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Securitization of Credit Card Debt and its Determinants

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1. Introduction

The market for asset-backed securities plays a significant role in consumer finance. Prior to the recent financial crisis, securitization was believed to reduce the cost of funding, improve credit risk management, and increase profitability. Securitization is a structured process where a financial institution transforms its liquid assets into marketable securities. Typically, a securitization transaction involves the pooling of assets with fixed or nearly fixed cash flows that are transferred to a special purpose vehicle (SPV). Special purpose vehicles are a bankruptcy remote entity through which floating rate notes backed by the pool finances the purchase.[1] The SPV issues securities with different risk ratings, duration, and supported by different levels of risky investments. Dividing the SPV or tranching, the SPV splits the credit risk and distributes it to companies that are able to absorb the risk. To make the SPV more attractive and receive higher credit ratings, the issuing institution uses credit-enhancing techniques (Sarkisyan *et al.* 2009). In short, securitization removes risky assets from financial institutions balance sheets thereby making then bankruptcy remote. (Gorton and Soules 2006).

Earlier studies such as Pavel and Phillis (1987) found that financial institutions securitized debt because it gave them an advantage to increase profits. Greenbaum and Thakor (1987) and Boot and Thakor (1993) suggest that an increase in revenue is due to asymmetric information. Minton, Sanders, and Strahan (2004) investigate the use of securitization to reduce balance sheets risk of highly leveraged institutions. In recent years, researchers have investigated the effects of the 2007-2009 Great Recession on the quantity of securitized debt and the reasons behind securitization. In order to examine

[1] A bankruptcy remote entity is an institution whose investors may not receive compensation from any other part of the company if it goes bankrupt. Thus a bankruptcy remote entity's obligations are secure even in the event of bankruptcy.

the effect of securitization on a bank's balance sheet, Sarkisyan *et al.* (2009) create a fictional group of banks to illustrate what would happen if the depository institutions and finance companies had not securitized. They compare this group to banks that did securitize and find they tend to be more profitable, with higher credit risk exposure, and a higher cost of funding than non-securitized depository institutions and finance companies. Pais (2009) argues that risky institutions with poor performance are more likely to securitize.

Most forms of consumer debt such as home equity loans, credit card receivables, automobile loans and automobile leases have been securitized since the 1980's. In spite of the fact that different types of household debt represent different risk exposures and other characteristics, with the exception of home mortgage securitization, most studies have looked at the decision of banks and finance companies to securitize entire consumer receivables. An exception is the paper by Hunter and Pennington-Cross (2009) that considers securitization of automobile loans. In this paper we examine the impact of the financial and economic condition of the consumer on the decision of depository institutions and finance companies to securitize consumer revolving debt.

At its peak in December, 2008, depository institutions and finance companies held $1,010,282 million worth of revolving consumer debt on their books. At the same time, they securitized $449,985 million of credit card debt or about 44.5% of the total credit card debt outstanding.[2] In contrast, in September 2010, these figures had declined to $835,955 million, $32,204 billion, and 3.85%, respectively. This drastic decline in securitization of consumer revolving credit raises a question as to what determines the decision to securitize consumer debt.

[2] Board of Governors of the Federal Reserve System, , Historical Statistics, G-19.

In this paper we examine the factors that influence the decision of banks, and finance companies, and credit unions to securitize revolving credit debt rather than retain these debts on their books. We also investigate whether the period preceding the financial crisis that began in August, 2008 had an impact on the amount of credit card debt securitized by these institutions. Using monthly data for the period from January, 1991 through September, 2010, we find some support for the argument that more credit card debt is securitized when economic conditions worsen. We also find evidence that depository institutions and finance companies securitize more of their credit card debt as consumers' credit conditions deteriorate. Our results indicate that financial institutions used asymmetric information to increase the portion of their credit card debt that they securitized in the year and a half preceding the start of the financial crises in August, 2008.

The remainder of the paper is structured as follows: Section 2 provides a review of previous work on this topic and how it shapes our research. Section 3 discusses determinants of securitization of credit card deb. Section 4 presents the model and a description of the data used in this study. Section 5 discusses the empirical results and their implications and Section 6 concludes the paper.

2. Previous Work

The focus of early studies of the causes of securitization is the possible financial benefits. Pavel and Phillis (1987) find that regulation plays a minor role in why banks securitize. Instead, they find that the largest impact is the advantage the bank has when creating and servicing loans measured by the ratio of non-interest expense to loans. They find poor performing risky banks are more likely to securitize and conclude that depository institutions and finance companies are likely to securitize when capital ratios are low and charge-offs are high.

Greenbaum and Thakor (1987) find that securitize their assets that have a better quality. They conclude that with symmetric information, banks are indifferent between deposit funding and securitization. On the other hand, with asymmetric information, depository institutions and finance companies prefer securitization for best assets and deposit funding for the worst. They claim that securitization is increased by third-party issuers and mutual funds. Boot and Thakor (1993) show that an increase in revenue can be expected if there is asymmetric information, polling of assets, and issuance of claims at different risk levels.

Pais (2009) studies the forces that lead U.K. banks to securitize. She finds that British banks securitize as an alternative financial source and concludes that risky institutions with poor performance are more likely to securitize. Bannier and Haensel (2007) find European banks have high credit risk and low liquidity and tend to securitize in order to reducing credit risk and raise liquidity and not to regulatory factors.

Sarkisyan *et al.* (2009) conclude that compared to banks that do not securitized, banks that do securitize tend to have a higher cost of funding, are more profitable, and have higher credit risk. They show that prior to the recent crisis, securitized banks did not show improved performance and tended to have higher systematic risk. Sarkisyan *et al.* find that securitization allowed depository institutions and finance companies to continue with their risky and more profitable practices. They find results contrary to what was previously believed to be the determinants of securitization. Securitized banks maintain higher profitability but these actions lead to higher credit risk and higher cost of funding.

Beltran and Thomas (2010) argue that asymmetric information about securitization's intrinsic value supplies current holders with more information than buyers. This causes complex securities to

trade at high discounts or not at all. The market for asset-backed securities was created based on the idea that both buyer and seller could benefit. Under asymmetric information, buyers are unable to determine the value of a security so they base the price on the value of similar assets they already own. Beltran and Thomas conclude that only when the market is pessimistic about the future of the economy does asymmetric information pose a problem.

Since the recent recession, studies have changed their focus to determining whether securitization is beneficial to financial institutions and to find factors that lead depository institutions and finance companies to securitize. For example, Hunter and Pennington-Cross (2009) test whether there is an increase in automobile loans securitized by finance companies before the recent financial and economic decline. They find that as consumers' financial conditions deteriorate the portion of automobile loans that finance companies securitize increases. They also find that asymmetric information played a role in securitization in the automobile loan market before the recent financial crisis.

In this paper we examine at the aggregate level the separate effects of two groups of variables on the proportion of revolving credit debt held by depository institutions (banks and credit unions) and finance companies that is securitized. One group of variables, which represents financial conditions, includes the net charge-off rate, the spread between credit card interest rates and the one-year Treasury rate, delinquency rate of credit cards issued by depository institutions and finance companies, and a measure of the overall risk in financial markets. The second group, which represents macroeconomic conditions, includes output growth, inflation, and unemployment. We also examine whether asymmetric information was a contributing factor to the securitization of credit card debt by these

institutions or whether markets were efficient and these institutions securitized portions of their revolving credit debt as needed.

3. Determinants of Securitization of Credit Card Deb[3]

Financial institutions can reduce risk by securitizing a portion of their assets such as consumer loans and mortgages. Securitization removes them from their balance sheets, which generally makes these loans "bankruptcy remote" (Gorton and Soules 2006). By extension, the process of securitizing assets may provide an incentive for financial institutions to securitize lower quality consumer assets or to increase their use of securitization when they predict a weakening in the overall consumer credit quality. Therefore, we expect to find securitization increases as the financial condition of the consumer deteriorates and decreases when consumer conditions improve.

Minton, Sanders and Strahan (2004) find that securitization lowers the cost of debt financing for more risky companies. They demonstrate that highly levered institutions use securitization more intensively than less levered firms. They conclude that securitization is a means of mitigating the risk of high financial leverage. Regulatory constraints on financial institutions tend to lead these institutions to securitize less risky assets. Market factors may also affect the decision of these institutions companies to securitize loans. Thus we postulate that consumer, financial market and economic conditions influence depository institutions and finance companies decisions as to the amount of credit card debt they hold and how much of it they securitize.

Minton, Sanders, and Strahan (2004) argue that given the competitive nature of the market for securitized assets, financial institutions hold their more risky assets and securitize their less risky assets.

[3] This section draws liberally on Hunter and Pennington-Cross (2009).

This conclusion follows from a number of economic and financial theories of efficiency where the market will ferret out the true cost of an asset (Akerlof, 1970). There are several conventions in the market for securitized assets that may diminish this market response. First, there are credit enhancements including prefunding, over-securitization, and default insurance that may significantly reduce the incentive, certainly for investors, to determine true market value (Fabozzi, 2008). In addition, the existence of an equity tranche may have a similar impact[4]. These securitization credit enhancements combined with asymmetric information favoring the loan originators may be of sufficient magnitude to allow depository institutions and finance companies to securitize more risky assets rather than less risky assets as appears to be the case for regulated institutions.

Depository institutions and finance companies have an incentive to use securitization not just to manage the risk associated with consumer lending but also to increase profits. Securitization allows depository institutions and finance companies to increase the total amount they lend without requiring additional capital. The securitization process not only removes the loans from the balance sheet, but it also returns the proceeds of the securitized debt back to the issuer making it available for additional consumer lending. The potential for profit through re-lending the proceeds of the securitization of consumer loans is enhanced when the spread between the firm's cost of funds and the consumer loan rates rises. Therefore, we expect that higher spreads have a positive impact on the decision of depository institutions and finance companies to securitize credit card debt.

While it has been established that securitization is used to reduce debt financing risks by highly leveraged depository institutions and finance companies, less is known about the riskiness of the class of consumer loans themselves. Can depository institutions and finance companies reduce the risk to

[4] Equity tranche holders have residual claim on any cash flows in excess of the payment of all higher tranches.

their portfolio by increasing the amount of loans that are securitized during periods when consumer default risk is greater? Doing so requires asymmetric information on the part of the loan originating institutions. While it is possible that credit enhancements of typical securitized assets reduce the moral hazard problem, under asymmetric information, depository institutions and finance companies tend to increase the percent of loans they securitize when consumer finances are weaker (Gorton and Pennacchi 1995 and DeMarzo 2005). Weakness of the consumer may be measured by the unemployment rate or more specifically by the structure of the loans themselves.

The risk of default by borrowers on consumer loans is significantly increased with deteriorating economic circumstances. Therefore, we expect depository institutions and finance companies to increase the proportion of securitized automobile loans when unemployment increases. An additional factor designed to capture economic conditions is the growth in the general level of economic activity. Increases in real GDP are consistent with growth in consumer income and ability to pay their bills. Therefore, we expect increases in real GDP to be negatively linked to the proportion of credit card debt that is securitized.

A measure of consumer financial status is credit card default rate, which we hypothesis is positively associated with the proportion of credit card debt securitized. Given that credit card debt is unsecured, consumers tend to default on credit card accounts first when under financial distress**.** It is generally only after they have defaulted on credit card accounts that consumer's default on secured debt such as automobile loans and home mortgages. Therefore, we expect depository institutions and finance companies to increase the proportion of automobile loans that they securitize when consumer credit card defaults rise.

4. Models and Data

Based on the discussion in the previous section, we examine the impact of financial and economic conditions on the proportion of credit card debt held by depository institutions and finance companies that is securitized using the following model that incorporates two sets of variable. One set includes measures of conditions related to the revolving debt held by depository institutions and finance companies, which include the delinquency rate (DELINQ), the net charge-off rate (NCO), and the spread between cost of funds and credit card interest rate (SPREAD). We expect each of these variables to exert a positive effect on the proportion of securitization credit card debt.

The second set of variables represents general economic conditions in terms of the civilian unemployment rate (UNEMP), consumer price inflation (INFL), growth of economic activity (GROWTH), and the level of risk in financial markets (VOL). We expect the proportion of securitization credit card debt to increase when economic conditions worsen that is when UNEMP INFL, and/or VOL rise. On the other hand, GROWTH is expected to have a negative relationship with the proportion of securitized debt. Thus our model is as follows:

$$1) \quad SEC_t = \beta_0 + \beta_1 DELINQ_t + \beta_2 NCO_t + \beta_3 SPREAD_t + \beta_4 UNEMP_t + \beta_5 INFL_t + \beta_6 GROWH_t + \beta_7 VOL_t + u_t$$

The dependent variable in this equation is the ratio of securitized consumer revolving credit to total consumer revolving credit outstanding of depository institutions and finance companies. We measure

the level of risk in financial markets (VOL) in terms of the conditional variance of S&P 500 return estimated using a GARCH(1, 1) process.[5]

As was mentioned earlier, one of our objectives is to examine whether there is evidence that asymmetric information was used by depository institutions and finance companies when securitizing revolving debt. For this purpose, we include in our models a dummy variable (CRISIS), which equals 1 during the period from January, 2007 until the onset of the financial crisis in August, 2008. A positive and statistically significant coefficient on this variable would suggest that depository institutions and finance companies did in fact use asymmetric information in their decision to increase their securitization activity.

The model in Equations 1 is estimated using monthly data covering the period from January, 1991 through September, 2010.[6] The data are from the Board of Governors of the Federal Reserve, Industrial Production and Capacity Utilization – G17, Consumer Credit - G.19 and the Federal Reserve Bank of Saint Louis FRED database. Table 1 in the Appendix contains a list of the variables and their summary statistics.

[5] As an alternative to the volatility of S&P 500 return, we used the 12-month moving average standard deviation of the yield on one-year Treasury bill. This did not alter materially the estimation results.

[6] The delinquency rate and net charge-off rate are only available in quarterly frequency. We disaggregated them to monthly figures using quadratic-match averages. Cubic spline-match averages generated similar results. Because real GDP data come in quarterly frequency, we use the rate of change of industrial production index as our proxy for economic growth is. We also disaggregated quarterly real GDP to monthly frequency and used its rate of change in place of the growth rate of industrial production and obtained results that were consistent with those from using industrial production growth.

5. Results

We begin by estimating Equation 1 using OLS and report the results in Table 2. Considering the three variables representing conditions related to the revolving debt held by depository institutions and finance companies, we see that they all coefficients that have the expected positive sign and are statistically significant at the 10% level or better. Regarding the four macroeconomic variables, we observe that, as expected, the GROWTH variable has a negative coefficient that is significant at the 5% level. The estimated coefficients on the unemployment and inflation variables have unexpected negative signs and are statistically significant. The variable representing financial market volatility has the expected positive sign but is not statistically significant at conventional levels. The estimated coefficient on the CRISIS variable has a positive sign but is not statistically significant at the conventional levels. The adjusted R^2 is 60%, which is not very high for a time-series model.

The results in Table 2 indicate the presence of ARCH effect in the residuals from the OLS model. Thus we re-estimate the model as an ARCH(1) process using Generalized Error Distribution (GED) since the residuals do not follow the normal distribution (Jarque-Bera static = 16.07 with a p-value = 0.00).[7] The results are presented in Table 3. With two exceptions, these results are consistent with those in Table 2 the exceptions having to do with the statistical significance of the estimated coefficients on the VOL and CRISIS variables. These two coefficients were positive but statistically insignificant in Table 2 but now the coefficient on the volatility variable, which is one again positive,

[7]Initially, we estimated the model as a GARCH(1, 1) process but the GARCH variable had a negative coefficient and was not statistically significant.

is highly statistically significant. The coefficient on the CRISIS variable is still positive but just misses the 10% level of significant (p-value = 0.11).

As is well know some financial variables respond to negative shocks differently than they respond to positive shocks. For example, equity markets response to negative news is larger than their response to a positive shock of an equal magnitude, a fact that is known as the leverage effect. We test for asymmetry in the response of depository institutions and finance companies debt securitization to negative and positive shocks using the Engle-Ng (1993) sign, size, and sign-and-size tests. The results are reported in Table 4. All three tests reject the null of symmetry and suggest presence of positive asymmetry. This leads us to use an exponential GARCH or EGARCH specification that allows for the asymmetry of response of conditional variance of securitization to positive and negative shocks. In this model, Equation 1 above serves as the mean equation and Equation 2 below as the variance equation:

$$2) \qquad \ln\left(\sigma_t^2\right) = \mu + \theta \ln\left(\sigma_{t-1}^2\right) + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \delta \left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right]$$

Here θ represents persistence of shocks while γ captures the symmetry/asymmetry response to shocks of different signs, and δ measures the effect of the shock.[8]

[8] A positive γ implies that positive shocks have a larger effect than negative shocks of the same size and a negative γ indicates the opposite.

The estimation results for the mean and variance equations are reported in Table 5. The results in the top panel pertaining to the mean equation indicate that the coefficients associated with the three variables representing conditions related to credit card debt have the expected positive sign and are statistically significant at high levels of confidence. The growth rate of industrial production has the expected negative sign and is statistically significant at the 10% level. Once again, we find the estimated coefficients on the unemployment rate and inflation to be negative and statistically significant, a result that continues to puzzle us. The sign of the coefficient on financial market volatility is positive, which meets our expectations and is statistically significant. We also observe that the coefficient on the CRISIS variable is positive and this time it is statistically significant suggesting that depository institutions and finance companies used asymmetric information crisis to securitize a larger portion of their credit card assets during the 17 months that preceded the financial crisis that began in August, 2008.

The estimated parameters of Equation 2 in the lower panel of Table 5 indicate that the effect of shocks on the variance of securitization ratio is rather persistent ($\boldsymbol{\theta = 0.72}$) and that the response of variance to shocks of different signs is indeed asymmetric given that the estimate of $\boldsymbol{\gamma}$ is is statistically significant. The positive sign of this parameter This latter result is consistent with the earlier finding from the Engle-Ng test of symmetry.

6. Summary and Conclusions

In this paper we used three estimation methods and monthly date for the 1991.01-2010.09 period to examine the effect of two sets of variables on the decision of depository institutions and financial companies to securitize a portion of their credit card debt. One set included factors related to

the credit card debt held by these institutions and finance companies, which included the delinquency rate, and net charge-off rate, and the spread between cost of funds and credit card interest rate. The second set of variables represented general economic conditions in terms of the civilian unemployment rate, the inflation rate, output growth, and a measure of the level of risk in financial markets.

The preponderance of empirical evidence found in this study indicates that the decision to securitize a larger portion of credit card debt is driven primarily by factors related to consumers' credit conditions namely the delinquency rate and net charge-off rate as well as the spread between cost of funds and the interest rate charged on credit cards. On the other hand, the results regarding the role of economic factors are quite mixed. While we find that increases in the growth of economic activity reduce the proportion of credit card debt that is securitized, we find that higher unemployment and inflation rates result in reduced rate of securitization, a result that contradicts our a priori expectations. We do, however, find that increased risk in financial markets is associated with increased rate of credit card debt securitization.

Finally, we find evidence suggesting that asymmetric information was in part responsible for the increased rate of credit card debt securitization just before the start of the recent financial crisis in August, 2008.

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Sample: 1991M01 2010M09

	DELINQ	INFL	GROWTH	CRISIS	NCO	SEC	SPREAD	VOL	UNEMP
Mean	4.56	2.60	83.87	0.08	5.13	40.75	10.89	0.002568	5.80
Median	4.55	2.75	87.96	0.000	4.70	46.78	10.73	0.001	5.50
Maximum	6.77	5.50	100.74	1.00	11.13	54.29	14.40	0.013	10.10
Minimum	3.22	-2.00	60.25	0.00	2.78	3.85	7.82	0.000	3.80
Std. Dev.	0.71	1.150	11.94	0.27	1.69	12.52	1.62	0.001	1.49

TABLE 1: Summary Statistics

Skewness	0.81	-0.87	-0.59	3.08	1.74	-1.01	0.35	3.68	1.22
Kurtosis	4.35	5.64	2.06	10.51	6.08	3.18	2.31	20.61	4.05
Jarque-Bera	43.54	98.61	22.26	928.40	212.63	40.31	9.36	3579.92	69.50
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Observations	236	236	236	236	236	236	236	236	236

LEGEND

DELINQ = Credit card delinquency rate

INFL = Consumer price inflation

GROWTH = Rate of change of the Industrial Production Index

CRISIS = Dummy variable that equals 1 for the 2007.01-2008.07 and equals zero otherwise

NCO = Credit card net charge off rate

SEC = ratio of securitized credit card debt to outstanding credit card debt

SPREAD = Yield on one-year Treasury bill minus credit card interest rate

VOL = conditional variance of S&P 500 return

UNEMPL = Civilian unemployment arte

TABLE 2: OLS Estimates of Credit Card Securitization Rate

	Coefficient	t-Statistic	Probability
CONSTANT	67.48438	13.04234	0.0000
DELINQ	2.676078	1.868130	0.0630
NCO	3.534518	6.003107	0.0000
SPREAD	1.162287	1.933119	0.0545
GROWTH	-219.6135	-2.499204	0.0132
UNEMP	-7.160580	-10.49487	0.0000
INFL	-1.287590	-2.129796	0.0343
VOL	452.1671	0.944432	0.3460
CRISIS	1.953918	0.943708	0.3463
F-statistic		45.35218	0.000000
ARCH $\chi^2(1)$		201.23	0.000000
Adjusted R^2	0.601572		
σ	7.902583		
LLF	-818.1382		

TABLE 3: ARCH Estimates of Credit Card Securitization Rate

	Coefficient	z-Statistic	Probability
MEAN EQUATION			
CONSTANT	61.22589	44.50517	0.0000
DELINQ	2.220805	5.510963	0.0000
NCO	4.104035	32.00669	0.0000
SPREAD	0.752365	4.926769	0.0000
GROWTH	-50.11541	-2.143029	0.0321
UNEMP	-6.999630	-48.29703	0.0000
INFL	-0.809208	-5.149557	0.0000
VOL	621.8677	3.415887	0.0006
CRISIS	0.705629	1.599480	0.1097
VARIANCE EQUATION			
CONSTANT	0.707037	2.547797	0.0108
RESID^2(-1)	0.943637	7.449247	0.0000
GED TAIL PARAMETER	4.274739	3.844111	0.0001
F-statistic		27.78325	0.0000
Adjusted R^2	0.556282		
σ	8.339642		
LLF	-639.2863		

TABLE 4: Engle-Ng Sign, Size, and Sign-and-Size Tests
Dependent Variable = $RESID^2$

	Coefficient	t-Statistic	Probability
		SIGN TEST	
CONSTANT	44.81556	2.721033	0.0070
RESID(-1)<0	36.40435	1.662839	0.0977
		SIZE TEST	
CONSTANT	-8.864825	-1.043697	0.2977
(RESID(-1)<0)*RESID(-1)	-20.63041	-17.02263	0.0000
		SIGN-AND-SIZE TEST	
CONSTANT	-29.82615	-2.086223	0.0381
(RESID(-1)<0)*U(-1)	-26.28635	-23.11567	0.0000
RESID(-1)<0	-56.19089	-3.157879	0.0018
(1-(RESID(-1)<0))*U(-1)	16.16763	6.641381	0.0000
F-statistic		196.02	0.0000

TABLE 5: EARCH

	Coefficient	z-Statistic	Probability
		MEAN EQUATION	
CONSTANT	66.67139	70.35751	0.0000
DELINQ	1.264439	4.950052	0.0000
NCO	4.361746	41.00197	0.0000

Estimates of Credit Card Securitization Rate

SPREAD	1.235957	11.73873	0.0000
GROWTH	-23.22803	-1.779014	0.0752
UNEMP	-6.606439	-62.35637	0.0000
INFL	-0.874747	-6.598196	0.0000
VOL	880.7852	7.870687	0.0000
CRISIS	1.044466	4.167437	0.0000
		VARIANCE EQUATION	
μ	-1.858572	-5.993484	0.0000
θ	2.768538	13.85700	0.0000
γ	0.381947	2.506659	0.0122
δ	0.717872	13.50120	0.0000
GED TAIL PARAMETER	9.722626	3.060357	0.0022
F-statistic		23.34509	0.0000
Adjusted R^2	0.552795		
σ	8.372347		
LLF	-635.7544		