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The Impact of Macroeconomic Indicators on the Nonperforming Loans (Case of Iran)

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Abstract

Financial statements of nineteen mature banks have been patronized to examine the impact of macroeconomic indicators and bank-specific determinants on the NPLs ratio through Quantile and Panel Data regression approaches. The impact of macroeconomic indicators on credit risk is statistically estimated for banking network via two directions. First, different quantiles are econometrically calculated, assessed and compared during 2007-12. Second, the Panel Data estimation is utilized in the same way to verify the outcomes of quanitle regression and to check the robustness. Results indicate that the impact of real money supply on the banks' NPLs in 25%, 50%, and 75% of data is positive and significant in line with empirical evidence. The coefficients of the other variables (including the ratio of individual banks' performing loans to total deposits, individual banks' performing loans to total loans ratio, as well as GDP would be positively significant as well. The real interest rate has negatively-significantly driven NPLs. The banks' NPLs are generally exacerbated by the impact of higher real money supply over the long run, real interest rate in the money market and upper return in the assets market mainly because of the negative-inflationary transmission effect.

Keywords: *Nonperforming loans, Macroeconomic indicators, Quantile regression, Panel data*
JEL Classifications: *C16, C23, E51, G21*

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1. Introduction

Banking network in Iran has been evidently hampered by the persistent-procyclical monetary policy, lending rate ceiling, and negative real interest rate which consequently raise NPLs. While the central bank has occasionally proceeded to take more disciplinary measures over monetary policy via issuing debt securities and targeting on aggregate money, the money market has repeatedly-financially been repressed by the negative real interest rate. Although the banking network of Iran should have been enriched since 2001 given the reinforcement to purchase the public debt securities in line with the negative real interest rates, banks' liquidity requirement declined under the regulatory benchmark along with mitigation in the real assets return. In this context, the banks' lending capacity has consequently dropped as well. The key question is "Does an expansionary monetary policy lead to an increase in the banks' NPLs as a macroeconomic credit risk measure?"

As the core business of any commercial bank, its principal 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 Central Bank of Iran started banking network restructuring at the institutional, market and instrumental[1] 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 context, 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. Iran banking sector 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. The monetary policy situation deteriorated again to the previous disordered

1. In 2001-02, the Central Bank of Iran issued bonds at the national and international level to improve the efficiency of monetary policy for the first time after revolution.

status via fiscal dominance, re-rationing credits as well as financial repression over the past eight years.

In this paper, it is proposed to study the impact of macroeconomic indicators on the NPLs and credit risk via two different approaches including Pooled and Quantile regressions in order to examine the outcomes. It will help to analyze the cross-sectional differences among banks balance sheets' response to the macroeconomic indicators' changes.

The paper applies unbalanced panel data approach including Quantile regression and Pooled data Regression methods to analyze the impact of macroeconomic indicators on the NPLs as a macroeconomic credit risk measure in the banking network of Iran. The rest of the paper is structured as follows: Section Two discusses the literature review on NPLs and banks' credit risk based on the Basel accord; Section Three briefly describes Iranian empirical facts as well as the impact of macroeconomic variables on the NPLs, and Section Four illuminates the econometrics methodology, model specification and data set; Section Five underscores the empirical results and analyses of the estimations, and the last section reflects concluding remarks.

2. Literature Review

Banks' credit risk measured by the NPLs ratio in the macroeconomic level is mainly-experimentally influenced by the output growth, monetary policy direction, and sound-financial transactions between lenders and borrowers as well as assets market cycles. Credit risk is the probability of borrowers' default which highlights the banks' exposure vulnerabilities against market, contagion and business cycles fluctuations. According to Caouette et al. (2000); probability of default is theoretically defined based on the overdue of loans at their maturities. Keeton and Morris (1987) observe that energy and agriculture sectors have been evidently more influenced by the macroeconomic recession during 1979-85 which causes higher NPLs in 2400 US commercial banks. They also realize that the macroeconomic indicators could obviously illustrate the loan/loss distortions in different episodes by a linear regression methodology. In this context, Sinkey and Greenwalt (1991) find a positive relationship between NPLs as the key soundness indicator and interest rate, additional lending and economic slump.

Huang, J.-Z., and M. Huang (2003) find an adverse relationship between credit risk premiums and default rates. Huang (2004) discovers that banks'

bond premiums are experimentally influenced by the default rates as well. Virolainen (2004) specifies a credit risk dynamics model for Finland (Top-down stress test) by using macroeconomic variables such as economic growth, inter-bank interest rate and the corporate indebtedness level in order to enlighten the banks' credit risk exposure in different periods.

The ratio of nonperforming loans to the total assets of the banks is considered to be the main cause of financial instability or crisis both in developing and developed countries such as, Sub-Saharan 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 the NPLs suggests a better and sound financial system while higher level of NPLs is a trouble for banks 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 a maturity of more than two months and less than six months, Deferred loans which are not paid off for 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.

Meanwhile, Altman and Sabato (2005) develop a distress prediction model specifically for the Small and Medium sized 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]

In recent studies, business cycle which is influenced by the firms' activities is simultaneously considered as the key vehicle of the institutional credit exposure and probability of default through a dynamic global macro econometric model [Pesaran, Schuermann, Treutler and Weiner (2006)].

Tarashev (2008) evaluates five structural credit risk models to estimate the default rates based on the firm-level data. The unbiased results indicate that

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) over the period 1994-2002.

banks' dynamic default trends are evidently exposed to the business cycles and monetary policy direction. 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.

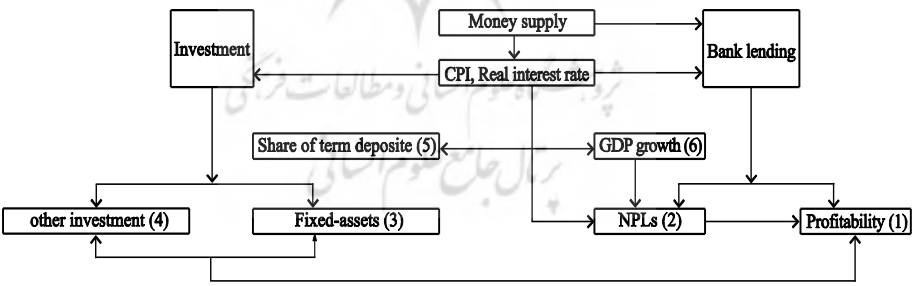
Empirical findings also underline the positive correlation between output growth and institutional credit risks' indicators including probability of default, exposure at default, loss given default, loan loss provision, and the NPLs. In this context, Espinoza and Prasad (2010) who apply a dynamic panel 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. Accordingly, 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.

Louzin, Vouldis and Metaxas (2010) evaluate nine large Greek banks during 2003-09 and found that economic recession, lending and unemployment rates negatively influence banks' health and specifically the level of NPLs. Accordingly, in another survey, 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 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 declines when NPLs exceed a specific level 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 these loans and a parts 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. Bank 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 checks, credit background of customers, duration of loan payment and average of account quantity with NPLs. Their study proved that the relation between having several deposit accounts with NPLs was not supported.

Chart 1. Money Supply Impact on Banks' Financial Soundness Indicators



Broad money growth influences banks financial statements through lending, investment, profitability as well as NPLs channels. An increase in broad money raises bank deposits, so banks lending and investment resources grow proportionally as well. In this context, the share of investment in total assets also dominates the share of loans to total assets in case the increase in money supply creates high inflation. High inflation might consequently cause negative-real interest rate and shrink sustainable economic growth. Thus, the

borrowers are evidently motivated not to reimburse the loans in case the outlook of interest rate remains negative. Meanwhile, the financial resources are swiftly conveyed from real to asset markets (Tobin Effect, 1969). Banks' profit/loss statements are also faced by ambiguous conditions. Notwithstanding, the spark in asset market induces banks' capital gain, the surge in the NPLs and loan/loss shrinks banks' profit contemporaneously. Moreover, the requirement provision should be swiftly augmented in order to enhance the bank resiliency against contingent shocks. Ultimately, accelerating broad money growth is expected to stimulate NPLs via a reduction in the real interest rate as a leading indicator to re-allocate financial resources in different financial markets, GDP growth as a key variable to explain business cycle, and individual banks' performing loans to total assets ratio as moral hazard indicator as well as deposit accumulation as an engine of lending channel and investment. Furthermore, the profitability is supposed to be exacerbated by the rapid lending momentum and higher provisions requirement including through an expected-increase in the NPLs.

3. Iran's Empirical Facts

Iranian macroeconomic environment has historically experienced inflationary states over the past few decades as the average inflation is annually reported about 19.8 percent since 1988. Studies imply that inflation has been evidently affected by the money growth as a main vehicle of aggregate demand along with cost push through exchange rate depreciation, energy price reform and persistent growth of preliminary inputs' price. In this regard, inflation has contemporaneously induced capital flow from the real to financial sector which sparks stock market. Table 1 illustrates the return of stock market has obviously been higher than the loan interest rate in different episodes. Meanwhile, the ratio of stock market return to the interest rate has dramatically augmented the investors' incentive over the past few decades. Real interest rate has also slammed depositors' enticement to keep term deposits in the same period. Negative real interest rate has also demotivated borrowers to pay off. Hence, the NPLs have also boosted and the banks' lending ability mitigate as well.

Table 1: The Return of Money and Stock Markets (%)

Period	Stock Market Return	Nominal Interest Rate	Inflation	(Stock Market Return/ Nominal Interest Rate)*100	Real Interest Rate
1989-94	42	9.9	21.3	422	-11.4
1995-99	26	14	25.1	186	-11.1
2000-04	41	13.2	14.1	307	-0.9
2005-10	12	14.8	14.7	78	0.01
2011-13	50	19.2	28.8	262	-9.6

Source: Authors' calculations

Figure 1 depicts the relationship between real money supply and NPLs during 2007-12. Given the fact that, the real money supply causes higher inflation and consequently a reduction in the real interest rate, borrowers refuse to pay off the loans. Thus, the NPLs escalate simultaneously as well. Moreover, non-performing loans respond slightly to the real money supply mainly because of the protracted transmission mechanism between monetary policy, commodity and money market price adjustments.

Figure 1: Real money supply and NPLs

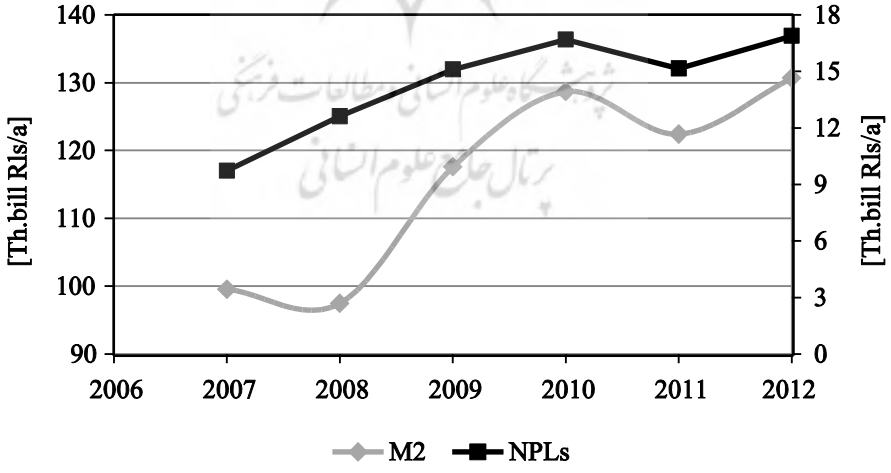


Figure 2 outlines the inflationary-prolonged impact on the NPLs through assets price channel. Higher inflation motivates economic agents and borrowers to transfer financial resources from real sector to the financial markets. Given the fact that, inflationary pressures swiftly convey to the financial markets from real sector, borrowers deliberately refuse to reimburse the loans. Hence, the banks' NPLs build up expectedly as well.

Figure 2: Inflation and NPLs ratio

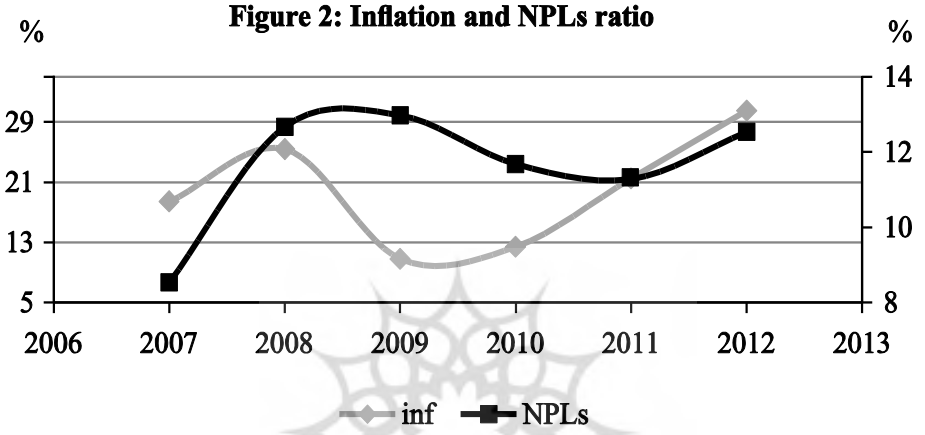


Figure 3: Real money supply and GDP growth

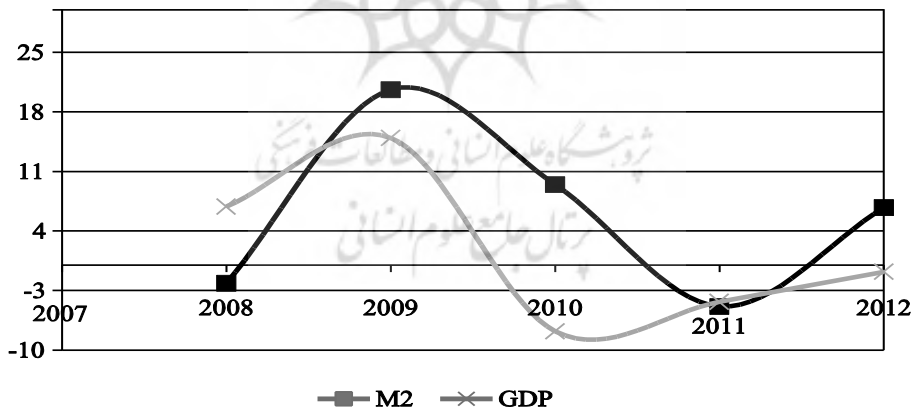


Figure 3 underscores the co-movement between the growth of real money supply and GDP which are evidently originated from pro-cyclicality of fiscal

policy, and fiscal dominance which contemporaneously lead to real money growth, too. In this context, Figure 3 also indicates the relationship between GDP growth and real demand for money based on the quantity theory of money. Ultimately, higher growth of the real money supply- which is obviously exposed to the pro-cyclical fiscal policy- than GDP growth causes higher NPLs.

4. Methodology and Model

In this article, Quantile and Panel Data regression models are empirically applied to examine the impact of macroeconomic indicators and bank-specific variables on the NPLs based on the data of 19 Iranian homogenous-mature banks which is issued by the Iran Banking Institute. Quantile regression is a conditional estimation which proves to be more robust against unexpected deviations and outliers. It also examines different estimators of sub-samples to explore a better coherent-comprehensive analysis about the relationship among variables while considering the possibility of structural breaks.

The dependent variable is highlighted as NPLs in i^{th} bank at time t and the independent variables including real money supply, real interest rate, individual banks' performing loans to total deposits , as well as individual banks' performing loans to total loans and real GDP; βi- the coefficient for explanatory variables. The number of the banks is statistically denoted by i= 1….19; C is a constant term; ε- error term of the model. The error term distribution is also presumed to be Normal with zero Mean and Variance σ^2.

The model which is statistically examined to describe the relationship between NPLs -as a main indicator of credit risk- and explanatory variables is constructed as follows:

$$NPLsit = C + \beta 1M2t + \beta 2R\,it + \beta 3LDit + \beta 4LTLit + \beta 5GDPt + \varepsilon it \qquad (1)$$

According to the model, the NPLs outlines real non-performing loans, M2 underscores real money supply, R underlines real interest rate, and the ratio of individual banks' performing loans to total deposits denoted by LTD, as well as individual banks' performing loans to total loans and real GDP are presented by the LTL and GDP respectively.

5. Empirical Results

All the explanatory variables which are applied in the model are statistically centralized around the mean so the coefficients of variation are almost lower than unit (table 2). The NPLs as an indicator to explain credit risk denote a higher coefficient of variation which is originated from the deviation of the soundness components including the ratio of individual banks' performing loans to deposits and the ratio of individual banks' performing loans to total loans. Skewness descriptive statistics illustrate a positive tail which designates the distribution of NPLs are significantly scattered above the mean of the banking network. Therefore, the banks' NPLs distribution outlines that the banks are evidently exposed to the asymmetric risks mainly because of the differences in the risk analysis capacities subsequently differences in investment and loans policies.

Table 2: Summary Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max	C.V	Skewness
NPLs	114	1.64	1.88	0	9.7	1.14	1.9
M2	114	57.9	5.17	50.7	64.9	0.08	-0.41
R	114	-6.7	6.63	-15.9	1.6	-0.07	-0.028
LTD	114	1.19	0.89	0	5.46	0.74	2.82
LTL	114	0.051	0.05	0	0.018	0.98	1.12
GDP	114	2001086*	90242.54*	1906447*	2157934*	0.045	0.66

Source: Authors' calculations. * Billion Rials

The correlation matrix illustrates no cross-correlation among explanatory variables which are technically resulted from the low 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 3).

Table 3: Correlation Matrix

Variable	NPLs	M2	R	LTD	LTL	GDP
NPLs	1					
M2	0.19	1				
R	-0.06	0.19	1			
LTD	0.28	-0.004	0.03	1		
LTL	0.55	-0.01	0.0003	-0.03	1	
GDP	0.22	0.41	0.15	0.05	-0.01	1

Source: Authors' calculations

Pooled regression does not specify by itself an exact estimation of all population parameters. Thus, to extract more robust-comparable and accurate estimators, the sample is randomly divided into several quantiles.

Table 4: Quantile Regressions Results

	Quantile 0.25		Quantile 0.5		Quantile 0.75	
NPLs	**Coefficient**	**p>ItI**	**Coefficient**	**p>ItI**	**Coefficient**	**p>ItI**
M2	0.02	0.00	0.03	0.02	0.05	0.04
R	-0.01	0.001	-0.01	0.08	-0.03	0.12
LTD	0.3	0.00	0.64	0.00	0.70	0.00
LTL	0.06	0.00	0.2	0.00	0.3	0.00
GDP	0.00017	0.01	0.00017	0.19	0.00003	0.011
_cons	-3.60	0.00	-4.40	0.005	-11.5	0.00
Number of obs.	114		114		114	
R-Sq.	0.22		0.29		0.43	

Source: Authors' calculations

Table 4 shows the statistical results of the estimated model which includes the output of quantile regressions. The coefficients of explanatory variables reflect the impact of real money supply, real GDP, real interest rate, individual banks' performing loans to deposits ratio, and individual banks' performing loans to total loans ratio on the NPLs in different episodes. In other words, the

output highlights the distinct influence of every single covariate on the Nonperforming loans. The results signpost that an increase in real money supply -as an engine of lending channel- causes significantly higher NPLs in different quantiles. Real interest rate as a contractionary variable to shrink lending capacity, negatively influence NPLs in different quantiles while the robustness of the coefficients is still not rejected either.

Individual banks' performing loans to deposit ratio as a soundness variable which reflects liquidity and management quality composite-indicator positively-progressively affects NPLs throughout the quantiles.

Moreover, the ratio of individual banks' performing loans to total loans as a concentration indicator underscores a positive-significant effect on the NPLs, too. Real GDP positively-procyclically leads to higher NPLs while the results are expectedly robust. Countercyclical impact of the NPLs denotes a slump in the output growth which reduces the borrower's ability to pay the installments back; therefore, the NPLs lift up and consequently credit channels shrink. The good of fitness coefficient- R^2- depicts progressive values in different quantiles as anticipated. Hausman test results indicate that the Chi-Sq statistics 7.22 proves to be insignificant for the Fixed Effect Estimation; therefore, the Random Effect Estimation must be substituted for interpreting the coefficients.

Table 5: Panel Data Regression Results

	Pooling Estimation		**Fixed Effect Estimation**		**Random Effect Estimation**	
NPLs	**Coefficient**	**p>ItI**	**Coefficient**	**p>ItI**	**Coefficient**	**p>ItI**
M2	0.05	0.04	0.05	0.00	0.05	0.04
R	-0.03	0.06	-0.03	0.00	-0.03	0.00
LTD	0.64	0.00	0.54	0.03	0.44	0.03
LTL	0.20	0.00	0.004	0.93	0.09	0.02
GDP	0.00003	0.03	0.00003	0.00	0.00003	0.00
_cons	-10	0.00	-9.4	0.00	-10.01	0.00
Number of obs.	114		114		114	
R-Sq.	0.47		0.48		0.43	

Source: Authors' calculations

The real money supply impact on NPLs designates that an increase in real money supply amplifies inflation in the real sector, and consequently triggers assets market prices based on the Panel Data approach (Table 5). Henceforth, deposits interest rate as a proxy of cost of fund is consequently affected by the upsurge in the assets market while inducing the macro flow of funds to move from real to financial sector. In this regard, the estimated coefficient is significantly positive in Random Effect Panel Data estimation which depicts the robustness of the outcomes. In other words, the quantile results are expectedly verified by the Panel Data estimation. Results of the estimation approve that the 19 selected banks are homogeneous in shape and quality since the coefficients are near according to their sign, value and significance. The inflationary status over the past few decades illustrate that real money growth has apparently influenced the inflation which is mainly caused by the exchange rate depreciation as well as the energy price reform. In this regard, the inflation has also affected the banks-specific determinants specifically the NPLs owing to the demotivation of borrowers not to reimburse the loans and credits which has remarkably restricted the banks' lending capacity.

6. Conclusions

Banks' non-performing loans are technically delineated for 19 Iran's mature banks including through selective explanatory variables such as real money supply, and real interest rate as monetary policy instruments; individual banks' performing loans to total deposits ratio, and individual banks' performing loans to total loans ratio as supervisory vehicles and financial soundness indicator; as well as real GDP as a business cycle index. This study applies balanced panel data and quantile regressions to estimate the impact of real money supply on the NPLs. In this regard, the constant rise in real money supply causes higher inflation and consequently a reduction in the real interest rate, so borrowers repudiate to pay off the loans. Thus, the NPLs surge concurrently. Furthermore, NPLs respond faintly to the real money supply mainly because of the protracted transmission mechanism between monetary policy, commodity and money market price-interest rate- adjustments.

Higher inflation also stimulates borrowers to transfer financial resources from real sector to the financial markets and consequently leads to higher capital gain against loans non-reimbursement. Henceforth, the banks' NPLs build up gradually-expectedly as well.

Statistically, the impacts of variables on the banks' NPLs as the macroeconomic credit risk indicator in 25%, 50%, and 75% of episodes are positive, significant and robust. In this context, the Panel Data estimation outcomes have consistently-significantly supported the quantile regression results which illustrate the robustness of the outcomes. The coefficients of the other variables (including the ratio of individual banks' performing loans to total deposits, individual banks' performing loans to total loans ratio, as well as constant GDP) would be positively significant. Notwithstanding, the real interest rate has negatively-significantly driven NPLs. Results indicate that the banks' NPLs are generally exacerbated by the impact of higher real money supply, lower real interest rate and GDP growth as well as higher individual banks' performing loans to total deposits and individual banks' performing loans to total loans ratios. Although the broad money growth evidently reduces NPLs in developed economies, the outlines underscore that the real money supply surges NPLs in the Iranian banks disproportionally mainly because of the inflationary transmission effects over long run, negative real interest rate in the money market and higher real return in the assets market.

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Appendix

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. sum totalnplto100 m2togdpcurrent100 realinterestrate ltd  ltotallbs100 gdpconstant
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Variable	Obs	Mean	Std. Dev.	Min	Max
totalnpl~100	114	1.648507	1.887374	0	9.792667
m2togdpc~100	114	57.90375	5.17089	50.79333	64.96522
realintere~e	114	-6.716667	6.63761	-15.9	1.6
ltd	114	1.199649	.8945073	0	5.46
ltotallbs100	114	5.169298	5.166162	0	18.9
gdpconstant	114	2001086	90242.54	1906447	2157934

```
. corr totalnplto100 m2togdpcurrent100 realinterestrate ltd  ltotallbs100 gdpconstant
(obs=114)
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	tota~100	m2to~100	realin~e	ltd	ltot~100	gdpcon~t
totalnpl~100	1.0000					
m2togdpc~100	0.1966	1.0000				
realintere~e	-0.0631	0.1943	1.0000			
ltd	0.2868	-0.0047	0.0366	1.0000		
ltotallbs100	0.5524	-0.0110	0.0003	-0.0382	1.0000	
gdpconstant	0.2223	0.4142	0.1519	0.0508	-0.0118	1.0000

```
. reg totalnplto100 m2togdpcurrent100 realinterestrate ltd  ltotallbs100 gdpconstant
```

Source	SS	df	MS		
Model	192.500253	5	38.5000507	Number of obs	= 114
Residual	210.026305	108	1.94468801	F(5, 108)	= 19.80
				Prob > F	= 0.0000
Total	402.526558	113	3.56218193	R-squared	= 0.4782
				Adj R-squared	= 0.4541
				Root MSE	= 1.3945

totalnpl~100	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
m2togdpc~100	.058635	.0281917	2.08	0.040	.0027542	.1145159
realintere~e	-.0372527	.0202247	-1.84	0.068	-.0773415	.0028362
ltd	.6446651	.1470952	4.38	0.000	.3530969	.9362332
ltotallbs100	.2074484	.025414	8.16	0.000	.1570733	.2578234
gdpconstant	3.49e-06	1.60e-06	2.17	0.032	3.09e-07	6.67e-06
_cons	-10.82668	2.999001	-3.61	0.000	-16.77122	-4.882137

.25 Quantile regression — Number of obs = 114
Raw sum of deviations 85.27195 (about .35234857)
Min sum of deviations 67.73214 — Pseudo R2 = 0.2057

totalnpl~100	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
m2togdpc~100	.0230666	.0073373	3.14	0.002	.0085228	.0376104
realintere~e	-.0177972	.005335	-3.34	0.001	-.0283721	-.0072222
ltd	.3595787	.0330696	10.87	0.000	.294029	.4251283
ltotallbs100	.0678128	.0074218	9.14	0.000	.0531014	.0825242
gdpconstant	1.07e-06	4.09e-07	2.61	0.010	2.57e-07	1.88e-06
_cons	-3.686039	.7698091	-4.79	0.000	-5.211935	-2.160144

Median regression — Number of obs = 114
Raw sum of deviations 146.314 (about .77590173)
Min sum of deviations 102.7315 — Pseudo R2 = 0.2979

totalnpl~100	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
m2togdpc~100	.0318893	.0143248	2.23	0.028	.0034952	.0602835
realintere~e	-.0178658	.0102881	-1.74	0.085	-.0382587	.0025271
ltd	.6437094	.0684816	9.40	0.000	.5079669	.7794518
ltotallbs100	.2014359	.0130223	15.47	0.000	.1756234	.2272485
gdpconstant	1.07e-06	8.25e-07	1.30	0.195	-5.59e-07	2.71e-06
_cons	-4.471453	1.551684	-2.88	0.005	-7.54716	-1.395746

.75 Quantile regression — Number of obs = 114
Raw sum of deviations 152.2815 (about 2.4519639)
Min sum of deviations 86.08838 — Pseudo R2 = 0.4347

totalnpl~100	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
m2togdpc~100	.0587524	.0282984	2.08	0.040	.00266	.1148448
realintere~e	-.0317753	.0202618	-1.57	0.120	-.0719377	.0083872
ltd	.7071321	.1699141	4.16	0.000	.3703329	1.043931
ltotallbs100	.3066821	.0227942	13.45	0.000	.2615	.3518643
gdpconstant	3.96e-06	1.53e-06	2.59	0.011	9.31e-07	6.99e-06
_cons	-11.57475	2.97012	-3.90	0.000	-17.46205	-5.68746

Fixed-effects (within) regression — Number of obs = 114
Group variable: code — Number of groups = 19

R-sq: within = 0.4835 — Obs per group: min = 6
between = 0.1106 — avg = 6.0
overall = 0.1719 — max = 6

F(5, 90) = 16.85
corr(u_i, Xb) = 0.0418 — Prob > F = 0.0000

totalnpl~100	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
m2togdpc~100	.0564414	.0127122	4.44	0.000	.0311864	.0816964
realintere~e	-.036303	.009129	-3.98	0.000	-.0544393	-.0181667
ltd	.5487525	.2575863	2.13	0.036	.0370123	1.060493
ltotallbs100	.0048532	.0576108	0.08	0.933	-.1096006	.1193071
gdpconstant	3.44e-06	7.38e-07	4.67	0.000	1.98e-06	4.91e-06
_cons	-9.436512	1.386905	-6.80	0.000	-12.19184	-6.681184
sigma_u	1.6630697					
sigma_e	.62486224					
rho	.87629232	(fraction of variance due to u_i)				

F test that all u_i=0: F(18, 90) = 24.88 — Prob > F = 0.0000

Random-effects GLS regression — Number of obs = 114
Group variable: code — Number of groups = 19

R-sq: within = 0.4690 — Obs per group: min = 6
between = 0.4818 — avg = 6.0
overall = 0.4300 — max = 6

Wald chi2(5) = 89.31
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

totalnpl~100	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
m2togdpc~100	.0565233	.0129031	4.38	0.000	.0312338	.0818128
realintere~e	-.0360606	.0092601	-3.89	0.000	-.0542101	-.0179111
ltd	.4474885	.2066068	2.17	0.030	.0425466	.8524304
ltotallbs100	.0968647	.0420205	2.31	0.021	.014506	.1792233
gdpconstant	3.55e-06	7.42e-07	4.79	0.000	2.10e-06	5.01e-06
_cons	-10.01091	1.425793	-7.02	0.000	-12.80541	-7.216402
sigma_u	1.3414147					
sigma_e	.62486224					
rho	.82169852	(fraction of variance due to u_i)				

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
m2togdpc~100	.0564414	.0565233	-.000082	.
realintere~e	-.036303	-.0360606	-.0002424	.
ltd	.5487525	.4474885	.101264	.1538322
ltotallbs100	.0048532	.0968647	-.0920114	.0394117
gdpconstant	3.44e-06	3.55e-06	-1.09e-07	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 7.22
Prob>chi2 = 0.1246
(V_b-V_B is not positive definite)