

POLICY STUDIES

Currency Exchange Use and the Unbanked: An Empirical Analysis

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Consumer Issues Research Series
Consumer and Community Affairs Division
Federal Reserve Bank of Chicago
July 2001 (2001-02)

FEDERAL RESERVE BANK
OF CHICAGO

Currency Exchange Use and the Unbanked: An Empirical Analysis¹

We apply a bivariate probit modeling technique to a recursive equations system involving two binary choice variables --the choice of using a currency exchange and the decision to be unbanked. We propose this technique as a tool for modeling the process of consumer financial decisions. The results from the empirical analysis are offered to researchers and practitioners who seek a better understanding of how unbanked consumers relate to the financial institutions in their communities.

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Introduction and Summary

In recent years, there has been phenomenal growth in the check-cashing industry. In Illinois, check-cashing businesses are known as currency exchanges (hereafter referred to as such). Nationwide, currency exchanges have doubled over the last five years to a total of approximately 6,000 establishments (FiSCA, 2001). Across the state of Illinois, there are over 700 currency exchanges, with more than 60 percent located in the City of Chicago.

Currency exchanges offer an array of alternative financial services (AFS), including cashing checks, selling money orders and providing wire transfers. They also provide a wide variety of non-financial services such as the sale of public transportation fares, motor vehicle stickers, and notary services. From a policy perspective, assessing the extent to which financial services are used and by whom, and the circumstances that might lead one to use these services are important for several reasons. It has been suggested that the financial services at currency exchanges may cost the consumer much more than comparable mainstream banking services (Dunham, 2001). While there may be inherent preferences for a currency exchange by some individuals, important savings and wealth building opportunities may be forgone by individuals who rely solely on transactions outside the mainstream financial sector (Rhine et al, 2001). Hence helping to ensure that consumers make informed financial choices may be an important policy objective. This research has been undertaken to provide a better understanding of the relationship that unbanked consumers have with AFS providers in their communities. The more we know about this relationship, the better we can identify policies to address their specific needs.

Currency exchanges are heavily used by households in low-to-moderate income (LMI) communities. In the Chicago metropolitan area, 37 percent of the census tracts are LMI areas.⁶ There are 348 LMI census tracts with either a currency exchange or a bank (branch). Over three-quarters of the population in these LMI areas are minorities. Drawing from information provided by the U.S. Census, the Illinois Department of Financial Institutions, and Sheshunoff's Directory of Bank Branches, we find that 40 percent of these LMI neighborhoods (representing 37 percent of the LMI area's population) had only currency exchanges available. Eighty-five percent of the population in these neighborhoods are minorities. An additional 32 percent of the LMI neighborhoods (accounting for another 37 percent of the LMI population) had a combination of banks and currency exchanges. In these areas, the ratio of currency exchanges to banks is approximately one-to-one. In contrast, only 28 percent of the LMI neighborhoods (representing the remaining 26 percent of the LMI community population) have only banks available with no currency exchanges. The availability of currency exchanges in LMI neighborhoods, therefore, is consistent with previous findings that minorities tend to use currency exchanges (Kooce-Lewis et al, 1996; Caskey, 1994).

The underlying factors or circumstances that lead consumers in LMI neighborhoods to use currency exchanges are unclear. Some consumer advocates suggest that currency exchanges are used more often in LMI neighborhoods because of the decrease in the number of bank branches available due to mergers and acquisitions (Woodstock Institute, 1997). However, recent evidence has shown that the per capita number of banking offices across all neighborhoods (including LMI neighborhoods) has remained nearly the same since 1995 (Bostic & Canner, 2000). Others contend that banks have inconvenient hours or locations, but this is not generally supported by surveys. For example, using data from the 1995 Survey of Consumer Finances, Hogarth and O'Donnell (1999) found virtually none of the LMI respondents citing inconvenient hours or locations as their reason for not having a checking account. Our research also finds similar results. A common view is that the mix of financial products and

services offered by currency exchanges, especially payday loans (short term, usually small dollar denomination)⁷ available in some states, is attractive to their customers. Thus, for some, currency exchanges may serve as a substitute for mainstream financial services; while for others, currency exchanges are a complement to banking services.

These various and conflicting views suggest that more research is needed for a better understanding of a consumer's decision to use AFS and of the factors influencing this choice. The main contribution of this study is that it provides a framework for analyzing such a decision. This study applies a bivariate probit model to explain the likelihood that a consumer obtains financial services from a currency exchange given that he/she is unbanked. Our findings are consistent with previous descriptive research regarding particular socioeconomic influences on the decision to use AFS. Taking a more rigorous approach, we find that unbanked households with lower income, who are younger, have less education, or those who are employed are more likely to use a currency exchange. Unbanked households residing in LMI communities also are more likely to use a currency exchange than those who reside in middle-to-upper income neighborhoods. In general, we find that the unbanked are more likely than their banked counterparts to patronize a currency exchange. The results also confirm that the decision to be unbanked and the decision to use a currency exchange for financial services are jointly determined. Furthermore, we find that for unbanked Black and Hispanic households, distaste for a checking account and perceived unfavorable checking account characteristics are important influences on the probability of obtaining currency exchange financial services.

The focus of this paper is the theoretical underpinnings of a consumer's choice of financial services and the empirical findings. For a detailed discussion of the policy implications of the results of the analysis presented in this paper see Rhine et al (2001). The remainder of this paper is organized as follows. In the next section, we provide a theoretical discussion and model of the decision to use a currency exchange for financial services and the decision to be unbanked. The third section discusses the methodology applied to estimate the theoretical specification. The fourth section presents the results, while the final section offers concluding remarks.

Theoretical Discussion

Currency exchange use is affected by several of the household's socioeconomic characteristics. Previous research finds that minority households, low-income households,⁸ and households residing in LMI neighborhoods are more likely to use a currency exchange than White households, higher-income households or households living in middle- and upper-income communities, respectively. In addition, gender, age, and marital status are demographic factors that may influence the use of currency exchanges.

Credit cards can be used both as a payment and a finance medium. The potential substitutability between using a credit card and obtaining financial services (for example, pay bills, obtain a short term loan) from a currency exchange business suggests that having a credit card would be negatively related to the likelihood of patronizing a currency exchange business. It is commonly assumed that convenient location and lower transaction costs in terms of time are major features sought by currency exchange users. To the extent that being tied to the labor market increases a consumer's market opportunity cost, working consumers may be more likely to use a currency exchange. Conversely, retired individuals with lower time cost may be less likely to use a currency exchange. A consumer's level of education can be an indicator for a consumer's human capital in financial literacy. Less educated households may possess a weaker understanding than their more educated counterparts about consumer protections as well as savings and wealth-building opportunities that they may forgo by not having a relationship with mainstream financial service providers. They may also be less able to conduct transactions in mainstream banking institutions that require more advanced knowledge of new technology (e.g., ATMs, online banking). As such, less educated households may be more likely to use a currency exchange.

The relationship between using a currency exchange and being unbanked is a fairly complex and important one. Currency exchange businesses offer the unbanked an alternative means of obtaining financial services. Hence being unbanked would tend to increase the likelihood of using a currency exchange for financial services. At the same time, factors influencing the decision to be unbanked could be inherent to the decision to use currency exchange financial services --accordingly these two decisions may be jointly determined.

Factors influencing the likelihood of being unbanked are well known from previous research (Hogarth and O'Donnel, 1997; Booz-Allen and Hamilton Shugoll Research, 1997). Unbanked consumers are more likely to have lower income and net worth (i.e. do not own a home), to be less educated and unemployed, and to be more heavily represented among Blacks, Hispanics and households in LMI neighborhoods. Unbanked consumers also tend to be female, younger and unmarried. It has been posed that unemployed households with a severed tie to the labor market are more likely to be unbanked. However retired individuals who previously had a connection to the labor market, even though no longer active in the labor market, would be less likely to be unbanked.

The decision to be unbanked (and hence use a currency exchange) may be affected by an individual's personal attitude toward banks and banking products. In an earlier study, Hogarth and O'Donnell (1997) find that Black and Hispanic consumers tended not to have a checking account because of unfavorable product characteristics (e.g., minimum balance/fee too high). The same groups also tended to have a distaste for banks (e.g., don't like dealing with banks or want to keep financial records private). These attitudinal factors are likely to increase the likelihood of being unbanked and of using currency exchanges for financial services.

In the model that follows, we explain a consumer's decision to use a currency exchange for financial services and the decision to be unbanked with a two-equation system:

$$CE = f_1(\text{Unbanked, Income30, Married, Education12, Age 18-25, Female, CreditCard, LMI, Employed, Retired, Black, Hispanic, Other}) \quad (1)$$

$$\text{Unbanked} = f_2(\text{Income30, Married, Education12, Age 18-25, Female, LMI, Retired, Black, Hispanic, Other, UNILF, OwnHome, Taste, Product, Black_Taste, Black_Product, Hispanic_Taste, Hispanic_Product, Other_Taste, Other_Product}) \quad (2)$$

The variables are defined in Table 1. A number of features in the model are worth emphasizing. First, both dependent variables are dichotomous. Hence a technique appropriate for binary choice modeling must be employed. Second, Unbanked, an independent variable in equation 1 also appears on the left-hand side of equation 2. The model is a recursive simultaneous binary choice model. The possibility that the decision to be unbanked (i.e., not having a relationship with a formal financial institution) is jointly determined with the choice to use a currency exchange business is an important issue for the equation estimates.

Table 1
Definition of Variables

Variables	Definition
CE	Dichotomous variable for respondents that have used a currency exchange to obtain financial services in the last year (= 1 if use currency exchange, = 0 otherwise)
Unbanked	Dichotomous variable for bank relationship status (= 1 if do not have a checking/and or savings account, = 0 otherwise)
Income30	Dichotomous variable for household income (= 1 if income is less than \$30,000, = 0 otherwise)
Married	Dichotomous variable for marital status (= 1 if married or in married-like relationship, = 0 otherwise)
Education12	Dichotomous variable for education (= 1 if number of years of schooling completed <=12, = 0 otherwise)
Age 18-25	Dichotomous variable for age of head of household (=1 if 18<=age<25, = 0 otherwise)
Female	Dichotomous variable for gender (= 1 if female, = 0 otherwise)
CreditCard	Dichotomous variable for respondents who have a credit card (= 1 if have a credit card, = 0 otherwise)
LMI	Dichotomous variable for low-to-moderate income geographies defined as areas with 80% or less of the median family income for the Chicago MSA (= 1 LMI, = 0 otherwise)
Employed	Dichotomous variable for employment status (= 1 if employed, = 0 otherwise)
Retired	Dichotomous variable for employment status (= 1 if retired, = 0 otherwise)
UNILF	Dichotomous variable for employment status (= 1 unemployed, not in labor force, = 0 otherwise)
Black	Dichotomous variable for race/ethnicity (= 1 if Black, = 0 otherwise)
Hispanic	Dichotomous variable for race/ethnicity (= 1 if Hispanic, = 0 otherwise)
Other	Dichotomous variable for race (= 1 if Asian, Native American or Other nonwhite), = 0 otherwise)

Table 1 (continued)
Definition of Variables

OwnHome	Dichotomous variable for homeownership (= 1 if respondent is a homeowner, = 0 otherwise)
Taste	Dichotomous variable giving reasons for not having/closing a checking account (= 1 if response was 'do not like to deal with banks', 'prefer to keep records private' or 'do not trust banks', = 0 otherwise)
Product	Dichotomous variable giving reasons for not having/closing a checking account (= 1 if response was 'do not have enough money to open an account', 'do not write enough checks', 'minimum balance/fee too high' or 'bank hours/location inconvenient', = 0 otherwise)
Black_Taste	Interaction term: (Black = 1) X (Taste = 1, 0)
Black_Product	Interaction term: (Black = 1) X (Product = 1, 0)
Hispanic_Taste	Interaction term: (Hispanic = 1) X (Taste = 1, 0)
Hispanic_Product	Interaction term: (Hispanic = 1) X (Product = 1, 0)
Other_Taste	Interaction term: (Other = 1) X (Taste = 1, 0)
Other_Product	Interaction term: (Other = 1) X (Product = 1, 0)

Technique for Estimating the Recursive Binary Choice Model

Following Greene (1998), a bivariate probit model, which is fit by a maximum likelihood technique is used. The bivariate probit model is as follows:

$$y_1^* = \beta' x_1 + \gamma y_2 + \epsilon_1, \quad y_1 = 1 \text{ if } y_1^* > 0, \quad 0 \text{ otherwise,} \quad (1)$$

$$y_2^* = \alpha' x_2 + \epsilon_2, \quad y_2 = 1 \text{ if } y_2^* > 0, \quad 0 \text{ otherwise,} \quad (2)$$

$$E[\epsilon_1] = E[\epsilon_2] = 0,$$

$$\text{Var}[\epsilon_1] = \text{Var}[\epsilon_2] = 1,$$

$$\text{Cov}[\epsilon_1, \epsilon_2] = \rho$$

where y_1 is observed to equal 1 if the consumer chooses to use a currency exchange (0 otherwise) and y_2 is observed to equal 1 if the consumer is unbanked (0 otherwise). On the basis of the joint, conditional, and marginal probabilities,

$$\begin{aligned} \text{Prob}[y_1 = 1, y_2 = 1] &= \text{Prob}[y_1 = 1 | y_2 = 1] \times \text{Prob}[y_2 = 1] \\ &= \{ \text{BVN}(y_1, y_2 = 1) / \text{Prob}[y_2 = 1] \} \times \text{Prob}[y_2 = 1] \end{aligned}$$

where BVN denotes the bivariate normal cumulative distribution function. If we insert the variables of our model and include the two parameter vectors, the preceding equation can be rewritten as

$$\text{Prob}[y_1 = 1, y_2 = 1] = [\text{BVN}(\beta' x_1 + \gamma y_2, \alpha' x_2, \rho) / \Phi(\alpha' x_2)] \times \Phi(\alpha' x_2)$$

which, after canceling like terms, reduces to the bivariate probability

$$\text{Prob}[y_1=1, y_2=1] = \text{BVN}(\beta' x_1 + \gamma, \alpha' x_2, \rho)$$

Here the bivariate probit conveys the likelihood that currency exchange use (y_1) is equal to 1 when unbanked (y_2) is equal to 1.⁹ The parameters to be estimated in this model are β' , γ , α' and the correlation coefficient to be estimated is ρ . Where β' is the coefficient vector for variables on the right-hand side of currency exchange use equation; γ is the coefficient for the unbanked variable; and α' is the coefficient vector for variables on the right-hand side of the unbanked equation. The correlation coefficient, ρ , measures the latent unmeasured effects in the two equations. For example, ρ , found to be statistically different from zero, would indicate that using a currency exchange is not only directly effected by the decision to be unbanked, but is also indirectly influenced through

household effects (such as latent unmeasured preference effects) which are not explicit in the currency exchange model. However, in this case, even if ρ equals zero, as long as γ is non-zero, the two consumer decisions would not be viewed as independent since Unbanked appears explicitly in the CE equation.

An attractive aspect of the bivariate probit technique is also its relative simplicity. The endogenous nature of the variable Unbanked can be ignored in the recursive equation system given the use of a maximum likelihood technique for the estimates (as opposed to ordinary least squares where the presence of simultaneity would render such estimates biased). Therefore, contrary to what intuition might suggest, the presence of y_2 or (Unbanked) in the first equation does not cause a “simultaneity” problem. The model can be estimated as a bivariate probit model, as stated, as if there were no joint determination. And, the bivariate probit offers a consistent, fully efficient estimator for this model (Greene, 1998).

Once the estimates of the coefficients are obtained, a natural next step is to calculate the marginal effects so that an interpretation can be given about how a one unit change in the independent variables influences the probability of the dependent variable. Greene (1996) derives the marginal effects of the bivariate probit model, which are fairly more involved than in a univariate probit model. Based on his calculations in the bivariate probit model specification, the marginal effects of y_2 are similar to those normally computed for the univariate probit model. However, in the first equation the marginal effect of a change in a variable is the sum of two terms. The first term is the *direct effect* of a change in that variable on the probability that $y_1 = 1$. The second term is the *indirect effect* of a change in this variable on the probability that $y_2 = 1$ (which in turn influences the probability that $y_1 = 1$).

Data and Results

The Federal Reserve Bank of Chicago sponsored a supplement of questions focusing on the use of currency exchanges in conjunction with the Metro Chicago Information Center (MCIC) 2000 Survey. The survey covers the Chicago metropolitan statistical area.¹⁰ Most of the data were collected in a telephone survey of a sample of households selected through a random-digit-dialing sampling technique. Supplemental surveys were conducted through face-to-face interviews as a way to include information from households in the sample population without telephones. In addition, survey interviews were conducted in Spanish to accommodate Spanish-speaking respondents.¹¹ The sample used in this study is 2,483 households.

Forty-two percent of the households in the survey reported patronizing a currency exchange. We observe currency exchange usage by both banked and unbanked individuals. Among the unbanked, there is heavy use of currency exchanges. Specifically, we find that 85 percent of the unbanked use currency exchanges. In contrast, 37 percent of the banked use currency exchanges.

The listing of financial and nonfinancial services obtained at currency exchanges (Table 2) shows that a wide variety of services are obtained from currency exchanges. Financial services such as cashing checks and purchasing money orders are comparable to the traditional transaction account services obtained at a bank, and as such, may be more relevant for an assessment of the potential substitutability between currency exchange services and mainstream banking services. For the scope of this paper, we direct our attention to the unbanked's patronage of currency exchanges for the purpose of obtaining financial services.

Table 2
Currency Exchange Patronage by Type of Service*

Financial Service Categories	Frequency
Cashing Checks	331
Purchase Money Orders	325
Wire Transfers	67
Payday Loans	5
Pay Bills	279
Nonfinancial Service Categories	
Bus Pass/Vehicle Stickers	398
Notary Public	40
Link Card/Government Aid	52

*Multiple responses possible.

Source: The Metro Chicago Information Center Year 2000 Annual Survey.

Bivariate Probit Model Estimates

The results from the bivariate probit model are given in Table 3.¹² Recall that if being unbanked and using a currency exchange are jointly determined, the correlation coefficient, ρ , estimated from this model should be statistically different from zero. We find, in fact, that the value of ρ is -0.267 with a standard error of 0.127, suggesting that ρ is significantly different from zero at the .05 level of significance. Hence, the two variables are jointly determined. A likelihood ratio test of the null hypothesis that ρ equals zero against the alternative reaffirms the ability to reject the null. In particular, the test statistic, $LR = -2[-1449.92 - (-1375.36)] = 149.11$. LR has a chi-squared distribution, with one degree of freedom. The calculated value, 149.11, exceeds the critical value, 2.71 (.10 level of significance), thus the null is once again rejected.

Table 3
Estimated Bivariate Probit Model

Index Equation for CE (currency exchange use)			
Variable	Coefficient	Standard Error	Means of x
Constant	-0.954*	0.139	
Unbanked	0.907*	0.164	0.10
CreditCard	-0.481*	0.090	0.79
Black	0.943*	0.084	0.21
Hispanic	0.458*	0.101	0.09
Other	0.197	0.137	0.06
Income30	0.199**	0.088	0.22
LMI	0.424*	0.075	0.24
Employed	0.230*	0.092	0.71
Retired	-0.286**	0.130	0.14
Married	0.024	0.067	0.54
Education12	0.112	0.077	0.26
Age18-25	0.433*	0.116	0.07
Female	-0.063	0.064	0.60
Index Equation for Unbanked			
Constant	-2.540*	0.245	
Black	0.686*	0.222	0.21
Hispanic	0.027	0.364	0.09
Other	0.354	0.335	0.06
Income30	0.477*	0.136	0.22
LMI	0.215	0.148	0.24
Retired	-0.223	0.255	0.14
Married	0.007	0.133	0.54
Eucation12	0.364*	0.134	0.26
Age18-25	0.018	0.146	0.07
Female	0.065	0.255	0.60
OwnHome	-0.511*	0.136	0.62
UNILF	0.452**	0.218	0.09
Black_Taste	-1.014*	0.390	
Black_Product	-2.339*	0.663	

Table 3 (continued)
 Estimated Bivariate Probit Model

Index Equation for Unbanked (continued)			
Variable	Coefficient	Standard Error	Means of x
Hispanic_Taste	-0.051	0.512	
Hispanic_Product	-1.648**	0.733	
Other_Taste	-0.408	0.676	
Other_Product	-1.885	1.518	
Taste	2.687*	0.325	0.04
Product	3.925*	0.629	0.08
Disturbance Correlation			
ρ (1,2)	-0.267**	0.127	

Notes: Log likelihood function -1375.361
 Sample Size = 2483
 * Indicates significance at the 0.01 level
 ** Indicates significance at the 0.05 level

Estimated Marginal Effects

The marginal effects of a change in the independent variables are reported in Table 4. The results show that being unbanked increases the likelihood of using a currency exchange by 14.6 percentage points. Moreover, unbanked households in LMI neighborhoods are 7.6 percentage points (the sum of the direct and indirect effects) more likely to use a currency exchange than unbanked households residing elsewhere. The fact that this neighborhood variable is a determinant in consumer use of CE speaks to the availability of these businesses in LMI neighborhoods.

The likelihood of using a currency exchange is 5.1 percentage points higher for unbanked lower-income households relative to their unbanked higher-income counterparts. Unbanked households, who are younger, between 18 and 25 years of age, are 7.1 percentage points more likely to use a currency exchange, while those with lower education are 3.2 percentage points more likely to use a currency exchange. Socioeconomic factors, therefore, play a significant role in unbanked households' use of currency exchanges. These findings suggest that educational initiatives and programs may be useful in increasing financial literacy and enhancing the consumer's awareness of the tradeoffs between utilizing mainstream and alternative financial service providers (Rhine et al, 2001).

In addition, unbanked who are employed are 3.7 percentage points more likely than their non-working counterparts to use a currency exchange, whereas those who are retired are 5.5 percentage points less likely to patronize a currency exchange. Hence, to some extent, convenience and value of time may be playing a role in the household decision to patronize a currency exchange.

Unbanked Black households are 17.8 percentage points (the sum of the direct and indirect effects) more likely than unbanked Whites to patronize a currency exchange. Similarly, unbanked Hispanic households are 7.5 percentage points more likely to use a currency exchange than unbanked White households. The lack of significance for Other race suggests that no differences exist in the likelihood of using a currency exchange between minorities in the other ethnic/racial categories and Whites.

Distaste for a checking account and perceived unfavorable checking account characteristics explain in part the influence that being an unbanked Black and Hispanic has on the likelihood of obtaining financial services from a currency exchange. Unbanked Black households with a distaste for a checking account, for example, are roughly 14 percentage points [total effect of race, Black, plus the direct effect of interaction term in the unbanked equation (17.8 - 3.9)] more likely to patronize a currency exchange than unbanked Black households without this distaste. On the other hand, unbanked Black households with an unfavorable perception about checking account characteristics are 8.7 percentage points (17.8 - 9.1) more likely to use a currency exchange than unbanked Black households without this unfavorable perception. These findings point to the relative importance of tastes and preferences for a checking account in determining the probability that unbanked Black households turn to currency exchanges to meet their

financial services needs. For unbanked Hispanic households, having an unfavorable perception about checking accounts increases the likelihood of using a currency exchange by 1.1 percentage points (7.5 - 6.4); whereas having a distaste for a checking account does not significantly influence the likelihood of currency exchange use among unbanked Hispanics.

Table 4
Estimated Marginal Effects

	Direct Effect	Indirect Effect	Total Effect	Standard Error
CE Equation				
Unbanked	0.146		0.146	0.054
CreditCard	-0.077		-0.077	0.040
Black	0.152	0.026	0.178	0.074
Hispanic	0.074	0.001	0.075	0.043
Other	0.032	0.014	0.046	0.029
Income30	0.032	0.019	0.051	0.022
LMI	0.068	0.008	0.076	0.035
Employed	0.037		0.037	0.022
Retired	-0.046	-0.009	-0.055	0.032
Married	0.004		0.004	0.012
Education12	0.018	0.014	0.032	0.016
Age18-25	0.070	0.001	0.071	0.039
Female	-0.010	0.002	-0.008	0.013
Unbanked Equation				
OwnHome	-0.020		-0.020	0.005
Unemployed	0.018		0.018	0.008
Black_Taste	-0.039		-0.039	0.015
Black_Product	-0.091		-0.091	0.026
Hispanic_Taste	-0.002		-0.002	0.020
Hispanic_Product	-0.064		-0.064	0.029
Other_Taste	-0.016		-0.016	0.026
Other_Product	-0.073		-0.073	0.059
Taste	0.104		0.104	0.012
Product	0.152		0.152	0.026

Based on these results, at least for the Chicago metropolitan area, the most substantial effects, at the margin, on the probability that a household will use a currency exchange are exerted by Blacks and by Blacks with distaste for a banking account product. As expected, being unbanked relative to being banked has a direct and significant influence on the probability of using currency exchange financial services. The perception of unfavorable checking account characteristics and distaste for a checking account exert a strong influence on the likelihood of being unbanked.

Notes on Estimates/Future Research

In this analysis we have discussed the combined marginal effects of race and the taste and preference variables. We recognize that the standard errors reported are not associated with these combined effects. Furthermore, we acknowledge that further adjustments are needed to take into account the marginal effects when dummy variables are specified. This adjustment is not expected to substantially influence the results. Corrections to these points will be made in the next version of the paper. Although beyond the scope of this study, we plan to extend the present model to include an analysis of currency exchange use by banked households.

Conclusion

We applied a bivariate probit modeling technique in a recursive simultaneous equation model involving two binary choice variables --currency exchange use and the decision to be unbanked. We propose this technique as an appropriate modeling tool to analyze a consumer's choice of alternative financial service providers. The results from the analysis are offered to researchers and practitioners to promote understanding of the relationship between unbanked consumers with the financial institutions in their communities.

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Endnotes

¹The analysis and conclusions set forth in this paper represent the work of the authors and do not indicate concurrence of the Federal Reserve Bank of Chicago or the Board of Governors of the Federal Reserve System. This working paper has been published in the *Consumer Interest Annual, Volume 47, 2001*.

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⁶There are 1748 census tracts in the Chicago metropolitan statistical area, of which 650 are defined as LMI areas.

⁷In Illinois, short-term loan companies, known as payday loan companies, have been permitted to operate in currency exchanges as Limited Purpose Branches. Thus, it is possible for a consumer to receive a short-term loan on the premises of a currency exchange.

⁸An income of \$30,000 or less will be taken in this analysis to mean low-income households. This closely corresponds to the income threshold consistent with the U.S. Census definition of a low-income household, whereby family income is less than 50 percent (\$31,893) of the metropolitan area's median income level (\$63,800).

⁹The bivariate probit model will also allow for three additional cases:

Prob [$y_1 = 0, y_2 = 1$] = BVN ($-\beta' x_1 - \gamma, \alpha' x_2, -\rho$),

Prob [$y_1 = 1, y_2 = 0$] = BVN ($\beta' x_1 + \alpha' x_2, -\rho$), and

Prob [$y_1 = 0, y_2 = 0$] = BVN ($-\beta' x_1 - \alpha' x_2, \rho$)

As clarified by Greene (2000), in all four cases these terms enter the usual likelihood function for the bivariate probit model. (In this paper we focus on the first case, whereby $y_1=1, y_2=1$).

¹⁰The Chicago metropolitan statistical area covered in this survey includes Cook, DuPage, Lake, Kane, McHenry, and Will counties.

¹¹More information about MCIC, a nonprofit organization located in Chicago, IL, can be found by going to www.mcic.org. In general, results from the total population survey can be expected to differ by no more than 1 percentage point in either direction from the results that would be obtained by interviewing all adults in the six-county area.

¹²This modeling technique was employed using LIMDEP (1998) software, version 7.0, from Econometric Software, Inc.