

# CREDIT RISK AND FINANCIAL PERFORMANCE OF THE JORDANIAN COMMERCIAL BANKS: A PANEL DATA ANALYSIS

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## ABSTRACT

*This study examines the impact of credit risk (CR) on the financial performance of Jordanian commercial banks listed in Amman Stock Exchange, for the period 2008-2017. A panel data analysis of both fixed and random-effect models and GLS method are employed to determine the impact of CR on performance of 16 Jordanian listed banks. The results showed that CR has a negative and significant impact on return on assets (ROA) and return on equity (ROE). Further, the results indicated that CR (measured by the ratio of doubtful debts to total loans, non-performing loans and loan losses to total loans) has a negative and significant impact on ROA, and ROE. While, the total deposits and bank size have positive and significant impact on financial performance of these Jordanian commercial banks.*

**Keywords:** Credit Risk, Financial Performance, Commercial Banks, Jordan.

## INTRODUCTION

Although, the banking sector is contributing greatly to support the Jordanian business environment by granting credit facilities. However, it was reported by CBJ (2017) that the impact of unstable political situations in the Middle East region has made many commercial banks more exposed to CR that threaten their financial and credit stability. Such risks may perhaps have significant impact that made banks to restrict their credit facilities more than ever as it was pointed by annual report of (CBJ, 2017). Thus, it might be useful to review existing literature on CR and their impact on banking sector performance, especially under the current condition of Arab-Spring issue.

In fact, the CR as argued by Bouteille and Coogan-Pushner (2012) and (Carling et al., 2007) are seen as one of the most highest financial risks that lead to serious problems associated with the lost principal and interest and investing. Therefore, banks should recognize the CR management as a key threat to their development; thus, they should be managed at the highest level of accuracy; considering that "*ineffective CR management can lead to large financial losses and even to bankruptcy*" (Shahzad, 2019).

Yet, many banks in developing countries like Jordan are still considering the CR management as a secondary activity. As such, the weak regulation of CR management and lower banks' credit standards are still the main causes of banking problems in the Jordanian banking sector. According to (CBJ, 2017) that, these issues still remain directly linked to a deterioration in the Jordanian banks' credit standing. This situation is currently increasing day over day, causing increased the ratio of non-performing loans along with increasing interest rates related to the loans granted. Such conditions could hinder the banks' performance, thus, leading to negative impacts toward the achievement of sustainable business development (Epure & Lafuente, 2015).

More specifically, it was documented that the increasing level of non-performing loan rates, poor loan processing, undue interference in the loan granting process, inadequate of loan collaterals have become a source of great concern to many interested parties of bank activities (Muriithi et al., 2016). Therefore, it was classified by (CBJ, 2017) as the main reasons that drive the Jordanian banking sector to fall into CR, which can impact negatively on banks performance. In this regard it is argued that banking management may be interested in implementing the strategy of risk management regarding their financial activities more than persevering to avoid such risks (Lambert & Cooper, 2000). Therefore, it is acknowledged by (CBJ, 2017) that risk management process should be pursued in a very correct way.

From the preceding sections, the Jordanian banking sector represents an ideal working environment in this paper that can confirm the impact of CR on the financial performance in Jordan. Therefore, the next sub-section will provide us with several actual indicators for the banking financial performance in Jordanian context, which can provide a detailed description of the main issue of this paper.

### **The Performance of Jordanian Banking Sector**

Commercial banks play an important role in economic development and promote economic growth of any country through the role of mediation and financial services provided to the local community and countries. Their credits facilities help expand productive investments by individuals and institutional investors.

In Jordan, banks are the main component of the financial sector, with total assets of 49.1 billion at the end of 2017 compared to 26.8% in 2007, representing 166% of GDP. Compared to other sectors listed on the Amman Stock Exchange, the assets of the banking sector have reached to 171% of the GDP by the end of 2017. The total deposits amount has also reached 115% of GDP, and loans about 114% of GDP, reflecting the relative importance of this sector in Jordan. Furthermore, it is reported that, licensed banks assets are reported to have reached 93.5% of the total assets of the other financial sectors in Jordan. Indeed, the Jordanian banking system enjoys a safe liquidity as total high liquidity assets accounted for 45% of the total assets at the end of 2017 compared to 48.9% in 2016. According to CBJ (2017) annual report, the recent decrease in liquidity ratios is mainly due to the continued improvement in the level of credit granted by banks, which began in 2015 and continued in 2016 and 2017, which led to the growth of credit facilities more than the growth of deposits. This is indicating the stability of the liquidity level, which indicates the health of the banking system is maintaining good levels of profitability where the rate of return on the assets of the banking system in Jordan is 1.2% in 2017 compared to 1.1% in 2016 (CBJ, 2017).

On the other hand, although the indicators above are impressive and reflect a number of positive aspects in the performance of banking sector in Jordan; yet the banking sector still faces multiple risks affecting financial performance. It is reported by (CBJ, 2017) that, the Jordanian banks' ability regarding the granting credit approval has witnessed to be significantly declined between 2014 and 2016. More specifically, by comparing the similar data between 2011 and 2013, it was noticed that the percentage of credit applications rejected by banks declined to about 16%. With regard to the ratio of non-performing debt to total debt, it continued to decline in 2017 to reach 4.2% compared to 4.3%, 4.9%, 5.6%, 6.8%, 7.7% and 8.5% for 2016, 2015, 2014, 2013, 2012 and 2011 respectively. In fact, the decline in 2017 was due to higher credit facilities than non-performing (CBJ, 2017).

These unsatisfactory financial indicators may be the explanation for this paper to focus more on the importance of banking safety for banks operating in Jordan, which benefits many investors such as investors and depositors to ensure their deposits and benefits, owners to maximize their capital and banking management to identify indicators of success and maximize profits. This could also be the possible explanation for the enabling credit managers to take effective measures to protect investors and other interested bodies to avoid financial crises affecting the national economy. Therefore, it can be argued that there is a need for further contributions to how CR impact banking performance in a developing country like Jordan, especially before and after the Arab spring period 2008-2017.

Consistent with the above argument, this paper has identified some of the CR variables and the importance of each variable and determined the degree of the impact of each variable on the profitability of Jordanian commercial banks. Thus, this study aimed to analyze and measure the impact of CR variables on the profitability of commercial banks in Jordan. To this end, the paper is organized as followings: Section 2 discusses related literature on the effects of CR on the profitability of commercial banks followed by theoretical framework in section 3.

## LITERATURE REVIEW

In both developed and developing countries, the impact of CR on banking profitability studies is investigated in different studies. Indeed, reviewing the related studies on the impact of a bank's CR on its financial profitability reveals mixed results, which generally ranged between positive and negative relationships (Abbas et al. 2019). For example; Abbas and his colleagues have used the generalized methods of moments in examining the effect of CR on profitability of 174 banks in the Asian region. Abbas et al. (2019) point out that CR is negatively and significantly influencing banking profitability in the short run. Using bank quarterly data, Wood and Mc-Conney (2018) in their study examined the effect of risk factors on the financial performance in the Barbadian commercial banks for the period 2000-2015. The results indicate that CR has a statistically negative effect on the financial performance of Barbadian banks. They concluded that government should adopt appropriate precautionary measures to limit internal and external impact of bank risks.

In international study, Al-khouri (2011) examined the impact of the Bank's risk factors and the public banking environment on the profitability (ROA- ROE) of 43 commercial banks in six GCC countries during the period 1998-2008. Using a constant impact regression analysis, the results showed that CR, liquidity risk and capital risk were the main factors affecting the ROA, while, liquidity risk was only the factor that affected the ROE. Similar to the study of Al-khouri, Kani (2017) tested the impact of the CR on banking performance in the member States of the West African Economic and Monetary Union in the largest 20 banks in West African countries. Using individual specific effects models, the results indicated that there is a significant negative relationship between CR and ROA during the period 2007-2015. Kani (2017), in this investigation, concluded that "*Banks should review their lending policy and inject more flow into the economy while improving their risk prevention measures*". In the similar context of the African region, Oduro et al. (2019) used the method of 2SLS to examine how the banks' financial performance affected by the CR. For this purpose, they have collected the data from listed Ghanaian banks for the period of 2003-2017. It's found that the large Ghanaian banks were more likely to face more CR of banks. Furthermore, it resulted that banks' profit was negatively associated to the CR. Based on this result; they recommended that in order to survive the banking industry, more "*attention needs to be paid to management of its CR exposure*".

Through the sample of five big UK commercial banks, Saeed and Zahid (2016) examined the two CR variables (impairments and non-performing loans) and their effect on the bank profit, which measured by ROA and ROE. Using multiple regression analysis, they analyzed bank data from 2007 to 2015 for the period of global financial crisis. The results showed that there was a positive relationship between CR variables and profitability of the banks. Islam and Nishiyama (2016) concluded that CR as measured by non-performing loans has a negative but insignificant impact on profitability in case of net interest margin in South Asian commercial banks. Quite the opposite, in developing countries Kodithuwakku (2015) used content analysis method to examine the impact of CR management on the financial performance of commercial banks in Sri-Lanka for the period 2009-2013. In fact, interview was primary method to collect data from 8 banks in Sri-Lanka. Also, bank annual reports and relevant articles were the secondary method to collect data. Results on panel data analysis showed that non-performing loans and provisions have a negative impact on profitability.

In Nigeria context, Ogboi & Unuafe (2013) studied the impact of CR and capital adequacy on financial banks in Nigeria. The study used time series data that obtained from the annual reports of banks in Nigeria for the period 2004-2009. Fixed effect Model was used to assess the relationship between different CR (loans and loan losses, loans and advances, bad loans, and capital adequacy) and ROA. The results showed that sound management of CR and capital adequacy has the positive impact on ROA, while, loans and advances were reported as significant factors with the negative impact on the ROA of banks during that period. In the same context, Marshal and Onyekachi (2014) analysed the impact of CR on the performance of banks in Nigeria over a period of 15 years (1997-2011). The research method of this paper involves conducting the analytical test of panel data. The study found that there is a positive relationship between the ratio of non-performing loans to loans and advances on the performance of banks. The results also revealed a positive relationship between the ratio of loans and advances to total deposits and banks' performance. The conclusion was that Nigerian banks with high financial performance level provide more credit services in their loan portfolio than those with low-level loan services.

Paudel (2012) examined the impact of CR management on the financial performance of 31 commercial banks in Nepal for 11 years (2001-2011). The researcher relied on the descriptive method in analyzing the study data, the quantitative correlation method and the multiple regression method. The CR was measured by the indicator of (rate of default, the loan assets cost and the capital adequacy ratio), while, ROA was used as a financial performance indicator. It was found that all CR indicators have a negative effect on the banks' financial performance, except the default rate which was the most influential factor in the financial performance of banking in Nepal. Boahene et al. (2012) examined the relationship between CR and profitability in Ghanaian commercial banks for the period 2005-2009. Fixed effects model was used to analyze the panel data on such relationship. Results showed that the positive relationship was found between CR and profitability in Ghanaian commercial banks. In the same vein, the result of Boahene et al. (2012) was consistent with Afriyie and Okotey (2013), who found a significant positive correlation between non-performing loans and the profitability of rural and community banks in Ghana.

In the Asia-Pacific Region, Islam et al. (2019) studied the impact of CR on 23 Bangladeshi commercial banks for the period 2006-2015. Using the fixed effect model, the results indicated that the non-performing loan ratio was negatively associated with Bangladeshi Commercial banks performance measured by ROA and ROE. While Saiful & Ayu (2019)

examined the impact of CR on performance of Indonesian banks for the period 2012-2016 by sampled of 26 Indonesian conventional banks and 11 sharia banks. The results showed that the CR positively influenced Indonesian banks performance measured by ROA. In the same vein, Ali & Dhiman (2019) investigated the impact of CR measured by non-performing loans ratio and loan loss provision ratio on profitability of the public sector commercial banks in India for the period (2010-2017). The empirical results showed that ROA is positively related to CR.

Under such diversity in the relationship between the CR of banks and their profitability; this therefore leads to the first key hypothesis:

*H0: There is a negative relationship between bank CR and their profitability.*

## THEORETICAL FRAMEWORK

### Credit Risk

Financial institutions risk is not a specific risk. Quite the opposite, the risks facing the financial sector are many and varied. These include CR, operational risks, exposure risks, investment risks, interest risks and market risks (Rose, 2002; Shawtari et al., 2015). However, CR is identified as the dominant key risk in banking environment (Rose, 2002). Indeed, bank loans are usually targeted by the CR as it is the largest asset of a bank. In fact, bank loans constitutes more than 70% of total bank assets, thus, CR fall within the framework of key financial risks that may have negative effect on the value of bank assets (Rose, 2002; Saeed & Zahid, 2016). According to Dionne (2013) CR has been theoretically appeared in the literatures post-Second World War. This terminology is defined generally by Bouteille and Coogan-Pushner (2012) as “*the possibility of losing money due to the inability, unwillingness, or untimeliness of counterparty to honor a financial obligation*”. Indeed, the term of CR, in older literature, was referring only to the increase individual cases of bankruptcy. However, in recent years, Basel committee (1999) identified the CR as the uncertainty factors that reveal the inability of a contractual party to meet its current commitments to the bank in accordance with the agreed terms (Brown & Moles, 2008). It is also identified as the unexpected effects of financial soundness indicators on the banks' profitability level (Bessis, 1998). Furthermore, CR is also defined by Hindi (2004) as an unexpected volatility in the future yield.

In fact, several researchers argued that CR is generally obtained through a number of financial ratios. These ratios can be used to recognize the CR, which include (subordinated debt to total loans, loan losses to total loans, and non-performing loans to total loans) (Saeed & Zahid, 2016; Bekhet & Eletter, 2014; Larson & Gray, 2010; Zubaidi, 2000). Recently, CR concept has overlapped with the managing of commercial banks activities and became more in line with the risk management concept. Thus, based on this interaction, banks are today seeking to deal and manage their CR rather than avoiding them in maximizing their profits (Brown & Moles, 2008).

According to Asllanaj (2018), banks as financial institutions may suffer from the CR for four reasons. The first reason is inadequate management practices leading to bad debts. The second reason is not having efficient and effective mechanisms for reducing bad debt. The third reason comes from bank-insider transactions as some employees in the bank may engage in illegal activities causing bad debt that cannot be recovered. Finally, poor credit management where techniques or decisions to decrease bad debt are ineffective.

Credit operations are the most attractive investment for banks to achieve profits. Therefore, these credit operations are considered the most dangerous investments to banks

because of the various risks that may lead to the collapse of the bank. It is argued that there is a close relationship between the credit decisions with profit maximization of bank shareholders. Commercial bank seeks to achieve the objectives of profitability through the adoption of sound lending decisions. This is to be achieved through balancing of stakeholder interests and taking safe policies to avoid such risks. Therefore, banks are growing their activities by (i) expanding their credit activity to maximize their returns; (ii) Formulating new lending policies; (iii) attracting high-value clients and monitoring their ratings.

### **Bank's Financial Performance**

Basically, the term financial performance is used as a general measure of a company's overall financial health over a given period of time and can also be used to compare similar companies in the same industry as well as to compare industries or sectors against each other. In the banking sector, financial performance indicates a bank's ability to use its assets to generate revenue to sustain itself through its core business operations. Commercial banks use the terms financial performance and profitability interchangeably to estimate their successes or failures (Amin et al., 2018).

Banks primary role remains in center of financing economic activity, and their effectiveness may have a positive impact on the macroeconomy (Amene & Alemu, 2019). A healthy and profitable banking sector is more able to withstand negative shocks and contribute to the stability of the financial system. If banks are not performing well, the negative impacts on macroeconomy could be wide and huge. Thus, measuring bank performances is vital for the investors and the sustainable development of the country (Pekkaya & Demir, 2018). The global banking industry has undergone considerable changes in recent decades due to international integration of financial markets, deregulation and innovations in banking (Robin et al., 2018).

The common methodologies to measure financial performance in banking sector are using a combination of financial ratios' analysis, measuring performance against the budget, benchmarking and any combination of these methodologies. These methods are divided into the traditional accounting-based profitability measurements and economic-based value measurements of financial performance (Amene & Alemu, 2019) and issue of their suitability has long been debated in the recent years (Akgun et al. 2018; Hamdan, 2018). According to Banerjee (2018), economic-based value measurements of financial performance include more future-looking measures that can reflect elements of risk and profitability. Despite the limitations of traditional accounting-based measures, they have been extensively employed in the banking sector as the most accurate in determining bank's financial performance (Platonova et al. 2018).

Traditional accounting-based measurements of financial performance use financial ratios expressed in the mathematical relationship or ratios between two or more quantities from financial statements. These ratios can be used to evaluate the results for decision-making purposes (Banerjee, 2018). More commonly in this group, ROA and ROE are used to analyze financial performance. ROA is the ratio of net income divided by total assets of company where ROE is the ratio of net income by shareholders' equity. Ruslan et al. (2009) pointed out that ROA is a measure of bank profitability which focuses on the bank's ability to earn income from its operations. Return in equity (ROE) reflects how effectively a bank management is using shareholders' funds based on total equity (Kennedy, 2019). ROE ratio is influenced by the degree of financial leverage and ROA ratio (Robin et al., 2018). Banks with higher leverage will usually show up lower ROA, but higher ROE. In order to make ROE highly competitive, Ommeren (2011) argued that most banks develop substantial financial leverage.

## RESEARCH STATISTICAL METHODS

The study population consists of the banking sector in Jordan. Therefore, the sample of this study includes all banks listed on the ASE for the period 2008-2017. After obtaining the necessary data, the appropriate statistical tests were used to answer the study questions and test their hypotheses. The unit root tests were used because they are the most commonly used tests in practical applications. The unit root tests are based on the hypothesis that the error limits are not intrinsically correlated and dropping this hypothesis leads to the problem of self-association. These include the test of Dickey-Fuller (1981); Phillips & Perron (1988).

The panel data concept consists of both time series and cross-sectional approaches. In other words, crossover data maintain the same entities and measure some of them over time. The use of panel data has some advantages compared to using time series data or cross-sectional data. Using panel data can handle a wide range of issues, more complex problems, they increase the degrees of freedom and the number of views, so the strength of the tests also increases and considers the data more efficient than the time series that face the problem of self-correlation, by structuring the model in an appropriate manner, and the implications of some doubt. The simplest way to estimate and measure regression in panel data is with the combined regression, which involves the estimation of one equation for all data together (Brooks, 2008).

$$y_{it} = \alpha + \beta x_{it} + u_{it} \dots \dots \dots (1)$$

Where  $y$  represents the dependent variable,  $i$  is unit,  $t$  is time,  $x$  is independent variables,  $u$  represents the random error limit in this equation.

In the panel data research, fixed-effects model and random-effects model are the two main approaches that can be applied to analyze both a time series and cross-sectional data (Gujarati, 2003). The assumption of fixed effects model, indicates that the intercept is varying for each group at different time, without changing on the coefficients. This means that, error component is allowed to be correlated via the explanatory variables. While, the model of random effects is more different than the fixed effects model because it allows to the explanatory variables can be changed over time and across different groups (Verbeek, 2012). In fact, it was documented that, selection of a fit model rely on the results of Hausman-test (Hausman, 1978).

$$y_{it} = \alpha + \beta x_{it} + u_i + v_{it} \dots \dots \dots (2)$$

The Hausman-test has been used to determine the appropriate model by relying on the value of Chi-Square, if the value is less than 5%, then fixed model will use, if not, than the random model will use. Based on result of Hausman-test, that the value of chi-square is greater than 5%, thus the random model is more valuable models to be used for the panel data in this paper.

$$y_{it}^* = \alpha^* + \beta x_{it}^* + \gamma \hat{x}_{it} + u_{it}^* \dots \dots \dots (3)$$

Based on the result of Hausman-test, this study attempts to explain the impact of CR on the financial performance of Jordanian commercial banks during the period (2008-2017) using the following standard model:

$$ROE_{it} = \beta_0 + \beta_1 CR + \beta_2 DTL + \beta_3 NPL + \beta_4 LSL + \beta_5 SZ_{control} + \beta_6 TD_{control} + u_{it} \dots (4)$$

$$ROA_{it} = \beta_0 + \beta_1 CR + \beta_2 DTL + \beta_3 NPL + \beta_4 LSL + \beta_5 SZ_{control} + \beta_6 TD_{control} + u_{it} \dots (5)$$

Where,  $ROE_{it}$  represents the dependent variable (return on equity) and  $ROA_{it}$  represents the dependent variable (return on asset),  $t$  represents bank,  $i$  represents time,  $u_i$  represents the individual effect of each bank,  $CR$  is credit risk,  $DTL$  is doubtful loans,  $NPL$  is non-performing loan,  $LSL$  is loan loss to total loan,  $SZ$  is the size of bank in logarithm and  $TD$  is the total deposits in logarithm  $u$  is the error terms.

In light of previous equation above, it is of important that the variables to be subjected to the analysis are identified and their measurement criteria explained. Indeed, there are two main variables within the context of this equation. This Include  $CR$  as independent variable and financial performance as a dependent variable. Two types of traditional ratios have been used as a numeric indicator in measuring  $CR$ , which include: the ratio of doubtful debts to total loans, loan losses to total loans and total deposits (Rose, 2002). While, the bank profitability is used in this paper as dependent variable to determine level of financial performance. Profitability in accounting and finance studies is widely measured by  $ROA$  and  $ROE$  although it could also be assessed by the dividend per share and earnings per share. Indeed, these traditional ratios are acknowledged as the most widely used in prior studies in various accounting and finance related fields in determining the effect of  $CR$  on financial performance (Abbas et al. 2019; Bani-Khalid et al., 2016; Marshal & Onyekachi, 2014; Paudel, 2012; and Rose, 2002).

## RESULTS AND DISCUSSION

### Descriptive Results and Discussion

Table 1 summarizes the descriptive statistics of the independent and dependent variables of the Jordanian commercial banks studied, which were calculated from their financial statements, showing the mean, the median, the highest value, the lower value, and the standard deviation for each variable.

Descriptive	ROE	ROA	CR	DTL	NPL	LSL	SZ	TD
Mean	6.8865	1.0781	0.067643	0.063233	0.00858	0.031423	2.39E+10	1.66E+10
Median	6.6605	1.0875	0.075639	0.069753	0.00301	0.036664	2.39E+10	1.72E+10
Maximum	10.061	1.583	0.085228	0.080364	0.057064	0.04423	2.59E+10	2.78E+10
Minimum	3.832	0.596	0.025925	0.02522	0.00137	0.006911	2.12E+10	19492215
Std. Dev.	1.931818	0.340777	0.020339	0.018617	0.016316	0.012427	1.34E+09	6.43E+09

As shown in the Table 1 above, the average and median of  $ROE$  are (6.8865), (6.6605) respectively, and the average of  $ROA$  is 1.0781, with the median 1.0875. These ratios are good, which reflects that Jordanian banks face low  $CR$  ratios. It's also shows in Table 1 that the average of doubtful debts to total loans (0.063233) and its median 0.069753. This indicates that approximately 93% of the loans granted are recovered by Jordanian commercial banks by the borrowers and 7% of the total loans fall under the category of doubtful loans. The table shows that the average ratio of non-performing loans (0.00858) and median (0.00301), respectively. The table shows that the ratio of average loan losses to total loans granted by commercial banks



in Jordan (0.031423) indicates that commercial banks have an efficient policy of managing credit and granting loans to customers.

The correlation matrix is used to show the relationship between the independent and dependent variables to ensure that there is no strong correlation between them. The Table 2 shows that the results of correlation matrix relationship between the dependent variables (ROE and ROA) and independent variables (doubtful loans, non-performing loans, loan losses and total deposit) do not show any problems of collinearity as they are ranged between medium and weak relationships (Peck et al., 2015). This indicates there are no serial correlations between the independent variables.

Correlation	ROE	ROA	CR	DTL	NPL	LSL	SZ	TD
ROE	1							
ROA	0.985706	1						
CR	-0.70915	-0.68188	1					
DTL	-0.70888	-0.67661	0.998342	1				
NPL	-0.15453	-0.26449	0.113789	0.100037	1			
LSL	0.396408	0.515538	-0.31116	-0.27791	-0.38555	1		
SZ	-0.54548	-0.64706	0.585022	0.559293	0.556188	-0.72706	1	
TD	0.553361	0.593131	-0.33912	-0.33389	0.095035	0.453444	-0.64855	1

\*Correlation coefficients are statistical significance if ( $p < 0.01$ ).

\*\* Correlation Values: (1- 0.8) Strong; (0.8-0.5) Moderate; (0.5-0.1) Weak; (0) Non-correlation(Peck et al. 2015).

The Dicky-Fuller and Phyllis-Peron test were used to test the stability of the time series of the study variables. It also used to ascertain the stability of the time series for the study period as the time series instability resulted in unrealistic regression results. Thus, the two tests were carried out for the study variables at the level.

Variables	t- Statistics in Log		t-statistics in Log First Differences	
	ADF	PP	ADF	PP
ROE	94.0430***	54.6194***	43.6288**	73.6334***
ROA	70.8292***	47.0848***	39.9658**	73.1885***
CR	274.113***	105.395***	146.777***	75.8117***
DTL	282.363***	109.582***	176.407***	76.9689***
NPL	26.0005***	61.2384***	58.2228***	196.057***
LSL	0.11151	0.05509	36.47911*	39.4687*
SZ	15.1978	71.8337***	35.0774*	34.05520*
TD	19.4062	108.142***	47.6575**	163.525***

Note. \*, \*\* & \*\*\* represent statistical significance at the 1%, 5% & 10% levels respectively.

Table 3 shows that all variables are unstable at the level and thus accept the null hypothesis that provides for the instability of the time series. Therefore, the first difference must be taken for all variables and then re-test, after taking the first difference (Ducky-Fuller and Phillips-Peron) tests shown that all variables are stable. Thus, the alternative hypothesis was accepted that the time series of the study variables became stable. This indicates that the effect of all temporary shocks will fade over time in the long term especially since the Phelps Peron test takes random errors into account and includes the Dicky-Fuller test.

## Regression Results and Discussion

The static effects model, the random effects model, and the Hausman test were used. In order to take into account, the heterogeneity and self-association of error reduction, the Generalized Least Square method was used (Green, 2008). Based on the results of Hausman test, the random model is appropriate to test the impact of CR on the profitability of Jordanian banks, where the probability value of Chi-Square is greater than 5%.

	<b>Ind-Variables</b>		<b>Dep- Variables</b>	
	(ROE)	Fixed-effects model	(ROE)	Random-effects model
CR	-309.886	(-2.324965)**	-681.569	(-5.315766)***
DTL	-394.97	(-2.764847)***	-621.704	(-4.619680)***
NPL	-5.36113	(-0.570012)	-128.4	(-9.388028)***
LSL	-38.3935	(-2.476973)**	-30.9158	(-2.880682)***
SZ	15.55156	(3.501344)***	2.84E-09	(9.256359)***
TD	3.42E-10	(3.15617)***	4.22E-10	(11.11519)***
Adjusted R-squared		0.762804		0.785945
F-statistic		24.04746***		79.94155***
Durbin-Watson		2.451393		2.451393
Hausman test Chi-Sq		6		
Prob (Chi-Sq)		<b>1</b>		
NO		130		130
Banks		<b>13</b>		<b>13</b>

Note. \*, \*\* & \*\*\* represent statistical significance at the 1%, 5% & 10% levels respectively.

	<b>Ind-Variables</b>		<b>Dependent Variables</b>	
	<b>Fixed effects model</b>	<b>ROA</b>	<b>Random effects model</b>	<b>ROA</b>
CR	(-3.947396)***	-2.94201	(-5.128770)***	-110.062
DTL	(-2.534612)**	-56.688	(-4.484651)***	-101.014
NPL	(-2.919258)***	-69.9778	(-9.847846)***	-22.5429
LSL	(-2.456361)***	-6.87341	(-6.75463)***	-8.72041
SZ	(3.375931)***	8.780607	(8.847349)***	4.54E-10
TD	(2.053525)**	6.49E-11	(11.16941)***	7.09E-11
Adjusted R-squared		0.786471		0.807303
F-statistic		27.39629***		91.07416***
Durbin-Watson		2.389201		2.389201
Hausman test Chi-Sq		6		
Prob (Chi-Sq)		<b>1</b>		
NO		130		130
Banks		<b>13</b>		<b>13</b>

Note. \*, \*\* & \*\*\* represent statistical significance at the 1%, 5% & 10% levels respectively.

In the impact of CR on ROE and ROA, the overall results of regression analysis are shown in Tables 4 & 5 indicated that the ratio of CR has a negative and statistically significant effect on ROE and ROA with the value of (681.5685) and (110.0616) respectively. Based on this result, it could be argued that the profitability of banks is negatively affected by high levels of CR, which means that Jordanian commercial banks follow an efficient policy in the management of CR.

This finding is consistent with the null hypothesis of the study. This result is also consistent with previous studies such as Paudel (2012); Ogboi & Unuafé (2013); Islam & Nishiyama (2016); Mc-Conney (2018); Abbas et al. (2019) and Oduro et al. (2019); who found a positive effect for CR on ROA and ROE.

Proceeding from the general result above, this paper aims also to explain the impact of sub-variables of CR on the banks' profitability (measured by ROA and ROE) as presented below. Regression analysis results in Tables 4 & 5, presents that, doubtful debts to total loans has a negative and statistically significant effect on the ROE and ROA (-621.7044) and (-101.0136). In fact, the profitability of banks is adversely affected by the highest level of doubtful loans, which exposes banks' profits to more credit risk due to the possibility of losing part of their loans. From tables, the ratio of non-performing loans to total loans has also a negative and statistically significant effect on ROE and ROA (-128.3999) and (-22.54294). The profitability of banks is adversely affected by levels unsecured loans, which pose a high risk of CR. Results in Table 4 & 5, indicate that the ratio of loan losses to total loans is having negative and significant relationship with ROE and ROA (-30.91578) and (-8.720413). Indeed, the profitability of banks is negatively affected by the levels of loans loss. This means that the Jordanian commercial banks follow an efficient credit policy in granting customers loans and also study the client and his ability to repay the amount of loans and interest value of the loan granted.

In contrast, with regard to the impact of bank size on the profitability of Jordanian commercial banks, the results in Tables 4 & 5 indicate that the bank size coefficient is having positive and statistically significant effect on the ROA, ROE. This is due to the fact that large banks have multiple sources of money, which increases their investments and financial activities. Therefore, lead banks to face more credit risk, thus, making less profit. Similarly, deposits coefficient is having significant positive impact on ROA and ROE. This result is attributed to the fact that Jordanian banks still regarded deposits ratio as a one of main source of funds.

## CONCLUSION

The study investigates the effects of CR on the profitability of Jordanian commercial banks. The study period covers the years 2008-2017. The sample includes 13 commercial banks in Jordan. The main objective of this research is to examine the impact of various CR including: doubtful loans, non-performing loans and loss loans on the ROE and ROA. Based on the empirical analysis of random effects model using a panel data, the study finds that there are several variables that appear to be the most significant ones when it comes to evaluating the performance of commercial banks. The results indicate that the impact of CR (doubtful loans, nonperforming loans and loan loss) are negative and statistically significant on profitability of Jordanian commercial banks.

The study recommends developing a strategy to monitor the credit facilities granted, control customers who have been granted credit and assess their financial position and develop an analytical model that helps the credit management to predict the client's situation and determine the probability of default and compliance with the necessary measures to reduce the risk the bank will be exposed. The study also recommends continuing the follow-up of non-performing loans because their negligence leads to a loss of the bank and a deterioration of its financial position. It distinguishes between work that suffers from temporary and non-permanent financial difficulties and attempts to provide technical advice and assistance by agreeing to settle

the situation in case of difficulty, and between the client whose loan is turned into a default loan and finally, recourse to legal proceedings must be taken to protect the bank's rights.

## REFERENCES

- Abbas, F., Iqbal, S., & Aziz, B. (2019). The impact of bank capital, bank liquidity & credit risk on profitability in post-crisis period: A comparative study of US & Asia. *Cogent Economics & Finance*, 7(1), 1-18.
- Afriyie, O., & Akotey, O. (2013). CR management & profitability of selected rural & community banks in Ghana. *Journal of Risk Finance*, 4(2), 1-18.
- Akgun, A.I., Samiloglu, F., & Oztop, A.O. (2018). The impact of profitability on market value added: Evidence from Turkish informatics & technology firms. *International Journal of Economics & Financial Issues*, 8(4), 105-112.
- Ali, L., & Dhiman, S. (2019). The impact of credit risk management on profitability of public sector commercial banks in India. *Journal of Commerce & Accounting Research*, 8(2).
- Al-Khouri, R. (2011). Assessing the risk & performance of the GCC Banking Sector. *International Journal of Finance & Economics*, 65(3), 72-80.
- Al-Zubaidi, H. (2000). *Banking management strategy for depositing deposits & credit provision (1<sup>st</sup> Edition)*. Al-Warraaq Foundation, Amman, 2000.
- Amene, T.B., & Alemu, G.A. (2019). Determinants of financial performance in private banks: A case in Ethiopia. *African Journal of Business Management*, 13(9), 291-308.
- Amin, M.A.M., Sanusi, N.A., Kusairi, S., & Abdallah, Z.M. (2018). Inverse relationship of financial risk & performance in commercial banks in Tanzania. *Innovations*, 11, 4-1.
- Asllanaj, R. (2018). Does credit risk management affect the financial performance of commercial banks in Kosovo? *International Journal of Finance & Banking Studies*, 7(2), 49-75.
- Bani-Khalid, T., Kouhy, R., & Hassan, A. (2017). The impact of corporate characteristics on social and environmental disclosure (CSED): The case of Jordan. *Journal of Accounting & Auditing: Research & Practice*, 1(2017), 1-29.
- Banerjee, A. (2018). Can ratios predict the financial performance in banks: A case of national banks in United Arab Emirates (UAE). *International Journal of Accounting & Financial Reporting*, 8(4), 2162-3082.
- Basel-Committee on Banking Supervision (2009). Principles for the management of CR-consultative document; Basel, Switzerland, Available online at: <http://www/Bank for International Settlements>.
- Bekhet, H., & Eletter, S. (2014). Credit risk assessment model for Jordanian commercial banks: Neural scoring approach. *Review of Development Finance*, 4(1), 20-28.
- Bessis, J. (1998). *Risk Management in Banking*. John Wiley & Sons Ltd, 1998.
- Boahene, H. Dasah, J., & Agyei, K. (2012). CR & profitability of selected banks in Ghana. *Research Journal of Finance & Accounting*, 3(7), 6-14.
- Bouteille, S., & Coogan-Pushner, D. (2012). *The Handbook of Credit Risk Management: Originating, Assessing, & Managing Credit Exposures*. Chichester: John Wiley & Sons
- Brooks, C. (2008). *Introductory Econometrics for Finance (2<sup>nd</sup> Edition)*. Cambridge, Cambridge University Press.
- Brown, K., & Moles, P. (2008). *Credit Risk Management, (1<sup>st</sup> Edition)*. Edinburgh Business School, Edinburgh, United Kingdom. Retrieved from: <https://www.ebsglobal.net/EBS/media/EBS/PDFs/Credit-Risk-Management-Course-Taster.pdf>
- Carling, K., Jacobson, T., Linde, J., & Roszbach, K. (2007). Corporate credit risk modelling & the Macroeconomy. *Journal of Banking & Finance*, 31(1), 845-868.
- CBJ (2017). Central Bank of Jordan, Annual Financial Performance Report 2017. Retrieved from <http://www.cbj.gov.jo/EchoBusV3.0/SystemAssets/5c395f60-ea7f-4da5-8897-d046f33b75f4.pdf>
- Green, W.H. (2008). *Econometric Analysis, (6<sup>th</sup> Edition)*. Upper Saddle River, NJ: Prentice Hall.
- Gujarati, N.D. (2003). *Basic Econometrics (4<sup>th</sup> Edition)*. Tata McGraw-Hill, New Delhi, 748, 807.
- Hamdan, A. (2018). Intellectual capital & firm performance: Differentiating Between accounting-based & market-based performance. *International Journal of Islamic & Middle Eastern Finance & Management*, 11(1), 139-151.
- Hausman, J.A. (1978). Specification tests in econometrics. *Econometrica*, 46(6), 1251-1271.
- Hindi, M. (2004). *Modern Thought in Risk Management, Financial Engineering using Derivatives*. Alexandrina Library.

- Islam, K.M., Alam, M.B., & Hossain, M.M. (2019). Impact of credit risk management on bank performance: Empirical evidence from Bangladesh. *South Asian Journal of Management*, 26(2).
- Islam, M.S., & Nishiyama, S.I. (2016). The determinants of bank net interest margins: A panel evidence from south Asian countries. *Research in International Business & Finance*, 37, 501-514.
- Kani., S. (2017). Credit risk & banks performance: Evidence from WAEMU countries. *Journal of Economics & Finance*. 5(2), 5-11.
- Kargi, H. (2011). CR & the performance of Nigerian banks. *European Journal Finance Management*, 7(5), 67-99.
- Kennedy, P.J. (2019). Can ROE predict PER? *International Journal of Science & Management Studies*, 2(3), 83-85.
- Kodithuwakku, S. (2015). Impact of CR management on the performance of commercial banks in Sri-Lanka. *International Journal of Scientific Research & Innovative Technology*, 2(7), 1-6.
- Marshal, I., & Onyekachi, O. (2014). CR & performance of selected deposit money banks in Nigeria: An empirical investigation. *European Journal of Humanities & Social Sciences*, 31(1), 1684-1694.
- Muriithi, J., Waweru, K., & Muturi, W. (2016). Effect of credit risk on financial performance of commercial banks Kenya. *Journal of Economics & Finance*, 7(4), 72-83.
- Oduro, R., Asiedu, M.A., & Gadzo, S.G. (2019). Impact of CR on corporate financial performance: Evidence from listed banks on the Ghana stock exchange. *Journal of Economics & International Finance*, 11(1), 1-14.
- Ogboi, C., & Unuafe, K. (2013). Impact of CR management & capital adequacy on the financial performance of commercial banks in Nigeria. *Journal of Emerging Issues in Economics, Finance & Banking*, 2(3), 703-717.
- Ommeren, S.V. (2011). *An examination of the determinants of banks' profitability in European banking sector*. Rotterdam: Erasmus University Rotterdam.
- Ozili, P.K. (2017). Bank profitability & capital regulation: Evidence from listed & non-Listed Banks in Africa. *Journal of African Business*, 18(2), 143-168.
- Paudel, R. (2012). The impact of CR management on financial performance of commercial banks in Nepal. *International Journal of Arts & Commerce*, 1(5), 9-15.
- Peck, R., Olsen, C., & Devore, J.L. (2015). *Introduction to statistics and data analysis*. Cengage Learning.
- Pekkaya, M., & Demir, F.E. (2018). Determining the priorities of CAMELS dimensions based on bank performance. In: Dincer H., Hacıoglu Ü., & Yüksel S. (eds) *Global Approaches in Financial Economics, Banking, & Finance*. Contributions to Economics. Springer, Cham.
- Platonova, E., Asutay, M., Dixon, R., & Mohammad, S. (2018). The impact of corporate social responsibility disclosure on financial performance: Evidence from the GCC Islamic banking sector. *Journal of Business Ethics*, 151(2), 451-471.
- Robin, I., Salim, R., & Bloch, H. (2018). Financial performance of commercial banks in the post-reform era: Further evidence from Bangladesh. *Economic Analysis & Policy*, 58, 43-54.
- Rose, P. (2002). *Commercial Bank Management (5<sup>th</sup> Edition)*. Mc Graw-Hill/Irwin, USA.
- Ruslan, A., Pahlevi, C., Alam, S., & Nohong, M. (2019). The role of efficiency mediation in the effect of banks size on bank profitability in Indonesia. *Hasanuddin Economics & Business Review*, 3(1), 49-58.
- Saeed, M.S., & Zahid, N. (2016). The impact of credit risk on profitability of the commercial banks. *Journal of Business & Financial Affairs*, 5(2), 192-197.
- Saiful, S., & Ayu, D.P. (2019). Risks management & bank performance: The empirical evidences from Indonesian conventional & Islamic banks. *Int J Economics & Financial Issues*, 9(4), 90.
- Shahzad, K. (2019). The influence of CR management strategies on the performance of commercial banks: A comparative case study of UAE & UK commercial banks. *Unpublished PH.D Thesis, University of Liverpool*.
- Shawtari, F., Saiti, B., Razak, S., & Ariff, M. (2015). The impact of efficiency on discretionary loans/finance loss provision: A comparative study of Islamic & conventional banks. *Borsa Istanbul Review*, 15(4) 272-282.
- Verbeek, M. (2012) *A Guide to Modern Econometrics (4<sup>th</sup> Edition)*. West Sussex, John Wiley & Sons Ltd.
- Wood, A., & Mc-Conney, S. (2018). The impact of risk factors on the financial performance of the commercial banking sector in Barbados. *Journal of Governance & Regulation*, 7(1), 76-93.