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The Impact of Business Cycles on Banking System Soundness (With emphasis on Asset Quality)

Y. Mousavi Jahromi[1*]
Bita Shaygani[2]
P. Noori Broujerdi[3]
M. Ashtiani[4]

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Abstract

A healthy and profitable banking system can better withstand economic shocks and play a more effective role in the sustainability and stability of the financial system. The creation of this type of banking system is possible when all financial institutions operating in a country's money market are sound institutions and have appropriate financial indicators. The experience of the recent financial crisis and the devastating effects of transition the crisis from the monetary sector to the real sector of the economy have shown that it is necessary to pay more attention to the issue of banking health. Therefore, the main purpose of this article was to investigate the factors affecting the asset quality ratio of the country's banking system, as one of the main indicators of banking system soundness with the emphasis on business cycles, macroeconomic variables and banking variables in the time period between the years 2001 to 2018. The statistical population in the study was 29 banks operating in Iran. In this research, the dynamic panel model, system Generalized Method of Moments (GMM) has been used to achieve the desired goals. The results show that business cycles have a significant negative correlation with the quality of assets in the banking system. Also, all macroeconomic and banking variables have a significant correlation with the ratio of asset quality in the banking system.

Keywords: Iranian Banking System, Banking System Soundness Indicators, Asset Quality, Business Cycle, Dynamic Panel Model (GMM).

JEL Classification: E32, G21, C1.

1. Professor of Economics, Department of Economics, Payame Noor University (PNU), Tehran, Iran. **Email:** yeganehmj@gmail.com
2. Associate Professor of Economics, Department of Economics, Payame Noor University (PNU), Tehran, Iran. **Email:** bitashaygan@yahoo.com
3. Visiting Professor of Iran Banking Institute Central Bank of Iran, Tehran, Iran. **Email:** p.noori@ipo.ir
4. PhD Condidate in Economics, Payame Noor University (PNU), Tehran, Iran. **Email:** mona.ashtiani@yahoo.com

1. Introduction

Banking industry in all countries is an integral part of economy. Banks are considered as one of the most important tools used by government and economic system of every country to implement monetary policies. From one hand, they collect wandering cash at hand of people as well as their small savings. On the other hand, in respect of implementing economic and credit policies formulated, they provide required financial resources to start production and industrial cycles of the country. If the cycle would be started regularly, banking system will provide service towards economic development; and, services provided through financial system to economy as a whole will expedite economic development and will reduce economic fluctuations (Shahchera, 2013). On the other hand, upon creation of economic growth, more effective and expanded services would be provided for financial systems. This way, a two-way relationship will be observed between performance of banking system and economic activities in the country at general level; and, formulating controlling and macro prudential laws and supervising them followed by creation of financial stability as one of the most important responsibilities of central banks in all countries will be logical. Central banks use different tools to support financial stability including macroprudential policy (Mostafapour, 2016). Macroprudential supervision on banking system and an efficient financial system as a result plays an important role in economy and is of much help in crisis control and prevention in financial markets, especially banking network. This way, maintenance of a correct and efficient financial system as an important policy making goal is included in a more expanded goal which guarantees stability and potential performance of economy (Sharif Moghadasi, 2017).

In most parts of the world, one of the main common strategies of macroprudential supervision on banking system is rating, evaluation of financial soundness and stability of banks based on CAMELS indicators (sharif Moghadasi, 2017). Main core of these indicators includes capital adequacy, asset quality, management stability, earnings, liquidity and sensitivity of operations compared to market risk. As suggested by Evans et al. (2000), CAMELS financial soundness indicators in banking system can well identify and explain main points of banking system vulnerability and related reasons. Moreover, It makes notice to banking supervising authorities to find banks with vulnerable position which makes weaknesses of banking system (Mahdian and Asadi Afshord, 2014).

According to indicators for measuring bank's power, asset quality is common and the most important parameter. Asset quality in financial institutes is related to their financial performance and it evaluates assets of financial institutes and measures credit risks related to it (Sargazi, 2015). Inappropriate asset quality puts banks at credit risk of the other party and finally it can affect banks' financial stability. Accordingly, evaluating banks' asset quality which usually is

used as synonym of quality of loans granted includes accurate identification of all problematic loans and calculating their share in total loans paid and achieving financial soundness level of bank asset (Shahchera and Abolfathi, 2016). To do so, four following criteria will be used: ratio of overdue banking claims to total loans paid, ratio of overdue banking claims to total assets, ratio of total loans paid divided by total assets and compensating loan loss divided by net interest revenue.

Financial soundness of banking system and asset quality ratio are closely related to behavior of depositors and those receiving loans (including real and legal entities); so, everything capable of affecting these two groups (depositors and those receiving loans) can indirectly affect banks' performance and those indicators studied as optimum behavior of banks, as well (Podpiera, 2004). On the other hand, with consideration of economic fluctuations governing societies and represented in form of economic recessions and booms, cyclic economic fluctuations and macroeconomic conditions can change performance of those active in the field of economy and finally performance and financial soundness of banks (Heydari et al., 2011). So, studying financial soundness of banking system under such condition is of special importance.

In this respect and in present study effort has been made for performance of banking system to be studied as effective factor in financial sector against cyclic economic changes and other key economic variables in the country including inflation rate, interest rate, amount and combination of liquidity (volume of term deposits to total liquidity in the country) as well as banking variables such as amount of financial claims of banking system from government. To do so, in present research, changes of asset quality ratio as one of the most important indicators of financial soundness of banking system of the country have been studied against cyclic economic fluctuations and economic and banking variables. Cycles in the research includes 18 years (2001-2018).

2. Theoretical Foundations

Banks are main focus point of financial stability having vital role in countries' economy. So, their bankruptcy will impose high costs on society (Ramezani, 2016). Banking soundness is a concept showing status and level of a bank or banking system being at risk. The more a bank or banking system would be capable of tolerating unfavorable conditions and confronting various types of risk; the more it would be of financial soundness (Sargazi, 2015). On the other hand, banks are facing with various risks in terms of assets and debts (Ahmadian, 2014). In an efficient and sound banking system, existence of enough capital and monetary reserves in order for banks to confront risks resulted from this profession has to be assured of.

Considering various risks a bank is facing with and important role played by banking system in economic system as well as countries' development, method of performance of banking system and its financial soundness as well as

identification and monitoring indicators of banking financial soundness is of high importance to maintain society's economic stability, monetary system, benefits of depositors and public trust against total banking network. This requires supervision of competent authorities especially Central Bank of Islamic Republic of Iran. From among the most important indicators of banking system's soundness reference can be made to the asset quality ratio and profitability which their susceptibility against cyclic economic changes and key economic and banking variables have been studied in present research.
Studying effective and determinant factors of asset quality index in theoretical and experimental literature is indicative of the point that these factors can be divided in two general groups of economic factors and certain bank factors. That is, macroeconomic factors will be interpreted as external factors susceptible to the environment and economic conditions; whereas, certain bank factors are attributed to internal features of banks. In continuation, some of these factors and how they are related to asset quality index of banks will be explained.

3. Effective factors on asset quality

Banks have to decide about how they allocate cashes deposited in them. This decision forms level of credit risk and possibility of dishonored notes. Therefore, this dimension of bank evaluation goals can be met through criterion of bank asset quality (Rafiei Shamsabadi and Karimkhani, 2011). Quality of bank asset especially quality of loan portfolio is considered as determinant factor in profitability and financial performance of banks (Sile et al., 2019). This index depends on bank policies about evaluating customers in terms of loan payment, as well as controlling systems and bank supervision (Eyvazlo et al., 2016). So, considering those factors having effect on loans and overdue claims of banks in interaorganizational and extraorganizational scopes is a must.

In most of empirical studies, non-performing loans are considered as a criterion for asset quality. So, ratio of non-performing loans to total loans granted is usually considered as one of the important indicators in terms of recognizing asset quality and achieving financial soundness level of banks. That is, increase made in aforementioned ratio means increase of credit risk (Beck et al., 2013).

Theoretical foundation regarding explanation of the relationship between macroeconomic conditions and overdue claims is more returned back to models of business cycles. Overdue bank claims has cyclic behavior i.e. during economic boom and through increase of national production, households and enterprises have enough income flow and financial power to supply repayment of debts and financial obligations; so, there is a low volume of overdue claims. However, in longer time horizon, this relationship would be weakened and gradually works vice versa. Upon continuation of economic boom and accelerated growth of national production, banks facilitate standards of loan payment and make weaker screening and move towards paying loans to those

borrowers with lower qualification due to their good condition of balance sheets, their optimism towards future, and pressures resulted from interbank competitions. On the other hand, when recession begins, volume of overdue claims takes an accelerated trend and banks move towards lack of stability. Incapability of low quality borrowers in their repayments under recession condition is also resulted from stock value decline and reduction of value of collaterals provided by borrowers to the banking system. Under economic recession, reduction of value of collaterals sometimes to lower than value of loan received has resulted in increasing tendency of borrowers to avoid repayment of loans. Moreover, under recession condition, contraction of banks' lending volume because of them becoming less risk taking would be added to the above reasons and would be followed by borrowers' more incapability in their repayments. This incapability especially for those people allocating their loans received to long term investments will be higher as they need receiving more loans to repay their loans as well as interest related (Nezafat, 2016).

Increase or decrease in exchange rate (The exchange rate considered in this study is the interbank exchange rate), depending on level and direction of affect it has on value of assets of borrowers will be resulted in repayment or lack of repayment of debts to banks (Babihuga, 2007). However, usually increase made in exchange rate under inflation condition will be resulted in creation of more overdue claims. Under this condition and when exchange rate increases, peoples' debt to banks will be also increased. This increasing rate will be resulted in people to be less capable of repayment of their debts and finally they will be less willing to repay their loans received (Mirzaie et al., 2012).

Increasing inflation rate will be resulted in lower ability of person in repayment of his debt and to show lower tendency towards repayment of loan received. On the other hand, under certain conditions that inflation rate is something between interest rate of bank loans and interest rate of bank loans in addition to late payment penalty; reverse relationship between inflation rate and amount of overdue claims can be obtained. Therefore, no certain relationship between inflation and overdue claims can be imagined (Aminian, 2016).

Economic growth and increasing demand in economy will be ended in increased production, followed by increased ability of borrowers in their repayments. In other words, positive economic growth will be usually interpreted as more income which improves ability of borrower in repayment. This in turn will play role in reduction of overdue claims (Beck et al., 2013). So, negative relationship between the two aforementioned variables will be observed in empirical literature.

High unemployment rate shows economic recession and will lead to reduction of financial capability of borrowers in timely repayment of loans and increasing overdue claims, as a result (Nezafat, 2016).

Increase of government's budget deficit will lead to Borrowing from banks or creation of liquidity, money printing, and finally increase of inflation; and, in

continuation it will lead to increase of economic tensions, instability and lack of confidence. This in turn will lead to overdue claims in banks to be probably increased (Najafi Chaleshtari, 2019). Of course with consideration of banking system in our country upon which loans granted to the government and governmental companies will be paid by government banks, the results can be different.

Weak banking supervision on quality of activity of borrower will lead him to exit determined path and to use capital in another direction which would be resulted in specified goals not to be met and banking financial claims to be created. Relationship between banking supervision and overdue claims has been empirically studied by Ahmadian and Davoodi (2012). According to the results, the more would be power of supervisors; the lower would become amount of overdue claims (Nezafat, 2016).

Bank size is another variable that can explain a part of fluctuation in overdue claims (In the present study, the size of the bank is determined by the amount of bank assets, which is extracted from the financial statements of the studied banks). Those banks with larger scope of activities can probably have more accurate evaluation of peoples' risk due to their advantages related to size and domain (Nezafat, 2016).

Interest rate is one of the economic factors determining non-performing or bad loans (In the present study, interest rates on long-term investment deposits have been used to calculate interest rates). Increasing interest rate is effective on banks' asset performance and will increase cost of loans requested for borrowers; while, their capability for repayment would be reduced. Therefore, the relationship between interest rate and non-performing loans is positive (Ombaba, 2013).

4. A review on previous studies

Some of the most important recent studies regarding asset quality ratio of banks are as follows:

- In study performed by Shahchera and Abolfathi (2016), effective factors on quality of bank assets in the country have been dealt with. To do so, effective factors in two intraorganizational groups(banking factors including ratio of capital to asset, ratio of return on asset, bank size, ratio of deposit to asset, loan growth and ratio of loan to asset) as well as extraorganizational groups (macroeconomic variables including inflation and GDP) have been separated and their effects on asset quality of 25 banks have been studied through usage made of data related to the period of 2006-2015), six-stage econometrics pattern as well as linear estimator of generalized method of moments (GMM). The results showed that all variables have significant effect on quality of asset in banking network.
- Investigates the effect of the performance of major and bad debtors and also the effect of not paying attention to intra-bank variables on the amount of

non-performing loans has been studied by Baharvandi (2015). The results of the observations obtained from the research show that the bulk of non-performing loans are due to the performance of major debtors and the bank does not pay attention to credit variables.

- Effect of macroeconomics and bank properties on non-performing loans and performance of banking stability in Indonesia has been studied by Jim Hey Yam (2016) through panel data model for the period of 2004-2013. The results from model's estimation shows that macroeconomics factor including gross domestic product, interest rate, exchange rate, inflation, unemployment and banking indicators such as loan growth, ratio of capital sufficiency and total asset are considered as effective factors on non-performing loans and performance of banking stability.
- In study performed by Eyvazlo et al. (2016), identification of factors within and outside enterprises (systematic and unsystematic) having effect on non-performing loans among Iranian banks has been dealt with via data related to the period of 2006-2014 and dynamic panel data method through generalized moments' estimator. The results showed that from among macroeconomic factors, economic growth and inflation have significant and negative relationship with non-performing loans; and, government's budget deficit has positive relationship with non-performing loans. From among bank level factors, variable of capital ratio to asset has had negative relationship with non-performing loans; and, ratio of loan to deposit also has had negative and significant effect on non-performing loans.
- Effect of especial banking variables and macroeconomic variables on asset quality and profitability of banks in Pakistan has been studied by Muneer et al. (2017) in an article titled "Determinant factors of asset quality and bank profitability". They have used data related to 25 banks in Pakistan and panel data model for the period of 2006-2014. The results showed that variables of bank size, rate of loans granted by banks and exchange rate are statistically of considerable effect on asset quality in Pakistani Banks.
- Effectiveness level of macroeconomic variables on credit risk of banking industry in Iran for the period of 2006-2015 as well as simulation and prediction of credit risk status during 2016 has been studied by Rostamzadeh et al. (2018) via different stress scenarios, using stress test. Data used in the research are time and seasons series. To implement stress test and achieve research goal, self-explanatory model with autoaggressive distributed lag (ARDL) have been primarily used to identify macroeconomic variables effective on credit risk and effectiveness level of each on this variable to be specified. Accordingly, variables of inflation rate, exchange rate, unemployment rate and housing index have overall positive effect and GDP, banking loans interest rate as well as volume of loans granted to governmental and non-governmental sectors have negative effect on credit risk.

- In as study performed by Koju et al. (2018), this question has been answered that "Whether method of performance of macroeconomic variables effective on non-performing loans of banks in counties with different income levels is different or not?" To do so, data related to banking systems in 19 Asian countries (with different income levels) have been used for the period of 1998-2015. Also data has been estimated through generalized method of moments (GMM). Overall results shows that NPL (nonperforming loan) amount in banking systems of Asian countries is dependent on basic variables of macroeconomics like unemployment rate, inflation rate, official exchange rate, and gross domestic production (GDP) which are different in countries with various income levels. Therefore, to minimize credit risk in various banking systems, economic level of various countries have to be sufficiently taken into consideration.
- In a study performed by Rivai and Wahyuni (2018), effect of business cycles and other macroeconomic variables on non-performing loans in banking industry of Indonesia has been studied for the period of 2001-2016. Most important findings showed that business cycles and unemployment are the most effective factors on asset quality of banks; and, increasing interest rate plays an important role in increasing non-performing bank loans. Moreover, according to the results, non-performing loans will be reduced along with increasing GDP. However, when an internal economic shock happens such as increase of fuel price; this process will be reversed and non-performing loans will act against the cycle. However, external shocks have no effect on aforementioned process. So, business cycle under condition of internal economic shock has positive effect on non-performing loans but that of external shock is negative. Fluctuations of exchange rate have no effect on non-performing loans.
- In a study performed by Esmaeeli (2018), the role played by occurrence of business cycles in terms of overdue claims of banks in the country has been dealt with through band-pass filters. The result showed that overdue claims of banks has cyclic behavior in a way that it will be increased during recession period and decreased during economic boom. In economic boom stage and through increasing national production, households and enterprises have sufficient income flow and capability to fund repayment flow of debts and obligations; so, there would be limited volume of overdue claims.
- Effect of efficiency and liquidity on credit risk of development banks for the period of 2003-2017 has been studied by Nadim et al. (2019). In this respect and using panel data and data related to five Iranian banks (Tosee Saderat Iran, Bank of Industry and Mine, Tosee Tavon, Keshavarzi, and Maskan Banks) extracted from banks' balance sheets and Central Bank's website for the aforementioned period, research hypotheses have been studied. The results from model estimation showed that liquidity, ratio of deposits and bank size have positive and significant effect on credit risk of development

banks. Also, efficiency, profit margin and return on asset rate have negative and significant effect on credit risk of development banks.

- Asset quality determinants of Indian banks: Empirical evidence and policy issues have been studied by Arrawatia et al. (2019). To answer this question, using a sample of 47 commercial banks over a sample period of 2000 to 2014, their study examines the bank-, industry-, and macroeconomic-specific determinants of asset quality of Indian banks. Our empirical analysis also accommodates the impact of different ownership structures (public and private sector) and the impact of financial crisis while analysing the determinants of poor asset quality of Indian commercial banks. Results reveal that bank, industry, and macroeconomic-specific factors are responsible for the burgeoning nonperforming loan assets of Indian commercial banks. The results are qualitatively similar across different ownership structures. The findings suggest that forecasting models for nonperforming assets should also consider macroecomomic and industry specific factors along with the bank-specific factors.
- In a study performed by Lee and Rosenkranz, (2019), Nonperforming loans in Asia: Determinants and macrofinancial linkages has been studied. Using a dynamic panel model, they assess the determinants of the evolution of bank specific NPLs in Asia and find that macroeconomic conditions and bank-specific factors, such as rapid credit growth and excessive bank lending, contribute to the buildup of NPLs. Further, a panel vector autoregression analysis of macrofinancial implications of NPLs in emerging Asia offers significant evidence for the feedback effects of NPLs on the real economy and financial variables. Impulse response functions demonstrate that a rising NPL ratio decreases gross domestic product growth and credit supply and increases unemployment rate.
- Factors effective on non-performing loans in banking system of countries being member of European Union (EU) have been studied by Ciukaj et al. (2020). To do so, data related to non-performing loans of banks in Bulgaria, Croatia, Cyprus, Italy, Greece, and Portugal has been used through panel data approach for the period of 2011-2017. The result shows that high level of non-performing loans of banks is explained via micro and macroeconomic variables. Specifically, bankers have to pay more attention to small banks with more dynamism in providing loans. Also, higher interest rate will lead to higher non-performing loans for banks. Considerable point in the report results is lack of effectiveness of business model of banks as well as banking supervision domain on asset quality, among various types of banks studied.

5. Empirical Research Model

The research has been performed in thematic framework of factors having effect on financial soundness of banking system aimed at identifying effect of business cycle, macroeconomic variables, and selected banking variables on asset quality

index of banks. To do so and after literature review and usage made of dynamic panel model (generalized model of moments=GMM) as well as data related to 29 banks in the country including Eghtesad Novin, Ansar, Parsian, Pasargad, Post Bank, Ayandeh, Tejarat, Tosee Tavon, Tosee saderat, Day, Refah, Saman, Sepah, Sarmayeh, Sina, Shahr, Saderat, Industry and Mine, Mehr Iran, Karafarin, Keshavarzi, Maskan, Mellat, Resalat, Hekmat Iranian, Gardeshgari, Khavarmianeh, and Iran Zamin Banks for the period of 2001-2018, three following hypotheses have been tested based on the results from related estimations:

- There is a significant correlation between asset quality (banking system financial soundness indicator) and business cycle;
- There is a significant correlation between asset quality (banking system financial soundness indicator) and macroeconomic variables;
- There is a significant correlation between asset quality (banking system financial soundness indicator) and selected banking variables.

In the research, financial statements of banks including profit and loss statement as well as balance sheets have been used to collect data and statistics related to the banks' performance i.e. performance report of banking system provided by Monetary and Banking Research Center of Central Bank of Islamic Republic of Iran and Iran Banking Institute have been used. Economic and banking statistics have been obtained from databases such as that of Central Bank and Statistical Center of Iran. To collect theoretical data and information provided in research literature; library method has been used (books, articles, theses, and digital texts).

To determine business cycles, GDP cycles as variable have to be separated from long term process (and short term irregular fluctuations). Different methods have been recommended in recent literature of business cycles to separate long term process from cyclic components. One of the methods is Hodrick-Prescott filter which is minimizing a square form to specify component of time series concerned; and, this method has been used in the research (Eynian and Barkchian, 2014).

Suppose that y_t is concerned time series and g_t is unobservable process component of it. HP filter defined the process in a way that minimization problem of relationship (1) would be solved.

$$\min \sum_{t=0}^{T} (y_t - y_t^x)^2 + \lambda \sum_{t=0}^{T} \left[(y_{t+1}^x - y_t^x) - (y_t^x - y_{t-1}^x) \right]^2 \quad (1)$$

Cyclic component of this time series is defined as $y_t^c = y_t - y_t^x$. λ shows equality level of process component. The more would be λ; the more level would be the process (Eynian and Barkchian, 2014).

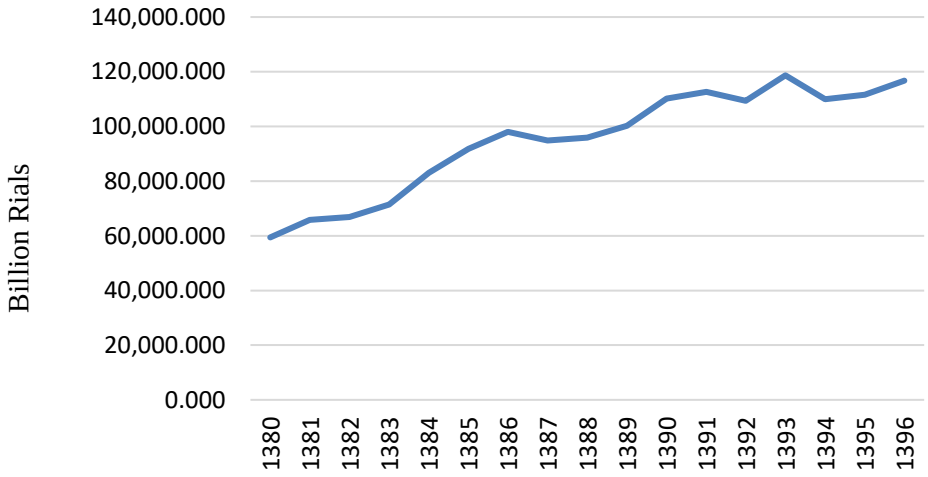
One of the important problems in using HP filter is selecting value of λ. If Hodrick-Prescott filter would be considered as a low-pass filter, value of λ will

have relationship with cut off frequency. Following equation shows how parameter λ is calculated via cut off frequency (Eynian and Barkchian, 2014).

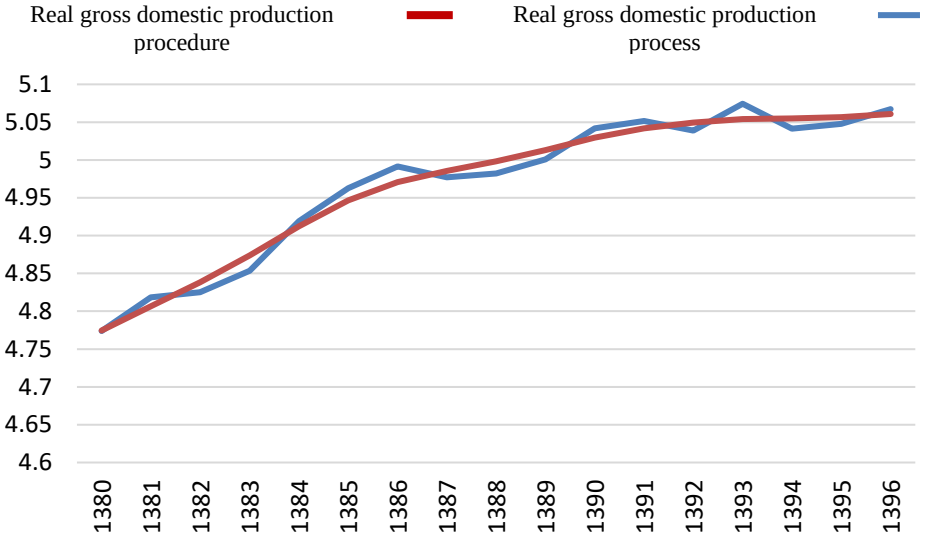
$$\lambda = \left[2\sin(\frac{\pi}{p}) \right]^{-4} \quad (2)$$

Where, **p** is cut off frequency. According to studies performed as well as statistics related to economic data in Iran, this cycle for Iran has been considered to be 8 years. This way, recession and boom cycles in Iranian economy will be specified as follows:

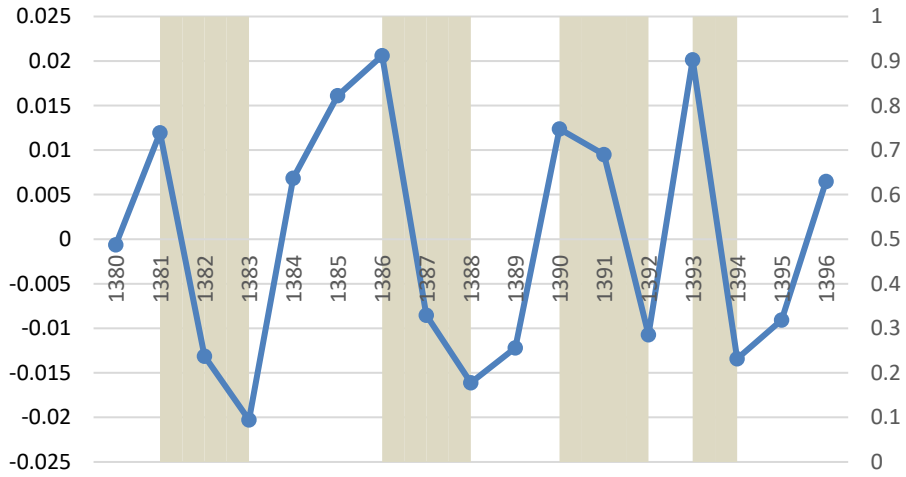
Changing process of real gross domestic production in Iran (2001-2018)

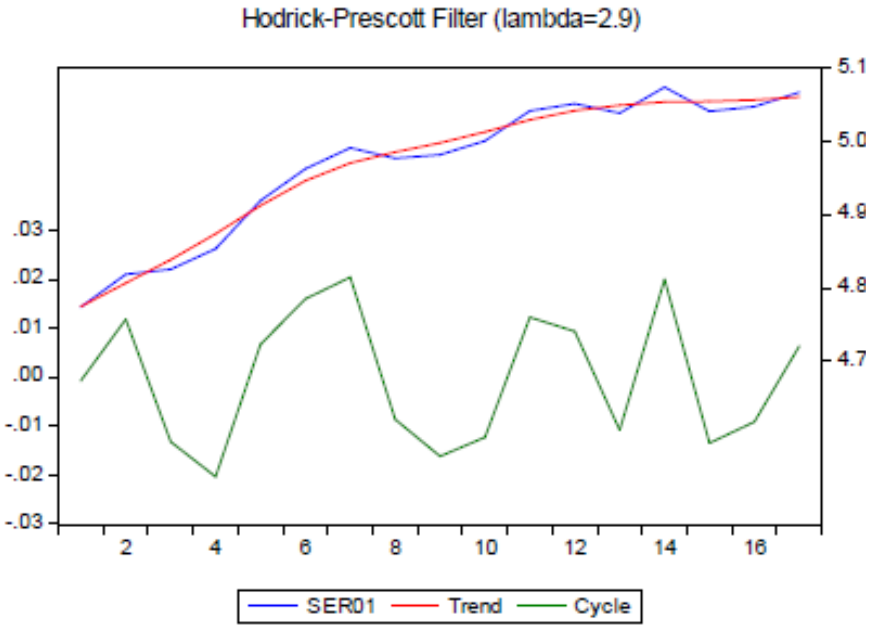


Fluctuations of real gross domestic production log without oil, around long term process in Iran (2001-2018)



Percentage of deviation from long term process (2001-2018)





Generalized method of moments (GMM) based on dynamic panel patterns will be used in those equations which unobservable effects specific to each country and lag of dependent variable in explanatory variables is the main problem in terms of their estimation. GMM will be used where numbers of variables in cross section (N) will be more than numbers of times and years (T) (Eynian and Barkchian, 2014). In present research, this condition has been observed. That is, number of banks (N-29) has been more than time cycle (T-17). This method that has been introduced by Casley et al. (1996) has some advantages and would be resulted in more accurate and efficient estimation and less colinearity.

Econometrics models of present research indicating the relationships between research variables will be shown as follows:

Asset Quality Model

$$AssetQ_{it} = \alpha_1 + \beta_1 AssetQ_{it-1} + \beta_2 ECycle_{it} + \beta_3 Iflation_{it} + \beta_4 Reer_{it} + \beta_5 Int\_r_{it} + \beta_6 Unrate_{it} + \beta_7 T\_Trade_{it} + \beta_8 BCP_{it} + \beta_9 LT\ Deposit_{it} + \beta_{10} GBudget_{it} + \varepsilon_{it} \quad (3)$$

Where, in model (3), $AssetQ_{it}$ is asset quality of bank i in year t as dependent variable and economic fluctuation of year t ($Ecycle_t$) and asset quality with one cycle of lag ($AssetQ_{it-1}$) has been considered as explanatory variable. Moreover, variables of economic control included in the model are: inflation rate

($Inflation_{it}$), real effective exchange rate ($\mathrm{Re}\,er_{it}$), interest rate ($Intr_{it}$), unemployment rate ($Unrate_{it}$), business index ($TTrade_{it}$), quality of supervising banking system (BCP_{it}), and banking system financial claims against government ($GBudget_{it}$); and, banking control variable used in this equation is ratio of saving deposits in banking system to total liquidity of the country ($LTDeposit_{it}$). Also, ε_{it} and are respectively disturbance term and β coefficient in the model. Symbol i in the model indicates concerned banks and $t = 1,...T$ shows time, period of 2001 to 2018 which of course is different for various sections.

- Exchange rate: It is the rate at which the currency of one country can be changed for the currency of another country. Exchange rate as a criterion for foreign exchange rate of one country against currency of other countries reflects economic status of that country compared to other countries. Concerned exchange rate in this study is interbank exchange rate (average official exchange rate of US dollar against Rials declared by Central bank of Iran on daily basis).
- Interest rate: It is the price paid for money and debentures in capitalist system. In present study, interest rate on account of term deposits has been used to compute the interest rate.
- Trade indicator: In this study, it has been computed as ratio of export value to the import value.
- Ratio of saving deposits in banking system to total liquidity of the country: Saving deposits or quasi-money include various types of saving accounts, house deposits, and term accounts from one to several years. On the other hand, the country-level liquidity by itself is divided into volume of money (bills and coins) and quasi-money (sight deposits). Ratio of saving deposits to the country-level liquidity has been considered as the variable concerned in this study.
- Quality of banking system supervision: In terms of quality of banking system supervision, the most important element of supervision is maintenance of stability and reliability of financial system; because, these factors will lead to reduction of depositors and other creditors' risk of loss. Due to some restrictions in terms of defining such variable in Iran's Banking System, variable of regulatory quality of the whole country has been used showing capability of government in formulation and proper implementation of supervision policies.
- Banking system's outstanding claims on government: Official reports on status of public debts are provided in three general formats by Central Bank of Iran, including public debts to the Central Bank of Iran, public debts to banks and non-bank financial institutions, and public debts to the banking system. In present study, data related to public debts to the banking system have been applied.

6. Empirical Results

Durability Test

Upon increasing usage made of panel data in macroeconomics having longer time series compared to micro data; reliability and co-integration study in panel data has been expanded. Using reliability tests in panel data is dated back to 1990s. Unit root test of panel data has been developed by Quah and Breitung (1994). These studies have been completed by Im, Pesaran, and Shin (2003), as well as Levin, Lin, and Chu (2002). In this study both of them have been applied.

Accordingly, the research results are as follows:

Table 1: The results from unit root test for research variables

Variable	Statistic value	Probability value	Result
AssetQ	-3.4880	0.0002	confirmed
Profit	102.364	0.0001	confirmed
ECycle	-4.5014	0.0047	confirmed
Inflation	2.8352	0.0769	Not confirmed
Reer	-2.7049	0.0947	Not confirmed
Int_r	-2.6446	0.1095	Not confirmed
LTDeposit	-0.8307	0.7825	Not confirmed
GBudget	-3.1222	0.0451	Confirmed
Unrate	-3.5508	0.0203	Confirmed
T_Business	-2.5251	0.1283	Not confirmed
BCP	2.0654	0.2592	Not confirmed
Ovr_Head	12.8092	0.0000	Confirmed

Source: EViews output

Considering probability value of unit root tests in some of the above scenarios being higher than 0.05; it is concluded that existence of unit root in all of the above variables as a statistical assumption is not rejected. So, all variables are not durable and cointegration test has to be used in order for concern about occurrence of spurious regression to be removed.

Cointegration Test

The results from cointegration test of Kao remaining on variables of quality model are as follows:

Table 2: Cointegration test results

Test	Statistic t	Probability value
Cointegration test of Kao remaining for asset quality model	-2.6110	0.0045

Source: EViews output

Since probability value for Kao cointegration test statistic is lower than 0.05; hypothesis regarding lack of long term relationship between variables of asset

quality model would be rejected and it is concluded that model variables are cointegrated.

7. Asset Quality Model Estimation Results

In regression equation of the model, we are going to study effects of business cycle on asset quality ratio with consideration of effective macroeconomic variables and certain banking variables on them. The results related to interpretation of coefficients related to dynamic panel model (GMM) based on table 3 indicates that all variables including banking and macroeconomic variables are effective on asset quality at significance level 5%. Asset quality with a lag directly affects asset quality ratio of current cycle in active banks of the country. In other words, dynamism of asset quality is confirmed. Business cycle having negative relationship of 0.094% with non-performing loans shows that during economic boom, amounts of non-performing loans would be reduced and during recession period it would be increased. These results are similar to what we expect. In respect of this negative effect, it can be suggested that during economic boom and upon increasing volume of production and earning, borrowers show more tendencies towards repayment of their debts; and, volume of overdue claims would be reduced. However, in long term and due to less supervision performed on provision method of loans, collaterals with less value would be received from customers as if screening is performed with lower quality. So, loans would be granted to deadbeat borrowers and volume of non-performing loans would be increased, in turn. On the other hand, during recession period, borrowers' income would be reduced and their tendencies towards repayment would be reduced as well; and, contraction in lending volume of banks will lead to lack of possibility of repayment of previous loans received by some borrowers and volume of non-performing loans to be increased. All economic variables i.e. exchange rate, inflation rate, and unemployment rate in addition to business index have significant effect on asset quality respectively through following coefficients: -0.0007, 0.0007, 0.0036, and 0.0965. The difference is that all variables except for exchange rate have positive relationship with asset quality ratio. Exchange rate has negative relationship with asset quality index. Of course regression coefficient is 0.0007 and can be ignored as a small value. Increase of exchange rate is effective on asset value of borrowers (receivers of loans); and, this will lead to increase or decrease of their tendencies towards their repayments. This way, non-performing loans of banking system would be decreased or increased. Therefore, no certain and similar result can be expected regarding effect of exchange rate on overdue claims and this effectiveness is subjected to combination of borrowers' assets. However, as shown by empirical studies, usually increase of exchange rate, decrease of asset value and decrease of borrowers' tendencies towards their repayments will lead to increase of non-performing loans. In present research

and contrary to what is commonly expected, one percent increase in exchange rate has led to 0.0007% reduction of asset quality ratio.

$$AssetQ_{it} = \alpha_1 + \beta_1 AssetQ_{it-1} + \beta_2 BCycle_{it} + \beta_3 Inflation_{it} + \beta_4 Reer_{it} + \beta_5 Int\_r_{it} + \beta_6 Unrate_{it} + \beta_7 T\_Trade_{it} + \beta_8 BCP_{it} + \beta_9 LT\ Deposit_{it} + \beta_{10} GBudget_{it} + \varepsilon_{it}$$

Table 3: Asset quality model estimation via GMM

Variable	Regression coefficient	Standard error	Statistic t	Probability value
Asset quality with one interruption cycle	0.2877	0.0052	54.9027	0.0000
Business cycle	-.0942	0.0427	-2.2038	0.0283
Exchange rate	-.0007	1.29	054.6378	0.0000
Inflation rate	0.0007	4.04	19.7602	0.0000
Interest rate	0.0047	0.0001	27.5812	0.0000
Ratio of saving deposits of banking system to total liquidity in the country	0.2164	0.0121	17.8236	0.0000
Banking system's financial claims from government	-0.0945	0.0032	-.29.1831	0.0000
Unemployment rate	0.0036	0.0004	8.7395	0.0000
Business index	0.0965	0.0035	27.1561	0.0000
Quality of supervision on banking system	-.0.0828	0.0014	-56.4978	0.0000

Source: EViews output

Increase of remaining part of economic variables will lead to increase of non-performing loans and it has positive relationship with asset quality. Inflation and unemployment rates as expected have respectively 0.0007% and 0.0036% effect on asset quality. Upon increase of inflation rate, banking interest rate, and unemployment rate, borrowers would be less capable of repayment of their debts; and, this will lead to increasing amount of overdue claims. Also, one percent increase in ratio of saving deposits in banking system to total liquidity amount in the country will be resulted in 0.2164% increase in asset quality ratio. The reason could be attributed to possibility of providing more long-term loans despite ratio of more long term deposits and proportionately more bank's overdue claims. Also, interest rate with coefficient of 0.0047 has significant positive effect on asset quality. Upon increase of interest rate, borrowers would be less capable of repayment and this will lead to increase of overdue claims. From among other variables studied in the research is business index with positive 0.0965% effect on asset quality ratio. The higher would be business index which means high ratio of export value to import value and increase of commercial activities; the more would become the need for financing and borrowing from banks. Non-performing loans and asset quality would be increased to the same extent. Therefore, effectiveness of this variable on asset quality ratio is directed towards financing model in different countries and whether it is bank-oriented or capital-oriented. As far as economy in Iran is bank-oriented, the effect has become positive.

The results are indicative of negative relationship between government debts to banking system and asset quality ratio (coefficient=-0.0945). As far as in our country loans granted to government are usually repaid on maturity date from government budget; these loans would be less placed under title of overdue claims and negative significant relationship would be created with asset quality ratio.

The results from present research show that the higher would be supervision quality on banking system; the lower would become non-performing loans. Negative -0.0828% relationship between these two variables at significance level of 5% has been shown.

8. Sargan Test

In continuation and to analyze the results and make sure of them being correct; correctness of usage made of instrumental variables in the pattern has to be assured of. The reason is that, adaptability of GMM estimators depends on validity of instrumental variables used. To do so, Sargan test has been performed; and, probability value and value of concerned statistic are presented in table 5.

Table 5: The results from Sargan test

Model	Probability value	Result
Asset quality	0.3986	Validity of instrumental variables

Extracted from research results

As specified in the results provided in table 5, probability value obtained is more than 5%. Therefore, null hypothesis related to Sargan test i.e. validity of instrumental variables defined wouldn't be rejected.

9. Conclusion and Recommendations

The research has been performed to the aim of studying the role played by business cycles in asset quality ratio of Iranian Banking System. To do so, after extraction of business cycles in Iranian economy and through study of theoretical foundations and previous studies performed, effective factors on asset quality ratio have been identified and regression of aforementioned model has been fitted via focus made on business cycle and macroeconomic and banking variables. Accordingly, it can be suggested that variable rate of business cycle in asset quality model shows its negative and significant relationship with asset quality ratio. Therefore, the hypothesis related to negative relationship between business cycle and asset quality ratio, as expected and the results of previous studies, would be confirmed. That is, upon improve of economic conditions and increase of economic growth, repayment of debts are more expected to be possible and ratio of non-performing loans to the loans granted in banking system of the country are expected to be reduced. So, adopting any policy

leading to exit of economy from recession is necessary to reduce ratio of non-performing loans.

Furthermore, due to the fact that in previous studies, less attention has been paid to the current state of our country's economy, which bank-oriented and the role that banks play in our country's economic growth and development, in this study more attention is paid to the banking system which is play important role in people's economic behaviors (deposit more assets in long-term accounts) as well as the government's reliance on our country's banking system (in the form of banks loans). Increasing people's willingness to deposit in banks and receiving risk-free bank interest increases, the higher ratio of long-term deposits of the banking system, the greater ability and willingness of banks to grant long-term loans, which may not repay or become non-performing. And as a result, the quality of loans granted decreases. In addition, the results of this study suggest that by paying more loans to the government, which in principle, with special supports, do not fall into the category of non-performing loans, the share of bank resources to provide loans to the private sector, which is more riskier than government groups loans, decreases, and therefore the loans granted with higher quality and the asset quality ratio decreases.

Also, negative and significant relationship between exchange rate and asset quality ratio, as expected and the results of previous studies, shows that in our country, currency is not only used as a tool for commercial transactions; but also, investment in currency market is one of the earning methods in Iran and huge part of peoples' asset is blocked in form of foreign currency savings with the hope of its price increase. That is, upon increase of exchange rate, value of its asset would be increased and repayment of loans received from banking system would become more possible. With regard to interest rate of banks, unemployment rate and inflation rate, as expected and the results of previous studies, the results show that upon increase of all of these three variables, ability for repayment of debts by borrowers would be reduced; and, this will lead to increase of overdue loans. Therefore, implementing economic policies in line with control of unemployment level and increase of ability for repayment of debts to banks will lead to cash flow in production sector of the country and increase of income level, economic boom and finally double reduction of non-performing loans, in addition to reduction of asset quality ratio and improvement of financial soundness indicators in banking system.

Considering Iranian economy being bank-oriented; financing takes place through bank channels. The higher would be the business index i.e. high ratio of export to import and increase of commercial activities; the higher would become the need for financing and borrowing from banks and the same extent non-performing loans. Due to the conditions of the country's sanctions in different years and the non-receipt of receivables, it is expected that the financing provided by banks has been used to increase exports and increase the country's trade index. On the other hand, due to the non-return of export profits, the

amount of non-performing loans of banks has increased and the lack of quality of assets has increased.

One of the most important factors having effect on asset quality ratio is supervision on banking system. According to the results from present study, and as expected and the results of previous studies, higher quality of supervision on banking system will lead to more accurate validation and provision of loans; and, non-performing loans would be reduced as a result.

In addition, the non-performing loans of previous periods, will increase the credit risk in subsequent periods, so banking policymakers should settle the non-performing loans of banks in the past, to minimize it's aggravating impact on non-performing loans in subsequent years.

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تأثیر چرخه‌های تجاری بر شاخص‌های سلامت نظام بانکی (با تأکید بر کیفیت دارایی)

یگانه موسوی‌جهرمی[1*]

بیتا شایگانی[2]

پیمان نوری‌بروجردی[3]

منا آشتیانی[4]

تاریخ دریافت: ۱۳۹۹/۱۰/۰۱ **تاریخ پذیرش:** ۱۳۹۹/۱۲/۰۴

چکیده

یک نظام بانکی سالم و سودآور، به‌صورت بهتری می‌تواند در مقابل شوک‌های اقتصادی مقاومت کرده و نقش پررنگ‌تری در پایداری و ثبات سیستم مالی ایفاء کند. این نظام بانکی، هنگامی محقق می‌شود که تک‌تک نهادهای مالی فعال در بازار پول آن کشور سالم باشند و از شاخص‌های مالی مناسب برخوردار باشند. تجربۀ وقوع بحران مالی اخیر و آثار مخرب ناشی از انتقال بحران از بخش پولی به بخش واقعی اقتصاد، اهمیت توجه هرچه بیشتر به موضوع سلامت بانکی را آشکار ساخته است؛ لذا در این مقاله، بررسی عوامل مؤثر بر نسبت کیفیت دارایی نظام بانکی کشور، به‌عنوان یکی از شاخص‌های اصلی سلامت نظام بانکی، با تأکید بر چرخه‌های تجاری، متغیرهای کلان اقتصادی و متغیرهای بانکی، طی دورۀ زمانی ۱۳۸۰- ۱۳۹۷، به‌عنوان هدف اصلی مدنظر است. قلمرو تحقیق حاضر، ۲۹ بانک شامل: اقتصاد نوین، انصار، پارسیان، پاسارگاد، پست بانک، آینده، تجارت، توسعه تعاون، توسعه صادرات، دی، رفاه، سامان، سپه، سرمایه، سینا، شهر، صادرات، صنعت و معدن، قرض‌الحسنه مهر ایران، کارآفرین، کشاورزی، مسکن، ملت، ملی، قرض‌الحسنه رسالت، حکمت ایرانیان، گردشگری، خاورمیانه و ایران زمین است. در این مطالعه، جهت رسیدن به اهداف مورد نظر، از الگوی پانل پویا (GMM) استفاده شده است. نتایج حاصل از بررسی‌های صورت گرفته نشان می‌دهد که چرخه‌های تجاری ارتباط منفی و معنی‌داری با کیفیت دارایی نظام بانکی دارد. هم‌چنین، تمامی متغیرهای کلان اقتصادی و بانکی، ارتباط معنی‌داری با نسبت کیفیت دارایی نظام بانکی دارند.

کلید واژه‌ها: نظام بانکی ایران، شاخص‌های سلامت نظام بانکی، کیفیت دارایی، چرخه تجاری، الگوی پانل پویا (GMM).

طبقه‌بندی JEL: E32, G21, C1

۱. استاد گروه اقتصاد، دانشگاه پیام نور، تهران، ایران (*نویسنده مسئول) **Email:** yeganehmj@gmail.com

۲. دانشیار گروه اقتصاد، دانشگاه پیام نور، تهران، ایران **Email:** bitashaygan@yahoo.com

۳. استاد مدعو مؤسسه عالی آموزش بانکداری ایران، تهران، ایران **Email:** p.noori@ipo.ir

۴. دانشجوی دکتری گروه اقتصاد، دانشگاه پیام نور، تهران، ایران **Email:** mona.ashtiani@yahoo.com