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Analysis of the Capital Adequacy Ratio and Nonperforming Loans Relationship in the Banking Network of Iran

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Abstract

The evidence of the recent years in the banking network of *Iran indicates the increasing trend of nonperforming loans each year; thus, the main objective of the current study is to examine the impact of bank specific factors, esp. capital adequacy ratio on the NPLs. Six years dynamic panel data (2007-2012) of 19 banks are applied to scrutinize the relationship between capital adequacy ratio as well as other determinants and the NPLs. Applying correlation and regression analysis shows that the research model which has been utilized is of decent statistical qualification. Results emphasize that banks should control and amend their credit advancement policy with respect to factors influencing the NPLs to have lower non-performing loan ratio and should take into account their risk weighted assets and riskiness of their loan portfolio before they commence lending. In advance of lending to high risky projects and to low quality borrowers, banks should pay attention to the interests of both stakeholders and banks as well as they should consider the riskiness level of their loan portfolio to provide the accurate information relating to their performance because of the probability of high risk project failure which might evidently lead to the growth in NPLs.*

Keywords: *Nonperforming loans, Capital adequacy ratio, Banking network, Bank-specific determinants*

JEL Classification: *C21, G23, G32*

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1. Introduction

Banking network was restructured by the central bank of Iran at the institutional, market and instrumental levels through privatization of the state-owned banks, partial liberalization of the inter-bank market as well as implementation of the more prudent supervisory regulations. In this framework, several regulatory steps have been gradually taken via introducing some new measures for capital and provision requirements, large exposures, connected lending, off-balance sheet articles as well as liquidity requirements. The banking network of Iran has continuously moved toward a more competitive environment since 2001 when state-owned banks were considered malfunctioning mainly because of the rationing facilities, lending ceiling and deposit interest rates as well as mandatory subsidized facilities. Given the fact that banks' liquidity requirement declined under the regulatory benchmark along with mitigation in the real assets return as well as higher failures in loan reimbursement by borrowers; in this context, the banks' lending capacity has been consequently dropped as well. The key question is "Is there any relationship between the capital adequacy ratio and the NPLs in the banking network of Iran?"

As the core business of any commercial bank, the principal of its activity is based on accepting deposits for the purpose of lending or investment. The role of banking industry is multipurpose: Banks utilize the depositors' funds in an efficient manner, share risk, play a significant role in growth of economy and are always critical to the whole financial system and remain at the center of financial crisis (Franklin and Elena, 2008). Financial institutions are responsible to operate the whole economy because they play an important role to transform deposits into productive investments (Podder and Mamun, 2004).

The percentage of nonperforming loans to the total assets of the banks is proved to be the main cause of financial instability or crisis both in developing and developed countries such as financial crisis in sub-Sahara African countries and East Asia. Similarly, the recent crisis in the US is created by

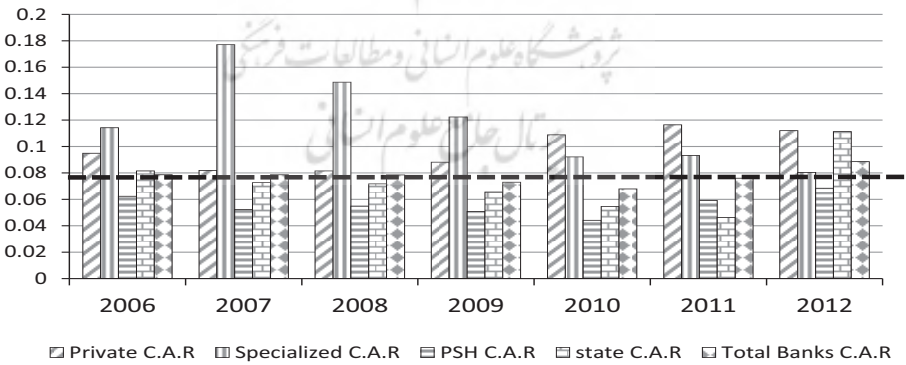
virtue of default in subprime loans or mortgages which means to confirm that lower level of NPLs suggests a better and sound financial system while higher level of NPLs is a trouble for bank management and regulators (Sorge, 2004). Time lapse of NPLs is not considered to be precise because it varies among different kinds of financial institutions and depends on the nature of loans. A loan is measured as performing if paid for principal and interest as per the terms decided at the time of loan funding. However, the NPLs are categorized into three main classifications: Overdue loans which are not reimbursed by borrowers to the banks from more than maturity of two months and less than six months, deferred loans which are not paid off from more than six months and less than eighteen months, and loans not paid back by lenders above eighteen months which are considered to be doubtful loans. Stakeholders have been always naturally monitoring banks for obviously fulfilling their responsibility to provide credit to different economic agents in order to make sure the lending channels are at economic growth disposal and also they are making profits. Moreover, the stakeholders are worried whether or not bank's resources are lent to those economic agents who have proved to be rated as unreliable customers and this consequently results in increasing their loan portfolio risk. If banks collect deposits and lend them to untrustworthy borrowers who are unknown to depositors (as one of bank key stakeholders) besides shareholders, it would be very risky and this is the beginning of Asymmetric Information. The problem arises where the two parties (stakeholders as principal and banks as agent) have different interests and asymmetric information (the agent having more information), such that the principal cannot directly ensure that the agent is always acting in its best interests particularly when activities that are useful to the principal are costly to the agent, and where elements of what the agent does are costly for the principal to observe. Consequently, moral hazard and conflict of interests may arise.

NPLs as a plague for the banking networks can directly affect two main components of the bank activities i.e. the liquidity and profitability as

increasing NPLs demands provisioning which diminishes earning efficiency. If provisioning might not suffice and compensate for bank NPLs, then bank capital adequacy must support the banks against failure and bankruptcy. Whereas, higher NPLs could also cause liquidity problems due to mismatch of maturities in assets and liabilities and the bank overall credit ratings as well as their long run image will deteriorate. Figure 1 shows that capital adequacy ratio (C.A.R) based on the Basel standard is considered to be accepted at eight percent. The higher the ratio, the less it is probable that banks fail as a result of accelerating growth of the NPLs and lack of provisioning. According to this figure, the total Iranian banks' C.A.R is moving slightly above and below eight percent during the study period whereas the banking network's subsectors[1], i.e. privatized banks and state banks, are obviously below the eight percent international C.A.R standard. However, The Private and Specialized banks have proved to comply with the C.A.R minimum standard.

On one hand, figure 2 depicts the banks' loans growth in line with their subsectors during the study period. According to this figure, banks have been generating an increasing rate of loan and in this context; privatized banks' loans plot strongly supports the total banks loans growth movement.

Figure 1: Capital Adequacy Ratio (%)



1. Iranian banks are generally comprised of four subsectors; Private Banks, State-owned Banks, Privatized Banks, and Specialized Banks.

Figure 2: Growth Rate of Loans (%)

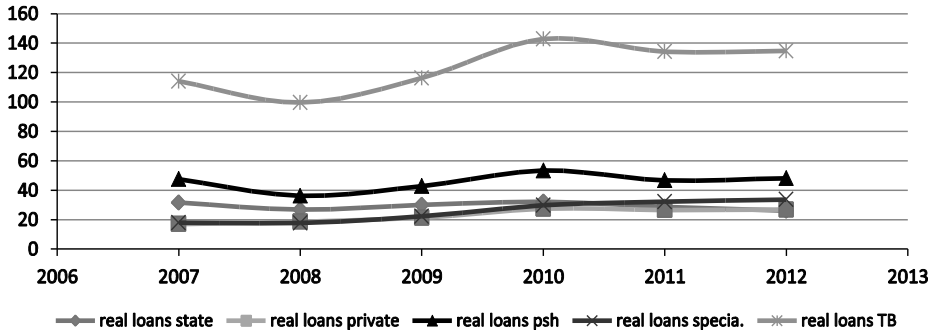
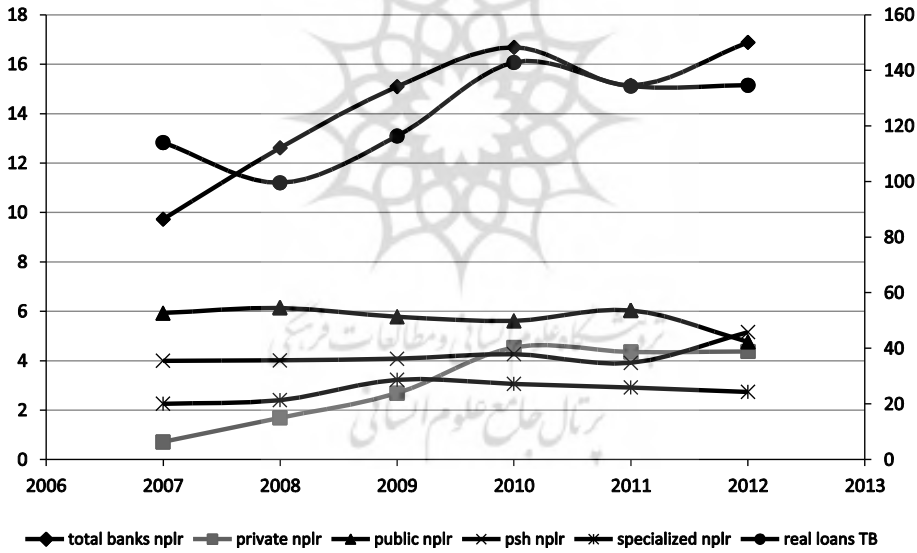


Figure 3: NPLS and Loans Growth Rate (%)



On the other hand, figure 3 depicts the co-movement of the total banks' loans and NPLs growth as an index for banks' risk appetite during 2007-2012. Banks have shown a risk taking behavior during the period

because loan generation has risen to the peak in 2010-2011 as well as the NPLs which have been rapidly increasing up until 2010. As a matter of fact, the circumstance of C.A.R, loans and the NPLs in the banking network of Iran shows that banks face higher NPLs when C.A.R is lower; in other words, the hypothesis of this study is "Higher C.A.R is accompanied by the lower NPLs." Thus, in this paper, it is proposed to study the relationship between the capital adequacy ratio (C.A.R) as well as other bank-specific determinants and the NPLs in the banking network of Iran.

The paper applies panel data approach to evaluate the relationship between Capital Adequacy Ratio (C.A.R) as well as other bank-specific determinants and the NPLs in the banking network of Iran. The rest of the paper is in turn structured as follows: Section two discusses the literature review on NPLs and its determinants; Section three illuminates the econometrics methodology, model specification and data set, Section four underscores the empirical results and analyses of the estimations, and the last section reflects concluding remarks.

2. Literature Review

This section highlights the historical evidence and the aforementioned literature review of the key determinants of the NPLs as well as credit risk in line with the quality of the banks' loans portfolio examining potential links between bank-specific variables, macroeconomic factors and other factors on the NPLs. Banks' credit risk as the oldest type of the risk is mainly-experimentally explained by a proxy from the NPLs and is mainly influenced by the macroeconomic environment, and sound-financial transactions between lenders and borrowers. Keeton and Morris (1987) observe that energy and agriculture sectors have been more influenced by the macroeconomic recession during 1979-85 which caused higher NPLs in 2400 US commercial banks. They also realize that the macroeconomic indicators could evidently illustrate the loan/loss distortions in different episodes by a linear regression

methodology. Financial development which basically originates from comprehensive progress in the financial markets, regulations, and instruments as well as an augmentation in the financial soundness indicators would evidently enhance flow of funds and consequently output capacity. Sinkey and Greenwalt (1991) find a positive relationship between NPLs as a default indicator and interest rate, additional lending and economic slump as covariates. The classical literature outlines the robust interactions between financial development and macroeconomic variables [King and Plosser (1984), Bernanke and Gertler (1989), Kiyotaki and Moore (1997) and Bernanke, Gertler and Gilchrist (1998)]. Caprio and Klingebiel (1996) compiled a study based on multiple episodes of banking crises among 69 countries segregated for each country for the respective time period, scope and estimated loss of crises mostly based on macroeconomic data, they describe that Poor management, supervision, regulations, corporate governance and unnecessary government intervention are the major causes of banking sector insolvencies during the 1980s to 1990s. Gavin and Hausmann (1996) argue that excessive credit growth is a primary factor behind banking crises as usually it reflects a decline in the credit standards analyzing the specifics of the crises literature. When causes contributing the banking crises in the Latin America are examined during the 1990s, interest rates, expected inflation, terms of trade, domestic income, credit growth and the monetary and exchange rate regime are important constraints on loan servicing capacity as similar results were found by Diamond and Rajan (2005). Banks face insolvency due to falling asset values when bank borrowers are unable to repay their debt as a result of adverse shocks to economic activity [Demirguc-Kunt and Detragiache (1998)]. According to Caouette et al. (2000); probability of default is theoretically defined based on the overdue of loans at their maturities. A methodological solution is implemented in order to model the sectorial dependence of credit risk to the state of the Austrian economy

both at the level of exposures to non-financial corporations and at the level of exposures to households. Hardi and di Pitti (2001) complied their study with trans log functional form covering the period from 1981 till 1997 to assess effects of financial reforms on the profitability and efficiency of Pakistani banks and identified in one of those aspects that the credit managers are directly responsible for the bank failures because their involvement were found to use substantial amount of funds for their own benefits in Pakistani banking crises. Empirical evidence shows that the factors generating default rates are, generally, the same for both types of counterparties, with the inflation rate and the short-term interest rate equally influencing the repayment ability of both non-financial corporations and households (Boss (2002)). As far as other developed economies like Europe are concerned, Salas and Saurina (2002) also provide that real growth in GDP, bank size, market power and credit expansion explain the variation in nonperforming loans after conducting a study covering the period of 1985 till 1997 in Spanish banking industry. Huang, J.-Z., and M. Huang (2003) find an adverse relationship between credit risk premiums and default rates. Huang (2004) discovers that the banks' bond premiums are also influenced by the default rates as well.

Virolainen (2004) models the credit risk dynamics for Finland by using macroeconomic variables such as economic growth, inter-bank interest rate for a maturity of up to one year and the corporate indebtedness level. In the recent studies, business cycle which is influenced by the firms' activities is simultaneously considered as the main course of the institutional credit exposure and probability of default through a dynamic global macro econometric model [Pesaran, Schuermann, Treutler and Weiner (2006)]. Fiori, Foglia and Lannotti (2007) envisage analyzing the extent to which the economic picture in Italy affects the developments in credit risk triggered by the exposures to non-financial corporations broken down by sector in eight categories. Meanwhile, Altman and Sabato (2005) develop a distress prediction model specifically for the Small and Medium size Enterprises (SMEs) to specify the impact of credit worthiness on the banks' NPLs as well

as on the SMEs' financial statements as the basic performance indicator of the SMEs in the macroeconomic environment. In this regard, a default prediction model is statistically constructed to characterize the impact of effective-significant variables on the entities' credit worthiness.[1] Tarashev (2008) evaluates five structural credit risk models to estimate the default rates based on the firm-level data. The unbiased results indicate that banks' dynamic default trends are evidently exposed to the business cycles and monetary policy direction. Empirical findings also underline the positive correlation between output growth and institutional credit risks' indicators including probability of default, exposure at default, loss given default, loan loss provision, and the NPLs. The high amount of NPLs represents high credit risk in today bank system and this encounters banks with market risks and liquidity risk. Although banks are trying to control the risks within the organization, high percentage of this risk and its consequences for the future could not be ignored (Ekrami and Rahnama, 2009).

In the global market reduction of credit position of borrower leads to loss. Adela and Iulia (2010) presented the idea by using Pearson correlation coefficient that how these banking elements average interest rate is connected with nonperforming loans in Romanian banking system covering the period of 2006 till 2010, results of their study also suggest that there are other indirect channels which affect the nonperforming loans as well. Most of the studies are conducted on developed countries but in the recent past we can find a number of papers published on developing countries as well.

Dash and Kabra (2010) revealed that the real income variation is negatively associated with NPLs and further probe that high interest rates, real effective exchange rate brought high level of NPLs in Indian banks cover the time period of 1998-2009. Louzin, Vouldis and Metaxas (2010) assessed 9

1. They develop a one-year default prediction model based on a Logit regression technique on panel data of 2,000 US firms (with sales less than 65 million Dollars) over the period 1994-2002.

largest Greek banks covering the period of 2003-9 and found that real GDP growth rate; lending and unemployment rates influence the level of NPLs. Espinoza and Prasad (2010) who applied a dynamic panel model over 80 banks for Gulf Cooperation Council during 1995-2008 find that a spark in the interest rate leads to a reduction in the output growth and consequently a rise in the NPLs. Omar, Bellalah, Walid and Frederic (2010) Credit mangers contributed a unique idea that years of service and experience of credit managers were positively correlated with nonperforming loans as decision making of credit managers were influenced by the external factors i.e. personal gain and political corruption. Asari et al. (2011) also bring the opinion with the help of vector error correction model by using Stata software converting the data of 48 months belonging to commercial banks in Malaysia during 2006 till 2010 to unearth the relationship of inflation and interest rate with nonperforming loans. They found a strong long run relationship between interest rate and nonperforming loans while inflation and interest rate have insignificant relationship in long run, whereas in short run both interest rate and inflation couldn't influence nonperforming loans. Further, the casual relationship is found non directional. The contraction in the output growth raises the NPLs through melting down the inputs' payoff and shrinking the firms' revenue channels. Meanwhile, the study also underscores the positive relationship between credit growth and NPLs which is technically reconfirmed via utilizing the panel data approach for 26 developed economies during 1998-2009, as banks' loan portfolio is significantly influenced by the macro-financial vulnerabilities [Nkusu (2011)]. Accordingly, in another survey, Glen and Mondragón-Vélez (2011) find strong evidence in 22 developed economies during 1996-2008 that the improvement in loan loss provisions are obviously explained by the output growth, private sector leverage and capital shortage in the banking network. Dimitrios Angelos and Vasilios (2011) compiled their study content from panel data of nine largest Greek banks by using generalized method of movement covering the period of 2003 to 2009 to examine the determinants of nonperforming loans in Greek

banking system separately for each loan category (consumer loans, business loans and mortgages); they have an opinion that both macroeconomic variables i.e. real GDP growth rate, unemployment and lending rate possess the ability to affect the level of nonperforming loans and bank specific variables i.e. performance and quality of management with risk management practices or system are also responsible for variation in NPLs. Siraj and Sudarsanan (2011) investigated the performance of Indian commercial banks from 1999 till 2011 before and after the global financial crises by using ratios and absolute figures, and urged that nonperforming assets are a major threat in credit risk management of banks in India and stability of banks depends on the performance and quality of assets they hold. Sofolis and Eftychia (2011) used univariate regression to measure the impact on nonperforming loans in Romanian banking system and provided that inflation, unemployment rate, external debt to gross domestic product, money supply and investment with construction expenditure jointly with country's crises specific variables influence the credit risk of banking system. Solarin, Sulaiman and Jauhari (2011) complied their findings on the basis of Auto regressive distributed lag (ARDL) approach on Islamic banks of Malaysia that interest rate has significant positive long run impact on nonperforming loans whereas productivity has a positive but insignificant relationship with NPLS which also lessens the stronger belief of Islamic banks operating on profit and loss mechanism because productivity has a weaker impact than interest rate. Saad and Kamran (2012) technically applied a Generalized Autoregressive Conditional Hetereoskedasticity to exemplify the impact of interest rate instability and some other macroeconomic determinants on NPLs during 1996 to 2011. In this context, the role of political factors, interest rate instability, and credit policy of the banks are discovered as critical contributors. In a comprehensive study by the ECB in 2011 over 80 economies, the asset quality of the banks are significantly influenced by the output growth, nominal

exchange rate fluctuations as well as interest rate in case the assets markets have been developed too.

Shajari, Parastoo and Shajari, Houshang (2012) analyze the financial soundness indicators in Iran`s banking system and emphasize on the asset quality measure by the nonperforming loans ratio. Findings of the study indicate that NPLs increase has an impact on real part of economy in the concept of credit crunch and bank lending decline when NPLs exceeds a specific ratio of total loans. The paper also analyzes the relationship between three financial soundness indicators (asset quality, capital adequacy and profitability) and key macroeconomic, bank-specific, and structural variables. The results show that asset quality and capital adequacy are influenced by business cycle and the lending interest rate over two previous years has a negative effect on asset quality. Capital adequacy is affected by short term deposit interest rate and changes in the exchange rate. Profitability fluctuates with inflation rate and NPLs ratio. Biabani, et.al (2012) argue that one of the fundamental problems in banks, finance and credit institutions is non-performing loans, because costumers don't reimburse loans and a lot of these loans remain in customers' accounts and this is one of the most important problems in Iran. The study is an assessment of effective factors on non-performing loans (NPLs) for preventing NPLs, increasing possibility of new income and improvement of scheduling power for using resources. Banks' documents were investigated for collecting data. Their findings have indicated that all hypotheses except for one were supported which means that there are significant relationships between collaterals, bounced check, credit background of customers, duration of loans payment and average of account quantity with NPLs. Their study proved that relation between having several deposit accounts with NPLs was not supported.

3. Data, Variables, and Hypotheses

The variables selected for this study are the key bank-specific variables such as the real nonperforming loans growth rate as the dependent variable and C.A.R: as Capital Adequacy Ratio, R.W.A: Risk Weighted Assets, L.I.D.: Long term Investment Deposits, I.D.I.: Investment Deposits Interest rate, I.R.V.: Interest Revenues and P.O.I.: Profit of Investment as the main independent variables:

-Nonperforming loans: Are comprised of the sum of overdue loans (2-6 months maturity date of loans during which the borrowers have lapsed loans reimbursement), deferred loans (also known as bad debts which highlights the failure in loans pay-off between 6 and 18 months) and doubtful loans (referring to over 18-months duration of loans reimbursement).

- C.A.R: Capital Adequacy Ratio also known as Capital to Risk (Weighted) Assets Ratio is the ratio of a bank's capital to its risk. National regulators track a bank's CAR to ensure that it can absorb a reasonable amount of loss and complies with statutory capital requirements. It is a measure of bank's capital and is expressed as a percentage of a bank's risk weighted credit exposures. This ratio is used to protect depositors and promote the stability and efficiency of financial systems around the world.

- R.W.A: Risk weighted assets is a bank's assets or off-balance-sheet exposures, weighted according to risk. This sort of asset calculation is used in determining the capital requirement or Capital Adequacy Ratio (CAR) for a financial institution. In the Basel I accord published by the Basel Committee on Banking Supervision, the committee explains why using a risk-weight approach is the preferred methodology which banks should adopt for capital calculation. R.W.A provides an easier approach to compare banks across different geographies, off-balance-

sheet exposures can be easily included in capital adequacy calculations and banks are not deterred from carrying low risk liquid assets in their books.

- L.I.D.: Long term Investment Deposits are those deposits that are kept with the bank for at least 30 days and the amount of deposit is not less than the minimum amount set for opening the account.
- I.D.I.: Investment Deposits Interest rate is paid by financial institutions to deposit account holders. Deposit accounts include certificates of deposit, saving accounts and self-directed retirement deposit accounts.
- I.R.V.: Under the accrual basis of accounting, Interest Revenue reports the interest earned by a bank during the time period indicated in the heading of the income statement. Interest Revenues account includes interest earned whether or not the interest was received or billed and are non-operating revenues or income for banks not in the business of lending money.
- P.O.I.: Profit of Investment is the benefit to the bank resulting from an investment of its resources. A high profit of investment means the investment gains compared favorably to investment cost. As a performance measure, POI is used to evaluate the efficiency of an investment or to compare the efficiency of a number of different investments. In purely economic terms, it is one way of considering profits in relation to capital invested.

The study is conducted for 19 mature banks in the period of 2007 till 2012 although total variables' data were available since 2004, but we could not use the data starting from 2004 due to the absence of data for NPLs rate. The following hypotheses are formulated based on the early literature and variables of study:

-There is a statistical-significant-negative relationship between the Capital Adequacy Ratio and the NPLs.

-There is a statistical-significant-positive relationship between the risk weighted assets and NPLs.

4. Model Estimation and Empirical Results

The research model can be mathematically expressed as equation (1):

$$NPLs.it = C + \beta 1\ NPLs.it\text{-}1 + \beta 2\ NPLs.it\text{-}2 + \beta 3\ C.A.R\ it + \beta 4\ R.W.Ait + \beta 5 L.I.D.it + \beta 6\ I.D.I.it + \beta 7\ I.R.V.it + \beta 8\ P.O.I.it + \boldsymbol{\varepsilon} it \quad (1)$$

Recent literature and aforementioned studies have used panel regression analysis to estimate the NPLs model. Henceforth, dynamic panel data regression analysis is applied in the current study where the NPLs, based on the existing studies relating the determinants of NPLs which have evidently used NPLs ratio or its growth rate, is applied as the dependent variable [Louzis et al., (2010); Festi et al., (2011)].

According to the Principal–agent problem or Agency Dilemma, banks as agents make influential decisions on behalf of or against the interest of the stake holders as principal. Consequently, there would be a dilemma because sometimes the banks are motivated to act in their own best interests by tending loans at any cost from the resources which are funded by the shareholders as well as the depositors rather than those of the stakeholders. The problem arises where the two parties have different interests and asymmetric information (the banks as agents have more information), such that the principal cannot directly ensure that the agent is always acting in its (the stakeholder’s or principal's) best interests, particularly when activities that are useful to the shareholders are costly to the banks, and where elements of what the banks do are costly for the shareholders to observe. Asymmetric information in the framework of Moral Hazard and conflict of interest may arise when high loans to assets ratio still deliberately increases as banks consciously realize that their capital adequacy ratio is lower than the 8 percent international Basel standard because banks have more risk appetite to extend loans for higher profitability, but they fail rating and scoring good and bad customers resulting in the growth of the

NPLs. Banks apply funds created by the depositors and obtain capital from the shareholders. Therefore, if higher NPLs are not covered by the provisioning, then banks must use their capital as a buffer against failure and if that is not adequate, banks go bankrupt. Thus, the higher the NPLs, the lower the capital adequacy ratio will be.

Table 4-1 evidently illustrates real banks-specific variables' descriptive statistics in the course of study. The descriptive-calculated measures show that data contains high variation e.g. real non-performing loans (NPLr) and the risk weighted assets (RWA) which technically originates from the heterogeneity of the banks and also it is justified as the time-varying nature of the data in the sample period. The volatility and deviation of the variables such as the standard deviation of NPLs as an indicator to explain credit risk originates from the deviation of the soundness components including the ratio of loans to deposits and the ratio of individual bank's loans to total loans. The banks are evidently exposed to the asymmetric risks mainly because of the differences in the risk analysis capacities and subsequent differences in investment and loans policies.

Table 4.1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
NPLr	164.85	188.73	0	979.26
CTA	0.17	0.35	0.02	3.39
RWA	1610.37	1739.65	33.65	8355.36
Longinvd.	394.06	446.02	0	2260.62
Inv Dep Interest	11.31	17.57	0	110.67
Interest Revenues	142.83	139.82	1.85	748.1
Profit of Investment2	14.16	22.37	0	169.68

Source: Author's calculations

Table 4.2: Correlation Matrix

	NPLr	CTA	RWA	Longinvd	Inv Dep Interest	Interest revenues	Profit of Investment(2)
NPLr	1						
CTA	0.11	1					
RWA	0.76	0.07	1				
Longinvd.	0.82	0.05	0.8	1			
Inv Dep Interest	0.58	-0.01	0.6	0.77	1		
Interest Revenues	0.80	0.06	0.9	0.70	0.71	1	
Profit of Investment2	0.66	0.08	0.6	0.77	0.94	0.72	1

Source: Author's calculations

According to table 4-2, the correlation matrix illustrates cross-correlation among key explanatory variables which technically result from the correlation-coefficients. Meanwhile, the sign of the cross-correlation for all the explanatory variables is underlined in accordance with the theory although the relative impact of the variables is different.

Table 4-3 denotes the statistical results of the estimated model including Arellano-Bond Dynamic Panel Data regression estimation which applies capital adequacy ratio, risk weighted assets, long term investment deposits, investment deposits' interest rate, interest revenues, and profit of investment to explain the NPLs in the study episode. According to this table, the coefficients of the NPLs lags show that though insignificant, the dynamic relationships between the NPLs at period t and t-i are negatively associated with the NPLs at period t-1 and positively correlated with the NPLs at period t-2.

The results also signpost that an increase in capital adequacy ratio as a connector between asymmetric information and the NPLs ratio from banks as agents and stakeholders as principal relationship causes significantly lower

NPLs although it is significant at 16% significance level. Specifically, the impact of capital adequacy ratio on the NPLs proves when banks care about their capital adequacy ratio as a key bank soundness indicator, nonperforming loans will dip, and consequently they can hedge their system from the hazardous situation caused by lack of provisioning and accelerating rate of loans generation. Hence, the cost of going bankrupt diminishes as well as more reliability and trusts are drawn from the shareholders in the financial sector. Risk weighted assets are positively-significantly related to NPLs which theoretically-factually support to prove the results since such assets in the banks' balance sheet denote the trigger before banks make their ways through taking their risk appetite in generating higher levels of nominal loans. Long term investment deposits profit of investment are positively-significantly relevant to the NPLs because if the duration of liabilities is supposed to be set and fixed, profit of long term investment would not be able to offset the NPLs loss as the position of the NPLs is short (2-6 months provisioning for the overdue loans) contrasting to the position of the long term investment which is long. However, investment deposits interest rate in line with investment revenues are negatively-significantly associated with the NPLs. Another stimulating observation to make is that the NPLs sparked dramatically as a result of a unit decrease in the capital adequacy ratio which has obviously emphasized on the explanation that for the contrasting trends between the NPLs and the C.A.R, stricter loan loss provisions perhaps forced to write off NPLs but these write-offs did not translate into improvements in the capital adequacy ratio if not adverse effects.

In order to assure whether or not the instrumental variables used in the Generalized Method of Moments, Sargan test statistics is calculated with a probability of 0.28 which shows the the null hypothesis regarding non-correlating behavior of the instrumental variables with the error terms can not be rejected. Therefore, the instrumental variables utilized in the estimation process has owned the necessary credibility.

Table 4.3: Model Estimation Results

Arellano-Bond Dynamic Panel-Data Estimation		
Group variable: Banks Code **Time variable: Year** **Number of groups=19**		
NPLr	**Coef.**	**Std. Err.**
l1.NPLr	-0.11	0.14
l2.NPLr	0.14	0.13
CTA	-17.3	12.4
RWA	0.06***	0.01
Longinvd.	0.27***	0.05
inv dep interest	(-5.2)**	1.4
interest revenues	(-0.5)***	0.16
profit of investment2	3.7**	1.27
_cons	39.6**	16.3
Sargan Test		
Chi2(8) = 9.71 **prob>chi2=0.28**		

Source: Author's calculations

5. Conclusions

The nonperforming loans spark in the banking network around the world as the most important-surviving issue for banks. Failures of the banks and financial crisis seem to be inevitable since the rapid growth in the NPLs leads to contingent financial crisis according to the evidence by the existing studies. Therefore, the way to evaluate how much financial systems especially the banking networks are vulnerable is studying the NPLs. Banks can reduce the level of NPLs in order to decrease the conflict of interest with the shareholders

by allocating loans only to the high quality borrowers controlling their loans portfolio risk as well as keeping capital adequacy ratio above the 8% in accordance with the Basel standard.

Using the theory of Principal-Agent Problem between the stakeholders and the banks, findings of the study represent that banks should not do extensive lending in order to utilize their deposits, because it will lead to the increased riskiness of the loan portfolio and growth in loans to deposits ratio resulting in higher NPLs. Banks should take into account their risk weighted assets and riskiness of their loan portfolio before they commence lending. The commercial banks can set a specific level of capital adequacy ratio above which banks confront with the lower NPLs although the relationship between the NPLs and capital adequacy ratio has not appeared to be significant. Before lending to high risky projects and to low quality borrowers, banks should pay attention to the interests of both stakeholders and banks as well as the riskiness level of their loan portfolio to provide the accurate information relating the future performance of economy and proposed projects because of the high probability of high risk project failure which might evidently lead to the growth in NPLs. Henceforth, banks can reduce the level of NPLs in order to decrease the conflict of interests with the shareholders by allocating loans only to the high quality borrowers controlling their loan portfolio risk as well as keeping capital adequacy ratio above the 8% in accordance with the Basel standard. Long term investment deposits profit are positively-significantly relevant to the NPLs, but investment deposits interest rate in line with investment revenues are negatively and significantly associated with the NPLs. Risk weighted assets are positively-significantly related to the NPLs which theoretically-factually support proving the results. It would be recommended that the bank has to compose an integrated database available for all branches and update borrowers' information for clarity as well as true balance of debts transfer to relevant heading automatically. Also, actions should be taken for performance appraisal and job promotion of branch managers for their decisive behavior.

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پژوهشگاه علوم انسانی و مطالعات فرهنگی
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Appendix

Table A.1: Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations	
totalnpl	overall	164.8507	188.7374	0	979.2667	N =	114
	between		175.9884	.2400958	712.8626	n =	19
	within		77.59086	-42.56586	433.4688	T =	6
cta	overall	.1708772	.3554794	.02	3.39	N =	114
	between		.2075298	.0416667	.74	n =	19
	within		.2918949	-.4091228	2.940877	T =	6
rwa	overall	1610.377	1739.658	33.65653	8355.362	N =	114
	between		1611.456	95.76246	5139.132	n =	19
	within		737.9183	-182.0588	4826.608	T =	6
longinvd	overall	394.06	446.0297	0	2260.623	N =	114
	between		379.4767	0	1294.894	n =	19
	within		247.612	-304.0972	1359.789	T =	6
invdin~t	overall	11.31407	17.57721	0	110.6793	N =	114
	between		10.94027	0	31.46153	n =	19
	within		13.94865	-20.14746	90.53188	T =	6
inter~es	overall	142.8376	139.8265	1.859107	748.1033	N =	114
	between		122.2349	9.367927	430.142	n =	19
	within		72.60306	-8.318334	460.7988	T =	6
profit~2	overall	14.16223	22.37112	0	169.6858	N =	114
	between		14.72906	.0498164	57.87726	n =	19
	within		17.12078	-43.71503	125.9707	T =	6

Table A.2: Correlation Matrix for the Variables of the Study

	totalnpl	cta	rwa	longinvd	invdin~t	inter~es	profit~2
totalnpl	1.0000						
cta	0.1193	1.0000					
rwa	0.7619	0.0737	1.0000				
longinvd	0.8239	0.0587	0.8283	1.0000			
invdinterest	0.5830	-0.0103	0.6402	0.7753	1.0000		
interestre~s	0.8036	0.0646	0.9188	0.9032	0.7172	1.0000	
profitofin~2	0.6647	0.0865	0.6298	0.7720	0.9484	0.7241	1.0000

Table A.3: Arellano-Bond Dynamic Panel-data Estimation for the Research Model

```
Arellano-Bond dynamic panel-data estimation  Number of obs         =        57
Group variable: code                         Number of groups      =        19
Time variable: year
                                             Obs per group:    min =         3
                                                               avg =         3
                                                               max =         3

Number of instruments =     17               Wald chi2(8)          =    194.19
                                             Prob > chi2           =    0.0000
One-step results
```

totalnpl	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
totalnpl						
L1.	-.1181275	.1418507	-0.83	0.405	-.3961498	.1598948
L2.	.1132928	.1346634	0.84	0.400	-.1506427	.3772282
cta	-17.37984	12.42639	-1.40	0.162	-41.73512	6.975443
rwa	.0657902	.0164875	3.99	0.000	.0334753	.0981052
longinvd	.2701816	.0509368	5.30	0.000	.1703473	.370016
invdinterest	-5.212016	1.433089	-3.64	0.000	-8.02082	-2.403213
interestre~s	-.5059936	.1632185	-3.10	0.002	-.825896	-.1860912
profitofin~2	3.756015	1.271196	2.95	0.003	1.264516	6.247513
_cons	39.66658	16.31378	2.43	0.015	7.69216	71.641

```
Instruments for differenced equation
        GMM-type: L(2/.).totalnpl
        Standard: D.cta D.rwa D.longinvd D.invdinterest D.interestrevenues D.profitofinvd2 L.totalnpl
Instruments for level equation
        Standard: _cons
```

Table A.4: Sargan Test of Overidentifying Restrictions

```
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(8)     =  9.715348
        Prob > chi2 =    0.2856
```