Origination by Lender Type
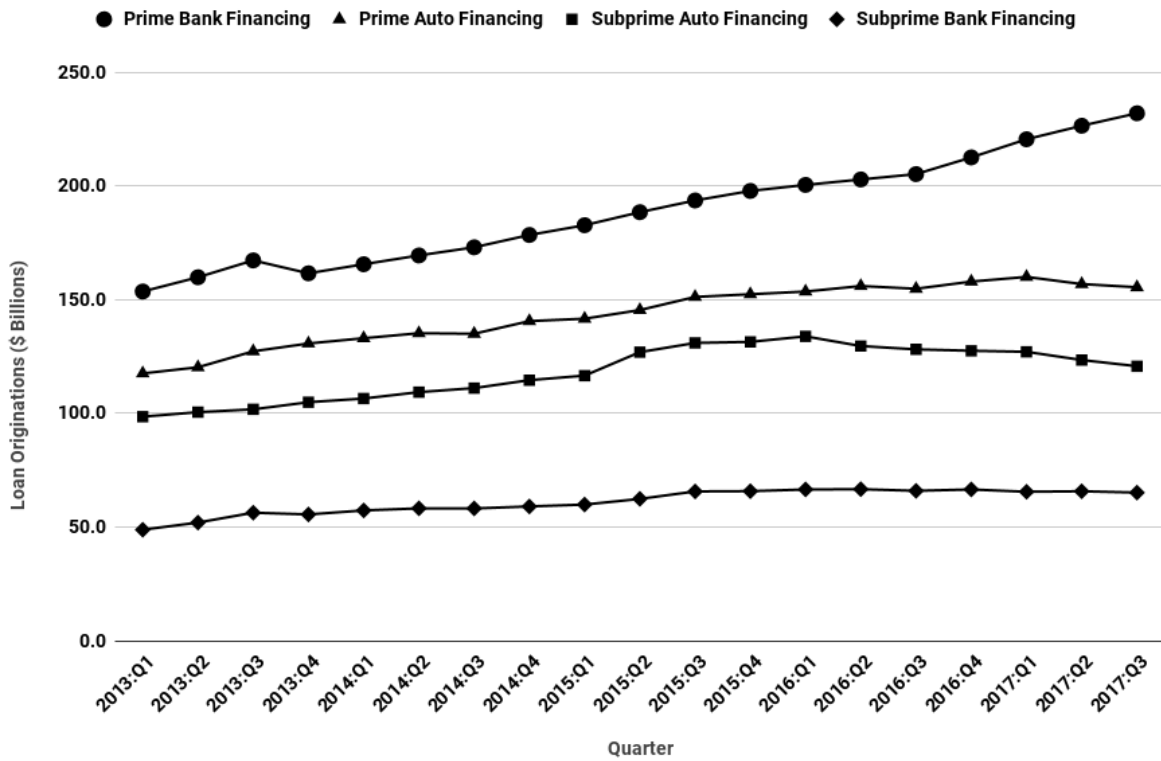
Figure 3: Subprime and Deep Subprime Auto Loan Delinquencies by Lender Type

90 Day Delinquency Rate by Lender Type for Subprime and Deep Subprime Auto Loans

● Auto Finance (Deep Subprime <620)   ▲ Bank Finance (Deep Subprime <620)   ■ Auto Finance (Subprime 620-659)   ◆ Bank Finance (Subprime 620-659)
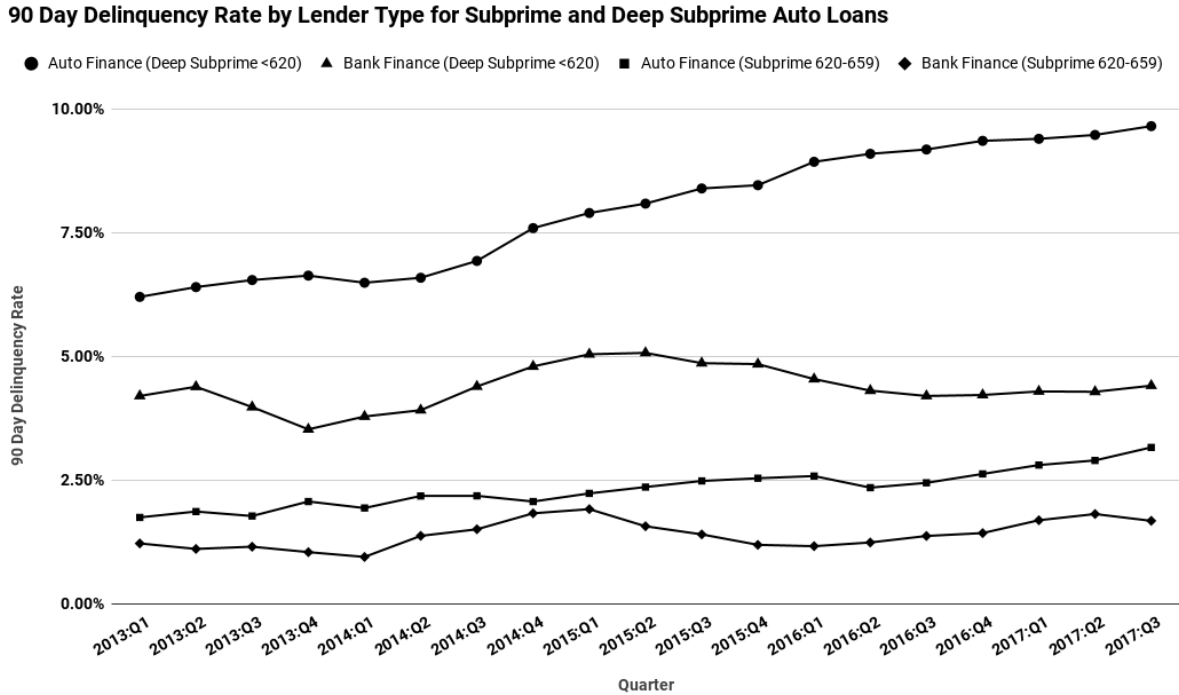
Figure 2 shows that for subprime auto lending, non-bank lenders actually originate a higher volume of loans than banks compared to prime auto loans where banks originate a higher volume of loans. The main difference between banks and non-bank lenders is that banks hold liability. Non-bank lenders will originate loans and then package them to sell to other financial entities who will securitize them. Banks create lines of credit while also maintaining deposits, so they must have enough liquidity to cover withdrawals and other financial obligations. Banks also carry the risk of defaults on loans they originate. Figure 3 shows that for both subprime and deep subprime auto loans, those financed through an automobile dealer have had higher 90 day delinquency rates, which often is a strong indicator of impending default.

While non-bank lenders simply issue loans and sell them for profit, banks will hold the

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loans they issue to gain profit. Since non-bank lenders don't hold their own debt, they are free to continue issuing loans and reaping profits as long as they can. Applying Minsky's model to the 2008 mortgage crisis, banks were supposed to be the stabilizing force and cushion the economy during the market crash, but as the crash occurred, banks were at a heightened risk of defaulting on their own debts. To prevent mass defaults by banks, the government had to intervene and bail out the banks (Wray 2011). Significant non-bank lending activity contributed further to the instability in 2008.

Turning back to the auto lending market, we could say that currently there is a period of economic stability, which is causing lenders to loosen their standard and engage in riskier behavior. This increasing fragility of the market is what this study aims to test by modelling whether changes in market conditions will have negative effects on the auto lending industry.

Methodology

Many studies have been dedicated toward understanding ethical issues with subprime lending, yet it is often difficult to quantitatively prove racial and income-based biases. This study does not intend to prove any ethical issues; rather, the goal is to assess the current state of the subprime auto lending market and determine whether there is a risk of a crash.

Credit rating agencies provide some of the most useful insights about the market, even though poor credit rating standards were one the major reasons for the 2008 recession. According to Atta-Krah, "Irresponsible credit underwriting practices played a major role in creating the bubble" (2016). Currently credit agencies publish reports on default rates, loan originations, and other metrics to provide an overview of the market.

This statistical model used data from Experian's State of the Automotive Finance Market quarterly reports. The reports contain auto loan delinquency rates for almost every state. The model also used data from the Bureau of Labor Statistics, which conducts an annual Consumer Expenditure Survey. These surveys are conducted on a sample of the US population to create a pool of consumers that represent the American consumer.

The statistical model for this study will analyze the default rate of auto loans by state and quarter, compared to the race, education level, marital status, contract length, outstanding credit card balance, fuel costs, wage earning status, and age of respondents in that state with an auto loan. This study is designed to show the correlation of other variables to the default rate in order to better understand the conditions of automobile loan defaults.

The empirical model for this study is as follows (Equation 1):

$$DefaultRates_{it} = Race_{it} + EducationLevel_{it} + MaritalStatus_{it}$$

$$+ ContractLength_{it} + Credit_{it} + FuelCosts_{it} \tag{1}$$

$$+ MultiEarners_{it} + Age_i it + e_{it}$$

A panel regression was conducted to determine whether any of these variables have a strong correlation to default rates. If there is a correlation between default rates and any of these variables, it will be possible to speculate whether increasing fuel costs or a lack of education have an impact on default rates to a certain degree.

Data

The data used in this study was collected by the Bureau of Labor Statistics in its annual Consumer Expenditure Survey is designed for use by various government and research agencies to track the spending habits of American consumers. The survey is conducted annually and compiled into yearly data that is broken down by quarter. The data is easily accessible and provides numerous demographic variables as well as certain specifics on automobile lending variables. The data is not perfect, however, as certain states are missing in certain years and there are many cases of respondent errors. The sample size of the survey is large enough to prevent these errors from causing issues, and the data still paints an accurate picture of the American consumer. For this study, the data was narrowed to individuals who had an auto loan during the period of the survey in order to effectively analyze the correlation between variables from the survey to default rates.

The data for default rates by state and quarter was obtained from Experian. Each quarter, Experian publishes its State of the Automotive Finance Market report which contains 30 and 60 day auto loan delinquency rates for 47-49 states depending on the quarter. It is an industry standard to track 30 and 60 day delinquency rates, although 90 day delinquency rates can also be useful in assessing the risk of subprime auto loans. In contrast to the Bureau of Labor Statistics data, these Experian reports are as readily available, so only 6 quarters of data were used in this study.

To perform the statistical analysis, the 6 quarters of data from the Consumer Expenditure Survey were matched to the same 6 quarters of data from Experian. To construct a panel data set, the data was narrowed to at most 1 respondent per state per quarter. For states with multiple respondents with an automobile loan, the respondent with the highest outstanding credit card

balance was chosen. This method allowed me to filter for respondents who would have a lower credit score because credit scores are not publicly available for these individuals. With certain states missing from either the Consumer Expenditure Surveys or the Experian reports, the data was narrowed to 176 respondents for use in the panel regression.

In addition to the previously mentioned data used in the statistical model, various data from the New York Fed Consumer Credit Panel and the Federal Deposit Insurance Corporation were used to understand the overall condition of the market. Some of the data from these government agencies is also based on data provided to them by Equifax. These datasets provide macro-level insights on trends in subprime auto lending.

Analysis

The data I used in this study consisted of auto loan default rates by state over 6 quarters, so I organized the data in panel data form. I ran a panel data regression on the following model (Equation 2):

$$DefaultRates_{it} = Race_{it} + EducationLevel_{it} + MaritalStatus_{it}$$

$$+ ContractLength_{it} + Credit_{it} + FuelCosts_{it} \tag{2}$$

$$+ MultiEarners_{it} + Age_{i}it + e_{it}$$

The default rate used in this regression is the 60 day default rate, because it is more closely aligned with industry standards for tracking delinquencies. Because the data was narrowed to only include respondents with low credit, super prime loans were essentially excluded from the data. These loans have the lowest likelihood of defaulting and would most likely not be affected by the independent variables in the regression.

Though the Consumer Expenditure Survey includes a wide array of demographic variables, the variables for this study were chosen with the belief that they would not change with current economic conditions. Intuitively, the additional variables like fuel cost are directly related to market conditions. For example, if fuel costs rose significantly, they would significantly increase the cost of owning and operating an automobile, which would lead to a higher probability of

default on a loan. These effects would be more noticeable for subprime borrowers, because in theory, prime and super prime borrowers would be more financially stable and able to cover the increased costs. Contract length is also a variable of interest because of recent market trends of offering longer terms on auto loans to subprime borrowers. "Originators of auto loans typically use the term of an auto loan strategically to help borrowers achieve a monthly payment that they can sustain. Loans of more than 60 months to maturity thus often indicate a relative weaker credit quality of borrowers" (Culp and Forrester 2015). By stretching out the term of a loan, lenders allow subprime borrowers to afford their monthly payments while also increasing the LTV of the loan.

After performing the panel data regression followed by the Hausman Test, it was most relevant to use random effects in the model. Random effects suit this model because it is assumed that the variation across entities is random and not correlated with the independent variables in the model.

The summary statistics of this model highlight a few important factors. The demographic variables are relatively self-explanatory. The higher education variable shows that most of the borrowers in this study across all loan types have above just a high school education level. Most of the borrowers were also white, with a mean of 0.864. The other demographic variables show that the majority of the borrowers are in the 40-50 range with an average age of 47, and 90% are in multi-earning households. The credit variable had significantly fewer responses, but it shows the average debt on respondents' credit cards was $14,473.01. The credit variable had a large standard deviation because the Consumer Expenditure data only reported ranges of credit card debt. The average contract length was 62 months or just a little over 5 years, with a standard deviation of just

under 1 year. Monthly fuel cost had an average of $314 with a large standard deviation, which was

expected given that fuel consumption varies greatly in a sample of only 176 respondents. Table 1

below shows the summary statistics for the independent variables.

Table 1: Summary Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Age	47.313	14.041	20	77
Higher Education	0.784	0.413	0	1
Single	0.301	0.46	0	1
MultiEarners	0.903	0.296	0	1
White	0.864	0.344	0	1
FuelCost	314.078	245.047	0	1500
Credit	14473.01	10271.34	250	35000
Contract Length	62.017	11.435	5	120

Upon testing the heteroskedasticity in this model, it was only relevant to plot the squared

residual values against those of the 60-day default rates in order to visually inspect for heteroscedasticity,

as can be seen in Graph 1 below. Based on the graph below, heteroskedasticity does not seem to be

an issue with the model. Regardless, by using robust standard error, random effects, and clustering

by state, the model corrects for any heteroskedasticity.

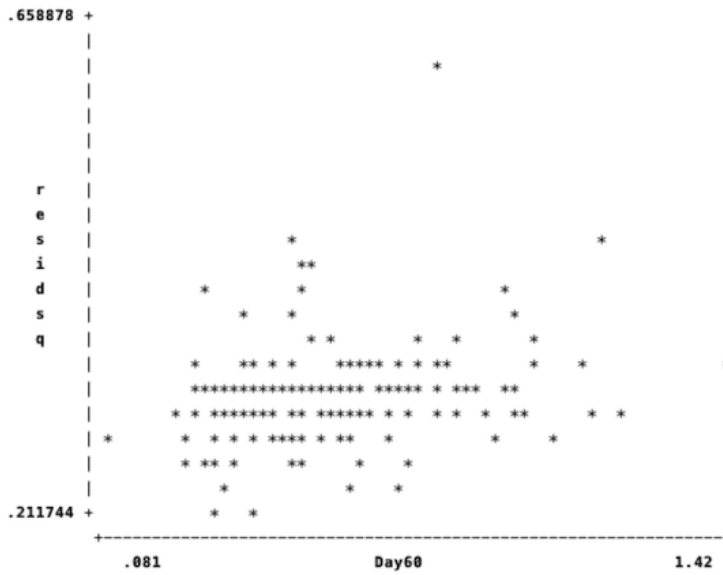Figure 4: Plot of residuals-squared and 60-day delinquency rates

Table 2: Panel Regression Results

Variable	Coefficient	Robust Standard Errors	t-statistic
Age	0.001	0.002	-0.02
Higher Education	-0.061	0.08	-0.76
Single	-0.03	0.053	-0.56
MultiEarners	-0.006	0.058	-0.09
White	-0.103*	0.052	-1.99
FuelCost	0.001	0.001	-0.32
Credit	0.055	0.131	0.42
Contract Length	-0.004	0.003	-1.66
Constant	0.991***	0.282	3.51

Legend: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Looking at the correlations in Table 2 above, it is clear that only the White variable is statistically significant. We can conclude that the White variable is statistically significant at the 95% confidence level. The fact that this variable is statistically significant lends to the idea that racial biases toward minorities may in fact have an impact on the subprime lending market. Though these results do not conclusively prove anything, they show that studies on the ethics of subprime lending may be valid. The model shows that non-white borrowers are statistically more likely to default on their automobile loan.

Unfortunately, none of the other variables are statistically significant at the 95% confidence level. Based on the initial hypothesis, Fuel Cost and Contract Length would have been statistically significant, but the model disproves that hypothesis. It was assumed intuitively that Marital Status and Multi Earners would be significant because these variables would indicate that if an individual lost their source of income, they would have a secondary source of income to prevent a default on their auto loan. Higher Education was also assumed to be significant because of the relation between education level and income/earning potential.

The nature of the data set used in this model lead to many assumptions about the data set. Even though the Consumer Expenditures Survey data is supposed to represent the American consumer, the administration of the survey gives way to many holes. There is always error when respondents omit a response, but there is also error when respondents give incorrect information. In addition, the survey covers a broad range of factors regarding the American consumer, so there is not enough data specific to automobile loans. For this model, the data was heavily filtered to include only respondents with automobile loans and low creditworthiness, which reduced the sample size to 176.

While constructing this model, a few other variables were considered because of their potential to impact the results. Variables around home ownership were considered, but the variation within such a small sample size did not make these a viable option. Another initial variable of interest was the actual monthly amount for respondents' car payments, but respondent errors in the sample made this variable unreliable.

I strongly believe that this model would be more effective with a different data set or even with data from a longer time period. Given the constraints on obtaining quarterly default rates for each state, it was nearly impossible to include more than 6 quarters of data in this study. With data over a longer duration, the sample size would be greatly increased and the correlations could potentially be much stronger if the chosen variables do indeed have an impact on default rates. Ideally, I would have analyzed data on specific asset-backed securities containing subprime automobile loans to create a model and show whether there is potential for a small scale crisis. However, this data is not publicly accessible, so auto loan asset backed securities were not a feasible option for the focus of this study.

Discussion

The results of this study to not support the original thesis in the ways they were predicted to do. The study hypothesized that market conditions like fuel costs and specific auto loan variables like contract length would have significant correlations with default rates. With only one statistically significant regressor in the model, the results of this study are more useful toward an ethical analysis of the subprime auto lending market. Despite the statistical model not showing any concrete evidence of a potential crash in subprime auto ABS, the macro-level data paints a slightly different picture.

Though there are not many ethics-based academic studies on subprime auto lending, time is an important factor. As more data is collected over time, these studies will be able to provide more useful results that could aid in answering the various ethical questions surrounding subprime auto lending. Regardless of data availability, there are still some concrete ethical concerns regarding subprime auto lending.

In a recent study, it was found that "Black and Hispanic applicants face lower credit approval rates than White applicants after controlling for credit score, income, and a broad set of personal and ZIP code characteristics," with an estimated "80,000 minority applicants fail to obtain auto loans each year due to discrimination" (Butler, Mayer, and Weston 2019). This discriminatory effect is more prevalent with subprime auto loans as minority borrowers on average pay higher interest rates than white borrowers. These practices increase the financial burden on minority borrowers and increase their likelihood of default.

Aside from discriminatory issues, the subprime auto lending market's largest ethical issue might be the use of starter interrupter devices (SID). SIDs allow auto lenders to remotely disable the ignition of a borrower's vehicle if the borrower defaults, and some devices allow lenders to track the location of the vehicle through GPS. For lenders, SIDs significantly decrease the repossession risk while allowing them to often avoid the due diligence of verifying a borrower's creditworthiness. BHPH dealers commonly use SIDs in conjunction with high interest rates and strict repossession rules so they can repossess a vehicle at the first indication of loan delinquency and maximize their profits (Atta-Krah 2016). Similarly to how borrowers were obtaining mortgages without credit checks before 2008, borrowers can now obtain an auto loan regardless of their credit as long as they agree to the installment of an SID. While SIDs pose a great deal of financial risk to borrowers, there have also been cases of SIDs causing actual harm to borrowers because certain devices actually allow the lender to shut off a vehicle regardless of whether it is moving. There was one case where a lender shut off a woman's car while she was taking her daughter to the emergency room due to an asthma attack (Atta-Krah 2016). With some states having explicit laws regarding SIDs and many states not having any laws regarding SIDs, the CFPB has a great deal of room for improvement to use its new powers under the 2015 final rule to further regulate SIDs.

A lack of proper government oversight also poses some ethical concerns with the subprime auto lending industry. In the United States Bankruptcy Code, there is a rule commonly referred to as the "Hanging Paragraph" that prevents borrowers from discharging auto loans for new cars when declaring Chapter 13 individual bankruptcy (Leonhard 2014). This rule allows for excessive subprime auto lending as lenders can loosen standards for checking a borrower's ability to repay the loan. Borrowers are also subject to asymmetric information as they are the least financially

sophisticated, and lenders tend to have the most information. Lenders are able to exploit this asymmetry by offering loans with absurdly high interest rates to borrowers who have no other option for financing an automobile.

Based on the recent findings of Butler, Mayer, and Weston, the results of this study could be applied to further studies on racial biases in the auto lending market by supplementing the data with additional demographic variables related to race and with more detailed auto lending specifics. A panel data set could be useful in determining how racial biases affect subprime borrowers in different states and whether those biases have changed over time. Using a larger, more detailed dataset is the logical next step for furthering this study.

Conclusion

This study aims to find possible correlations of auto loan default rates by state with macro-level market conditions, demographic variable, and conditions specific to individual auto loans. Market conditions such as fuel costs could have a significant effect on default rates for subprime borrowers. An increase in fuel costs would directly increase the cost of automobile ownership, which is usually already a financial burden for subprime borrowers. Contract length is a loan specific variable that has received a great deal of interest recently, as contract lengths of six to eight years tend to indicate low creditworthiness of the borrower. While longer contract lengths aid subprime borrowers by reducing monthly payments, they also increase risk for lenders if a borrower defaults early on in the loan period. So far, under ideal market conditions, the health of these loans and securities backed by them has held up, but their health under unfavorable market conditions remains uncertain because automobiles are depreciating assets unlike homes.

Given the results of the model used in this study, the only statistically significant variable was the white variable, a dummy variable to represent race. The outcome shows that market condition variables, demographic factors, and contract lengths were not significant in predicting default rates. The statistically significant correlation between default rates and being of the white race show that there is a correlation between being a non-white borrower and higher default rates on auto loans. This result poses many other research questions for ethical studies of the subprime auto lending industry. Though some studies have shown a racial bias in auto lending exists, this study lends an additional statistical analysis toward future quantitative studies with expanded data sets on bias in auto lending. Also, given the rise in default rates under favorable economic conditions in

the past few years, there is much more data to be analyzed in order to push for stronger regulation

by state and federal governments of the automobile lending industry with a focus on auto dealers

that specialize in subprime lending.

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