CREDIT CARD ASSET-BACKED SECURITIES

AND THEIR IMPACT ON U.S. HOUSEHOLD FINANCIAL STABILITY

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April 2013

I.   Introduction

On September 15th, 2008, one of the Wall Street's leading financial firms, Lehman Brothers, filed for bankruptcy. With over $600 billion of assets under holding, Lehman's collapse stirred up huge waves in the financial markets. Today, this case still remains the largest bankruptcy filing in U.S. history. The significant amount of borrowing and exposure to securitization markets played a big factor in Lehman's fall.

Right after Lehman Brothers' bankruptcy, more problems in the U.S. financial markets emerged. The unemployment rate surged to 10.2 percent in October 2009, reaching its highest level in 26 years. According to the National Bureau of Economic Research, the semi-official recession counter, the recession started December 2007 and ended in June 2009, making the 18-month recession the longest downturn for the U.S. economy since the Great Depression. Securitization products were largely blamed for the crisis and have since received a lot of public attention.

Securitization, a process of pooling illiquid financial assets (such as loans, bonds, and mortgage) and selling the assets as liquid products to investors, emerged in 1970s and grew dramatically in early 2000s. As Figure 1.1 shows, we can see the explosive growth in issuance of securitization products from 2000 to 2007. Before the financial crisis broke out, the markets saw securitization as a way to help provide liquidity, funding sources, and risk transferal. However, after the crisis, securitization was criticized for allowing the illiquid financial assets of poor quality to be passed to unsuspecting investors and providing credit lines to less creditworthy borrowers.

Figure 1.1

Bond issuance, $ bil, annualized

Source: Thomson Reuters

Legend: CDO, ABS, CMBS, RMBS
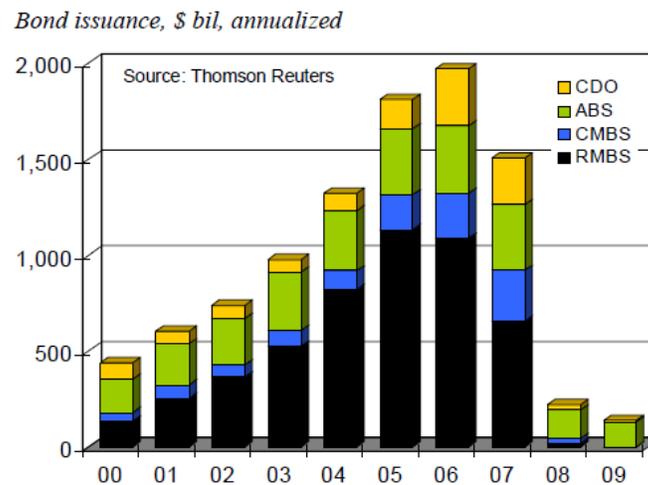
Source: Written Testimony of Mark Zandi, Chief Economist and Cofounder, Moody's Economy.com http://www.economy.com/mark-zandi/documents/FCIC-Zandi-011310.pdf Page 3

Nowadays as safe-haven assets generate low returns, yield-seeking investors are thinking about investing in securitization products again. Will this new wave of interests in securitization lay the foundation of another financial crisis in the future? How is securitization correlated to the stability of our US household? With those questions in mind, I will develop my thesis to hopefully provide an answer.

As Figure 1.1 shows, while there was a sharp upwards increase in Mortgage-Backed Securities (MBS) during the 2000s, Asset-Backed Securities (ABS) have been a consistent security with relatively stable performance over the decade. My focus for this paper will be on Credit Card Asset-Backed Securities (credit card ABS), one of the most consistent consumer securitized debt products, which allows us to evaluate the nature of securitization. Credit cards performance is usually a good indicator of other economics problems and household financial issues. This paper will explore the impacts that credit card securitization brings to the U.S. household. Despite the dramatic growth of securitization products and increased public attention, there are relatively limited amount

of academic literature to examine the impact of securitization on the economy and the U.S. households.

In Section II, first I will review the concept of securitization and credit card ABS, and then I will analyze the previous academic papers on securitization. In Section III, I will elaborate on my data collection. In Section IV, I will run data analysis based on the datasets, and in Section V, I will interpret the outcomes to draw conclusions.

II.   Background & Past Academic Papers

Securitization emerged in the 1970s and has grown in popularity since late 1990s. Through securitization, underwriters create securities backed by a pool of financial assets. This transforms illiquid assets, such as mortgage payments or car loan payments, into a tradable security, thus creating more liquidity for funding. The products created through securitization are called structured finance products.

The process of securitization is as following: first, the originators pool a group of similar illiquid and non-tradable financial assets (such as mortgage or car loan payments). Second, they transfer those assets to a Special Purpose Vehicle (SPV), whose sole purpose is to issue the securities. Then, they repackage the cash flows through financial contracts with different parties involved.

In Figure 2.1 from the International Monetary Fund, we can see that securitization process creates different types of products. ABS, Asset-Backed Securities, are a type of note, bond or certificate backed by a pool of assets, such as Home Equity Loans, Auto Loans, Credit Card Receivables, and Student Loans. The main suppliers of ABS are banks, financial institutions, and credit card issuers. The main buyers of ABS are

institutional investors, pension funds, mutual funds, overseas accounts, and REITS (real estate investment trust). Similarly, MBS, Mortgage Backed Securities, are a type of securities backed by a collection of mortgages. Agency MBS are mortgage bonds that are guaranteed by a government agency or government-sponsored enterprise (GSE) such as Fannie Mae, Freddie Mac, or Ginnie Mae. Non-Agency MBS are mortgage bonds that are issued by banks and financial companies not associated with a government agency. CMBS, Commercial Mortgage-Backed Securities, are a bond secured by the loan on a commercial property. RMBS, Residential Mortgage-Backed Securities, are a type of bond backed by mortgages on residential debt such as mortgages, HELs, and subprime mortgages. CMO, Collateralized Mortgage Obligations, are mortgage-backed bonds that separate mortgage pools into different maturity classes, called tranches. CDO, Collateralized Debt Obligations, are bonds backed by a pool of variously rated bonds, including junk bonds.

Figure 2.1
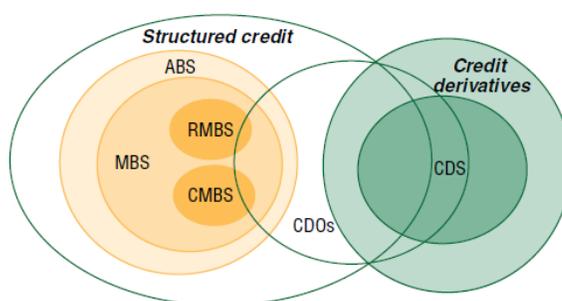
Note: ABS = asset-backed security; MBS = mortgage-backed security; RMBS = residential mortgage-backed security; CMBS = commercial mortgage-backed security; CDS = credit default swap; and CDOs = collateralized debt obligations. Not proportionally representative.

Source: IMF Structured Finance: Issued of Valuation and Disclosure, Page 3-4

As Figure 1.1 shows, RMBS increased most explosively from 2000 to 2007, due to large number of speculative investors betting on the housing markets. By contrast, ABS is the most stable type of consumer security product and has remained relatively consistent over the years despite market conditions in booms or recessions. The stable

nature of ABS to market conditions makes ABS the best representative to reflect the essence of securitization.

Within ABS, there are 4 main types: Credit Card ABS, Auto ABS, Home Equity ABS, and Student Loan ABS. As Figure 2.2 shows, all four types of ABS products boomed in early 2000 till 2007, and Home Equity is the most inflated due to the heated market conditions for home ownership. Student loan is the tiniest category among the four. Credit card and Auto have the longest history and are most stable in issuance relative to market conditions. I decided to specifically focus on Credit Card ABS because it has been the largest in issuance volume over the history. It is also the most liquid among all asset categories of ABS.

Figure 2.2
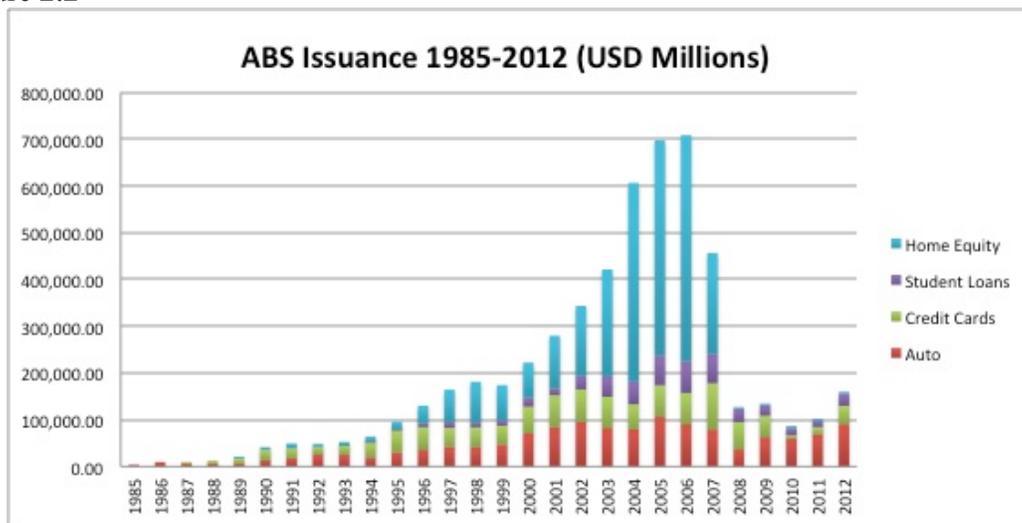
Source: Securities Industry and Financial Markets Association (SIFMA)

According to the Federal Deposit Insurance Corporation (FDIC), securitization represents over 50 percent of the credit card industry's funding, making it the largest funding source for credit cards. There are many participants involved in credit card ABS securitization process. Credit card issuers, such as large financial institutions, act as sellers and would sell a group of credit card receivables accounts to a SPV (Special

Purpose Vehicle), a subsidiary legal entity created with a sole purpose to issue those accounts as securities. Once the accounts are transferred to a SPV, the credit card issuers would remain to provide services to the accounts but remove the underlying assets from its balance sheets. This allows the credit card issuers to keep issuing more accounts to various SPVs while keeping their capital reserve relatively low. The SPV then issue securities backed by the credit card receivables under the accounts. Underwriters, such as banks, underwrite the whole transactions. Underwriters help credit card issuers and SPVs securitize the credit card receivable accounts, while connecting potential investors with the card issuers. Investors include banks, hedge funds, pension funds, insurance companies, and asset managers who seek predictable cash flows. When choosing types of products to invest in, investors refer to the credit ratings rated by ratings agencies. Rating agencies, such as the big three—Standard & Poor's, Moody's, and Fitch Ratings, evaluate the quality of the credit card receivables and give out ratings based on predicted performance.

According to Federal Deposit Insurance Corporation (FDIC), the cash flows for credit card ABS are structured to have two periods: a revolving period and either a controlled amortization period or controlled accumulation period. During the revolving period, every month when credit card holders pay down principle and interest, credit card issuers pass on the payment to the SPV to pay the investors while keeping a small portion of the principle as servicing fee (sellers' interest), and investors receive interest payment only. During the controlled amortization period, investors receive periodic principal payments as well as interests. During the controlled accumulation period, the principal payments collected are deposited into a SPV and reinvested in short-term investments,

which become the collateral for the outstanding investor certificates and increase as principal payments are received from the credit card holders until the investments equal the amount of the outstanding investor certificates in the maturing series. The investments mature at the same time, and the SPV pays the principal to investors at once. Most credit card ABS follow the controlled accumulation structure. The length of each period depends on the Monthly Payment Rate (MPR) determined in the contract and the structure of the underlying credit card portfolio. Therefore, the underlying cash flow from credit card ABS is more variable than most other fixed-income products such as corporate bonds or treasuries.

Throughout the life of the credit card ABS, the rating agencies will monitor the performance of the securities and determine if any upgrade or downgrade is necessary to reflect the change of expectation of future performance. Usually, credit enhancements are used to help credit card ABS obtain higher ratings and attract more investors. Externally, credit enhancements can be achieved through corporate guarantee, letter of credit, and bond issuance. Internally, credit enhancements can be done through increase in reserve funds, use of excess spread, overcollateralization, and senior and subordinate trenches.

When used properly, credit card securitization can bring benefits to all participants. For credit card issuers, securitization allows them to lower cost of funding, diversify funding sources, increase their transaction volumes, and better manage the risk of default. Also, securitization enables lower-rated institutions to achieve higher ratings thanks to the tranche structure of the underlying asset and credit enhancements. For investors, securitization enables them to gain access to a broader scope of investment products that comply with their investment grade policies and embrace more diversity in

the investment portfolio. For banks, securitization contributes to generating larger volume of transactions, bringing more fee income, and creating more underwriting and pricing disciplines through practice. For rating agencies, securitization allows them to expand business beyond traditional single-name corporate bond ratings, gain access to a larger pool of clients, and earn fees from rating structured finance products.

However, all those benefits come with a cost. In order to achieve the aforementioned benefits, all parties involved need to closely monitor the quality of underlying assets—credit card receivables. Underwriters in credit card ABS need to make sure that the credit card receivables meet the requirement of credit quality for their borrowings. One of the main issues that caused the Mortgage-Backed Securities (MBS) crisis was that underwriters were concerned with the quantity of new mortgages not the quality, because of the underlying conflict of interests.

There have been many previous academic papers on securitization regarding the economics of securitization, banks' incentives to securitize assets, and how securitization has affected the capital markets. In the following, I will discuss several representative academic papers and analyze how their findings help me to form my thesis.

Gorton and Pennacchi (1988) consider that regulation is one of the incentives to for banks to choose securitize. Ambrose, Lacour-Little, and Sanders (2005) show that regulatory capital rules also favor the securitization of credit cards and mortgages in response to regulatory capital arbitrage. Similarly, Calomiris and Mason (2004) also believe that the regulatory capital arbitrage is an important consequence of securitization. The avoidance of capital requirements could be motivated either by efficient contracting or by safety net abuse. They find that securitizing banks set their capital relative to

managed assets according to market perception their risk, and seem not to be motivated by maximizing implicit subsidies relating to government safety net when managing their risks.

To further demonstrate the incentives for banks to securitize assets, Thomas (1999) proves that securitization would alleviate the regulatory burden by analyzing effects on debt and equity claimants of asset sales into securitizations. Jiangli and Pritsker (2008) point out that prior to the advent of securitization, a bank's decision to extend a loan was a bundled decision to originate the loan, hold it on balance sheet, and fund it with the bank's debt and equity. Securitization un-bundles these activities, allowing the bank to separately choose which loans to originate, and which loans to hold and fund on balance sheet. According to Martín-Oliver and Saurina (2007) from the Bank of Spain, the securitization process enables banks to gain liquidity with assets on balance sheets. In addition, securitization also makes it possible for banks to reach higher returns with unchanged capital. Additionally, Hoffmann and Nitschka (2008) suggest that securitization also creates value by reducing intermediation costs and increasing opportunities for risk sharing and risk diversification.

After the financial crisis broke out, Stein (2010) still believes that under securitization, risks associated with the loans can be distributed across a wider range of end investors. The improved risk-sharing represents a real economic efficiency, and lowers the ultimate cost of making the loans. However, Gaied, Aloui, Salha and Nguyen (2012) assume that securitization has largely contributed to excessive risk taken by American banks on their subprime credit lending. They prove the point through an empirical investigation with a sample of 6775 US banks between 2003 and 2007.

Shin (2009) finds both views miss the endogeneity of the credit supply. By itself, securitization may not enhance financial stability if the imperative to expand assets drives down lending standards. Shin believes that although securitization may facilitate greater credit supply to ultimate borrowers at the aggregate level, it is the banking system as a whole that takes the choice to supply credit. Although final investors, such as pension funds and insurance companies, will also suffer losses, the large financial intermediaries are running at a higher risk because they may lose their entire capital. Before 2008, financial intermediaries kept the bad loans on their balance sheets instead of passing bad loans to final investors. The credit crisis of 2007-2009 precisely proves the severity of this issue.

The International Monetary Fund (2012) report shows that it is the combination of declining housing prices and over-indebtedness that explains the severity of the financial contraction. Bullard (2012) points out that this is the first recession in postwar U.S. history where deleveraging really matters. To further prove the leverage problem, Dynan (2012) finds that highly leveraged homeowners has larger declines in spending between 2007 and 2009 than other homeowners, despite having smaller changes in net worth; in other words, debt-overhang effects appear to dominate pure wealth effects of U.S. household.

From all aforementioned arguments and perspectives demonstrated by different researchers, while much research has been done on the economics and credit risk related to the securitization process, the focus has been mainly on its impact on the financial sector, and there have been relatively few empirical studies to examine the impact of securitization on U.S. households. While these macroeconomic issues are certainly

central to the securitization of consumer debt, I would like to focus on the U.S. household and explore the effects from securitization to household financial stability.

III.   Data

The growing securitization rate of credit card receivable accounts in the market made credit cards available to less creditworthy household borrowers, and as a result, it contributed to massive credit card defaults during the 2007-2009 credit crisis. What I want to investigate is whether there exists a correlation between ABS securitization and the financial stability of U.S. household. To test if this is the primary reason for credit card default, I argue that the increase in the credit card securitization rate is not a major factor that influenced credit card default rate.

I employ data that can best measure the two sides: the data that represent issuances of the credit card ABS, and the data that represent the wellbeing of U.S. households. For information about credit card ABS, I use the data provided by the Securities Industry and Financial Markets Association (SIFMA), which provides monthly updated data on structured finance product, including issuance and outstanding. For data about household financial stability, I obtain the data on the unemployment rate from the Bureau of Labor Statistics, the U.S. household debt default rate from the Federal Reserve Bank of New York, the U.S. household debt ratio from the Bureau of Economic Analysis, and the Senior Loan Office Survey from the Board of Governors of the Federal Reserve System.

3.1 Credit Card ABS

3.1.1 Issuance/Outstanding

The issuance of Credit Card ABS represents the supply of Credit Card ABS in the market to meet the demand. Outstanding data can tell us how many products have been originated, issued, purchased and currently held by investors. Issuance is a great signal of the investors' demand for structured finance products. From observation of the change of trend in issuance, I am able to derive the volume of products in the market and how those products affect the stability of household finance.
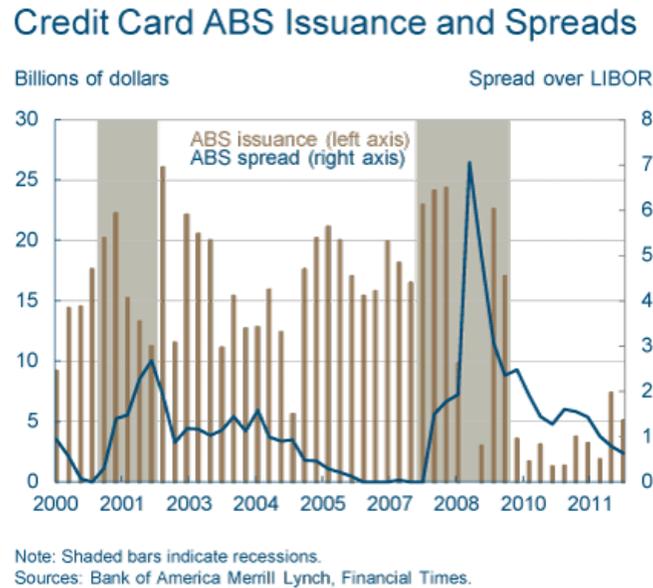
The price of Credit Card ABS is usually quoted as a spread to a corresponding swap rate. Sabarwal (2005) lists an example of the price of a credit card-backed, AAA-rated security with a two-year maturity by a benchmark issuer might be quoted at 5 basis points (or less) to the two-year swap rate (of Treasuries to 1 month LIBOR).

Figure 3.1 shows the issuance and spreads of Credit Card ABS. The issuance of Credit Card ABS has been relatively stable from 2000 to mid 2008. According to the Federal Reserve Bank of Cleveland, in the fall of 2008, investors panicked and both the market for short-term bank funds and the market for securitized credit card receivables seized up. As a result, banks could only fund new credit card debt on their balance sheets instead of through securitization. As Figure 3.1 illustrates, during the five-month period between September 2008 and March 2009, there was no credit card ABS issuance, and spreads on existing securities spiked from around 1 percent to nearly 7 percent.

Based on data from 1999 to 2006 and the empirical methods, Sabry and Okongwu (2009) conclude that a 10% increase in the securitization rate is associated with a decrease in yield spreads for auto loans of between 22 and 64 basis points and a decrease in yield spreads for credit card loans of between 8 and 54 basis points. The spread remained normal from 2000 to 2007, it peaked up when the market was frozen during the

market panic in 2008-2009, and it went back to normal since 2009.

Figure 3.1

Credit Card ABS Issuance and Spreads

Note: Shaded bars indicate recessions.
Sources: Bank of America Merrill Lynch, Financial Times.

Source: Federal Reserve Bank of Cleveland

3.1.2 Key Performance Metrics

According to DBRS Master U.S. ABS Surveillance Methodology (2012), key performance metrics of Credit Card ABS include: a) charge offs/delinquencies, b) credit enhancement excess spread, c) payment rate, d) yield, e) transaction parties, and last but not least f) triggers.

According to the Board of Governors of the Federal Reserve System, charge-offs are the value of loans and leases removed from the books and charged against loss reserves. Charge-off rates are measured net or recoveries as a percentage of average loans and annualized. Charge-off occurs when consumers are delinquent on debt and unable to pay it back. A higher charge-off rate indicates a higher percentage of uncollectable loans, and is a sign of an economy under stress. As Figure 3.2 shows, the charge-off rates on

credit card loans at all U.S. commercial banks remain around 4% before 2008, and from 2008 to mid 2010, the charge-off rates peaked to 10.97%, indicating widespread default among borrowers due to the economic downturn in 2007-2009 financial crisis.

Figure 3.2

Charge-Off Rates on Credit Card Loans at all U.S. Commercial Banks
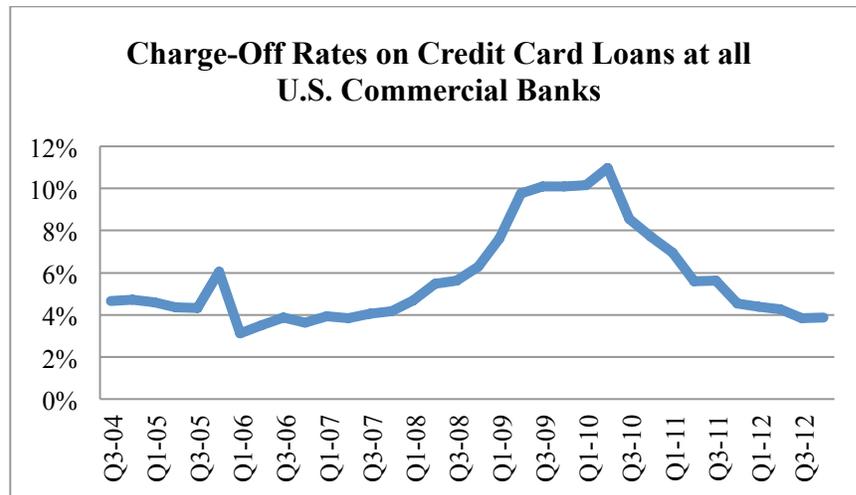
Source: Board of Governors of the Federal Reserve System

3.2 U.S. Household Financial Stability

U.S. household financial stability can be reflected through household balance sheets. Asset includes: net value of one's home (home equity), non-home real-estate holdings, automobile ownership, farm and business assets, checking and savings accounts, other savings (e.g. bond funds), stocks, and investments of other forms. Liabilities include: debt loan, credit card, other accounts payables, and more. There are many factors that reflect the household financial stability. Since employment income is the biggest resource for household spending, and household total-debt-to-income rate reflects the overall health of household financing activities, I choose to focus on the unemployment rate and total-debt-to-income rate to represent U.S. household financial wellbeing.

3.2.1 Default Rate

Default rate refers to percentage of borrowers that fail to pay back loans on time. It is critical indicator for lenders to determine their risk exposure. It also helps economists to evaluate the health of the overall economy. To determine the default rate of credit cards, I used the S&P/Experian bankcard default index, which measures the default rate across bank cards. The index seeks to measure the balance-weighted proportion of consumer credit accounts that go into default for the first time each month. To seek to ensure that indices measure only new defaults, a High Water Mark indicator is used to record the worst delinquency status of the account. Any accounts previously meeting the default definition are excluded from the index. Default is defined as 90 days past due or worse for auto loans, first and second mortgages, and 180 days past due or worse for bankcards. In addition, bankruptcy, repossession, and write-off also constitute default.

3.2.2 Unemployment Rate

Since the biggest resource for household asset is income, the employment rate is perhaps the best measure of household financial wellbeing. The unemployment rate shows the percentage of total labor force that does not have jobs but is actively seeking job opportunities. Unemployment is a lagging indicator, confirming but not foreshadowing the long-term market trends. One of the most widely recognized indicators of a recession is a higher unemployment rate.

From Bureau of Labor Statistics, we can see that the unemployment rate remained low before the start of the recession in December 2007, when it was 5.0%. It peaked at 10.0% in October 2009, the highest rate in 26 years, and remains 7.6% in as of March 2013. Compared with previous recessions, the higher proportion of long-term

unemployed (those unemployed for 27 weeks or longer) in the recent recession and its post-recession period is notable.

Figure 3.2
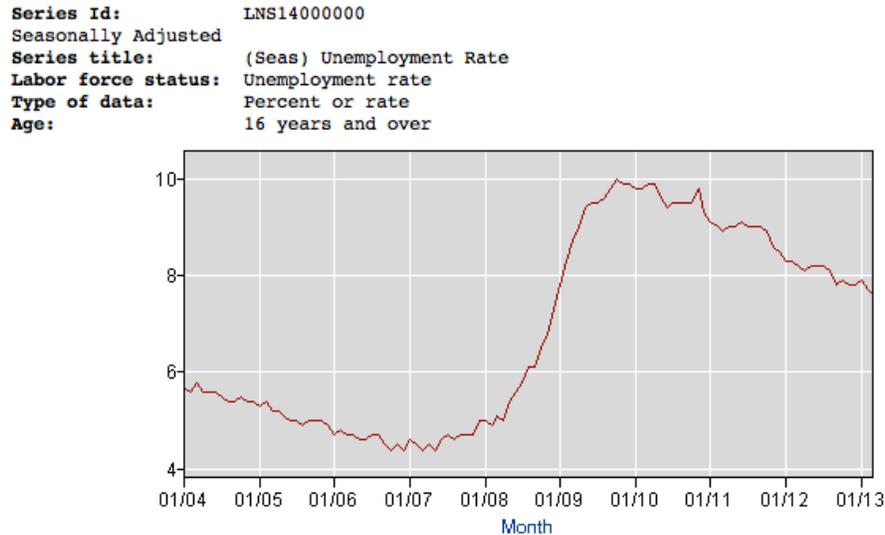
Source: Bureau of Labor Statistics

3.2.3   Household Total-Debt-to-Income Rate

Household total-debt-to-income rate reflects how much debt the household bears as a rate to disposable income. The rate is a good indicator of the health of household financing activities and whether the household will be able to repay the loan on time. The higher the rate is, the more burden there is on the household to make debt payment on time. Figure 3.3 shows the U.S. household total-debt-to-income rate between 2004 third quarter and 2012 fourth quarter. As the figure demonstrates, the household total-debt-to-income rate remained above 100% from 2005 first quarter to 2011 third quarter, meaning that the U.S. household owed more debt than their disposable income. This illustrates how overleveraged the U.S. household were before the financial crisis and how it took time for the household to deleverage after the crisis. For this paper, I employ both the credit-card-debt-to-income rate and the total-debt-to-income rate. Through the lens of

these two leverage rates, I would like to examine their impact on the household financial stability.

Figure 3.3
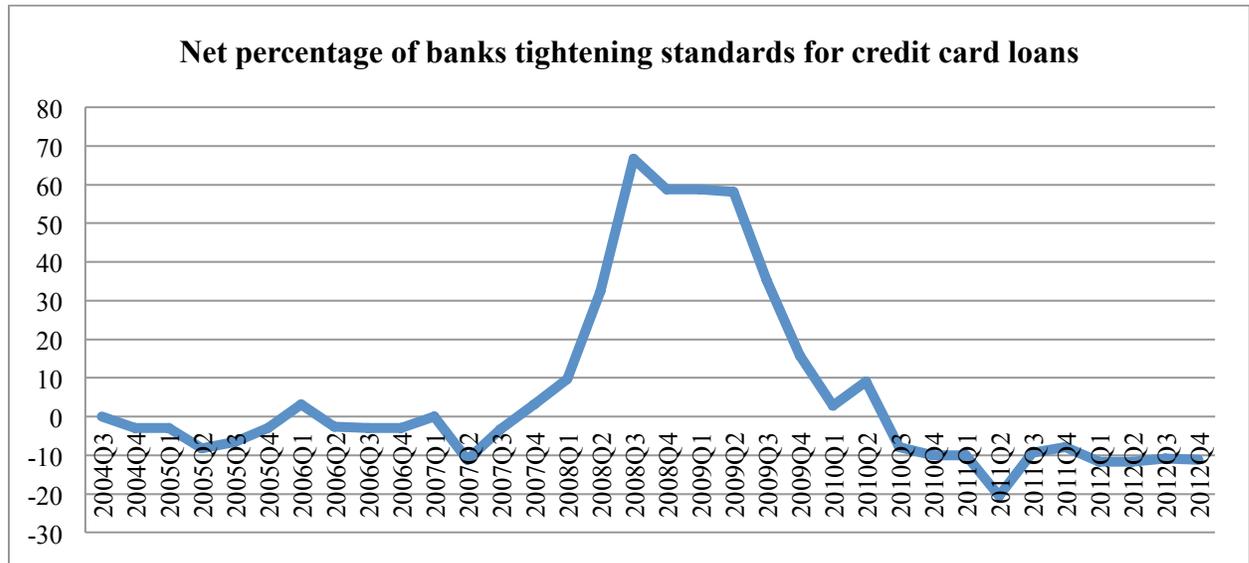

U.S. Household Total Debt to Income Rate
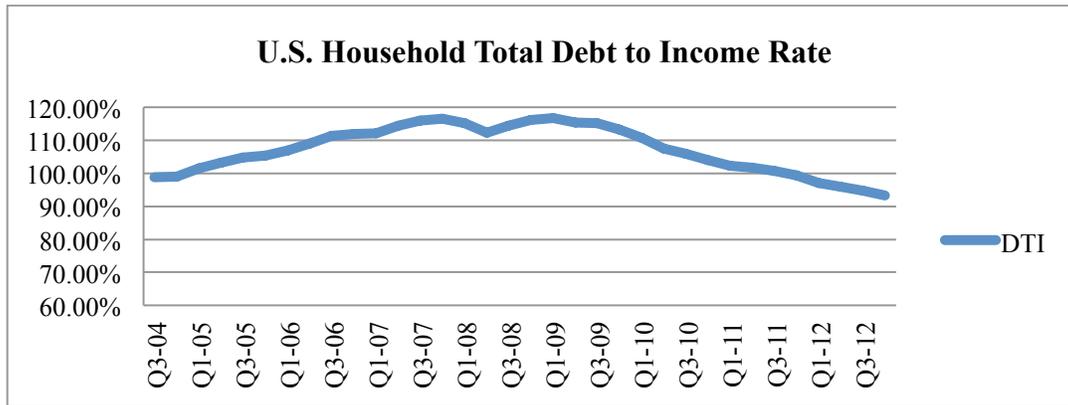
Source: Bureau of Economic Analysis

3.2.4   Net Percentage of Banks Tightening Standards for Credit Card Loans

Net percentage of banks tightening standards for credit card loans measures how hard it is for credit card applicants to be approved for their new credit card applications. The higher the net percentage is, the harder it is to be approved. Figure 3.4 demonstrates that from 2004 third quarter to 2007 first quarter, banks remained loosening their standards for credit card applications. This made credit card available to less creditworthy borrowers, which lay the foundation for the break out of financial crisis in later 2007. Right after the financial crisis merged, the banks immediately tightened their standards for credit card loans, as reflected by the sharp upward slope in the figure. Between 2008 third quarter and 2009 second quarter, the banks kept tightening standards for 58.1% - 66.6% each quarter, which shows the tremendous amount of efforts for banks trying to raise the quality of their new credit card loans. Starting from 2010 third quarter, banks began to lower the standards again. From this cycle of banks tighten and loosen standards

for credit card loans, I would like to explore how the trend has impacted the household credit card default rate during that period.

Figure 3.4

Source: Federal Reserve Bank of New York, Senior Loan Office Survey

IV. Empirical Tests

I first ran a multiple regression to take a quick look of the relationships and significance among all factors. My dependent variable is the credit card default rate, and my independent variables are the unemployment, credit card securitization rate, credit-card-debt-to-income rate, total-debt-to-income rate, and percentage of banks tightening standards. This helps me to understand how much impact the changes in value of my independent variables has on my dependent variable—credit card default rate, and thus leads me to find out which factors impact households the most on their credit card debt. Through exploring the possible main factors, I can find out which factors play the most influential roles. By measuring the influence of those factors, I will be able to see what

behaviors of households, credit card banks, and other market participants led to the 2007-2009 financial crisis. Therefore, perhaps, we can learn how to avoid it.

From the output results we can see that unemployment rate yields a t-value of 8.02, the highest among all other t-values from other independent variables. This signals that the unemployment rate has the most significant impact on the credit card default rate. In addition, the p-value of 0.000 also reassures the accuracy of this strong influence. The coefficient between unemployment rate and credit card default rate is 0.79, showing that for every 1% increase in unemployment rate, the credit card default rate will correspond with 0.79% increase.

Secondly, the credit-card securitization rate also has an important influence on the credit card default rate with a t-value of 5.25. This signals that the credit cards securitization rate has a significant impact on the credit card default rate, but not as much as the unemployment rate. In addition, the P-value of 0.000 also reassures the accuracy of this relationship. The correlation between unemployment rate and credit card default rate is 0.84, showing that for every 1% increase in the credit-card securitization rate, the credit card default rate will correspond with 0.84% increase.

Among the rest of the independent variables, credit-card-debt-to-income rate, total-debt-to-income rate, and percentage of banks tightening standards all correspond to t-values below the critical value, which demonstrates that they do not have as significant an influence on the stability of household finance. I decided to drop these variables from my examination.

Figure 4.1

```
. regress credit_card_default_rate unemployment_rate credit_card_debt_to_income total_debt_to_income
> credit_card_securitized_pct banks_tightening_standards_pct
```

Source	SS	df	MS
Model	.007436048	5	.00148721
Residual	.000605614	27	.00002243
Total	.008041662	32	.000251302

Number of obs = 33
F(5, 27) = 66.30
Prob > F = 0.0000
R-squared = 0.9247
Adj R-squared = 0.9107
Root MSE = .00474

credit_card_default_rate	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
unemployment_rate	.7915665	.0987599	8.02	0.000	.588928	.9942051
credit_card_debt_to_income	-.7439346	.6333942	-1.17	0.250	-2.043552	.555683
total_debt_to_income	-.0068474	.0215768	-0.32	0.753	-.0511194	.0374246
credit_card_securitized_pct	.8413161	.1602747	5.25	0.000	.5124595	1.170173
banks_tightening_standards_pct	.0000335	.0000701	0.48	0.637	-.0001103	.0001772
_cons	-.0221681	.0328336	-0.68	0.505	-.089537	.0452008

To further exam the exact significance that unemployment rate and credit cards securitization rate have on the credit card default rate, I use a partial F-test to find out the impact. The partial F-test measures how the significance of the overall equation changes when one independent variable is removed.

From the following results in Figure 4.2 to Figure 4.4, we can see that the f-value for total amount is 170.94, after dropping the unemployment rate, F dropped to 1.07, which shows that unemployment rate has a F-value influence of 169.87, contributing 99.37% of the independent variable influence on the dependent variable— credit card default rate.

After dropping the credit cards securitization rate, f-value dropped to 26.83. This shows that the credit card securitization rate contributed 144.11 significance value, which is 84.30% of the total impact.

With degree of freedom of 2 and 31, and with significance level of p=0.05, the critical value of f is 3.31. Therefore, we can see that unemployment rate falls under the critical value level, and it is the main contributor to the change in credit card default rate.

Figure 4.2 All Factors

```
. regress credit_card_default_rate unemployment_rate credit_card_securitized_pct
```

Source	SS	df	MS		Number of obs =	34
					F(2, 31) =	170.94
Model	.007709918	2	.003854959		Prob > F =	0.0000
Residual	.000699091	31	.000022551		R-squared =	0.9169
					Adj R-squared =	0.9115
Total	.00840901	33	.000254818		Root MSE =	.00475

credit_card_default_rate	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
unemployment_rate	.8743683	.0481475	18.16	0.000	.7761708	.9725657
credit_card_securitized_~t	.6043084	.0461012	13.11	0.000	.5102843	.6983325
_cons	-.0644689	.0069863	-9.23	0.000	-.0787176	-.0502201

Figure 4.3 After dropping unemployment rate

```
. regress credit_card_default_rate credit_card_securitized_pct
```

Source	SS	df	MS		Number of obs =	34
					F(1, 32) =	1.07
Model	.000272648	1	.000272648		Prob > F =	0.3082
Residual	.008136362	32	.000254261		R-squared =	0.0324
					Adj R-squared =	0.0022
Total	.00840901	33	.000254818		Root MSE =	.01595

credit_card_default_rate	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
credit_card_securitized_pct	.132407	.1278644	1.04	0.308	-.1280443	.3928584
_cons	.0419683	.0127673	3.29	0.002	.0159621	.0679745

Figure 4.4 After dropping credit card securitization rate

```
. regress credit_card_default_rate unemployment_rate
```

Source	SS	df	MS		Number of obs =	34
					F(1, 32) =	26.83
Model	.003834983	1	.003834983		Prob > F =	0.0000
Residual	.004574027	32	.000142938		R-squared =	0.4561
					Adj R-squared =	0.4391
Total	.00840901	33	.000254818		Root MSE =	.01196

credit_card_def~e	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
unemployment_rate	.518624	.1001256	5.18	0.000	.3146748	.7225732
_cons	.01905	.0072153	2.64	0.013	.004353	.033747

Although credit card securitization rate demonstrates a significant impact on the household credit card default rate, the regression result supports my hypothesis that it is not the primary factor for default. This conclusion is reasonable because people rely on their monthly income stream to pay off their credit card debt. The cash inflow and outflow work well when there is stable income available. However, when unemployment rate starts soaring, people lose jobs and suffer from no income stream, while at the same time, the elastic monthly expenses on rent, food, transportation, and other items remain unchanged, and thus the cash outflow little changed. With no income, people begin to fail to pay back on credit credits on time. After 30 days, 60 days, and 90 days of delay, if they are still not able to pay back the amount they owe on credit card, they occur as default on the credit card issuers' books.

On the other hand, the securitization rate is contingent upon the investment demand from investors. The increase in demand of credit card ABS may have made credit cards available to some less creditworthy borrowers, causing the increasing risk of credit card defaults. However, when the housing bubble burst and financial markets suffered, investors become more conservative and risk averse. The deterioration of quality of credit card receivables made investors lose interest in the credit card ABS market, and as a result the credit card ABS market seized up. A case in point was, as Figure 3.1 shows, during 2008 fourth quarter, there was no credit card ABS issued at all.

To further test the hypothesis, I also ran a similar model on auto loan ABS. Similar to credit card ABS in most aspects, Auto loan ABS is backed by auto loan payments. Auto and Credit Card are the most similar items under ABS.

Similar to the previous process, I first ran a multi-variable regression for auto loan ABS. My dependent variable is the auto loan default rate, and my independent variables are unemployment rate, the auto loan securitization rate, auto loan debt-to-income rate, and total-debt-to-income rate. Because there was no data about banks tightening standards rate on auto loans until 2011 second quarter, the limited observations are not enough to draw any significant conclusion, so I decided to drop this variable for auto loan observation.

From Figure 4.5, we can see that unemployment rate and total-debt-to-income rate have the most significant impact on auto loan default rate, with t-value of 4.45 and 6.03 respectively, and the p-values of 0.000 also testify to the accuracy of this relationship. The auto loan securitization rate and auto loan debt-to-income rate, however, do not show any significant t-value, so I decided to drop those two variables for my later observation.

Figure 4.5 All factors

```
. regress auto_default_rate unemployment_rate auto_debt_to_income total_debt_to_income a
> uto_securitized_pct
```

Source	SS	df	MS		
Model	.000430812	4	.000107703		
Residual	.000219984	28	7.8566e-06		
Total	.000650796	32	.000020337		

Number of obs = 33
$F_{(4, 28)}$ = 13.71
Prob > F = 0.0000
R-squared = 0.6620
Adj R-squared = 0.6137
Root MSE = .0028

auto_default_rate	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
unemployment_rate	.2555229	.0574158	4.45	0.000	.137912	.3731338
auto_debt_to_income	.1307978	.1980985	0.66	0.514	-.2749885	.5365842
total_debt_to_income	.0459382	.0076224	6.03	0.000	.0303245	.0615519
auto_securitized_pct	.2493687	.1943589	1.28	0.210	-.1487575	.6474949
_cons	-.0673541	.0155749	-4.32	0.000	-.0992579	-.0354504

After dropping variables of the auto loan securitization rate and auto loan debt-to-income rate, I further examine the influence that unemployment rate and total-debt-to-income rate have on the auto loan default rate. According to Figure 4.6 and Figure 4.7 show, partial f-test demonstrates that unemployment has f-value of 15.42 and 21.84% influence on the default rate, and total-debt-to-income rate has f-value of 1.48 and 92.50% influence on the default rate.

Figure 4.6 After dropping unemployment rate

`. regress auto_default_rate total_debt_to_income`

Source	SS	df	MS			
Model	.00021616	1	.00021616			
Residual	.000434636	31	.000014021			
Total	.000650796	32	.000020337			

	Number of obs =	33
F(1, 31) =	15.42
Prob > F =	0.0004
R-squared =	0.3321
Adj R-squared =	0.3106
Root MSE =	.00374

auto_default_rate	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
total_debt_to_income	.0362976	.0092443	3.93	0.000	.0174438	.0551514
_cons	-.0212436	.0099488	-2.14	0.041	-.0415343	-.000953

Figure 4.7 After dropping total-debt-to-income rate

`. regress auto_default_rate unemployment_rate`

Source	SS	df	MS
Model	.000030631	1	.000030631
Residual	.000664209	32	.000020757
Total	.00069484	33	.000021056

	Number of obs =	34
F(1, 32) =	1.48
Prob > F =	0.2333
R-squared =	0.0441
Adj R-squared =	0.0142
Root MSE =	.00456

auto_default_rate	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
unemployment_rate	.0463503	.0381547	1.21	0.233	-.0313684	.1240689
_cons	.0143358	.0027495	5.21	0.000	.0087353	.0199364

The findings show that unlike credit card ABS, the default rate on auto loans is mostly influenced by total-debt-to-income rate. There are many reasons that lead to the difference in main drivers for the credit card ABS and auto loan ABS default rate. First, while credit card receivables have no collateral, automobiles are the collateral of auto loan payments and depreciate in value over holding period. Therefore, for credit card, it is more important for households to have a steady monthly income to pay off credit card debt on time; for auto loan, it is more crucial for household to maintain enough asset on household balance sheet to make auto payments on time over years. As a result, employment is essential for credit card payment, and total household debt level is a dominant factor for auto loan payment. Second, there has been a prevalent and fraudulent practice of reporting stated income to quality for car loans. Such practice of car loan borrowers providing stated income rather than actual income has allowed many unqualified borrowers to get auto loans. In addition, rising levels of credit card debt and home mortgages contribute to higher household total debt to actual disposable income. As a result, when credit crunch hit, people started juggling debts, and as a result, many people chose to forgo auto payments in order to keep their house.

Traditionally, the credit-card industry is resilient during economic downturns because of its pricing flexibility. When faced with deteriorating default rate, credit card issuers chose to protect themselves from the borrower defaults by implementing higher late fees, higher default penalty fees, and contract with confusing terms about the costs of credit cards. This practice jeopardized all credit card holders at large, and the credit card industry was in under-regulated.

In response to the problem, the Obama administration issued the Credit Card Accountability Responsibility and Disclosure Act of 2009 ("Credit Card Act of 2009" for short). The new regulation aims to reform the credit card markets and "establish fair and transparent practices relating to the extension of credit under an open end consumer credit plan, and for other purposes." The implementation of the Credit Card Act of 2009 changed industry practice mainly in four ways. Frist, the Act curtailed the hiking interest rates that credit card issuers charged on existing card holders. Second, the Act substantially reduced the late fees implement on credit card holders. Third, the Act helped to abolish the over-limit fees in the industry. Last, the Act contributed to modifying the contracts, making the credit card costs more transparent, and allowing credit card holders to have better understanding of their credit card expenses.

Faced with more regulations and lower fees, credit card issues needed to make up their lost revues from other channels. One measure was to increase the maintenance fees and annual fees applied on the credit cards. Another measure was to tighten the standards by introducing stricter requirements for credit card applications and credit scores, making it harder for applicants to get approved for credit cards. This discouraged households' demand for credit cards in the market. At the same time, different states also incentivize households to change spending behaviors from paying by credit card to paying by cash. In some states, gas stations give customers price discounts if the purchase is paid by cash rather than credit card. On one hand, customers like lower fees applied on their credit card, and on the other hand, customers also enjoy the cash discount. Therefore, the net effect of Credit Card Act of 2009 is slightly less demand for credit cards. This can also be

reflected through decreasing portion of credit card to total debt on the U.S. household balance sheet as Figure 4.8 shows.

Figure 4.8

Total Debt Balance and its Composition
Source: FRBNY Consumer Credit Panel/Equifax
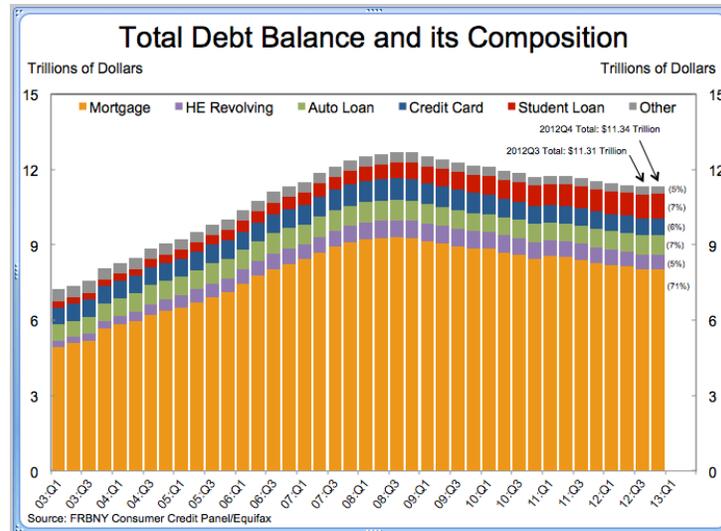
V. Conclusion

Frist, credit cards, unlike various other securitized debts, namely mortgages and sometimes auto loans, depend largely on monthly income, which in turn, has a significant correlation to the unemployment. Unlike other kinds of debt that are secured by collateral whether home or car, unsecured credit card borrowing quality has by large depended on households' ability to pay their monthly interest and payment.

Second, due to the increasing amount of legislation and regulations, credit card companies have faced greater restrictions of offering credit lines to consumers. However, my findings show that the household financial stability is mainly impacted by the stable stream of income rather than increased ability to borrow through credit cards.

Third, among all structured finance products, credit card ABS is the most stable in overall performance and least sensitive to market conditions. Even if the credit card default rate reaches as high as nearly 9% in 2010, the total default amount is still far less

than mortgages and has far less disastrous effects on the U.S. household financial stability than what mortgages did during the 2007-2009 financial crisis.

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