

Ordered Choice Modeling of Farmers' Decision to Obtain Commercial Banks' Credit in Kano State

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Abstract

The research seeks to empirically analyze those factors affecting farmers' decision to obtain commercial banks' credit in Kano State with emphasis on personal attributes of the farmers. A sample of 294 registered farmers was used for the purpose of the research. Ordered choice models were employed where outcome of the research shows that while age, gender and geographical location of farmers significantly affect their decision to borrow from commercial banks, their level of formal education and experience in farming profession were insignificant in determining their decision to borrow. Post estimation test indicates that there is no specification bias in the models. However, the presence of heteroscedasticity made it necessary to employ the White's Robust Standard Errors (VCE). The study highly recommends among other things that commercial banks' loan classification should reflect farmers' individual attributes for example; the youth, women and rural farmers should be targeted whenever it comes to agricultural lending.

Keywords:

Ordered choice,
Heteroscedasticity
and Post estimation

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Background to the Study

Agricultural production in Nigeria has been constrained by shortage of capital and crude method of production especially in the rural areas. Due to low productivity in the agricultural sector, income and hence the tendency to save and increase capital becomes almost impossible. This problem is further propelled by the low incentive of farmers to borrow especially from deposit money banks. Although it has been found that farm credit can stimulate the transfer of technology and lead to higher crop yield (Henry and Joyce; 2012), it is surprising that farmers hardly recognize credit as an alternative financial source.

This could explain why agricultural practice in Nigeria is still largely subsistence and for domestic use. According to Ugwu (2010), credits are not easily available for most Nigerian farmers because of lack of collateral and other things that are usually required by commercial banks and other credit institutions. She further posits that this makes it possible for most of the farmers to lack the required capital for investment in large scale agriculture hence, the reason for the recent low agricultural productivity. While positing on this, Sunny (2013) indicated that until the mid-70s, agriculture was the primary foreign exchange earner for Nigeria. It has now lost this prime position to the mineral sector. And inadequate capital is one of the major factors affecting the performance of the sector.

The low income level characteristic of such economies makes savings difficult and hence, the main alternative source of funding is agricultural credit. In obtaining such credit, farmers are faced with the option of borrowing either from formal or informal financial institutions. The decision to borrow is arrived at after considering some conditions attached to the available loan or credit (Emerole; 2013). However, even where the farmers are ready to borrow the funds are not easily available. This explains why most Nigerian farmers keep complaining of loan non availability and inaccessibility. As Henry and Joyce (2012) rightly pointed out, loan availability and accessibility are the major constraints bedeviling the agricultural sector in developing nations. The government on its part has rolled out many policies with the aim of boosting agricultural credit like the Agricultural Credit Guarantee Scheme Fund. However, the attitude of Nigerian farmers towards agricultural credit especially one that comes from commercial banks is very disturbing. Most researches on agricultural finance are more focused on the impact of agricultural credit on farmers' productivity (Ugwu, 2010; Sunny, 2013) where little attention is paid to the financial institutions' lending decision; less is given to the farmers' borrowing decision and to a great extent the determinants of such decisions. The research covers crop farmers of all categories i.e. large scale, medium scale and small scale farmers. It also includes both dry season and wet season farmers. The major crops harvested by these farmers are: sorghum, rice, maize, millet, cowpea, moringa, beans, wheat and so on. The study is also delimited to registered crop farmers in Kano State meaning, the study did not cover all non-registered farmers in the state. In addition the variables captured in the study include age, gender, formal educational level, geographical location and years of experience in farming.

Research Question

To what extent do individual attributes determine farmers' decision to obtain credit from commercial banks in the study area?

Objective of the Study

To empirically examine those individual attribute test that determine farmers' decision to obtain commercial banks' credit.

Review of Related Literature and Theoretical Framework

Determinants of Demand for Agricultural Credit

Nwaru (2004) in Shallone and Simon (2013) views agricultural credit as the present and temporary transfer of purchasing power from a person who owns it to a person who wants it, allowing the latter the opportunity to command another person's capital for agricultural purposes but with confidence in his willingness and ability to repay at a specified date. Agricultural credit can be in form of cash, farm implements, consultancy services, research, technology and so on. Despite these benefits of agricultural credit, the rate at which farmers borrow from formal financial institutions especially commercial banks is very discouraging. At the micro level, scholars have attempted to provide explanations as to why farmers are reluctant to borrow. In other words what are those factors that influence farmers' decision on agricultural borrowing?

Faqir (1983) used a Logit model to predict the odds of small holder farms to use credit conditional upon information about economic attributes of the farm and personal characteristics of the farmer. He came to the conclusion that among other things, farm size, experience in farming, formal educational level, frequency of contact with extension agents, perception on credit and number of children below 14 years directly relate with the decision of farmers on credit. While as expected, the prevailing interest rate is inversely related to the decision of farmers to obtain credit. In their studies, Ayamga, Sarpong and Asuming (2006) tried to find out why rural house hold refused to borrow despite provision of financial institutions by the government in form of micro credit institutions. They came to the conclusion that age, value of farm output, non-farm income, number of micro credit institutions, level of education and distance of these institutions influence individual's decision to participate in the credit scheme. In the same vein, Sebopetji and Belete (2013) revealed that farming experience, gender and marital status have positive significant effect on farmers' decision to use credit while age, educational level and membership of association have a negative effect. Similar results were found by Otunaiya, Ologbon and Akerele (2014) where in addition, amount of credit available, farmers' main occupation, and access to extension agents play a significant role in determining their decision about credit. In his own findings, Kofar Mata (2013) identified educational qualification and off farm variables as significant determinants of farmers' demand for credit as well as the amount of credit demanded. Whereas, marital status, number of dependents, farming experience, commercial farming, off farm commitment and income significantly explain the probability of being credit constraint.

Scale of Preference

Scale of preference is a basic economic tool used to determine the demand for certain items and revolves around the essential need of humans. It refers to the ranking of wants or needs according to their order of importance for the purpose of effective choice (<http://www.reference.com/economics>). In most instances, rating scales are employed in research to capture the variations in responses/response categories. Of the widely used rating scales in research is the Likert rating scale which is a psychometric response scale used

in questionnaires to obtain respondents' preferences or degree of agreement with a statement or set of statements (Likert, 1932). Most rating scales including the Likert type scale and other attitude opinion measures contain either five or seven response categories (Bearden, Netmeyer and Mobley 1993; Shaw and Wright, 1967 cited in Carolyn and Andrew, 2000).

Those ratings that come in five scale points start from strongly disagree on one extreme and end with strongly agree on the other. This study employs this system of scaling where farmers' responses begin with the decision to definitely not borrow and ends with the decision to definitely borrow.

Pecking Order Theory

Pecking order refers to a hierarchy of status among members of a group (originally as observed among hens)(Oxford, 2011). The pecking order theory was developed by Myers et'al (1984) to explain why corporate bodies make use of debt finance because private firms seem to use retained earnings and bank debt heavily (Murray & Vidhan, 2005). According to Myers (1984), the motivation for pecking order is adverse selection and adverse selection implies that retained earnings are better than debt and debt is better than equity. He further states that a firm is said to follow a pecking order if it prefers internal to external financing and debt to equity if external financing is used(Myers, 1984).

The basic argument is that internal finance is assumed to always work i.e. it would avoid all asymmetric information issues while external finance on the other hand is in most cases expensive as such firms will give up positive net present value projects to avoid it(Myers & Majluf, Corporate Financing and Investment Decision when Firms have Information that Investors Do Not Have , 1984). This position is corroborated by Jibrane't'al (2011) where their study indicated that firms prefer to use internal resources and debt over equity for reinvestment and fund raising purposes and this is mainly because the way in which firms cover their finance deficits is not dependent on the current levels of debt therefore, they prefer internal to external funds and in many cases where external funding becomes necessary, they prefer debt to equity.

Many research conducted in developing countries support the order theory and the reason was the difficulty associated with equity financing(Jibrane, Wajid, Waheed, & Muhammad, 2012). This means that firms with high profit levels may choose to finance their investment using internal sources rather than by raising debt finance.

The Life Cycle Theory

The life cycle theory was formulated by Franco Modigliani, Richard Brumberg and Albert Ando in the early 1950s and it posits that the level of savings for individuals depends on the age of consumers and hence on the demographic structure of the society rather than on the level of family income (Mauro; 2005). The theory assumes that the household chooses its current expenditure optimally taking into account its future income during its lifetime. In the words of Modigliani (1986), "one might expect and generally finds a fairly constant rate of savings in the central age group, but lower savings or even dissaving in the very young or old". Thus the theory assumes that individuals start with a negative savings rate because at younger ages the

income level is far lower than consumption expenditure but as age advances towards the fifties then savings becomes positive. This means that at the onset, the tendency of individuals to borrow is very high because their incomes are lower than their consumption expenditure but as age rises, income also rises and then savings is resorted to leading to decline in the tendency to borrow.

Methodology

The research adopts a cluster sampling procedure where a sample of 294 farmers was drawn from a population of 12,000 registered farmer groups who are spread across 3 agricultural development areas of the Kano Agricultural and Rural Development Authority (KNARDA). A structured questionnaire was used to collect the data for this research which was validated using a pilot study.

Model Specification

The model is specified as thus:

$$FD = \beta_0 + \beta_1 AGE_j + \beta_2 GEN_j + \beta_3 EDU_j - \beta_4 AGE_j^2 + \beta_5 LOC_j + \beta_6 FEX_j + E_i$$

Where,

Y_i is an ordered multi categorical dependent variable and it represents the borrowing decision of farmers.

$Dib = 1$ if $-\infty < Dib \leq \mu_1$,

$Dib = 2$ if $\mu_1 < Dib \leq \mu_2$,

$Dib = 3$ if $\mu_2 < Dib \leq \mu_3$,

$Dib = 4$ if $\mu_3 < Dib \leq \mu_4$,

$Dib = 5$ if $\mu_4 < Dib < \infty$,

Where, μ_s are the thresholds.

X_i represents the set of explanatory variables. While some are continuous, others are categorical. These include:

$AGE = X_1$Age: This is a continuous variable but measured on an interval scale. $GEN = X_2$Gender: This is a binary variable.

$EDU = X_3$Educational background of the farmer measured in number of years spent in acquiring formal education.

$AGE^2 = X_4$Age²: Also a continuous variable just like age. $LOC = X_5$ Geographical location of farmers: This is a multi-categorical variable and =1 if a farmer is located in Rano zone; =2 if he/ she is located in Dambatta zone; and =3 if he/ she is located in Gaya zone.

$FEX = X_6$ Farming experience measured in number of years spent in farming.

β_j represents the coefficients of the individual explanatory variables;

e_i is the error term which is assumed to follow both a normal and logistic distribution for the Oprobit and Ologit models respectively;

And the μ_j s are the threshold parameters

Diagnostic Tests

Heteroscedasticity Test

Due to nature of the data i.e. cross sectional, there is great tendency for the error term to be correlated with the explanatory variables giving birth to heteroscedasticity in the model.

Misspecification Test

Since the logistic regression assumes that the dependent variable is a linear combination of the explanatory variables; that no unimportant variable was included in the model and that all relevant variables were incorporated in the model, it happens that if the model is incorrectly or improperly specified, then no additional predictor should be statistically significant except by chance. This study will use the link test to find out if there is any specification error in the logistic model.

Data Presentation

The study employs ordered probit and logit models to analyse the responses gathered after they have been duly coded using the Stata 11 software package

Table 1: Estimated Ordered Choice Models: The Determinants of Farmers' Borrowing Decision

S/N	Variables	Models		
		Ologit	Oprobit	Marginal Effects
1.	Age	-.1565474** (.0709526)	-.0875975** (.0424926)	-.6080666
2	Gender	.9155085* (.306727)	.5520777* (.1921302)	-.1472809
3	Formal educational level	-.0087543 (.0185635)	-.0025444 (.0108764)	.0006788
4	Geographical location			
	2	1.337826* (.2850951)	.7515958 * (.1652502)	-.2203179
	3	1.175759* (.2904956)	.6298406 * (.1682423)	-.1927491
5	Farming experience	-.0185222 (.0243697)	-.0126056 (.0141248)	.0033629
6	Age2	.0019186** (.0009018)	.0010803 ** (.0005405)	-.0002882

Ordered logistic regression

Number of obs	=	294
LR chi2(6)	=	22.69
Prob > chi2	=	0.0009
Log likelihood	=	-433.47328
Pseudo R2	=	0.0255

/cut1 -2.166081
 /cut2 -1.291181
 /cut3 -.6738698
 /cut4 1.436226

Ordered probit regression

Number of obs = 294
 LR chi2(6) = 20.37
 Prob > chi2 = 0.0024
 Log likelihood = -434.63279
 Pseudo R2 = 0.0229

/cut1 -1.21689
 /cut2 -.7027817
 /cut3 -.3264899
 /cut4 .902767

Source: Compiled from the researcher's field work (2015) and analysed using Stata 11 software package

Table 2: White's Robust Standard Errors (VCEs) Compared with the Estimated Ordered Choice Models

S/N	Variables	Ologit	Ologit (Robust Standard Errors)
1.	Age	-.1565474** (.0709526)	-.0875975 (.0393123)
2	Gender	.9155085* (.306727)	.5520777 (.1467284)
3	Educational level	-.0087543 (.0185635)	-.0025444 (.0109895)
4	Geographical location		
	2	1.337826* (.2850951)	.7515958 (.1720067)
	3	1.175759* (.2904956)	.6298406 (.1792959)
5	Farming experience	-.0185222 (.0243697)	-.0126056 (.0146415)
6.	Age2	.0019186** (.0009018)	.0010803 (.0004978)

Wald chi2(7) = 32.50
 Prob > chi2 = 0.0000

Compiled from the researcher's field work (2015) and analysed using Stata 11 software package

The Misspecification Test Result

Table : The Link test for Specification Bias

S/N	Variables	Coefficients	P values
1	_hat	-.0714621	0.10
2	_hatsq	-.6080666	-1.48

Compiled from the researcher's field work (2015) and analysed using Stata 11 software package

Discussion of Findings

From table (I) it is evident that the highly significant coefficients are those of gender and location meaning both variables significantly determine farmers' decision to obtain credit from commercial banks in the study area. For example, the coefficient of gender being positive indicate that the likelihood of borrowing is always increasing for male farmers rather than female farmers such that the marginal effects or rate of change in probability of deciding not to borrow decreases by 15% if a farmer is a male and vice versa. On the other hand, age also significantly explain farmers decision to borrow looking at the coefficients of age and $age2$ @95 confidence level. The sign of the variable conforms to the lifecycle theory in which at a younger age the tendency of borrowing is higher due to low income but as age advances, this tendency declines. However, educational level of farmers and their experience in farming turned out to be insignificant in all the models. But the likelihood ratio is highly significant hence the parameters could be said to be jointly significant despite the low value of the Pseudo R^2 . So also in the robust model the wald χ^2 is also significant all pointing to the fact that the variables are jointly significant. Although the link test result in table III indicates a slight evidence of misspecification which could be due to omission of some variables it could be stated that the models are free from specification bias because the hat coefficient is significant at 90%.

Conclusion

From the foregoing, it is necessary to stress that unless agricultural lending by commercial banks is structured to reflect farmers' individual attributes, they (farmers) are less likely to borrow from commercial banks in order to finance their production. And low patronage of commercial banks' loans by farmers given the acute shortage of capital in the sector will continue to pose a serious threat to the development of the agricultural sector in particular and the economy in general despite the current drive by governments at all levels to boost domestic production.

Recommendations

Based on the findings of this study, it is recommended that commercial banks' loan classification should reflect farmers' individual attributes. For example, since there is more tendency for the younger farmers to borrow, some incentives could be used to make commercial bank loans more attractive to them. In other words, the youth should be targeted. Similarly, a female friendly loan application and repayment procedure can be introduced such that the lending protocols are relaxed for the women farmers in a way that they are encouraged to apply for and benefit from agricultural loans. Lastly, cash/credit Centre's should be established in remote areas to cater for rural farmers.

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