

MICRO CREDIT DEFAULTERS

Submitted by:

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We first would like to thank god for giving us the opportunity to be here and make this project. Secondly, we thank our families for their unwavering support and great sacrifices in order to help us reach this moment. We would also like to thank the faculty of Mohd Kashif sir and FLIP ROBO for their work and efforts to give us the best education possible in order to reach our full potential, especially our SME Mr.Mohd Kashif for his guidance and assistance in not only this but Throughout our entire journey.

**INTRODUCTION**

Many micro financing institutions (MFI) are operating in developing countries where micro-loans are a valuable credit source for segments of the population that are in many ways restricted from traditional banking credit lines. This market participation adds to the overall operational risk of a MFI however, as the majority of borrowers are those with little to no credit history.

This lack of any credit trail invariably opens up the information asymmetry gap between the loan recipient and the MFI which subsequently increases the challenge in distinguishing between good and bad loans.

Existing research indicates classification models, both parametric and non-parametric, can help improve the prediction of loan outcomes for MFIs, but there are still high associated misclassification costs due to the presence of information asymmetry. Much of the research in this domain has also been applied to data sets composed of demographical attributes that are not always readily available in a digital app driven business.

In P2P lending, various forms of social network data have been introduced to mitigate the information asymmetry gap and the integration of such data has been shown to improve default rate prediction.

Formal banking began in Ghana (then the Gold Coast colony) in 1896 with a local office of the Bank of

British West Africa [1]. Barclays Bank DCO followed in 1917 [2]. The Gold Coast Cooperative Bank was

established in 1945 as the first indigenous bank. But till date Ghana’s commercial banking system, which

has about twenty-three (23) major banks, reaches only about 5% of households and captures 40% of money

supply [3].

Most individuals, micro and small businesses in Ghana do not possess the documentary evidence required in

the credit methodology such as long-standing bank-customer relationship and collateral which the traditional

commercial banking principles demand [4].

Available data from the Registrar Generals Department indicates that 90% of businesses, registered in Ghana

as of December 2016 were small and medium scale enterprises (SMEs). According to the 2010 population

and housing census, 80% of the working population is found in the private informal sector while 63% of the

populations live in rural areas and this group is characterised by lack of access to commercial credit facility

[5].

These observations indicate that a major barrier to the speedy development of the private sector which is the

engine of growth of the economy is the lack of access to credit facility.

The core of Ghana’s development strategy has focused on poverty reduction.

The foremost goal of Ghana’s Growth and Poverty Reduction Strategy (GPRS) is to eradicate widespread

poverty and growing income inequality, particularly among the productive poor who form the majority of

the working population. These trends justify why governments in developing countries and their developing

partners in the recent decades have emphasised the need for microfinance.

It has been identified as one of the best means of providing small loans and other financial services to poor

low-income households and microenterprises.

However, microfinance credit default constitutes a great hindrance to the smooth implementation of the

microfinance policy in Ghana. According to the ARP Apex Bank 2016 annual report, the number of

community and rural banks dropped from one hundred and eleven (111) to ninety-six (96) between the

periods of 1993 and 2010 as a result of loan write-offs [6].

None of the poverty alleviation programs through microcredit entered into by the Government of Ghana

such as the Developing Cottage Enterprise Project (1989), National Board for Small-Scale

Industries(NBSSI) revolving fund scheme (1992), NBSSI/DED credit scheme (1993) and NBSSI/NFED-

Development Assistance (1994) being administered by the NBSSI (which charges 20% interest) has reached

a 70% recovery rate [7].

Empirical research shows that demographic, economic and financial ratios can help to predict company and

individual credit default through the implementation of statistical techniques. Large and medium-sized

enterprises have mainly been the focus of most literature [8].

Kwofie et al. [9] in their study identified the predictors of loan default in Ghana as marital status, number of

years in business and base capital.

Awunyo-Vitor [4] investigated the determinants of loan repayment default among farmers in the Brong

Ahafo region of Ghana using the Probit model. His results showed that farm size, larger loan amount, longer

Boateng and Oduro; JAMCS, 26(1): 1-9, 2018; Article no.JAMCS.33569

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repayment period, access to training and engagement in off farm income generating activities reduces the

likelihood of loan repayment default significantly.

Pollio and Obuobie [6] applied logistic regression on four factors and concluded that the probability of

default increases with the number of dependents, whether the proceeds are used to acquire fixed assets, the

frequency of monitoring, decreases with the availability of non-business income, years in business, the

number of guarantors, whether the proceeds were used for working capital purposes and whether the client is

a first-time borrower.

Kocenda Vojtek [10] developed a specification of the credit scoring model with high discriminatory power

to analyse data on loans at the retail banking market. They were able to detect that the most important

characteristics of default behaviour were the amount of assets the client has, the educational level, marital

status, the use of the loan and the duration for which the client has had an account with the bank.

Continuous default by borrowers affects the economic growth of every country and is therefore a major

concern for governments and financial institutions.

To ensure that credit worthy customers do not carry the burden of default of other persons, the government

of Ghana through legislative instrument, the Borrowers and Lenders Act 2008, has provided a legal

framework to prohibit certain credit practices and also to promote a consistent framework related to credit.

But till date, the rate of credit default is high with the aggregate non performing loan ratio of the banking

industry at 23.6% as at December 2015 [3].

One of the major barriers to the development of microfinance in Ghana is credit default. According to the

ARP Apex Bank Report 2015, microfinance credit default accounted for the majority of bankruptcies of

microfinance institutions in Ghana.

It is against this background that this paper presents a statistical validated model to predict the factors that

contribute to microfinance credit default using logistic regression model.

**ANALYTICAL PROBLEM FRAMING**

Data pre-processing and training Once the independent input variables X have been defined, and the dependent output variable Y, which indicates whether a certain microcredit should be granted or not (variable Credit granted), the dataset instance is used to perform the appropriate pre processing.

In this process, missing or null data have been considered, which can affect the training of the models, the evaluation and management of the missing data is carried out, due to human error, as they are not entered or not declared, the accumulation of missing values are evaluated and are identified as null values.

To complete the missing data, first a count of the null values in the entity’s dataset, completed with the mode of the variable, as they were categorical data type variables, next, data exploration was performed, analyzing the dataset. In this analysis it is considered whether it is necessary to apply the normalization of variables of numerical type, in order to obtain

**MODEL/S DEVELOPMENT EVALUATION**

Machine Learning Model Comparison After the training is completed; the evaluation of the Machine Learning models is carried out, where tree obtains the best score in Accuracy, followed by ANN, which reflects a global measurement of the granting of micro credits, since this metric depends on the balance of positive and negative cases. Applying Recall, the model with the best score is RF, followed by ANN, which indicates the ratio of micro credits identified as granted out of the total that should be granted, this metric also focuses on positive cases. In F1 Score, the first place is occupied by tree, followed by ANN, which indicates the precision of the micro credits granted, this metric involves the balance between the Precision and Recall metrics, it focuses on positive cases. Finally, in AUC ROC the model with the best ANN scores.

The ANN model used automates the analytical models development with the minimal human intervention, works by receiving a variables set in the input layer, a linear combination is used to generate new characteristics, and an activation function that allows generating a neuron as output, which is the input of the next layer; in the hidden layers, new characteristics of the previous layers are generated, until reaching the output layer, obtaining a predicted value (forward propagation). The predicted value is readjusted to minimize the error margin of previous iterations until the model converges through 50 epochs with 0.001 learning rate, using the Adam optimizer.

Considering the results of the AUC ROC metric, the performance of the algorithm is obtained through the ROC curve, shown in Figure 1, so the evaluation of their performance accomplish according with its non-discrimination line, the most assertive micro lending model is the Artificial Neural Networks (ANN), determining which loans should be granted or not granted with 93.72% of assertiveness, the data of loans granted in the period of analysis by the entity with its traditional methodology reaches 76.81%, and with the ANN model 93.72% is achieved, showing an improvement of 16.91% in the index of delinquent customers.

* **RANDOM UNDERSAMPLING**

Random under sampling is a simple under sampling based approach. Majority class instances in the training set are randomly eliminated until the ratio between the minority, and the majority class is at the desired level. Theoretically, one of the problems with random under sampling is that one cannot control what information about the majority class is thrown away. In particular, crucial details on the decision boundary between the minority and majority class may be eliminated. Despite its simplicity, random under sampling has empirically been shown to be one of the most effective re sampling methods. In particular, few of the more sophisticated under sampling methods have outperformed random under sampling in empirical studies. In random under sampling, examples have been randomly removed from the majority class to balance the class instances, which results in the removal of vital information from the majority class.

* **CLUSTER CENTROID**

One major problem of using under sampling is that important information may be lost from the majority class, which can cause overly general rules, which means samples can be misclassiﬁed after classiﬁcation. This cannot be afforded

To develop the credit card default prediction model, especially for default samples. Hence, to overcome this problem, the Cluster Centroids method has been introduced in [30].Cluster Centroids under samples the majority class by replacing majority samples from clusters with the cluster of cancroids using the K-means algorithm by considering the ratio of majority class samples to minority class samples

* **RANDOM OVERSAMPLING**

Like random under sampling, random oversampling is a simple yet effective approach to re sampling. Random Oversampling is a very naive approach to data oversampling. It merely replicates the minority class examples and adds them to the training data. By using this technique, new examples come

From the existing minority class examples in the training set those results in the problem of over-ﬁtting

**CONCLUSION**

The microfinance institution analyzed specializes in rural micro credits, it was determined that the loan default of the analyzed entity represents 23.19%, therefore the credit risk level must be minimized. The entity’s process was evaluated to determine the variables involved in the rural credit granting, based on empirical variables and were validated through the literature review in the credit risk field, the use of tools that allow better results to be obtained through a computational model based on Artificial Intelligence to grant credits more assertively has been determined, which reduce loan defaults. In this way, a tool is obtained that serves as a decision-making aid for personnel specialized in granting loans.

The data preparation has considered the determination of the most significant variables to be used; finding a coincidence of 25 empirical variables supported in other studies and 9 variables typical of the proposed rural microcredit granting. Machine Learning models applied to credit risk were used which were selected, trained and evaluated.

Machine learning methods, in conjunction with the use of imbalanced methods, have been utilized in various domains. The objective of this paper is to train various supervised learning algorithms to predict the client’s

Behaviour in paying off the credit card balance. In classiﬁcation problems, an imbalanced dataset is also crucial to enhance the performance of the model, so different resembling techniques were also used to balance the dataset.

We ﬁrst investigated the datasets by using exploratory data analysis techniques, including data normalization.

The study showed that educational level, number of dependents, type of loan, adequacy of loan, duration for

repayment of loan, number of years in business, period within the year the loan was acquired and how the

customer ranks the interest charged on the loan were significant determinants of micro credit default. Based

on the findings of this study, the following recommendations are suggested;

The Microfinance Institutions (MFI’S) should adopt the group loan policy as the main mode through which

microcredit may be issued to suitable applicants. Considering the current value of the Ghana cedi relative to

the exchange rates and the economy as a whole, the MFI’S

should consider increasing the size of loan

amounts. The government through the Ministry of Health should also collaborate with agencies such as the

Planned Parenthood Association of Ghana to educate the populace, especially the rural and semi-rural folks,

on the importance of family planning.This would help decrease household sizes and consequently decrease

their expenditure levels which are a major determinant of default. The MFI’S should team up with the

Ministry of Education through the Non-Formal Education Division to organize functional literacy

workshops for microcredit beneficiaries to equip them with the required knowledge to do successful

business. The government through Bank of Ghana and the ARP Apex Bank should come out with more

stringent policies and if possible Acts to effectively control the cost of capital (interest rate) being charged

by MFI’S. Finally, the MFI’S should give out long term loans preferably one to two years repayment period

rather than one to six months repayment period which is typical of most micro loans and also MFI’S

should

be more cautious when issuing loans in the last quarter of the year.

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