

Islamic Credit Risk Analysis: Case Of Sudanese Banking Sector (2006-2014)

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Abstract: Islamic banking system has been expanding so quickly over the past few years. Moreover, it has been developing significantly around the non-Muslim territories including Middle Eastern countries, Southeast Asian countries, and European countries and even in North American countries. The existing of Islamic banks is to attract the customers who seek to avoid interest. The prediction of corporate bankruptcies is an important and widely studied topic since it can have significant impact on bank lending decisions and profitability, the ultimate purpose of credit risk management is to ensure that credit fund is of safety, profitability and fluidity. At present, it is extremely important of commercial banks to set up an early bank risk warning system.

Index Terms: Credit Analysis, Classification, Islamic Credit, Finance Mode

1 INTRODUCTION

Conventional banking is largely based on interest rates, accounting, various products and services, risk management activities, as well as long-term strategies, which are based on interest rates. Islamic scholars have raised questions about the necessity and validity of the interest in the process of financial intermediation. In the desire to provide sustainable and justified distribution of wealth and income, Islamic finance has attempted to find alternates to the conventional form of financing. Interest has been considered as a form of exploitation since it is merely a charge on money. Hence, the prohibition of giving and taking interest among the Muslim population can be considered as a prime reason for the origin of Islamic banking. A common thread running across all these tenets is protection of the poor and weak from exploitation by the rich and powerful. Islamic finance has a strong root in sustainable society with focus on welfare, equality, and justice. Social implications of commercial activities cannot be neglected in Islamic finance since it has a strong emphasis on a socially responsible form of financing. The activities of Islamic finance are not purely materialist, although profit is a motive, but it is supported by strong social responsibilities and accountabilities. The social objectives cannot be separated from commercial objectives in Islamic finance. Some of these differences between conventional financing and Islamic financing are summarized in Table 1.

The rest of this paper is organized as following, first we will discuss the Islamic finance in Sudan, its history and time-line of development, second Islamic credit risk will be covered along with credit risk models, third we will present data set properties, then we will discuss the model design and its results, finally discussion and suggested future work will be highlighted.

2 ISLAMIC FINANCE IN SUDAN

The banking system in Sudan has passed through six stages. The first stage, from 1903 to 1956, during the British colonial rule, was characterized by the domination of foreign banks branches in Sudan. The second stage from 1956 to 1976, following the independence of the country, witnessed the establishment of the Central Bank of Sudan (CBOS) and other national banks, which operated, hand in hand, with the then existing branches of foreign banks until their nationalization and amalgamation into national banks between 1970 and 1975. The third stage, from 1976 to 1989, was marked by the declaration of Shari'ah law in Sudan, Islamisation of financial legislations, and establishment of many Islamic banks. The fourth stage, from 1989 to 2002, witnessed the strengthening of Islamisation of financial institutions and legislation. The fifth stage, from 2002 to 2011, following the Comprehensive Peace Agreement (CPA), signed in 2002 between the Government of Sudan and the Sudan People Liberation Movement (SPLM) of South Sudan, has been embodied in the Transitional Constitution of the Republic of Sudan, and the financial system witnessed the establishment of two banking systems in Sudan. An Islamic banking system existed in the North of Sudan, whilst it was agreed in the Nevasha agreement that a conventional banking system would be implemented in the South of Sudan. The sixth stage was the return to a full Shari'ah - compliant financial system following the declaration of independence of South Sudan. The emergence of Islamic banks has helped in attracting considerable funds to the banking system.

3 ISLAMIC CREDIT RISK

Conventional banks face credit risk in almost all of their operations, because the relationship between the banks and those who transact with them is that of a debtor with a creditor in all cases. Islamic banks also face this form of risk in most of the modes of financing that they use. It is well known that murabaha, Istisna, and installment sale are sales with delayed payment thus generating debts in the accounts of the banks. The fundamental form of risk in all these contracts is credit

Islamic finance	Conventional finance
Interest is prohibited	Primarily based on Interest rate
Unstructured and still informal in many ways	Structured and formalized
Stress on social, ethical and financial efficiency	Stress on financial efficiency
Standards for risk management, accounting and other activities are still developing	Highly systematized in terms of risk management, accounting and other and other standards
Non-existence of short-term money market	existence of short-term money market

Table 1: Differences between conventional and Islamic financing.

risk. Salam gives rise to a commodity debt rather than a cash debt, but it also involves credit risk. Mudarabah and Musharakah, on the other hand, are contracts of participation, and the funds given by the bank to entrepreneurs are not liabilities. Nevertheless, these two also bear a credit risk in two ways. First, in the case of wrongful act or negligence, the entrepreneur is liable to guarantee the capital which means a debt liability. Second, when the capital of Mudarabah or Musharakah are employed in a deferred sale, which is what takes place in most Mudarabas, the owner of capital (rabb al-mal), the bank in this case, bears an indirect credit risk. This risk pertains to the ability of the counter parties to repay.

3.1 CREDIT ANALYSIS MODELS

The basic idea of this research is different from normal credit scoring systems, because the other models were built to score the clients for commercial banks where the proposed model is targeting the macro risk analysis for whole banking sector. Instead of classifying clients in term of loan applications information, banks will be scored in term of Islamic finance modes used or any other information regarding the credit operations. After reviewing the literature of related work, logistic regression outperformed other models [3] with the following advantages:- It is more robust: the independent variables don't have to be normally distributed, or have equal variance in each group, It does not assume a linear relationship between the independent variables and dependent variables, It may handle nonlinear effects, Ability to add explicit interaction and power terms, The dependent variables need not be normally distributed, There is no homogeneity of variance assumption, Normally distributed error terms are not assumed, It does not require that the independents be interval, It does not require that the independents be unbounded. But in correspondent, logit analysis requires much more data to achieve stable, meaningful results, which is the case of selected data set (more than 50 data points per predictor) as we will explain in the later section. Logistic regression produces models that are easy to explain and implement and has been widely accepted in the banking industry as the method of choice. The focus of the rest of the study will therefore be logistic regression is application in credit risk analysis.

4 DATA SET PROPERTIES

Data has taken from DAS (Data Acquisition System), banks regularly send their finance information containing the dimensions required by central bank to study weather banks comply with finance policies and circulars or not. Those dimensions are (finance mode, sector, payment type, bank) along with customers and non-performing loan amount. Our sample consists of 15218 bad cases and 1078 good ones. This implies the bad rate of the whole sample equals almost to 70 percent. There is an empiric condition that if anyone wants to create a robust logistic model, they need to have the bad rate of at least 5 percent. As our bad rate is far over to this level, we will assume that this condition has been fulfilled. In this phase in the following paragraphs, the variables that are going to be used in the model are Payment Method, Mode of Finance, Sector.

5 MODEL DESIGN AND RESULTS

The logistic regression modeling analysis will use an automatic stepwise procedure, which begins by selecting the strongest candidate predictor, then testing additional candidate predictors, one at a time, for inclusion in the model. At each step, we check to see whether a new candidate predictor will improve the model significantly. We also check to see whether, if the new predictor is included in the model, any other predictors already in the model should stay or be removed. If a newly entered predictor does a better job of explaining loan default behavior, then it is possible for a predictor already in the model to be removed from the model because it no longer uniquely explains enough. This stepwise procedure continues until all the candidate predictors have been thoroughly tested for inclusion and removal. When the analysis is finished, we have the following table that contains various statistics. from variables in the equation table which shows the contribution of each independent variable to the model and its statistical significance The Wald test ("Wald" column) is used to determine statistical significance for each of the independent variables. The table shows that Payment Method not significant predictor and so it is excluded from the classification model that the logit analysis has completed in two steps, first using Sector variable, and then Mode of finance variable. From the same table we can decide about the significance of every single category of available variable values, while the "B" column is convenient for testing the usefulness of predictors, the "Exp (B)" column is easier to interpret. Exp (B) represents the ratio change in the odds of the event of interest for a one unit change in the predictor. so as a result of logit variables in the equation table analysis only following variable values found to be significant and possess a certain degree of power among other values

Variable	Value	Sig	Exp (B)
Mode of Finance	Murabaha	.000	.077
	Mudarabah	.000	.0098
	Other	.001	.0285
	Deferred Credit	.000	.16
	Letters of Guarantee	.000	.005
Sector	Summer agriculture	.004	.28
	Short term agriculture	.000	.42
	Poultry	.000	.1
	Short & long term agriculture	.003	.30
	Public Non-Financial Sector Transportation: Short Term Local Finance	.000	.54

Table 2: Significant Predictors Summary.

In Mode of Finance variable, deferred credit finance mode considers the most significant finance mode with Exp (B) equals to 16.025 which means odds of default for deferred credit is almost 16 times the odds of default for other finance modes followed by Murabaha with almost 8 times, Other finance modes indicates that banks sent their finance data without specification of finance mode used. Interestingly Salam is not considered significant although it used heavily in agricultural projects finance as well as Mudarabah which ranked last at the significant finance modes. On the other hand, Public Non-Financial Sector Transportation: Short Term Local Finance Sector considers the most significant in bank default probability with odds of its default account 54 times other sectors followed by Public Non-Financial Sector agriculture: Mid and long term finance, Public Non-Financial Sector : Short term Agriculture and Summer Agriculture respectively , it's obvious that agricultural sectors considers the main determinant of the default possibility of Sudanese commercial banks , so special attention should be there while approving credits for such operations. Binomial logistic regression estimates the probability of an event (in this case, having defaulting loan) occurring. If the estimated probability of the event occurring is greater than or equal to 0.5 (better than even chance), classification tool (SPSS) classifies the event as occurring (e.g., bank default being present). If the probability is less than 0.5, SPSS Statistics classifies the event as not occurring (e.g., no bank default). It is very common to use binomial logistic regression to predict whether cases can be correctly classified (i.e., predicted) from the independent variables. Therefore, it becomes necessary to have a method to assess the effectiveness of the predicted classification against the actual classification. However, all methods revolve around the observed and predicted classifications, which are presented in the "Classification Table", as shown in table 3. The table shows that the model correctly classified about 92.5 percent of the modeling sample's defaulters and about 40 percent of the modeling sample's non-defaulters, for an overall correct classification percentage of about 89.1%.

Classification Table					
	Observed		Predicted		
			Defaulted?		Percentage Correct
	0	1	0	1	
Step 2	Defaulted?	0	431	646	40
		1	1124	14094	92.5
Overall Percentage					89.1

a. The cut value is .500

Table 3: Classification table for credit risk model.

6 DISCUSSION

The selected model shows satisfactory performance with overall classification performance 89.1 percent but we noticed high percentage of type I error (59 percent) and relatively low type II error 7.5 percent, the objective is to maintain the lowest type II error which means not wrongly classified defaulted credits as good ones which achieved by our model. Murabaha

considers the most used finance mode in Sudanese banking sector due annual financial reports produced by central banks of Sudan since 2004, but in contrast deferred credit is found the most significant Islamic finance mode which can be used to predict the possibility of bank default. By reviewing the usages of differed credit finance mode we found that is mostly used in import and export operations which have direct relationship with national balance of payment. Table 4 presents balance of payment information.

Year	2005	2006	2007	2008	2009
A- Current A/C	-2,830.30	-4,919.40	-3,268.20	-1,575.70	-3,908.10
Trade Balance	-1,121.70	-1,448.10	1,156.80	3,441.10	694.6
Exports (FOB)	4,824.3	5,656.6	8,879.20	11,670.5	7,833.70
Imports (FOB)	-5,946.	-7,104.0	-7,722.4	-8,229.40	-8,528.0
Services, Income & Transfers A/C	-1,708.60	-3,471.30	-4,425.00	-5,016.80	-3,213.80
B- Capital & Financial A/C	2,427.20	4,611.00	2,945.50	1,218.50	4,663.30
Direct Investment (Net)	2,304.60	3,541.40	2,436.30	2,600.50	2,922.80
Portfolio Investment (Net)	11.1	-35.3	45.6	-33.4	7.4
Other Investment (Net)	111.5	1,104.90	463.6	-1,348.50	1,733.10
Omissions & Errors	933.6	99.8	40.7	378.3	-1,257.2
Official Reserve Asset of Transferable Currencies	-530.5	208.6	282	-21.1	502
Overall Balance	530.5	-208.6	-282	21.1	-502.2

Table 4: Sudan National Balance of Payment (2005-2009) [4]

The data on the table 4 provided by central bank of Sudan, define the huge gap between imports and exports (-502.2 M) although this data was taken during the period when Sudan economy high performance before the crises caused by south-Sudan separation, the bond is found in large volume of import operations which have been executed using differed payments and customers didn't fulfilled their obligations leading putting the whole credit system at risk. Subject matter experts should find a way to mitigate these risks such like increase the advance payment percentage or assure the loan collateral sufficient to absorb the later payments difficulties. Reforms can extend to prohibit some finance modes just like what stated in 2016 monetary policy issued by central bank of Sudan which ban the usage of all forms of restricted Mudarabah. Agricultural sectors found to be the most significant sectors as a normal result if we take in consideration the volume of agricultural investment in the country but transportation sector found the most predictive factor, central bank of Sudan knew this fact and decide to interfere by issuing many policies to organize the transportation sector finance, the latest policy has issued in July 2013 which states "Exception to finance public

transport from the publication No. (3/2012) dated 08/01/2012 AD Requirements and on the regulation of finance Murabaha, specifically item, which is required to collect the premium offered to finance Murabaha and set at 40 percent of the funding”, this indicates that expert on the CBOS has discovered the risk exposed through financing public transportation and tried to control it by increasing the advance payment portion from the total credit amount. Payment type was found not significant in credit risk analysis, didn't include this variable in both logistic regression steps give the evidence that the repayment loan type weather in (cash, cheaques or stocks) has no effect on loan default possibility.

7 CONCLUSION AND FUTURE WORK

We have demonstrated the use of risk modeling using logistic regression analysis to identify macro finance characteristics associated with likelihood to default on a bank loan. We identified that finance mode and sectors are important predictors for designed model, deferred credit finance mode found the most significant finance mode letters of guarantee and Mudarabah on other hand were significant but have less power than Murabaha, other finance modes were classified not significant. Non-Financial Sector Transportation: Short Term Local Finance Sector considers the most significant in bank default probability, payment type didn't classify as important predictor for Islamic credit risk analysis. The selected model shows satisfactory performance with overall classification performance 89.1 percent. As a future work, new Islamic credit risk dimensions can be studied beside payment method, finance mode and sector by building new data model depending on the newly established credit agency (CIASA) in Sudan which exposes new information.

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