Assessment of the Financial Performance of Islamic Commercial Banks in Sudan under Credit Risk and Inflation Pressures (1995-2017)

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Abstract

The study aims to assessment the financial performance (FP) of Islamic Commercial Banks (ICBs) in Sudan under credit risk (CR) and inflation pressures (1995-2017). Data were collected from the annual reports of the Central Bank of Sudan (CBOS). Unit root test were applied. Ordinary least square method were used to determine the direction of the relations between the FP measured by return on assets (ROA) as indicator the dependent variable and the following independents variables: ratio of nonperforming loan to total finance, ratio of provision finance by *murabaha* mode to total finance, capital adequacy ratio and inflation rate were used as indicators the CR. The results found that the CR indicators are negatively affecting the FP of ICBs. The study recommends that ICBs should not totally rely on collateral as a reason for expanding the provision of finance in *murabaha* mode as the market value of collateral might decrease against the finance. CBOS should adopt contractionary monetary policy to reduce inflation. Moreover, implementation of Basel Accord to support ability of the regulatory capital of ICBs to cope with CR.

Keywords: Assessment; Financial Performance ;Islamic Commercial Banks; Sudan ;Credit Risk

1. Introduction:

Islamic banking is a financial system with key aim is to fulfil the teachings of the Holy Quran. The issue of credit risk (CR) in Islamic Commercial Banks (ICBs) has become more significant because of its influence on the financial performance (FP). Basel Committee on Banking Supervision (BCBS) defined CR as the possibility of losing the outstanding loan or finance partially or totally, due to credit events or default risk and asserts that loans are the largest source of CR. Therefore, it is a requirement for ICBs to identify measure, monitor and control CR and determining how it could be lowered (BCBS, 2001). This study aims to assess the FP of ICBs under the CR and Inflation Pressures in Sudan during (1995-2017).

1.1 Statement of the Problem:

According to the annual reports of the Central Bank of Sudan (CBOS) for the period (1995- 2017), ICBs provision more than 45% of their finance to the customers by *Murabaha* mode. This concentration of finance might exposure ICBs to CR and may lead to deterioration of FP. The problem of the research can be presented by the following question: What is the impact of CR and inflation on the PF of ICBs?

1.2 Importance of the Research:

Although a significant studies done on the efficiency of Islamic banking globally, there is still a little quantitative analysis done on the FP of ICBs.CR affects the ability of ICBs to providing finance to various economics sectors, so this matter considered one of the most important issues facing the (ICBs) in Sudan.

1.3 Objectives of the Research:

The main purpose of the study is to evaluate and examine empirically the relation between FP of the ICBs and CR indicators in Sudan (1995-2017). Moreover, to achieve the following sub-objective:

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- To clarify the influence of macroeconomic environment (inflation) that might affects the FP of (ICBs).
- To evaluate the CR management policy implemented by the CBOS.
- To briefly review of history of Islamic banking and modes of finance.

1.4 The Research Hypotheses:

The following hypotheses will be examined:

- CBOS credit policy plays major role in mitigation CR associated with (ICBs) through implementation of BCBS guiding principles.
- There is a significant relationship between the FP of (ICBs) and CR indicators; (Nonperforming loans, provision finance by *Murabaha* mode, capital adequacy and inflation rate).

1.5 The Research Methodology and Data:

To investigate the relationship between the dependant variable (FP of ICBs) and the independents variables (CR in terms of inflation, nonperforming loan, capital adequacy and provision finance by *Murabaha* mode), ordinary least of square were conducted. Data were collected from annual reports of CBOS. Unit root test were applied.

1.6 Literature Reviews:

Allen, L. (2003) examined how macroeconomic factors and risk effects are incorporated into measures of CR exposure. The study found that the correlation between default and loss given default is also neglected in currently available models.

Heffernan, (2005) stressed that CR is the risk that an asset or finance becomes irrecoverable, in the case of total default or the risk of delay in servicing of loans and advances.CR emanates from a bank's financial exposure to dealing with individuals, corporation, financial institutions or a sovereign. Allen, (2011) examined four methods used in the measurement of CR and provide the shortcomings and advantages of each method. The study includes external ratings approaches, financial statement analysis model, the Merton / KMV structural model, and the transition based model of Credit Metrics and Credit Portfolio View. The study found that, each model assesses different criteria. Kargi, (2011) investigated the impact of CR on the banks profitability in Nigeria (2004 - 2008). The ratio of nonperforming loans to total loans (NPLTL) and the ratio of total loans and advances to total deposit (TLATA) were used as indicators of CR while ROA indicates performance. The results found that ROA is inversely influenced by the levels of NPLTL and TLATA, thereby exposing the banks to great risk of illiquidity and distress. Ravi, (2012) explored various parameters (default rate, cost per loan assets and capital adequacy ratio) pertinent to CRM as it affect bank's performance (2001-2011) .The study revealed that all these parameters have an inverse impact on the FP.

Swartz,(2012) reviewed the guidelines for CRM in Islamic banking and issues related to the nature of risks arising from the use of funds of ICBs. The study found ICBs system is primarily equity-based, therefore, ICBs conduct business on a PLS principle. Srinivas, (2013) examined empirically the impact of CR on the FP of Tanzanian Banks (2006-2013). Banks' profitability was measured by the return on assets (ROA) and CR were measured by two ratios ; Ratio of nonperforming Loans to Loans Advances (NPL/ LA) and ratio of loans advances to total deposits (LA/ TD). The results revealed that there is a negative relationship between CR and FP of Tanzanian banks. Mutual,(2014) examined the relationship between CR and profitability of commercial banks in Kenya. The study found that CR measures: non-performing loan, loan loss provisions and capital adequacy have a significant impact on the profitability.

Hussain & Naysay, (2014) showed that the CRM practices in ICBs in Kuwait through addressing CRM processes, type of risks, and measuring and mitigating risks. The finding indicated that the practices of CR in ICBs in Kuwait is almost similar to the practices of used by conventional bank in Kuwait in term of risk management process, tools that measure the CR and the techniques adopted to mitigate risks.

Tadesse, (2014) examined empirically the effect of CR on the FP of Ethiopian banks (2008-2012).The investigation uses ROA to represent the FP. The econometrics method used the provision to total loans, loan to total asset, credit administration and natural logarithm of total asset, on the performance of the banking sector. The study found that the selected variables have significant effect on the FP. Kader,(2015) discussed CRM in ICBs focuses on the credit risk, operational and Shari'ah risks during (2007-2009), The study found that ICBs are submerged in the global system makes the risk treatment not only urgent but also extra complicated. Tekalagn et.al,(2015) investigated the relation between CRM and its impact on the FP of 9 Ethiopian banks (2009-2014) .

ROA and Return on equity (ROE) were used as performance variables while Capital Adequacy Ratio (CAR), NPL, Loan provision to Total Loan (LP/TL), Loan Provision to Non-Performing Loans (LPNPL), Loan Provision to Total Assets (LPTA) and Non-Performing Loans to Total Loans (NPLTL) were used as variables of CRM. The findings reveal that there is strong relationship between CRM and the FP in Ethiopia.

Suleiman, (2015) examined the effect of CRM on FP of the Jordanian commercial banks (2005-2013).The study revealed that, the CRM effects on FP of the Jordanian commercial banks as measured by ROA and ROE. Djan et.al, (2015) examined the impact of CR on performance of banks in Ghana (2005-2014).In the study parameters covered were; default rate, cost per loan assets and capital adequacy ratio. The study revealed that all these parameters have an inverse impact on banks' performance. Adesugba et.al, (2016) examined the relationship between CRM and performance in deposit money banks in Nigeria (2010-2015). The found that, most research conducted under this study shows a significant relationship between CRM and performance using ROA and ROE in Sub-Saharan countries.

Although, a growing body of research has discussed the impact of the CR on both developing and developed countries, however, few researches have investigated the impact of the CR on the FP of ICBs in Sudan. Thus this study aimed to examine empirically the impact of CR on the FP of ICBs in Sudan during (1995-2017).

2. Islamic Banking: A Historical and Religious Perspective:

Although the establishment of Islamic banks (IBs) has only become a reality in the 1960s, it does not mean that Islamic banking activities do not exist in the history of Islam (Taqiuddin, 2013). Banking activities had begun in the Arab land with its operation based on riba (usury). During that time the Arabs also gave their money to another party for trading through the methods of al-*Qirad* or *al-Mudarabah* to gain profit. These methods were famous among both of Arabs and the Jews during that time (Karim, 1996). Activities such as receiving of deposits, loans, money exchange and other exchange bills that are considered as modern banking practices took place during the time of early Islam and the time of Islamic development. The origin of the modern IBs can be traced back to the birth of Islam from the days of Prophet *Mohammad* (peace be upon him) when he used to work as agent in his wife's own business operations through - *Mudarabah* - Islamic partnerships (Khurram, 2013). IBs emerged in the early 1960s with the objective of developing and providing alternative financial contracts in conformity with Shari'ah principles as necessitated by Islam. Islamic modes of financing were used in different parts of the Muslim world but the institutionalization of Islamic finance in the form of banks and financial institutions became possible with the establishment of the first Islamic social bank, *Mit-Ghamr Islamic Saving Associations* in Egypt in 1963 (Mehmet, 2008).

Since 1970s, a number of Islamic based banks appeared .*Nasir Social Bank* in Egypt in 1971; *Nasir Social Bank* was established and declared itself as a commercial bank without interest rate. *Philippine Amanah Bank* was established in 1973 by presidential decree. The establishment of the *Islamic Development Bank* (IDB – Jeddah KSA) in 1974 was a watershed moment for Islamic banking, coming just after the establishment of the first major Islamic commercial bank—the *Dubai Islamic Bank*—in the United Arab Emirates in 1975. The success of the latter led to the establishment of a series of similar banks, including *Faisal Islamic Bank* (Sudan) and *Kuwait Finance House* (Kuwait) both in 1977, *Bahrain Islamic Bank* (Bahrain) in 1979, *Tadamon Islamic Bank* (Sudan) in 1983 and *Pilgrims Savings Corporation* established in Malaysia in 1983 and aims to help those who want to save for a pilgrimage. As early as the late 1970s, steps were taken in Pakistan for making the financial system compliant with Shari'ah principles (IMF, 2015).

The legal framework of IBs was then amended in 1980 to allow for the operation of Shari'ah compliant profit-sharing financing companies, and to initiate bank finance through Islamic instruments. Similarly, Iran enacted a new banking law in August 1983 to replace conventional banking with interest-free banking. The law gave banks a window of three years for their operations to become compliant with Islamic principles. Sudan's efforts to align its entire banking system with Shari'ah principles began in 1984 (Ibid).

3. Islamic Modes of Finance: A brief Description:

The prohibition of interest in Islam raises the question of how financial intermediation will take place in an Islamic economy in which also there will be, as in interest-oriented economies, sectors having a surplus or deficit of savings and liquidity. Islam has encouraged a greater reliance on equity and profit loss sharing (PLS) Basis) by emphasizing on the following primary modes; *Mudarabah* (passive partnership), *Shirkah* or *Musharakah* (active partnership), and shares of joint stock companies (which are a combination of both the *Mudarabah* and *Musharakah* forms of financing), it has also allowed certain secondary modes like *Murabahah* (cost plus service charge), *Ijarah* (leasing), *ijarah wa iqtina'* (hire-purchase), *Salam* (forward delivery contract), *istisna'* (contractual production) and *Qard Hassana* (good loan with zero interest rate), to take care of financial needs that are not amenable to the primary modes.

The difference between these two sets of financing modes is that in the primary modes, the financier's rate of return does not get determined in advance and depends rather on the ultimate outcome of the business. The financier thereby participates fully in the risks of business. In contrast with this, the rate of return in the case of secondary modes gets stipulated in advance. This may make the secondary modes look similar to interest-bearing instruments.

The well-recognized principal of the *Shari'ah* is that: *"No risk, no gain".* The financier has to bear some risk if he wishes to derive an income. If the conditions imposed by the *Shari'ah are* not fulfilled earnestly, the secondary modes may easily degenerate into interest-bearing instruments. There can be no doubt about permissibility in the case of modes where the financier bears the entire risk and about non-permissibility in the case of modes where the financier transfers the entire risk to the entrepreneur. The secondary modes lie in between the two. One may have to be very careful when pronouncing a judgement about them. Their permissibility would depend on the risk that the financier bears and the extent to which the debtor's interest is also safeguarded. Therefore, people would be treading on a thin edge while undertaking secondary modes. Although the legal system should try to create safeguards by specifying clearly the conditions that must be satisfied for the permissibility of these modes, the ultimate safeguard would be the financiers' own conscience (Umer, 1998).

4. Nature and Types of Risk in Islamic Banks:

Major feature of IBs is that they are required to adhere to Shari'ah Principles in all their operations. In addition to facing common risks with conventional financial institutions, IBs also face their own unique risk is called Non-Compliance Risk (IFSB, 2012). The Shari'ah-compliant nature of assets and liabilities distinguishes them from conventional banks while at the same time exposing them to the following risks:

4.1 Shari'ah Non-Compliance Risk (SNCR):

The Islamic Financial Services Board (IFSB) defines the SNCR as the risk arising from Islamic banks' failure to comply with the Shari'ah rules and principles determined by the Shari'ah board or the relevant body in the jurisdiction in which the Islamic bank operates. The failure to comply with such principles will result in the transaction being cancelled, and hence the income cannot be recognized. IBs must ensure that their operations are compliant with Shari'ah requirements (ISFB, 2013).

4.2 Credit Risk (CR):

CR is defined as the chance that a costumer or issuer (bank) of a financial instrument whether an individual, a company, or a country will not repay principal and other investment-related cash flows according to the terms specified in a credit agreement. Inherent to banking, CR means that payments may be delayed or not made at all, which can cause cash flow problems and affect a bank's performance (Endaweke,2015).

4.3 Market Risk (MR):

MR for a financial institution arises in the form of unfavorable price movements such as foreign exchange rates, equity and commodity prices which have a potential impact on the financial value of an asset over the life of the contract. IBs are further exposed to MR arising from the volatility in the values of tradable, marketable assets (Ahmed, 2007).

4.4 Liquidity Risk (LR):

LR is defined as the risk of insufficient liquidity for normal operating requirements, that is, the ability of the IBs to meet its liabilities when they fall due or it refers to inability to fund its day-to-day operations (Heffernan, 2005).

4.5 Operational Risk(OR):

OR is often considered as a residual risk given the fact that any risk faced by a bank that is not market risk or credit risk falls under this category.

BCBS, (2001) identified seven categories of OR associated with IBs includes: Internal and external fraud, employment practices and workplace safety, client, damage to physical assets, system failures and the financial impact associated with an operational event that is recorded in the institution's financial statements consistent with "Generally Accepted Accounting Principles".

5. Risk Management in Banking Business:

Management is defined as the act of planning, directing, controlling, monitoring and testing for desired results to be obtained. Risk on the other is defined as the possibility that something unpleasant might happen.

Banks might expose to one types of risk which in most cases is an uncertainty although at times it can be certain that it will occur .The best possibility for banks is to try to manage the risk so as to reduce the possibility of occurrence or to reduce the consequences. The decision makers in banks they need to first of all identify the type of risk involved, measure its intensity, assess it, monitor it and then look for measures on how to control it.

This act of managing the risk is called risk management (RM). RM is "a course of action planned to reduce the risk of an event occurring and/or to minimize or contain the consequential effects should that event occur" (Williams et al, 2006).
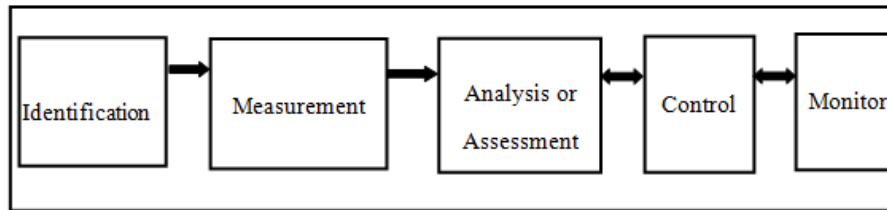
Figure 1. Risk Management Process in Banking Business.
Source: Keith (1992) Pg. 15 / General Literature

## 6. Financial Performance of Banking System in Sudan (1995-2017):

The CBOS adopted a number of international standards and regulation measures complies with the IFSB guiding principles and BCBS accord emphasized on credit risk. Supervisory policies of CBOS aimed at achieving financial stability of banking system to ensure the efficiency and quality. Table (1) and figure (2) shows the financial Solvency indicators of ICBs in Sudan during the period 1995-2017. Table (2) and figure (3) shows the consolidated balance sheet indicators of ICBs in Sudan (1995 – 2017).

Table 1 Financial Solvency Indicators of ICBs in Sudan (1995-2017)

Year	Return on Assets	Non Performing Loan /Total Finance	Capital Adequacy Ratio	Provision Finance by Murabaha	Inflation Rate
1995	0.9	11	4	54.3	69
1996	0.6	13	5.6	53	130.3
1997	(3.3)	15.1	7.2	52	46.5
1998	1	15.6	9	54.3	17.7
1999	1.2	23	6	49.1	16.1
2000	3	16	7	33.7	8.1
2001	0.9	17	11	39.5	4.9
2002	4	13	9	39.5	8.3
2003	5	11	10	44.7	7.4
2004	5.3	9	12	38.5	8.7
2005	5	7	19	43.3	8.4
2006	2.1	19	27	53.4	7.2
2007	2.5	17	25	58.1	8.1
2008	3	15	12	46.9	14.3
2009	3.4	15.1	11	52.3	11.2
2010	3.9	14.1	10	54.7	13.1
2011	4.2	12.6	13	61.4	18.1
2012	4.4	11.9	12	49.9	35.1
2013	3.7	8.4	16.6	53.2	37.1
2014	4.0	7.1	18	52.2	36.9
2015	4.0	5.1	20.2	49.8	16.9
2016	4.7	5.2	18.7	46.2	30.5
2017	3.8	3.3	16.2	48.5	25.2

Sources: Central Bank of Sudan – Annual Reports

Figure 2 . Financial Solvency Indicators of ICBs in Sudan (1995-2017)
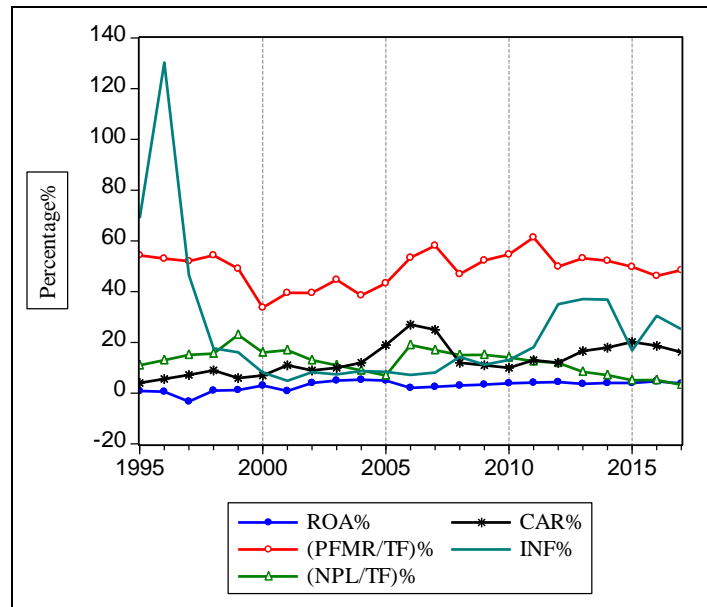
Sources: Central Bank of Sudan – Annual Reports
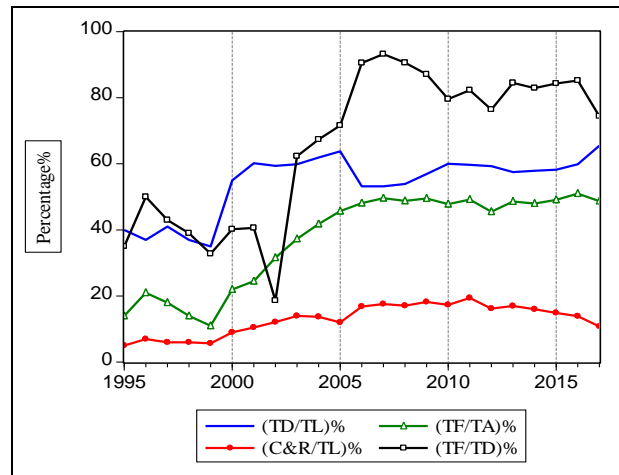Some evidences from table (2) and figure (2):

- The Return on Assets (ROA measures the asset turnover) the minimum value showed in the year 1997 of (3.3) % while the maximum in the year 2005 of 5%.
- The ratio of nonperforming loans to total finance (NPL/TF) decreased notably from 5.2% in 2016 to 3.3% in 2017 reflecting an improvement the assets quality and success of the CBOS in its targeted effort to reach the international indicator 6.0%. However, the NPL/TF ratio was still above the targeted 6% ceiling.
- Capital adequacy ratio (CAR) it reflects the ability of regulatory capital to cope with banking risks (credit, market and operation). CAR rose from 12.0% in 2012 to 16.2% in 2017 as a result of the reduction in the weighted risky assets and the increase in the bank's capital, deemed as a good indication of the improved financial solvency. Nevertheless, the CAR was still above the international standard 12% as stated by BCBC II.
- The ratio of provision finance by *Murabaha* mode to total finance (PFMR/TF), it provides us clear evidence that ICBs concentrated more than 45% of provision finance to their customers by *Murabaha* mode about 48.5% by the end of 2017.
- Inflation rate fluctuated sharply during the last twentieth years. It decreased from 35.5% in 2016 to 25.2% by the end of 2017.

     Overall performance of mentioned indicators improved in some indicators, particularly with regard to default finance and its provisions, as a result of the efforts of the CBOS in this area. While the decline in the performance of some of these indicators as a result of the impact of the macroeconomic environment on the financial positions of the banks.

Table 2 Consolidated Balance Sheet of Indicators of ICBs in Sudan (1995-2017)

Year	Total Deposits/ Total Liabilities	Capital & Reserves /Total Liabilities	Total Finance /Total Assets	Total Finance/Total Deposits
1995	40	5	14	35
1996	37	7	21	50
1997	41	6	18	43
1998	37	6	14	39
1999	35	5.7	11	32.8
2000	55	9	22	40.2
2001	60.2	10.5	24.5	40.6
2002	59.4	12.1	31.6	18.6
2003	59.9	14	37.3	62.3
2004	61.9	13.7	41.8	67.4
2005	63.8	12	45.7	71.6
2006	53.2	16.8	48.1	90.5
2007	53.2	17.6	49.6	93.2
2008	53.9	17.1	48.8	90.6
2009	56.9	18.2	49.5	87.1
2010	60	17.3	47.8	79.6
2011	59.7	19.4	49.2	82.3
2012	59.3	16.2	45.5	76.4
2013	57.5	17	48.6	84.5
2014	57.9	16	48	82.9
2015	58.2	14.9	49.1	84.3
2016	59.9	13.9	51.0	85.2
2017	65.5	10.8	48.7	74.4

Sources: Central Bank of Sudan, Annual Reports

Figure 3. Consolidated Balance Sheet of Indicators of ICBs in Sudan (1995-2017)

Sources: Central Bank of Sudan , Annual Reports
Some evidences from table (2) and figure (3):

- The ratio of total deposits to total liabilities (TD/TL) increased from 59.9% in 2016 to 65.5% in the year 2017.
- The ratio of capital and reserves to total liabilities(C&R/TL) decreased from 13.9% in 2016 to 10.8% by the end of 2017.
- The ratio of total finance to total assets (TF/TA) decreased from 51% in 2016 to 48.7% in 2017 indicating optimal utilization of the available resources resulting from the little increase in deposits in 2017.
- The ratio of total finance to total deposits (TF/TD) ratio declined from 85.24% in 2016 to 74.4% in 2017 which is considered as a good indication of better utilization of resources in the finance operations.

7. Theoretical Framework of Credit Risk Measurement Models:

There are a variety of available credits modeling techniques, leaving banks faced with the dilemma of deciding which model to choose.

7.1 Traditional Approaches to Credit Risk Measurement:

It is hard to draw the line between traditional and new approaches, because many of the better ideas of traditional models are used in the new models. There are four classes of models as comprising the traditional approach: (1) expert systems; (2) neural networks; (3) bank internal rating systems; and (4) credit scoring systems (Saunders, 2002).

7.2 Modern Model of Credit Risk Measurement:

The risk Adjusted Return on Capital (RAROC) model is a framework for analyzing the risk-adjusted financial performance, with the aim of providing a consistent view on profitability across businesses. RAROC is a powerful tool that enables financial institutions to manage their businesses. The best thing about it is that, once you understand the concepts behind economic capital, RAROC is easy to grasp.
RAROC is defined as:

$$RAROC = \frac{Expected\ Net\ Earnings}{Absolute\ Value\ Unexpected\ Losses}$$

This contrasts with the return on capital (ROC) that simply specifies:

$$ROC = \frac{Expected\ Net\ Earnings}{Available\ Capital}$$

Thus, where ROC simply measures the accounting return on available capital, RAROC is a real indicator of commercial performance as it measures the return that is generated on the risks that a business takes. This also means that one has to carve out those earnings that are the result of the risks that are being taken.

7.3 Portfolio Credit Risk Models:

7.3.1 Credit Risk+ Model:

Credit Risk+ is a default-mode model which distinguishes between two states, default or survival of an obligor within a one-year period. The popularity of Credit Risk+ is due to the following features: the input data and parameters are readily available. For instance, default probabilities and recovery rates are required in the context of the internal ratings-based approach of the Basel II framework on the regulatory treatment of credit risk.

7.3.2 The Basel I International Bank Capital Accord:

The 1988 Basel **I** [2] Capital Accord was revolutionary in that it sought to develop a single capital requirement for credit risk across the major banking countries of the world. Moreover, Basle **II** proposal states that overall capital adequacy after 2005 will be measured as follows:

Regulatory Total Capital
= Credit Risk Capital Requirement
+ Market Risk Capital Requirement
+ Operational Risk Capital Requirement

Where:

The credit risk capital requirement depends on the bank's choice of either the standardized approach or an internal ratings-based (foundation or advanced) models.

The market risk capital requirement depends on the bank's choice of either the standardized approach or internal model. The operational risk capital requirement depends on the bank's choice among a basic indicator approach, a standardized approach, and an advanced measurement approach.

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[2] The Basel Committee consists of senior supervisory representatives from Belgium, Canada, France, Germany, Italy, Japan, Luxembourg, the Netherlands, Sweden, Switzerland, the United Kingdom, and the United States.

While part of the 8 percent ratio under Basle **I** were viewed as capital allocated to absorb operational risk, the proposed new operational risk requirement (to be introduced in 2005) aims to separate out operational risk from credit risk and, at least for the basic indicator approach, has attempted to calibrate operational risk capital to equal 12 percent of a bank's total regulatory capital requirement. Specifically, on November 5, 2001, the Basle released potential modifications to the BIS II proposals that reduced the proposed target of operational risk capital as a percent of minimum regulatory capital requirements from 20 percent to 12 percent.

7.3.3 Credit Metrics Model:

Credit Metrics Model, originally developed in 1997 by JP Morgan's Risk Management Research division (a division, that eventually became the Risk Metrics Group), has withstood the test of time and has emerged as a powerful industry standard for understanding and managing credit risk. Since 1999 banks and other financial institutions throughout the world have used Credit Manager with its Credit Metrics analytics as one of their core risk and economic capital management tools.

7.3.4 The KMV-Merton Model:

The KMV-Merton model applies the framework of Merton (1974), in which the equity of the firm is a call option on the underlying value of the financial institution with a strike price equal to the face value of the firm's debt. The model recognizes that neither the underlying value of the firm nor its volatility is directly observable. Under the model's assumptions both can be inferred from the value of equity, the volatility of equity and several other observable variables by solving two nonlinear simultaneous equations. After inferring these values, the model specifies that the probability of default is the normal cumulative density function of a z-score depending on the firm's underlying value, the firm's volatility and the face value of the firm's debt (Sreedhar, 2004).

7.3.5 KMV Structural Model of Measuring Credit Risk:

The model measures changes to default probabilities based on the distance to default of a firm which is a combination of asset values, debt, and the standard deviation of asset value fluctuations, from which Probabilities of Default. The point of default is considered to be where debt exceeds assets and the greater the volatility of the assets, the closer the entity moves to default (Ibid,p 4)

8. Empirical Analysis and Conclusions:

8.1 Model Specification:

To empirically examine and to explain how the financial performance (FP) of Islamic commercial banks (ICBs) in Sudan might affect by the credit risk (CR), the following model will be applied:

$$\textbf{\textit{Bank's Performance = f (Credit risk, External Factors)}}............................ \textbf{\textit{(1)}}$$

Equation (1) implies that the financial performance (FP) of bank is the function of credit risk (CR) and external factors. The external factors are variables that are not related to commercial banks management but reflect the macroeconomic environment that affects the (FP) of commercial banks, such as inflation (Marianne, 2001). Equation (1) can be rewritten as follows:

$$ROA = f\left(\frac{NPL}{TF}, PFMR, CAR, INF\right) .... (2)$$

Where:

(ROA): Return on Assets: It's indicates to the financial performance of ICBs and measured by ratio of bank's income after tax to total assets.

(NPL/TF): Ratio of Non-Performing Loans to Total Finance: This ratio indicates to credit quality, therefore, an increase (NPL) indicates an increase in CR and deterioration in the quality of finance consequently affecting FP adversely (Ahmed et.al, 1998). Concluding, the predicted sign for the relationship between NPL and FP is negative; a lower asset quality is expected to negatively influence bank's profitability (Stefan, 2011).

(PFMR/TF):Ratio of provision finance by Murabaha mode to Total Finance: The predicted sign for the relationship between this ratio and profitability is negative (IFSB, 2013).

CAR: Capital Adequacy Ratio: It's recommended by BCBS (1998) for judging asset quality and CRM. The higher ratio is the indication of adequacy the bank's capital and better assets quality, therefore, low CR and high FP of bank (Noman, 2015).

INF: Inflation rate: It's indicates to external factors that might affect the FP. Inflation plays an important role on ICBs choice of issuing or not issuing finance. The predicted sign of inflation is negative due to deterioration of value of money (Mekasha, 2011).

The estimated equation of the model is described in logarithmic form as follows:

$$log(\text{ROA}) = \beta0 + \beta1\ log(\text{NPL/TF}) + \beta2\ log(\text{PFMR}) + \beta3 log(\text{CAR})$$
$$+ \beta4\ log(\text{INF}) + \mu \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where:

ROA = Return on Assets indicates to bank's performance.
$\beta 0$ = Intercept while $\beta 1, \beta 2, \beta 3$ and $\beta 4$ = Coefficients of independent variables.
NPLTF **=** Measures the credit risk in term of non-performing loan to total finance.
PFMR = Measures the credit risk in term of *Murabaha* modes of finance.
CAR = Indicates to ability of capital of bank to cover credit risk.
Inf = Inflation rate and μi = Error term.

8.2   Stationary Test Results:

Before estimating of the model, Augmented Dickey-Fuller (ADF) test had been calculated. Result of unit root test is reported in table (3).

Table 3 Unit Root Test Results

Null Hypothesis: D(Log(ROA)) has a unit root , Exogenous: Constant					
Lag Length: 0 (Automatic based on SIC, MAXLAG=3)					
ADF Test Equation, Constant, Trend NO,(1ST Difference):					
Variable	ADF Statistic	Probability	MacKinnon Critical Value			Decision At (5%)
			1%	5%	10%	
ΔLog (ROA-1)	-3.1673	0.0114	-4.004425	-3.098896	-2.690439	Stationary
ΔLog (PFMR-1)	- 4.8351	0.0002	-3.886751	-3.052169	-2.666593	Stationary
ΔLog (NPLTF-1)	- 4.6316	0.0003	-3.886751	-3.052169	-2.666593	Stationary
ΔLog (CAR-1)	- 3.6497	0.0024	-3.886751	-3.052169	-2.666593	Stationary
ΔLog (INF-1)	-3.5589	0.0029	-3.886751	-3.052169	-2.666593	Stationary
* Time series stationary at 1ST Difference of 5% MacKinnon critical value.						

Source: Own calculation

Table (3) shows that the set of time series are stationary at 1st difference of 5% MacKinnon Critical Value and its integrated of order **I**(1), these time series includes Log(ROA), Log(PFMR), Log(NPLTF), Log(CAR) and Log(INF).

8.3 Model Estimation :

Table (4) show the results of estimated parameters of the model.

Table 4 Model Estimation Results

Dependent Variable: D(Log(ROA-1))
Method: Least Squares, Date: 12/4/19   Time: 16:08
Sample (adjusted): 1995 2017, Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.954753	0.610819	3.200218	0.0151
D(Log(PFMR-1))	-1.710347	0.506155	-3.379097	0.0118
D(Log(INF-1))	-0.766947	0.202440	-3.788520	0.0068
D(Log(NPLTF-1))	-1.175463	0.241034	-4.876745	0.0018
Log(CAR-1)	-0.687369	0.233189	-2.947683	0.0215
R-squared	0.934699	Mean dependent var		0.1831
Adjusted R-squared	0.897384	S.D. dependent var		0.796239
S.E. of regression	0.255065	Akaike info criterion		0.399743
Sum squared resid	0.455408	Schwarz criterion		0.601787
Log likelihood	2.601545	F-statistic		25.04889
Durbin-Watson stat	1.929216	Prob (F-statistic)		0.000304

Source: Own calculation

8.4 Discussion of the Results:

All the parameters signs are consistent with literature and theory. Set of explanatory variables (PFMR, INF, NPLTF and CAR) are significant because they have probability less than (0.05).

Adjusted R- Squared is very high, this means that the explanatory variables interpret about 89% of total changes in profitability or the financial performance (FP) of ICBs. Overall test of regression is significant because, F-statistic have value of (25.04889) with probability (0.000304).

The coefficient of PFMR appearing with a negative sign (probability of 0.01) indicates that an increase of provision finance by *murabaha* might lead to reduce the profitability of ICBs, because CR by Shariah Contract exposed when Islamic bank delivers asset to customer but does not receive payment on time so the profitability will reduces.

The estimated parameter INF appeared with a negative sign and it has strong significant influence to the profitability (probability of 0.006). This suggests that a one percent reduction in inflation would probably lead to improvement of the profitability by (0.76) percent. Therefore, in inflationary period ICBs prefer to choice not issuing finance rather than of issuing due to deterioration of value of money. The worsening of money has a negative effect on ROA. The result is a country with higher inflation exhibits a lower financial bank's performance.

The estimated parameter of NPLTF has a negative sign with probability of (0.001), this implies that a one percent reduction in this ratio would probably lead to improvement of the FP of ICBs by (1.7) percent. An increase of NPLTF indicates an increase in CR and deterioration in the quality of finance affecting the FP of ICBs adversely.

The estimated parameter of CAR has a negative sign (probability of 0.021). This implies that a one percent increase of CAR would probably lead to reduce CR by (0.68) percent consequently affecting the FP of ICBs positively. This result reflects efforts of CBOS with regard to CRM policy and improvement the FP of ICBs through implementation of BCBS accords.

9. Conclusions:

The results reveal a robust significant negative relationship between credit risk indicators and the financial performance of ICBs in Sudan. ICBs in Sudan have options to provision of finance to their customers (*murabaha, musharakaha,..ect..)*.The problem comes from the concentration of finance by *murabaha* mode because in case of inability of customer to repayment the finance, CR takes place and negatively affects the profitability. In practice, ICBs in event of default absorbed CR by imposing more collateral on their customers and sells it to covering loss. This explains why the increase of *murabaha* provision might reduce of CR and improve the profitability.

Sudan economy suffers from high inflation, about 75% in 2017 exhibits a lower value of domestic currency. As its purchasing power decreases in relation to the other currencies, typically means worsen of financial performance of ICBs.

10. Recommendations:

ICBs need to use prudent CR management procedure to ensure profitability and safe their financial performance form loss and crisis. ICBs should not totally rely on collateral as a reason for expanding the provision of finance by *murabaha* mode because in case of value of collateral decreased against the finance, will lead to CR and reduces the performance. Increasing trend of NPLTF (1995-2017) indicates that ICBs are move to words CR. Therefore, a good feasibility studies and implementing standards of finance provision should be applied. CBOS should fulfilment of international standards issued by IFSB in the context of the requirements of BCBS to supporting ability of CAR of ICBs to cope with CR.Inflation considers one of the factors that affecting the FP of ICBs; therefore, CBOS should adopt contractionary monetary policy to control it to improve the FP of ICBs.

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