Early Warning Indicators for Monitoring Non Performing Loans in Jordanian Banking System

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Abstract

This study aims at: 1) Exploring the macro and micro level variables that predict the loan quality deterioration in banking system at early time span, 2) To support more proactive corrective actions from the regulatory authority toward the problem financial institutions; 3) provide a guidance for establishing differential premium system for deposit insurance corporation based on the risk level for member banks; and 4) enhance the current supervisory authority's framework to control the banking system and insure the stability of the economy.This research used panel data analysis for a sample taken from 20 banks operating in Jordan for the years 2006-2014. This paper uses well-determined macroeconomic and microeconomic indicators that have been applied by different researches, several bank regulators, and deposit insurers, to estimate its relation with the level of nonperforming loans. The results found that there significant relationships between the selected indicators and the level of nonperforming loans ratio.

Keywords: Credit Risk, Banking System, Risk Management, Nonperforming Loans,Financial Indicators.

1.Introduction

Financial system stability is an important factor in the stability of overall economy.As an intermediary of fund flow, it is the main source of funding for most of investments, and it is the store of the surplus fund represented by households and corporate deposits. In addition, the cost of failure of any bank or financial institution is much higher than the cost of any other non-banking institution. This sensitive role made the financial authorities focus on monitoring and controlling financial system players more strictly than any other sector in the economy (Levine and Zervos, 1998).Supervisors of the banking system have a crucial role, they have to find different techniques to identify, measure, and monitor, and control the level of risk for the banks under concern. This risk management structure require the use of accurate measurement instrument to quantify the bank risk at early stages, and to enable the regulators to deal with it before deteriorating more. The risk quantification includes usingwell defined indicators to measure the risk and monitor it, then imposing the appropriate actions to control it. The timing of intervention to resolve the bank problems is very important in decreasing the cost of resolution. The earlier the intervention by the supervisory authority the lower the cost of this intervention. The resolution techniques used by supervisory authorities vary from the simplest and least costly ones, like levying fines and penalties on the management for violating the regulation, to the most complex and costly ones like liquidation and purchase and assumption. The decision taken from the regulatory authority depends on the severity of the case undertaken. This severity depends on the timing of this intervention, in other words; the small problems can be exacerbating to more severe ones if not dealt properly as soon as possible.Some exposures are more harmful to the safety and soundness of the banking system than others, and the bank regulators should consider these exposures and the indicators measuring it more carefully.

The main exposures that should be concerned are tracked to the key types of risksfor the banking system which are; credit risk, market risk, operational risk, and liquidity risk. These types represent the main challenge for the bankers and their supervisors as well. Regulators should be proactive in defining, measuring, monitoring, and controlling these risks. Accordingly they should be aware of the effective indicators for tracking the level of risk in the targeted banks.regulators are required to be updated with the riskiness position and the true level of safety and soundness for these banks to insure that they operate in the accepted levels of risk and identify any problem occurs as early as possible, to prepare for sudden adverse incidents (Summers, 2000).Deposit insurance is a very important tool for managing risk in the banking system if applied properly; jurisdictions have to adopt best practices when designing the deposit insurance scheme. Best practices may be crucial in determining the cost benefit for the deposit insurance system. One of the most important features in the deposit insurance system is the adoption a risk based premium system in pricing insurance policies (Gacia, 1999).The insurance premiums must be priced properly, otherwise the negative consequences will be higher that the positive ones. This implies that the premiums should be higher for risky banks and lower for less risky ones. Deposit insurer is in need for a valid and reliable approach to assess the level of bank risk, to be able to price the insurance policy efficiently.

This study aims at identifying the most effective indicators for tracking and measuring the level of credit risk in the Jordanian banking system, in a try to establish an early warning model for prediction credit risk deterioration in the banking system. This will enables the regulators to track the level of risk and to remain updated with it. Early warning system can be very helpful for bank regulators, they can be proactive in making corrective actions. The study is trying to define a group of indicators that can help to measure and monitor the risk in banking system, and decrease the cost of resolution for the troubled banks.

2.Literature Review

2.1 The crucial importance of Bank risk

Investments in the banking system are much more sensitive than investments in any other sectors. The financial connections between the banking system and other sectors, through borrowing lending relationships, make the whole economy more vulnerable to any shocks in the banking system. This relationship does amplify the contagion effect for problems triggered anywhere in the economy (Aharony and Swary, 1983). Most of the economic crises were triggered by troubles in the financial systems, and then transferred among different other sectors through the credit network provided by the banking system, in a phenomenon called domino effect (Crotty, 2009). Although the banking system does not trigger problems, it can facilitate the dispersion of it through other different sectors. Shocks can come from outside the country, but because all financial systems are well connected, the contagion or the domino effect can transfer easily to inside (Freixas et. al., 2000). Subsequently, the more stable the financial system is; and the more efficient the supervisory inspections are; the healthier and more resilient the economy to face any troubles (Serwa and Bohl, 2005).

The severity and speed of the dispersion of any trouble in the banking system can be a function of the level of connection between banks, represented by the market structure, (Allen and Gale, 2000; Degrysea and Nguyenb, 2007). Empirical results showed that the more diversified linkages and relationships (represented by symmetric structures), the less the contagion effect to the institution. Other points of view revealed that when a regular bank is connected to a money center, then it should be exposed to contagion from the troubles occur within that money center, even if the structure were symmetrical, (Freixas, et. al., 2000). Sundararajan et al. (2002) sees that the 2008 global financial crisis was started in the US and then dispersed around the world, and that is because of the global banking connections and relationships, that is why they think that the banking system should have excessive attention in examination and inspection.

The failure of the commercial banks draw much attention of the regulatory authorities than other non-banking institutions, and the researches have focused on predicting the failure of the bank before the event actually becomes a matter of fact. The failure prediction trials started many decades ago, not starting from (Altman, 1968) and (Merton, 1974) and (Scot, 1981). Failure prediction models can take the form of early warning system (Canbas, 2005), which monitor the level of risk and extract a probability of default for the institution, and keep update this probability periodically. The failure prediction frame works use group of factors that determine the solvency of the bank, and can estimate the probability of default (Meyer and Pifer, 1970; Altman, 1968). Some method follow top down approaches in analysis (Duttweiler, 2009; Sabatier, 1986). Which means the analyst start from the macro level indicators and then go down to industrial variables and then to bank specific variables.

Some other methods adopt bottom up approach which use the opposite direction in analysis.Crouhy et al., (2000) applied Merton KMV model in estimating the probability of default of any bank based on the option pricing model detected from Merton's famous paper (Merton, 1974). The model estimate the market value of the assets, and define the default threshold point as when the market value of the assets decline below certain level which is usually the book value of the liability (Atiya, 2001).

In commercial banks,a substantial attention is paid to credit risk. This is due to the fact that the largest portion of commercial bank assets is concentrated in the loan portfolio, and therefore this portfolio represents the largest and the most serious exposure for these banks. That is why commercial banks themselves and the banking system regulators focus intensively on monitoring the levels of credit risk in banks using different methods.Fundamental analysis is one of the most reliable approaches to estimate the financial safety and soundness for banks.This analysis uses actual disclosed historical financial data that will be interpreted in certain mathematical ways to extract financial ratios and indicators (Elsinger et. al., 2005; Pastor, 2002). Each indicator measures specific element of the financial position and performance of the bank under investigation. Assigning a weight to every indicator of the selected ones, then grouping these indicators will produce a composite index for banks. This composite index is the main proxy for the overall safety and soundness of the banks, and it's sometimes called banks rating (Cole, 1998).

With respect to deposit insurance system, it is the umbrella that provides the coverage for depositors to mitigate financial panic and bank run that occurs postbank failures. This insurance system can eliminate the contagion effect for that failure and stop the accelerating dispersion of the problem (Demirgüç-Kunta and Detragiache, 2002; Demirgüç-Kunt and Kane, 2002; Diamond and Dibvig, 1983; Bryant, 1980). Applying deposit insurance can create moral hazard as a byproduct(Cropp and Vesala, 2001; Kam, 2011), and that moral hazard can be magnified as the coverage provided by deposit insurer increase (Kam, 2011; Ngalawa et. al., 2011). The bad consequences resulted from deposit insurance coverage, can exceeds the intended benefits. Empirical evidence suggest that a well-designed deposit insurance scheme that follow the best practices can eliminate the negative consequences (Gacia, 1999)In order to apply the most efficient models of deposit insurance, without increasing moral hazard, the insurer should adopt a risk based premium system in pricing insurance policies.Well priced insurance policy for member bank can mitigate the level of moral hazard risk (Cummins, 1988; Markus, 1984). To apply the risk based premium system effectively, the deposit insurer should estimate the expected loss or the probability having submitted claims from depositors.This expected loss can be estimated by making assessment ofthe level of risk for member banks accurately and efficiently (Zhihong, 2004; Falnnery, 1991; Pennacchi, 1987; Thomson, 1987).Deposit insurer should apply a comprehensive risk assessment approach, by combining the sub risk assessments and produce a composite rating.Composite rating should include the credit risk, market risk, operational risk, and liquidity risk. The scope of this paper is limited to estimate the level of credit risk as a step forward to apply the risk based premium system (Garcia, 1999, Avery and Belton, 1987).

2.2On-site and Off-site Analysis

A comprehensive approach for producing banks' composite rating that includes more than one indicator in assessing the level of risk is the CAMELS rating.This approach was first put in service in the US in 1979, and later becomes to be a key approach in banking supervision by the three US banking supervisory agencies, the Federal Reserve, Federal Deposit Insurance Corporation (FDIC), and Office of the Comptroller of the Currency (OCC) (Dang, 2011). This approach uses a composite index that consists of a group of financial indicators (mainly financial ratios) from six different area of analysis which are: Capital adequacy (C), Assets Quality (A), Management efficiency (M), Earnings level and consistency (E), Liquidity (L), and Sensitivity to market risk (S). Each of these areas uses some ratios that measure the bank's performance and financial position in that category (Dang, 2011; Wheelock and Wilso, 2005; Sangmi et. al., 2010). This technique is classified as on-site technique because the required data to apply this analysis cannot be obtained except through on-site inspection. Regulators apply this technique to assess the level of risk for licensed banks operating in the country, which provides them with an early warning system for failure and turbulence and enables them to interact as early as possible(Barr and Siems, 1994; Cole and Gunther, 1998).CAMEL'S analysis or sometimes called CAMELS composite rating, can be an efficient approach in predicting bank's failure. The resulted information can reflect the actual financial position for the investigated banks, (Cargill, 1989; Wheelock and Wilso, 2005).

It is a bit difficult for non-regulators to adopt CAMELS composite rating approach because of the need for some qualitative internal data related to the bank that needs on-site inspection, and no other external analysts can have an access to such data except the regulator. Some other analysts believe that the CAMELS analysis results can uncover some confidential information about the financial position of the banks (Berger and Davis, 1994).Consequently, the analysts have developed a very similar technique called CAEL (Kapil and Kapil, 2005).This approach includes all previous categories of analysis except the management and sensitivity to market risk, which difficult to obtain as mentioned, Federal Deposit Insurance Corporation FDIC developed this offsite approach and used it in evaluating the safety and soundness for the financial institutions, and then developed it to what so called Statistical CAMELS Offsite Rating SCOR (Hafeman and Randle, 2009). FDIC used CAEL approach for offsite analysis; it applied the analysis on a quarterly data from call reports. FDIC tried to overcome the problem of onsite supervisory data that is required to apply CAMEL (Sahajwala and Bergh, 2000).

Sometimes external analysts or independent institution can do the same mission, and issue an external financial rating using similar designed customized composite rating. Rating agencies can issue the rating for any company when the company itself ask for that, and for certain fees, which make the rating itself to doubtful from some parties point of view (Sy, 2009; Altman and Rijken, 2004). Rojas-Swarez, (2001) explored the banks rating methodology in the emerging market, with a focus on the financial indicators that should be used, and what the experience tells us to learn about these indicators. She found that not only the credit quality for banks and capital adequacy are important for determining bank's risk level, but rather there are a severity of indicators that should be applied along with it, like the interest rate spread for individual bank, and risk taking behaviors for weak banks. Bonginiet al., (2002) investigated the differences between three groups of indicators in exploring the banks fragility. These indicators were the accounting data, the credit rating, and the stock market data. The results showed that the implications of these different groups are different and the timing of the discovery of the problem is different as well. The indicators from the stock market were not efficient in outpacing the information imbedded in financial statements about the financial position. Stock market indicators, on the other hand, were more quickly in responding to any changes in the financial position or condition than the credit rating indicators and the accounting indicators.

2.3 The effect on nonperforming Loans

A lot of researchers have investigated the determinant of credit risk in banks using the nonperforming loans as aproxy, and estimated the effect of agroup of macroeconomic variables andmicro economic variables on the level of nonperforming loans, using panel data analysis, (Das and Gosh, 2007; Curak et al. 2013; Suryanto, 2015; Vatansever and Hepsen, 2013;Klein, 2013;Messai and Jouini, 2013; Khemraj and Pasha, 2009; Louizis et al., 2010). Most of the results revealed that there were significant relationships between these independent variables and the dependent variable.Other used only macroeconomic variables to investigate its effect on the quality of loans, (Saba et al., 2012; Filip, 2013; Nkusu, 2011; Bofondi and Ropele, 2011; Pesola, 2007) and they used the panel regression analysis to estimate the models, and the results were significant in all researches. Other researchers used only thebank specific variables to estimate its effect on the level of bad loans, (Hou, 2007). The majority of the researches have used a combination of macroeconomic and microeconomic variables.Some papers studied the behavior of nonperforming loans in the cyclical movement of the economy, and how it is going to move in prosperity and recessions (Quagliariello, 2007). Barr and Siems (1996) proposed an early warning system that can predict the level of nonperforming loans for any bank using macro and micro variables, this early warning system is supposed to predict the failure of any bank based on its level of problem loans.Fofak (2005) investigated the same relationship during the banking crisis happened in 1990. The study has been applied on the countries of sub-Saharan Africa, and found a significant causality effect of macroeconomic and microeconomic variables on the nonperforming loans.Literatures may classify the variables that affect the nonperforming loans into internal variables, which represent the bank specific or micro economic variables, and external or macroeconomic variables, (Sinkey and Greenwalt, 1991). Sinkey and Greenwalt used a sample of the US banks for the period from 1984 to 1987. The results of the regression applied showed that the volume of the loans and the sufficient capital level had a significant effect on the level of loan losses for the preceding three years.Nkusu (2011) analyzed the mutual two sides' relationship between macroeconomic effect on the nonperforming loans, and the nonperforming loans effect on the macroeconomic variables. The study used a sample from 26 developed countries and used panel regression for the first relationship and panel vector auto regression (PVAR) for the second relationship.

The results were consistent with suggestions, where the macroeconomic variables had a significant effect on the level of nonperforming loans, and the nonperforming loans proof a significant effect on the overall prosperity of the economy through macroeconomic variables. Rinaldi and Sanchis-Arellano (2006), focus more on household's loans while detecting if there are any effect of the different economic variables on the loans in arrears with. The study has been applied on a sample from European countries, using co integration and error correction model, the results revealed that the financial position of the households and then the quality of their loans are well affected by the their income and wealth. Some papers applied the same approach with a focus on the differences of the effect on the developing and developed countries, (Demirgüç-Kunt and Detragiache, 1998).Vazquez et al. (2012) interacted with the same topic from different perspective, they have applied a macro stress test for the credit risk in the Brazilian banking sector, they used several macroeconomic variables to track its effect on the level of credit risk, the study used panel data analysis on the sample of banks, and found that there were significant effect of the macro variables like GDP growth rate on the level of credit risk represented by nonperforming loans.

3. Methodology

This paper will use the quantitative approach to estimate the relationship between micro level variables, as independent variables, and the level of non-performing loans (NPL) as a dependent variable represent the level of credit risk in the bank.The major operations for commercial banks is concentrated in accepting deposits and granting loans, the majority of assets are concentrated in loan portfolio, and this concentration will represent the largest exposure in the commercial banks operations. The model will control some macro level variables that theoretically have a significant relationship with the level of NPL. This can help to avoid the problem of omitted variables in the model, and will increase the validity and reliability of the results. A panel data analysis will be applied to a sample from the Jordanian banking system, this sample will consist of 20 bank for the period from 2006 and 2014. The model is shown below.Credit Risk = ʄ (Macro-variables, Micro-variables) … (1)With respect to the deposit insurance, the risk based premium system will ensure charging the risky banks higher premiums than the least risky ones. This means that the premiums paid by member banks will be a function of the overall risk level inherent in the bank, including the credit risk.Deposit Insurance Premiums = ʄ (Credit risk, Market Risk, Operational Risk, Liquidity Risk) ……. (2)

The extent of this paper is limited to the estimation of the first equation that implies the effect of multiple macro and micro variables on the level of credit risk (proxied by nonperforming loans). The variables included in the model will be divided into two levels, micro or bank level variables, and macro level variables (Nkusu, 2011). The macro level ones will be GDP growth (GDPG) which can catch the level of prosperity of the economy without worrying about the stationary problem the sign for this variable is expected to be negative.The general level of interest rates prevailing in the economy (INT) and the sign for this variable is expected to positive, since the more the spread the higher the cost of borrowing or cost of fund on the investors or fund users, and the higher the probability of default. And the inflation rate (Inf) which we assume to have a negative relationship with the nonperforming loans because usually inflation deteriorate in recessions and even approach negative records. Finally the unemployment rate will be used in the model (UNEM).

While the bank level variables, which represent the actual contribution of this paper, will be Capital Adequacy Ratio (CAR) as determined by Basel accord (regulatory capital / risk weighted assets), and the relationship between this variable and the dependent variable is expected to be negative. Return on Assets (ROA) which is the net income for the year over the average assets,and the expected sign is negative. Liquidity ratio (LIQ) represented by the ratio of cash and cash equivalent to noncore customer deposits, (customer deposits over JD 100,000), and the expected sign is negative. The efficiency ratio which is the ratio of general and administrative expenses over the interest revenues, this ratio measures the bank management efficiency in running the bank operations in general (EFCY), the expected sign is negative. The ration of operating assets, which represent the ratio of the income generating assets to total assets (OPASST).The ratio of loans to customer deposits (CRDEP). The ratio of loans for related parties to total loans will be considered as well (LRP),(Louizis et al., 2010).The data for the macro level variables will be easily found on the website of the statistical data base of the Central Bank of Jordan, while the bank level variable will be taken from the annual financial statement for those banks which are available from the annual reports. The bank level variable will take the form of ratios, and the calculations for these ratios are simple and straight forward.

With respect to CAR, this paper will depend on the data as calculated by banks and audited and approved by the Central Bank of Jordan,with respect to ROA its calculation will depend on using average total assets in the denominator,the last variable is the liquidity variable which represents a proxy for liquidity measurement. The model will be as follow:

NPLit=αit+β1GDPGit+β2INTit+β3INFit+β4UNEM +β5ROAit+β6CARit+β7LIQit+β8EFCYit+β9CRDEPit+β10LRPit+β11OPASSTit+β12NPLit-1+µit .... (4)

4. Findings and discussion

4.1 Unit Root Test

Testing the stationary of the variables used in the regression show a stationary for all variable used, Table (1) show the results of the unit root test for these variables using "Liven, Lin & Chu test" for panel data unit root tests.

Variable	Statistic	Prob.	Test
ROA	-9.72734	0.0000	Levin, Lin & Chu t*
CAR	-8.07187	0.0000	Levin, Lin & Chu t*
EFCY	-6.26645	0.0000	Levin, Lin & Chu t*
OPASST	-9.49273	0.0000	Levin, Lin & Chu t*
CRDEP	-5.90042	0.0000	Levin, Lin & Chu t*
LIQ	-11.4973	0.0000	Levin, Lin & Chu t*
LRP	82.3081	0.0001	PP - Fisher Chi-square
NPL	-6.21846	0.0000	Levin, Lin & Chu t*
GDPG	-9.62448	0.0000	Levin, Lin & Chu t*
INT	-15.5236	0.0000	Levin, Lin & Chu t*
INF	-5.37851	0.0000	Levin, Lin & Chu t*

The results show that all variables are stationary at the level and with a level of significance of 5%, and there is no worry about spurious regression and non-reliable regression results, and there is no need for applying co integration and error correction models, like some researchers have done in similar researches.

4.2 Regression Results

Running the panel regression on the data produced results that are compliant with the suggested and hypothesized directions and the significance of the relationships. The model selected succeeded to explain more than 80% of the variations in the NPL in the Jordanian banking system. 80% is sufficiently high to rely on it to forecast and track future changes in NPL.The resulted coefficient for the GDPG variable was consistent with the expected economic direction and the theoretical assumption, where the coefficient was negative and statistically significant.This means that the state of the economy for the country significantly affect the performance of loans portfolio represented by the nonperforming loans ratio. So we can expect that at the time of prosperity, the NPL will be at minimal, while at the times of recessions it will be higher. This result is quiet reasonable and it is consistent with all previous studies. With respect to inflation, the relationship was negative but statistically insignificant. Interest rate and unemployment both show a positive relationship but they were statistically insignificant. The coefficient of ROA variable was negative and statistically significant, which is consistent with the theory and with the expectation as well, that is when the bank's management was prudent, and the institutional process of running the bank were efficient, then the overall performance of the bank will be good, then, the efficiency of the bank financial performance and position will be reflected on its financial indicators, and one of the most important financial performance indicator is the profitability for that bank, measured by ROA, and that will significantly affect the level of bad loans.

The coefficient of LIQ variable was positive and statistically significant, which is, from certain perspective, consistent with the expectations.Since, as mentioned earlier, as the bank management follow a prudential risk management procedures, and run the business in a well-organized manner, then the overall performance will be good, and one of the financial indicators that will reflect the good performance is the liquidity indicators, represented by LIQ. Efficiency ratio coefficient (EFCY) was positive and statistically significant, and that is consistent with the theory and the logic of analysis.

Where the lower the efficiency ratio the better the efficiency management for the bank, and the lower the default risk expected.The ratio of operating assets coefficient (OPASST) was negative and statistically significant, which means that the higher the non-income generating assets in the bank balance sheet; the higher the non-performing loans it will has.The coefficient for NPLt-1 variable (which is the one period lagged dependent variable that represent the last year's level of nonperforming loans ratio) was positive and statistically significant, which is consistent with what was expected. This result is logical and reasonable because when certain debt is classified into nonperforming loans, it passes through multiple stages of classification, starting from loans in arrears and ending up with written off debt. Each stage with certain additional provisioning requirements, so, by passage of time, and assuming the bad loans continue to be a bad loans, that bad loans will continue to be registered as a bad loan for additional time in the future until the board of director decision to write off these debts.

In addition to that, the loan losses usually increase in the bad economic and financial conditions, and the collapsing of the healthy loans will not happened one time, but rather some of them will be deteriorated in quality before the other. And by time the NPL for time (t) will be more than NPL for time (t-1), and the NPL for time (t-1) will be more than NPL for time (t-2).CAR coefficient waspositive but it was statistically insignificant, and as the Central Bank of Jordan set a legal minimum requirement for the capital adequacy ratio, which is equal to (12%), and any bank violates this minimum level will be punished, and it is very unlikely that any licensed bank to violate central bank's regulations in Jordan, so we expect that all licensed bank to comply with it. On the other hand,the actual variation of the CAR among banks was for levels over the minimum requirement, which means that some of the banks may have a very high CAR over the requirement level, and other banks may have lower level but still over the minimum requirement, and it is highly unlikely to have violation in this ratio.Over set CAR is not justifiable asa preferable risk management practice, rather it may indicate to a low profitability and inefficient investment management. This was the case for most of the banks for the period that followed the recent financial crisis (2008), and that period was included in our sample, so we can expect that many of the over conservative banks will have a high levels of CAR in that period, so we should expect that the variation of this ratio will not explain the variation of the non-performing loans.With respect to the CRDEP and LRP the sign of its coefficient was negative and statistically insignificant, which is inconsistent with the expectations. As the ratio CRDEP represent some long term liquidity indicator, then this variable should be consistent with the variable LIQ, since both of them measure the level of liquidity of the bank and the level of safety and soundness for that bank, see table (2).

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.220539	0.184997	1.192124	0.2351
ROA	-2.308351	0.376012	-6.13903	000000
CAR	0.000748	0.006137	0.121954	0.9031
EFCY	0.047214	0.023944	1.9718	0.0505
OPASST	-0.386131	0.123131	-3.13594	0.0021
LIQ	0.016397	0.005629	2.912756	0.0041
CRDEP	-0.016467	0.018281	-0.900747	0.3692
NPL(-1)	0.582917	0.04835	12.05618	000000
LRP	-0.086623	0.081055	-1.068695	0.287
GDPG	-0.300131	0.150409	-1.995435	0.0479
INF	-0.041278	0.064527	-0.63969	0.5234
INT	1.547814	1.396304	1.108507	0.2695
UNEM	0.55257	0.486183	1.136549	0.2576

4.3 Reliability of the regression Results

With respect to the main statistics for these results we find that Adjusted R^2(which represent the reliability levelof the model as a whole and its ability to explain the variations in the dependent variable) was 80.5% which is pretty high and enough to be satisfied about the model. F statistics was significant which means that all variables included in the model were collectively significant in explaining the variations in the dependent variable.

Autocorrelation was note existed between the error terms of the regression because Durbin Watson statistics was 1.91 which is very close to 2 and we can conclude that the residuals of the regression have no serial correlation, see table (3).

R-squared	0.804969	Mean dependent var	0.086433
Adjusted R-squared	0.788939	S.D. dependent var	0.065817
S.E. of regression	0.030237	Akaike info criterion	-4.081273
Sum squared resid	0.133485	Schwarz criterion	-3.830356
Log likelihood	337.4612	Hannan-Quinn criter.	-3.979378
F-statistic	50.21668	Durbin-Watson stat	1.909587

With respect to the multicollinearity between the independent variables, we used the correlation matrix to measure the correlation between the repressors, as shown from table (4).From the correlation table we can see that there is no significant high correlation between the explanatory variables (relatively speaking) except for NPL and NPLt-1, which is expected of course, as a lagged variable. Excluding the lagged dependent variable from the equation will produce the same results with the same sign for the coefficients and with the same level of significance and without any multicollinearity problem, but with autocorrelation, which means that the results are reliable and there is no multicollinearity that threatens the reliability of the regression.

	ROA	CAR	EFCY	OPASST	LIQ	CRDEP	NPL(-1)	LRP	GDPG	INF	INT	UNEM
ROA	1.00	0.05	-0.04	0.31	0.07	0.05	-0.23	-0.08	0.13	0.09	-0.07	-0.08
CAR	0.05	1.00	0.07	0.24	0.07	0.12	-0.07	-0.10	0.09	0.17	0.03	0.02
EFCY	-0.04	0.07	1.00	-0.04	0.40	-0.29	0.41	-0.11	-0.20	-0.08	-0.04	-0.05
OPASST	0.31	0.24	-0.04	1.00	0.27	-0.31	-0.50	-0.38	0.19	0.05	0.06	0.10
LIQ	0.07	0.07	0.40	0.27	1.00	-0.41	0.13	-0.21	0.10	0.01	-0.10	0.05
CRDEP	0.05	0.12	-0.29	-0.31	-0.41	1.00	-0.13	0.22	0.39	0.22	-0.03	0.24
NPL(-1)	-0.23	-0.07	0.41	-0.50	0.13	-0.13	1.00	0.22	-0.24	-0.05	-0.16	-0.11
LRP	-0.08	-0.10	-0.11	-0.38	-0.21	0.22	0.22	1.00	0.02	0.04	0.01	-0.03
GDPG	0.13	0.09	-0.20	0.19	0.10	0.39	-0.24	0.02	1.00	0.38	-0.02	0.46
INF	0.09	0.17	-0.08	0.05	0.01	0.22	-0.05	0.04	0.38	1.00	-0.14	0.14
INT	-0.07	0.03	-0.04	0.06	-0.10	-0.03	-0.16	0.01	-0.02	-0.14	1.00	-0.14
UNEM	-0.08	0.02	-0.05	0.10	0.05	0.24	-0.11	-0.03	0.46	0.14	-0.14	1.00

4.4 Implications for Regulatory Authorities and Deposit Insurers

These important empirical results should be meaningful to all concerning parties. Regulatory authority should be interested in selecting the most appropriate indicators in monitoring the levels of credit risk for banks under consideration. The level of future NPL can be estimated more precisely using the model developed in this paper. The decision maker that is trying to govern and supervise the banking system in the most efficient way may be interested in this model as well.The central bank, as a regulatory authority, can set certain virtual limits or thresholds for the ratios applied in this model, and keep monitoring the operating banks and their performance, the banks that exceed this virtual threshold will be classified on the watch list for more excessive inspection.So, these indicators is not the end of the story, rather they are the beginning, they should provide the supervisor with the alarming points, and help him to red flag the doubtful areas for excessive inspection.Regulators used to control few numbers of indicators that concern the risk level, like capital adequacy ratio (CAR), credit concentrations, loans to related parties, and some liquidity indicators,and they do not hesitate to make comments to the bank management about any critical values or comments.Deposit insurer, on the other hand, can utilize these results when applying the risk based premium system.The dilemma for deposit insurance systems is the tradeoff between bank run risk and moral hazard. The initiation of deposit insurance system can create moral hazard, and to minimize this problem deposit insurers should adopt risk based premium system. Applying such risk based system needs assigning risk level for member banks carefully.This risk classification can take a form of risk rating. This rating should clearly reflect the actual risk level for those banks without any debate about it.

Deposit insurer can generate such risk rating through careful fundamental analysis using particular selected indicators. The model developed in this paper represents a good starting point to develop such rating system. After the risk rating has been generated, each single bank should fall in certain risk category or risk group that is consistent with its risk rating. Accordingly, a group of risk categories will be set, and the banks will fall in these risk groups according to their risk rating.Each group of banks must pay premiums for its insurance policy that is different than the premiums paid by other banks in different risk groups.The better the risk rating for the bank, the higher the risk group it will be classified in and the lower the premium it will pay for the insurance policy. The way this paper can help deposit insurer is in the risk rating stage, the variables used in this paper represent an example of the variables that should be used when developing the risk based premium system. Developing such system requires using several financial and non-financial indicators, quantitative and qualitative; this paper can represent the first step toward developing efficient risk based premium system.

5. Conclusion

This research give an empirical evidence for the macro andmicro variables that really affect the level of nonperforming loans ratio in a group of Jordanian banks, these variables are selected among variety of available variables that used to estimate the safety and soundness of the banking system, whether used by the central bank of Jordan, or any other regulatory authority, or even suggested by analysts.The analysis show approved negative relationship between the prosperity of the economy as a whole and the level of credit risk in the banking system, and that is clear from the negative significant relationship between GDPG and NPL, which is a normal result again.The analysis show a proved negative relationship between profitability and risk which is very clear from the negative significant relationship between ROA,EFCY, LIQ, OPASST, and lagged NPL on the dependent variable. These variables can effectively direct the banking system supervisors (or stakeholders), whether they were regulators or insurers or even investors, to the most accurate and reliable indicators of the level of credit risk in banks, and to watch the deterioration of this level over time. Regulators can use such indicators to establish an early warning system for loss and failure prediction, to be prepared previously and sufficiently for any resolution action or loss recovery burdens.These results can be very useful for deposit insurer for the purposes of applying risk based premium system, and mitigate the effect of moral hazard. For investors, it is quiet important to direct the investor to the most efficient investment appropriate for them based on their risk tolerance, and according to the well-known risk return relationship. For deposit insurers, these indicators can help them to butter price the insurance policy for the member banks, and efficiently mitigate the moral hazard that may arise, and can better protect their reserves from over risky member banks.

References

Aharony, J. Swary, I. (1983), "Contagion Effects of Bank Failures: Evidence from Capital Markets", *The Journal of Business*,Vol. 56, No. 3, pp. 305-322.

Allen, F., and Gale D., (2000), "Financial Contagion", *the Journal of Political Economy*, Vol. 108, No. 1.

Altman, E. and Rijken, H., (2004), "How Rating Agencies Achieve Rating Stability", Journal of Banking and Finance, Vol. 28, No. 11.

Atiyah, A., (2001), " Bankruptcy Prediction for Credit Risk Using Neural Networks: A Survey and New Results", *IEEE TRANSACTIONS ON NEURAL NETWORKS*, VOL. 12, NO. 4.

Avery, R. and Bolton, A., (1987), "A Comparison of RiskBased Capital and RiskBased Deposit Insurance", Economic Review, Available at <https://core.ac.uk/download/files/153/6229994.pdf> (accessed July 24, 2016)

Barr, R., Siems, T. (1994), "Predicting Bank Failure using DEA to quantify management quality", Federal Reserve Bank of Dallas, Financial industry Studies, Working papers No. 94.

Berger, A., and Davies, S., "The Information Content of Bank Examinations',' *Finance and Economics Discussion*, Series No. 94±20, Board of Governors of the Federal Reserve System, 1994.

Bofondi, M., Ropele, T. (2011), "Macroeconomic determinants of bad loans: evidence from Italian banks", Bank of Italy, Economic Research and International Relations Area, Occasional Papers, 89.

Bongini, P., Aeven, L., Majnoni, G., (2002), "How good is the market at assessing bank fragility? A horse race between different indicators", Journal of Banking & Finance, Vol. 26,pp. 1011–1028.

Cifter, A., Yilmazer, S., Cifter E., (2009), "Analysis of Sectorial Credit Default Cycle Dependency with Wavelet Networks: Evidence from Turkey", *Economic Modelling*,Vol. 26, No. 6, pp. 1382-1388.

Cole, R., and Gunther J., (1998), "Predicting Bank Failures: A Comparison of On- and Off-Site Monitoring Systems", Journal of Financial Services Research, Vol. 13, Issue 2, pp. 103-117.

Crotty, J., (2009), "Structural causes of the global financial crisis: a critical assessment of the 'new financial architecture", *Cambridge Journal of Economics*,Vol. 33, pp. 563–580.

Crouhy, M., Galai, D., Mark, R., (2000), "A comparative analysis of current credit risk models",*Journal of Banking & Finance*, Vol.24, pp. 59-117.

Cummins, J., (1988) "Risk-Based Premiums for Insurance Guaranty Funds", *the Journal of Finance*, Vol. 43, Issue4, pp. 823–839.

Ćurak, M., Pepur, S., Poposki, K., (2013), "Firm and Economic Factors and Performance: Croatian Composite Insurers", *Business Review Cambridge*, Vol. 19, No. 1, pp. 136-142.

Dang, U. (2011), "The CAMEL Rating System in Banking Supervision"Arcada University of Applied Sciences, International Business.

Das, A. & Ghosh, S. (2007), "Determinants of Credit Risk in Indian State-owned Banks: An Empirical Investigation," MPRA Paper 17301, University Library of Munich, Germany.

Degrysea, H. and Nguyen, G., (2007), " Interbank Exposures: An Empirical Examination of Contagion Risk in the Belgian Banking System", *International Journal of Central Banking*, Vol. 3, No. 2.

Demirgüç-Kunt, A. and Kane, E. J. (2002). "Deposit Insurance Around the Globe: Where Does It Work?",*Journal of Economic Perspectives*, 16(2), pp. 175–195.

Demirgüç-Kunt, A., and Detragiache, E., (2002), "Does Deposit Insurance Increase Banking System Stability? An Empirical Investigation," *Journal of Monetary Economics*, Vol. 49, No. 7, pp. 1373-1406.

Demirgüç-Kunt, A., Detragiache, E., (1998), "The Determinants of Banking Crises in Developing and Developed Countries", Staff Papers, *International Monetary Fund*, Vol. 45, No. 1, pp. 81–109.

Diamond, D. and Dybvig, P. (1983), "Bank Runs, Deposit Insurance, and Liquidity", *Journal of Political Economy*,Vol. 91, No. 3, pp. 401-419.

Duttweiler, R. (2009) Managing liquidity in banks: A top down approach. United Kingdom: Wiley, John & Sons.

Elsinger, H., and Lehar, A., and Summer, M., (2005),*"Using Market Information for Banking System Risk Assessment"*, Available at:<SSRN:http://ssrn.com/abstract=787929> (accessed 12 July 2016)

Evanoff, D., and Wall, L. (2001), "Measures of the riskiness of banking organizations: Subordinated debt yields, risk-based capital, and examination ratings", *Journal of Banking & Finance*, Vol. 26, Issue 5, pp. 989–1009.

Farhan, M., Sattar, A., Chaudhry, A. and Khalil, F.(2012),"Economic determinants of nonperforming loans: Perception of Pakistani bankers",*European Journal of Business and Management*, Vol. 4, No. 19, pp.87-99.

Filip, B. (2013), "The quality of bank loans within the framework of globalization", *Procedia Economics and Finance*, Vol. 20, pp. 208-217.

Flannery, M.,(1991), "Pricing deposit insurance when the insurer measures risk with error," Journal of Banking & Finance, Vol. 15, No. (4-5), pp. 975-998.

Fofack, H. (2005), "Non-performing loans in sub-Saharan Africa: Causal Analysis and Macroeconomic Implications", World Bank Policy Research Working Paper No. 3769.

Freixas, X.,Parigi, B., and Rochet, J., (2000), "Systemic Risk, Interbank Relations, and Liquidity Provision by the Central Bank", *Journal of Money, Credit and Banking*, Vol. 32, No. 3, Part 2: What Should Central Banks Do? pp. 611-638

Garcia, G., (1999), "Deposit Insurance: A Survey of Actual and Best Practices", IMF Working Paper, WP/99/54.

Gropp, R. and Vesala, J. (2001). "Deposit Insurance and Moral Hazard: Does the Counterfactual Matter?".European Central Bank Working Paper 47.

Hafeman, M. and Randle, T.(2009), "On and offsite inspections". Primer series on insurance, issue no. 13. Washington, DC: World Bank. http://documents.worldbank.org/curated/en/2009/12/14357042/offsite-inspections

Hitchcock, J. (2014), "Determinants of Microfinance Loan Performance and Fluctuation over the Business Cycle".Availableat:< http://hdl.handle.net/10066/14563> (accessed July 12, 2016).

Hou, Y. (2007), The Non-performing Loans: Some Bank-level Evidences. The 4th Advances in Applied Financial Economics, the Quantitative and Qualitative Analysis in Social Sciences conferences.

Kapil, S. & Kapil, K., (2005), "CAMEL's ratings and its correlation to pricing stocks – An analysis of Indian banks", *University Journal of Bank Management*, Vol. 4, No.1, pp. 64-78.

Kam, H., (2011). "Deposit Insurance and Banking Stability",*CATO Journal*, Vol. 31, No. (1), pp. 99–117.

Keeton, W., (1999), "Does Faster Loan Growth Lead to Higher Loan Losses?", Federal Reserve Bank of Kansas City, Economic Review, Vol. 84, No. (2), pp. 57-75.

Klein, N. (2013), "Non-Performing Loans in CESEE: Determinants and Impact on Macroeconomic Performance", IMF Working Paper European Department, WP/13/72, 2013 International Monetary Fund.

Khemraj, T. and Pasha, S. (2009), "The determinants of non-performing loans: An econometric case study of Guyana", The Caribbean Centre for Banking and Finance Bi-annual Conference on Banking and Finance, St. Augustine, Trinidad.

Levine and Zervos (1998), "Stock Markets, Banks, and Economic Growth", the American Economic Review, Vol. 88, No. 3, pp. 537-558.

Louzis, D., Vouldis, A. and Metaxas, V. (2010), "Macroeconomic and bank-specific determinants of non-performing loans in Greece: a comparative study of mortgage, business and consumer loan portfolios", Bank of Greece, Working Paper, no.118.

Markus, A., (1984), " Deregulation and bank financial policy", Journal of Banking & Finance, Volume 8, Issue 4, pp. 557-565.

Merton, R., (1974), " On the pricing of corporate debt: the risk structure of interest rates", the journal of Finance, Vol. 29, Issue 2, pp. 449–470.

Messai A., and Jouini J. (2013), "Micro and Macro Determinants of Non-performing Loans", *International Journal of Economics and Financial Issues*, Vol. 3, No. 4, pp.852-860.

Meyer, P., &Pifer, H., (1970),"Prediction of Bank Failures",*the Journal of Finance*, Vol. 25, No. (4), pp. 853-868.

Ngalawa, H.; Tchana, F. T.; and Viegi, N., (2011), "Banking Instability and Deposit Insurance: The Role of Moral Hazard",*Munich Personal RePEe Archive*, pp. 1–41.

Nkusu, M. (2011),"Nonperforming Loans and Macrofinancial Vulnerabilities in Advanced Economies", IMF Working Paper, No. 11/161.

Quagliarello M. (2007), "Banks' Riskiness Over the Business Cycle: a Panel Analysis on Italian Intermediaries", *Applied Financial Economics*, Vol. 17, pp. 119-138.

Pastor J., (2002),"*Credit risk and efficiency in the European banking system: A three-stage analysis*", Applied Financial Economics, Volume 12, Issue 12, PP. 895-911.

Pennacchi, George (1987a) "Alternative Forms of Deposit Insurance: Pricing and Bank Incentive Issues," Journal of Banking and Finance 11, 291-312

Pesola, J. (2007), "Financial fragility, macroeconomic shocks and banks' loan losses: evidence from Europe", Bank of Finland Research Discussion Papers No. 15.

Xue-zhi, Q., Xiao-lin, S., Kang, Z., (2012)," Pricing Deposit Insurance under Responsibility Layers with Bank Default Relevance", Journal of Systems & Management, 2012-01, available at <http://en.cnki.com.cn/Article_en/CJFDTotal-XTGL201201003.htm> (accessed 24 July 2016).

Rajan, R., Dhal, S., (2003), "Non-performing loans and terms of credit of public sector banks in India: An empirical assessment", Reserve Bank of India Occasional Papers, Vol. 24, No. (3), pp. 81-121.

Rinaldi L. and Sanchis-Arellano A., (2006), "Household Debt Sustainability: What explains Household Non-performing Loans? An Empirical Analysis", ECB Working Paper, NO. 570 / JANUARY 2006.

Rojas-Suarez, L.,(2001), "Rating Banks in Emerging Markets: What Credit Rating Agencies Should Learn from Financial Indicators", Working Paper Series WP. 01-6, Peterson Institute for International Economics, available at :< https://piie.com/publications/wp/01-6.pdf> (accessed July 24, 2016).

Saba, I.Kouser, R. and Azeem, M. (2012), "Determinants of Non-Performing Loans: Case of US Banking Sector" *The Romanian Economic Journal*, Vol 15 no. 44, pp. 141-152.

Sahajwala, R., and Bergh, P., "Supervisory risk assessment and early warning systems ", Basel Committee for Banking Supervision Working Paper, No. 4, December 2000.

Sangmi, M., and Nazir, T., (2010), "Analyzing Financial Performance of Commercial Banks in India: Application of CAMEL Model", Pak. J. Commer. Soc. Sci, Vol. 4, No. (1), pp. 40-55.

Serwa, D., &Bohl, M.,(2005), "Financial contagion vulnerability and resistance: A comparison of European stock markets," *Economic Systems*, Elsevier, Vol. 29, No. (3), pp. 344-362.

Sinkey, J., Greenwalt, M., (1991), "Loan-loss experience and risk-taking behavior at large commercial banks", *Journal of Financial Services Research*, Vol. 5, No. (1), pp. 43-59.

Summers L., "*International Financial Crises: Causes, Prevention, and Cures*", the American Economic Review, Vol. 90, No. 2, pp. 1-16

Sundararajan, V., Enoch, C., Jose, AS., Hilbers, P., Krueger, R., Moretti, M. & Slack, G. (2002), "Financial Soundness Indicators: Analytical Aspects and Country Practices", IMF occasional paper 212, April 08,available at <http://www.imf.org/external/pubs/nft/op/212/index.htm> (accessed 24 July 2016).

Suryanto, (2015), "Nonperforming loans on Regional Development Bank in Indonesia and Factors that Influence", *Mediterranean Journal of Social Sciences*, Vol 6 No 4, pp 280-287.

Sy, A. (2009), "The Systemic Regulation of Credit Rating Agencies and Rated Markets", IMF Working Paper 09/129. Washington, DC: IMF.

Vatansever, M. and Hepsen, A. (2013), "Determining Impacts on Non-Performing Loan Ratio in Turkey", *Journal of Finance and Investment Analysis*, Vol. 2, No.4, pp. 119-129.

Vazquez, F., Tabak, B. andSouto, M. (2012), "A macro stress test model of credit risk for the Brazilian banking sector", *Journal of Financial Stability*, Vol. 8, No. 2, pp. 69-83.

Wheelock, D. and Wilson P. (2005), "The Contribution of On-Site Examination Ratings to an Empirical Model of Bank Failures", Review of Accounting and Finance, Vol. 4, No. 4, pp.110 – 133.

Zhihong, W., (2004), " On the Pricing of Deposit Insurance in China", Journal of Finance, 2004/-05, Available at <http://en.cnki.com.cn/Article_en/CJFDTOTAL-JRYJ200405011.htm> (accessed 24 July 2016).