Petroleum
Business
Review

The Impact of Oil Price Movements on Bank Nonperforming Loans (NPLs): The Case of Iran

Ameneh Nadalizadeh[a], Kambiz Kiani[b]*, Shamseddin Hoseini[c], and Kambiz Peykarjou[d]

[a] *Ph.D Student, Management and Economy Faculty, Islamic Azad University, Science and Research Branch, Tehran, Iran, Email: shahrzad.nadali@cbi.ir*

[b] *Professor, Management and Economy Faculty, Islamic Azad University, Science and Research Branch, Tehran, Iran , Email: anadalizadeh@cbi.ir*

[c] *Assistant Professor, Economic Department, Allameh Tabataba'i University, Tehran, Iran, Email: economic1967@cbi.ir*

[d] *Assistant Professor, Economy Faculty, Islamic Azad University, Science and Research Branch, Tehran, Iran, Email: r.k.peykarjou@@cbi.ir*

ARTICLE INFO

Keywords:

Bank Nonperforming Loans (NPLs)

Oil Exporting Countries

Generalized Method of Moments (GMM)

JEL Classification: E32, E44, G21, G32

Received: 6 Dec. 2018
Revised: 21 Jan. 2019
Accepted: 30 Jan. 2019

ABSTRACT

It is generally believed that macroeconomic and financial performance in oil exporting countries is interlinked to oil price movements. Regarding that assumption, the present study aims to examine the impact of oil price movements on bank nonperforming loans (NPLs) ,as a criterion for evaluation of bank credit risk, by applying the Generalized Method of Moments (GMM) on data from 18 Iranian banks data over period 2006–2017. The result of the estimated model indicates that there is a significant relation between fluctuations of oil price and bank nonperforming loans; accordingly, any decrease in the price of oil will result in an increase in bank nonperforming loans. Also, in order to have comprehensive assessment, economic and bank specific control variables were used in the model. Findings show that the NPLs ratio increases as economic growth decreases and exchange rate and real interest rates rise. Among bank specific factors, equity ratio as a criterion for efficiency and loan growth has a negative effect on NPLs, but by raising bank industry concentration, credit risk and financial stability can be threatened. Thus, the reliance of oil rich economies on oil incomes leads to the linkage of oil prices, and macroeconomic and financial performance. Therefore, the result of this study will be useful in adapting and diversifying macroeconomic policies in the face of drastic changes in oil prices and mitigating its adverse effects.

1. Introduction

Oil, as one of the most important natural resources, has created the largest industry since the 19th century, and global economy has been influenced by variations in its price. Available documents and evidence show that the price of oil is an important driver in changing economic and financial variables in oil-exporting countries that the strong operation of real and financial variables is attributed to upward oil price periods (Khandelwal et al., 2016).

* Corresponding Author

Oil prices fluctuate in response to changes in global oil supply and demand conditions, political communication, changes in institutional arrangements and future market (Sadorsky, 2004 and 2008). These fluctuations in oil prices have a crucial impact on economic activities and firms' performance in oil-rich countries. Increases in oil prices lead to higher oil revenues and thus higher government spending, better corporate performance, asset price appreciation, higher real estate prices and strong bank balance sheets (Al-Khazali and Mirzaee, 2017).

Despite the fact that the impact of variations on oil price on the macroeconomics of oil exporting countries are well-documented, sufficient attention has not been paid to the impacts of the aforesaid variations on the bank balance sheets and financial stability of the banks. However, based on investigations associated with the development and vulnerability of financial markets, variations in oil price has always played a main role in credit and stock markets (Khandewal et al., 2016). For example, the recent recession of 2014 in Russia, which occurred due to changes in oil and energy market and the drop of Brent crude oil to less than $60, strongly influenced the credit market and the stability of the banking system. In that period, despite the efforts of Russian Federation and a 6.5% change in bank interest rate in order to avoid outflow of capital, the value of the ruble against that of the dollar decreased by 21%. Another marked evidence relates to the occurrence of the financial crisis in the United States and oil price slump during 2007–2008, in which the oil exporting countries did not remain immune from such a decrease, and the banking industry of these countries particularly Oman, Qatar, UAE, and Kuwait ran into instability in their banking system and lost their credit allocation capability.

Due to the dependence of government income on oil revenue in oil exporting countries, any fluctuation in the price of oil leaves its effect on the real and financial sector in the economy. As a result of an increase in the price of oil and a subsequent increase in government expenditure due to oil income surplus, an improvement in the performance of the companies is expected, and a strong performance of companies will guarantee payment of bank loans (IMF, 2015). On the other hand, any decrease in oil price will result in a reduction in government income as well as the level of economic activities, which will easily shift to financial markets, banking industry, and asset market, leading to instability in the banking system. In fact, any changes in the price of oil will spread out into the bank balance sheets and assets, resulting in the destabilization of the healthy operation of the banking system, crises, and more complicated conditions and in the risk of bankruptcy for the banks.

Iran, as one of the world's oil exporting countries, is capable of absorbing adverse oil price movements and transferring them to the banking sector because of at least two reasons. First, Iran relies heavily on oil, gas, and hydrocarbon exports, and fiscal dependence on hydrocarbon revenues is considerable. During 2003–2018, the oil exports exceeded about 74% of the total exports on average (Figure 1). Second, the high dependence of Iran on oil leads to a high level of vulnerability of the economy to oil price movements and threatens the financial sectors, including equity and credit markets and banking system stability. The upturn in oil price contributes to economic growth and increases outputs, GDP growth, investment, economic activities, and liquidity in the banking sector. Consequently, the financial position of firms can be strengthened, and the position of bank substantial claims on these firms will be improved (Bruckner et al., 2012). However, the oil price downturn weakens the financial position of corporates and their capacity to repay bank loans, thereby leading to raised default rates of bank loans and high nonperforming loans due to a close relation between bank loan portfolios and the performance of the companies (Al-Khazali and Mirzaei, 2016).

Therefore, the dependence on oil revenues on the one hand and the volatility of world oil price on the other hand make Iran a good case for examining the extent to which oil price movements influence bank NPLs. It should be noted that the importance of banks' financial stability is realized in the transparent control of money supply and demand in the banking system as well as in the stability of interest rates in the money market.

In this regard, the ratio of nonperforming loans as an appropriate indicator of credit risk assessment and financial stability of banks is discussed. According to comparative surveys conducted between 2008 and 2013, Iran is ranked 10th among the 87 countries in terms of the severity of the ratio of NPLs. This ratio was 15.7, 18.3, 13.9, 15.1, 14.7, and 18% in the mentioned years, respectively. While the average of worldwide ratio is 3, 4.3, 3.9, 3.8, 3.7, and 4% respectively in the above-mentioned years. The important key in this survey is reporting ratios for some OPEC member oil-exporting countries that have faced credit risk during the global financial crisis of 2008 (Mehrabi, 2014). Saudi Arabia, Brazil, Kuwait, and Nigeria are in the best positions, respectively (Figure 2). The comparison between these

countries and Iran is in respect of government funding by oil revenues and the emergence of their financial markets. This comparison shows that the Iranian banking system has been affected by drastic oil price changes and has not performed well.

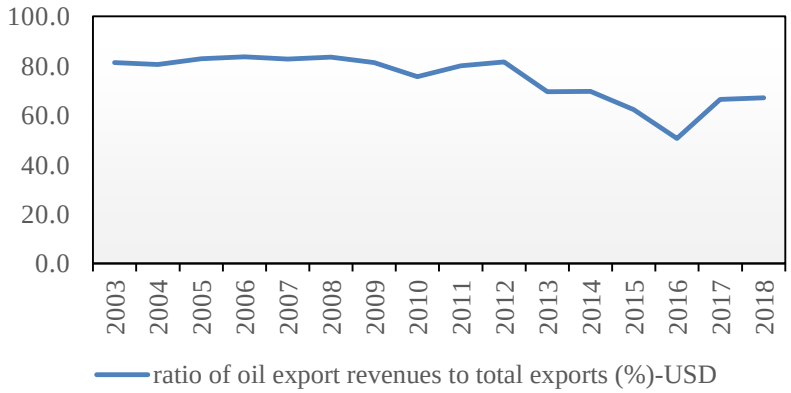

Figure 1. Oil export revenues as percent of total exports of goods and services-USD (2003-2018); Source: Central Bank of the Islamic Republic of Iran; www.cbi.ir.

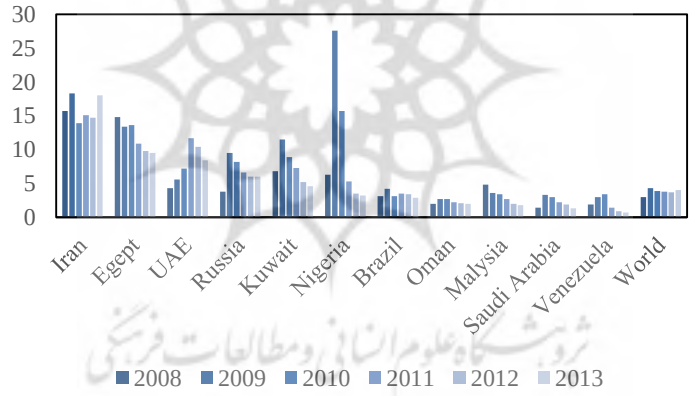

Figure 2. Bank nonperforming loans as percent of total gross loans (2008-2013); Source: World Bank; www.worldbank.org.

Considering the above introduction, the existence of a coherent study to examine the channels of transmitting oil price fluctuations to the banking sector is essential. Therefore, the current work seeks to examine such an important issue with the intention of explaining the channels transmitting oil price fluctuations to bank balance sheets, as well as examining the impact of such fluctuations on the nonperforming loans as an index for the evaluation of bank credit risk in developing countries. The present study investigates the hypothesis that oil price fluctuations have a significant and reverse impact on the bank nonperforming loans. Hence, we use the panel data within the framework of GMM technique. A proper understanding of the impact of oil price movements on the banking system in Iran, where hydrocarbon revenues stimulate economic growth, reveals important policy implications. Adopting and diversifying macro prudential policies to mitigate the threat of adverse oil price movements on the stability of the banking sector and assisting policy makers to regulate the banking sector effectively and make the banking sector less vulnerable and more elastic to oil price movements are required.

While there is a large body of research on the association between oil price shocks and macroeconomic

variables (e.g. Henriques and Sadorsky, 2008; Dayanandan and Donker, 2011; and Elyasiani et al., 2011), there is little empirical evidence on movements in oil price that affect bank NPLs. It is worth mentioning that examining the effect of oil price volatilities on the financial stability of Iranian banks' by applying the diversity of explanatory variables, which include a wide range of macroeconomic variables; bank specific factors based on capital adequacy, asset quality, management, earning, and liquidity (also known as CAMEL components); and the market concentration index distinguishes the present study from other internal works.

It should be noted that bank specific factors based on CAMEL components are associated with the quality of bank loan portfolio (Al-Khazali and Mirzaee, 2017), and the market concentration index is related to bank efficiency and profitability. According to the structure-conduct-performance (SCP) hypothesis, a higher market concentration first generates profit but then lowers NPLs (Al-Khazali and Mirzaee, 2017). Thus, this paper aims to fill this gap. Indeed, we address this important question: do oil price shocks affect bank NPLs in Iranian banks?

The remainder of the paper is organized as follows. Section 2 provides a brief literature review and develops our hypothesis. Then, Section 3 discusses the empirical model and further introduces different measures of oil price shocks. Section 4 discusses data and the empirical findings, and the final Section offers a conclusion.

2. Theoretical Foundations and Literature Review

In the recent decade (2006–2017), international oil prices have experienced extreme changes and two major oil shocks have occurred during this period. First, the price of each barrel of oil during the period of 2007 to 2008 rose to $100 and lost 35% of its value simultaneously with the global financial crisis. Second, the price of each barrel of oil in 2014 decreased by 50% and reached $40, which caused uncertainty in the policies of oil exporting countries. Drastic fluctuations in oil price during the mentioned periods, in addition to the creation of uncertainty and negative impacts on the performance of the abovementioned countries, strongly affected their financial stability and banking systems. These negative impacts are firstly the result of severe dependence of economic and financial performance on oil price variations, which have had serious impacts on the performance of economic enterprise of oil-exporting countries. Secondly, the dependence of economic and financial performance on oil price variations can intensify the impacts of oil price variations on business cycles. Changes in oil price and government expenditure policies create feedback loops between the value of asset and credit, which can increase systemic vulnerability in financial sector (IMF, 2016).

Theoretically, variations in oil price can effect bank balance sheets through government budget and exchange rate channels; however, in oil-exporting countries, government's budget is considered as the most important transmission channel due to being highly influenced by such fluctuations. Figure 3 shows the potential dynamism of the drop in oil price in the oil-exporting countries' economies and relevant transmission channels that can transfer oil price changes to bank balance sheets.

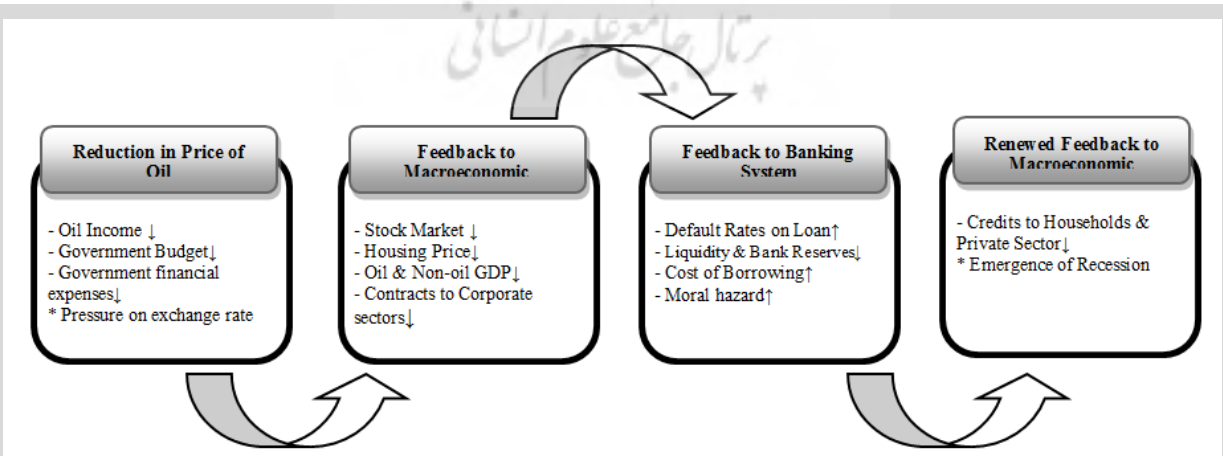

Figure 3. Channels transferring the drop in oil price to the banking system; Source: Alodayni (2016).

2.1. Government Budget Channel

The economy of oil-exporting countries is strongly dependent on oil incomes; hence, government budget is deeply affected by oil income. Due to the non-realization of budgetary forecast income or increase in expenses, when the oil price declines, the government faces budget deficiency, so it seeks to reduce the current development, infrastructure, and investment costs to compensate for such deficit. Given the stickiness of the government expenditure, the reduction of costs occurs mostly in the private sector by cancellation and suspension of contracts, which results in a drop in the level of economic activities. Therefore, the reduction of economic levels will influence the potential enterprises toward the removal of financial commitments such as repayment of banking loans, i.e. paying the principal debt plus its interest. Accordingly, it is expected that negative changes in oil prices result in an increase default rate on loans. Recent researches carried out by IMF (2015) show that in Arab oil-producing countries, a 1% slump in oil price results in a 0.1% increase in the rate of NPLs (Alkhazli and Mirzaei, 2016). Therefore, when the price of oil falls, the banks face an increased credit risk.

Still another consequence of the reduction in economic activities, particularly in the private sector, is the decline of the stock market and reduction of asset value. Asset devaluation will lead to the reduction in the value of bank collaterals, as well as the net value of the bank assets and firms, and consequently to the weakening of bank balance sheets. In this case, banks with less capital and weak balance sheets tend to strengthen their loan portfolio basket via accepting the risk of paying credit to risk-taker borrowers or paying credits at a higher interest rate (Berger and De Young, 1997), leading to default in the repaying of bank loans and an increase in NPLs. In most studies carried out so far, it has been proved that there exists a negative relation between the economic growth and NPLs (Bolhasai, 2011–2012).

Another solution to the budget deficit compensation in oil-producer economies is using banks' resources. In such economies, the governments under fiscal imbalanced conditions and facing the impossibility of paying back the debts compel the banks to pay back their own debts (Mishkin, 2010). In such circumstances, the balance sheets of the banks taking care of governmental debts are weakened and the amount of banking debts will increase. Argentina's banking crises of 2002 are marked examples in this context. On the other hand, investors, who realize the inability of the government to repay the debt, sell the government bonds. Therefore, by increasing government bonds supply in the market, their price drops, so the net value of bank assets will be reduced; eventually credit allocation power of banks will be decreased. In such a situation, problems resulting from asymmetric information and emergence of "Adverse Selection" and "Moral Hazard" phenomenon will be imposed on the banks due to the compensation of damages and losses incurred by the banks (Mishkin, 2010).

In fact, "Adverse Selection" and "Moral Hazard" in credit market, originate in information asymmetry between borrower and creditor. Banks, which are less informed about the risks related to the enterprise, will be misled about distinguishing bad borrowers from good ones. As a result, the banks may probably make an adverse selection and unintentionally classify the bad borrowers as good ones. On the other hand, the enterprises' awareness of the incompleteness of the banks' information will reduce the enterprises' endeavors to make a profit and increase their motivation to use long-term loans in cases with higher risks (Moral Hazard). In both cases, the risk of not repaying debt and the potential loss of bank from credit allocation operation will increase (Nili and Mahmoudzadeh, 2014).

2.2. Exchange Rate Channel

Oil price movements put pressure on the exchange rate and value of the domestic currency via fluctuations in foreign currency earnings. When oil prices drop, foreign exchange earnings reduce, so the economy faces a domestic currency depreciation and an increase in value of the exchange rate, on the contrary; when the oil price increases, exchange rate devaluation and appreciation of domestic currency will happen. The important concern of economic policy makers from the fluctuations of exchange rate is that production and inflation are affected by such fluctuations. That is to say, when the exchange rate is soaring and domestic currency is depreciating, all imported merchandise in the country will be expensive, leading to an inevitable inflation. As far as the output of speculative activities is increased in proportion to an increase in the inflation rate, willingness toward receiving loans with lower interest rates and spending the funds in unofficial markets with higher interest rates becomes prevalent. And in spite of contracts signed between the banks and the borrowers and their commitment to paying penalties in case of any delay in returning the loans received, borrowers prefer to pay interest and the bank penalties in comparison to getting the required funds from unofficial markets

because the cost of funds from unofficial markets is high. Therefore, the borrowers are unwilling to settle their loans on time in times of inflation (Mohammadi et al., 2016).

On the other hand, when exchange rate devaluates and domestic currency becomes valuable, domestic producers lose their capability to compete with foreign manufacturers because increased domestic inflation will result in an increase in the cost of production and consequently, the domestic producers manufacture their product at a much higher cost compared to foreign rivals. By eliminating domestic producers in the international arena, the overall economic revenue is decreased. Given a decreased level of sale and economic activities of enterprises, the banks' resources for lending facilities will be reduced, leading to a lack of credits on the one hand, and stagnation and liquidity reduction on the other hand, a condition in which repayment of banking credits will face real complications.

In case the banks have debt contract in a foreign currency (usually the dollar), a negative shock in the value of the domestic currency leads to what is referred to as currency mismatch[2] ; thus, in this situation, the bank debts will increase, while no increase has taken place in their assets. In such a case, a weakening of bank balance sheets definitely occurs, which increases the risk of adverse selection in credit allocation. Moreover, in times of negative shock in the value of domestic currency, borrowers' ability to repay debts will be weakened, which leads to increased moral hazard and consequently to a rise in NPLs.

2.3. Review of Literature

The various studies mentioned below show different variables for different nations limited to the specified traditional analysis. Therefore, we refer to the studies presented in our context.

Hamilton (1983) in his essay entitled "Oil and Macroeconomic after World War II" examined the impact of fluctuations in oil prices on real income within the framework of Granger Casualty test by using data from America and considering economy supply side. According to the results of his study, the reason for recession during postwar era was attributed to oil shocks (an increase in energy prices). In a later essay published in 1996, he examined the oil price while glancing at the fundamentals of demand. The results were indicative of the impact of oil price on the consumption, investment, and, subsequently, the stimulation of demand. He was regarded as one of the first researchers to examine the impact of oil price on macroeconomic variables and the real sector of the economy. His researches constituted an appropriate basis for upcoming studies.

Bernanke et al. (1999), within the framework of a theoretical model, explained the relationship between the real sector of the economy and capital markets and examined the expansion of credit friction and distortions distributed in macroeconomics. Using the amount of bank nonperforming loans (as bank's credit risk index), he examined the relation between the financial stability of the banks and the real sector of the economy and determined factors of nonperforming loans and feedback relation between fiscal instability in banking systems and real economy. Factors affecting the nonperforming loans in macroeconomics include business cycles, exchange rate pressure, rate of unemployment, and the identified loan rate, as well as determining banking factors, which are the size of the bank, difference in risk management, and operational costs.

Relying on the literature of twin crises (crises in banking and currency) in the 90s and explaining causes of the occurrence of currency crises through bank credit risks, Kaminsky and Reinhart (1999) embarked on an examination of the impact of macroeconomic variables on bank balance sheets and NPLs. Their study attributed the NPLs to factors such as business cycles, exchange rate pressure, unemployment rate, and rate of interest, examining the effectiveness of variables relating to banking operations, including risk management, cost operations, and size of bank on the NPLs.

Domenico Fanizza (2009) examined the relation between oil shocks and profitability of MENA banks, using data from 145 banks (87 commercial banks, 40 Islamic banks, 18 investment banks) in 11 oil-exporting countries during 1994–2008. The results of the study indicate that there is an indirect relation between oil price shock on bank profitability, directed by special macroeconomics and organizational variables of the countries while its direct influence is insignificant. Further, in comparison to Islamic and commercial banks, investment banks showed greater vulnerability.

Espinoza and Prasad (2010) examined constitutional factors of NPLs of countries with a coastline on the Persian Gulf. This study, which was carried out before

[2] A problem, which is specific to oil exporting countries with emergent markets.

the global financial crisis of 2008, reported an increase in nonperforming loans ratio under weak economic conditions. According to dynamic panel analysis model developed during 1995–2008 for 80 banks, the rate of nonperforming loans increases due to the reduction of economic growth, increase of interest rate, and risk aversion by investors. This study investigates actions and reactions of NPLs and economic growth within the framework of vector auto regression model (VAR) and estimates the loss of bank balance sheets at an economic level with 4% elasticity based on a strong and short-term model.

Gosh (2015) studied the impact of macroeconomic variables on NPLs. In this study, the intensification of recession cycles and economic prosperity provokes the increase of NPLs.

Osamah and Mirzaei (2015) have studied the influence of oil movements on the financial stability of banks in some oil-exporting countries. In the estimated model, a significant relation was estimated between the negative shocks of oil price and the bank nonperforming loans that any drop in oil price leads to an increase in the amount of NPLs.

Moshiri (2015) using generalized autoregressive conditional heteroskedasticity (GARCH) model in a study carried out in Saskatchewan, Canada examined the asymmetric effects of oil price shocks in oil-exporting countries during 1970–2010. The study presents the asymmetrical effect of oil shock on macroeconomic variables of oil-exporting countries in such a way that any decrease in lower oil prices leads to a reduction in incomes and causes a recession in the economy, while high oil prices resulting in higher economic incomes have an insignificant impact on economic growth.

Saleh Alodayni (2016) used the generalized method of moments (GMM) to examine the impact of oil price reduction on the financial stability of the Persian Gulf Cooperation Council Countries (PGCC). In this study, the oil price, non-oil GDP, the rate of interest, the price of shares, and the housing prices have been identified as factors effective in the bank nonperforming loans of the abovementioned countries in such a way that the credit risk shock tends to spread disorders in non-oil GDP, credit growth, and share price in the PGCC.

Khandewal et al. (2016) used Logit strategy in 42 banks during 2000–2014 and examined the impact of oil prices on banking systems of the PGCC concluding that there is a loop of feedback among variations in variables of oil price, bank balance sheets, and price of assets. Oil prices and the level of economic activities identified to be moving along the same direction, meaning that they have a significant impact on the quality of bank assets. Moreover, the analysis concluded that bank capital showed an anti-cyclic behavior.

Hamann et al. (2016) carried out a research attributed to Federal Reserve Bank of St. Louise and examined monetary policies in the economy of oil-exporting countries. From the researcher's point of view, a sudden decrease in the oil price will push the central banks of oil-exporting countries into a new challenge when deciding on inflation policies. In this study, which was carried out in Colombia, the impact of oil price fluctuation on macroeconomics and bank variables was examined with the extent of their susceptibility being attributed to the size of price shock. The most important mechanisms of oil shock transition to real economic sectors are real effective exchange rate, country risk, and slow price adjustment. Finally, the research concludes that inflation targeting in these countries is extremely difficult because the increased exchange rate aimed at a control of inflation either is increased, moves far ahead of exchange rate, or reduces it in order to stimulate the economy.

Abrishami and Mehr Ara (2009) studied the quality and quantity of positive oil shocks on economic growth of countries, which were members of OPEC during 1970–2005. The research, using panel analysis model, examined oil shock symmetry. Their findings show that the reaction of economic growth to oil shocks is asymmetric and far severe to negative oil shocks.

Heidari (2011), using generalized method of moments (GMM), analyzed the impact of macroeconomic variables on NPLs; also, he used variables, including non-oil GDP, inflation, liquidity growth, growth of interest rate facilities, and housing price index growth in big cities and concluded that housing price growth is the most important factor which adds to NPLs in Iran.

Norouzi, in 2014, using systemic generalized method of moments (GMM), found that the following factors are effective in Iranian bank credit risk: facility interest rate variables, the rate of inflation, the debt of the government, the rate of unemployment, and the growth of GDP. Except for the last variable having established a negative relation, the other variables have a positive effect on NPLs.

Mohammadi et al. (2016), applying the generalized method of moments (GMM), explained the effect of macroeconomic variables and special banking features on NPLs of Iranian banking system during 1985–2013.

They showed that the economic growth has a negative impact and the real interest rate gap (gap between unofficial markets from the real interest rate in official market) and exchange rate have a positive effect on the NPLs. Also, specific banking variables, including capital sufficiency, the ratio of deposit to cost, and the ratio of deposit share (as the size of bank) have a negative and significant impact on the NPLs.

Overall, our study contributes to this strand of literature by highlighting oil prices as a main and key determinant of bank NPLs in oil-exporting countries. Understanding the oil price dynamics is important since oil prices are now acknowledged as the key source of macroeconomic risk in these countries (Barkoulas et al., 2012).

3. Methodology

3.1. The Model and Variables

Our examination of the relationship between the ratio of bank nonperforming loans to total bank loans and some banking and economic variables is conducted in three steps. First, we employ panel cross-section dependence and unit root tests. Then, we evaluate variables co-integration to examine whether a long-run relationship exists among them or not. Finally, we estimate coefficients using appropriate methodology, i.e. the generalized method of moment.

The matter of autocorrelation appears due the following two reasons: first, the existence of a lagged dependent variable among explanatory variables, and second, nonhomogeneous sectional effects between sections, which is by itself the reason behind the bias and inconsistence of ordinary least squares (OLS) estimator. Even if ε_it proves not to be correlated serially, OLS estimator by supposing accidental impact for dynamic combined data is biased and maladjusted. Hence, to solve this issue, two stage least squares (2SLS) of Anderson-Hsiao, Arrelano and Bond, entitled Blundle and Bond, under generalized method of moments (GMM) are recommended (Matutes and Vives, 2000).

In the current literature of econometrics, the most widely circulated advance technique is GMM that has an explicit connection to other estimating methods and produces "efficient" estimators. The accuracy and efficiency of the finite sample size is examined by the variant of Arellano-Bond and the Blundell-Bond GMM estimations that considers the existence of heteroskedasticity due to dynamic nature of data along with endogeneity (Kiviet et al., 2017). In this analysis, GMM is employed to account for the dynamics in the model along with covering the issue of endogeneity and heteroskedasticity. When there are changes in one explicative variable, they affect the dependent variable but it adjusts to the impact towards its long run equilibrium over time. GMM umbrellas OLS estimators, 2SLS, and IV technique which are not only applicable to a single equation but to a whole system of equations in the case of panel data along with an extension to panel study. The dynamics of panel data is better handled by this technique by covering the cross-section differences and by taking differenced lagged value as an instrument making the estimators consistent (Hassan and Nosheen, 2019).

In this study, both behaviors of explanatory and dependent variables are examined. The general form of this model is represented by equation (1):

$$y_{it} = \delta\, y_{it-1} + \beta x'_{it} + \varepsilon_{it} \quad i = 1 \ldots . N \;\; t = 1 \ldots . T \tag{1}$$

In which, δ is coefficient, y_{it-1} entails the lagged value of dependent variable for bank *i* over period *t*, x'_{it} is the other repressor included in the model as the control variable for bank *i* over period *t*, and ε is error term. Thus, we have:

$$\varepsilon_{it} = \mu_i + V_{it} \tag{2}$$

where ε_{it} represents error term, and μ_i represents bank-specific fixed effects that are time invariant; meanwhile, V_{it} is assumed to be independent and normally distributed with zero (0) mean and constant variance ${\sigma^2}_{it}$ both over time and across banks, that is, $V_{it}(0,{\sigma^2}_{it})$. These are distributed as equations (3) and (4).

$$V_{it} \sim iid(0, \sigma_v^2) \tag{3}$$

$$\mu_i \sim iid(0, \sigma_\mu^2) \tag{4}$$

The pattern used in this study is expressed in equation (5):

$$npl_{it} = a_1 npl_{it-1} + a_2 oil\ growth_{it} + \sum_l a_l r_{l,it} + \sum_m a_m z_{m,it} + e_{it} \tag{5}$$

In equation (5), the explanatory variables include oil price changes, macroeconomic (r_l), and bank specific control variable (z_m). Thus, in the present study, the panel data technique was used to examine the effects of oil

price fluctuations on the credit risk of selected banks in Iran during 2006–2017. In the dynamic pattern, the dependent variable, i.e. the ratio of bank nonperforming loans to allocated total loans, abbreviated to NPL, as an appropriate criterion for measuring bank credit risk, is independently located to the right of the equation.

3.2. Data Sources and Hypothesis

Overall, we expect an association between oil price movements and bank NPLs in oil exporting economies. This leads our hypothesis to be as follows: oil price movements affect bank NPLs in Iranian banks. Hence, to examine the hypothesis, we follow the approach of previous studies (Salas and Saurina, 2002; Louzis et al., 2012; Love and Ariss, 2014; Imitrios et al., 2016; and Al-Khazali and Mirzaei, 2017) by adopting a dynamic panel regression of the form:

$$\begin{aligned} npl = \alpha_0 + \alpha_1 npl_{it} + \alpha_2\, oilg_{it} + \alpha_3\, gdpg_{it} \\ + \alpha_4\, exg_{it} + \alpha_5 loag_{it} \\ + \alpha_6 ldr_{it} + \alpha_7 eqt_{it} \\ + \alpha_8 hhi_{it} + \alpha_9 bsh_{it} \\ + \alpha_{10} rir_{it} + \alpha_{11} siz_{it} \end{aligned} \quad (6)$$

$I = 1, \ldots, n$

$t = 1, \ldots, m$

Based on this equation and the base studies, variables and their sources are presented as below:

npl represents the ratio of bank nonperforming loans to total bank loans, which indicates how much of the bank's loans has not been repaid within the specified maturity.

Oil growth ($oilg_{it}$) is calculated based on the average of the annual changes of crude oil price index.

gdp growth ($gdpg_{it}$) measures the percentage of GDP changes in a year compared to the previous year.

exg_{it} represents exchange rate growth.

bsh_{it} is bank industrial index, which represents the average price changes of banks' stocks in the banking network.

rir_{it} stands for the real interest rate calculated from the differences between interest rate of loan and inflation.

$loag_{it}$ is bank loan growth.

ldr_{it} indicates the ratio of loans to the deposits of banks.

eqt_{it} represents the ratio of equity to total assets of banks.

hhi_{it} stands for banking industry concentration which is calculated using Herfindahl-Hirshman (HHI) index. HHI is the sum of squares of market shares in the banking industry for total assets. If the index is less than 1000, industry is considered as a competitive one, and if it is between 1000 and 1800, the focus is moderate; if it is higher than 1800, industry is regarded as monopolistic one.

$size_{it}$ represents bank size regarding banks' total assets.

The data required for this study were collected from the Central Bank of the Islamic Republic of Iran, and the Statistical Center of Iran during the period of 2006–2017. The sequence of data used is also annually updated. The statistical sample consists of 18 selected Iranian banks[3].

The statistical sample in the present study consists of 18 selected banks in Iran for the period of 2006–2017. The reason behind selecting the banks was extreme dependence of Iran's budgets on oil income, its suffering from a weak credit culture in credit allocation screening and control, the weak adjustment of banking sector with standard banking indices on the basis of international recommendations and CAMEL indices (compiled by National Credit Union Administration in 1987). In the present study, the ratio of bank nonperforming loans to total bank loans, as a dependent variable, and oil price variations as an independent variable, as well as macroeconomic variables, including GDP growth, bank industrial index, exchange rate, and real interest rate as macroeconomic control variables along with bank specific factors such as loan growth, loans to deposit ratio, equity ratio, bank size and market concentration have been considered.

4. Data Analysis

4.1. Cross-Section Dependence and Unit Root Tests

Before proceeding to co-integration techniques, we need to determine the order of integration of each variable. One way to do so is to implement the panel unit root test. Panel data integration tests of "first generation"

[3] Including Tejarat, Sepah, Saman, Saderat, Parsian, Melli, Mellat, Maskan, Keshavarzi, Eghtesad Novin, Refah, Sarmayeh, Industry and Mine, Karafarin, Sina, Post Bank, Export Development, and Pasargad.

(as IPS, 2003) assume cross-sectional independence among panel units (except for common time effects), whereas panel data unit root tests of the "second generation" (as Pesaran, 2007), allow for more general forms of cross-sectional dependency (not only limited to common time effects). To test our data for the presence of such cross-sectional dependence, we have implemented the simple test of Pesaran (2004) and have computed the cross-section dependence (CD) statistic. This test is based on the average of pair-wise correlation coefficients of the OLS residuals obtained from standard augmented Dickey-Fuller regressions for each individual. Its null hypothesis is cross-sectional independence and is asymptotically distributed as a two-tailed standard normal distribution (Eggoh, et al., 2011). The results available on the request indicate that the null hypothesis is rejected regardless of the number of lags included in the augmented DF auxiliary regression (up to five lags) at the level of significance of 5%. The results of the CD test are listed in Table 1.

Table 1: Residual Cross-Section Dependence Test.

Test	Statistic	Probability
Pesaran CD	2.893287	0.0038

The results tabulated in Table 1 indicate that the null hypothesis in the CD test is rejected at the significance level of 1%, which indicates that our sample of Iranian Banks is cross-sectionally correlated. The next step is the evaluation of variable stationary. Due to the existence of cross-sectional correlation, we should use Pesaran (2003) and Pesaran (2007) unit root tests which are represented by CADF or CIPS. These tests are used instead of other tests including Phillips-Perron, Fisher, Levin-Lin-Chu, LLC, Im, Pesaran and Shin, Haris-zavalis, Dicky Fuller, augmented dick Fuller. The results of Pesaran (2003) unit root test are presented in Table 2.

Table 2: IPS (2003) Panel unit root test results.

Variable	Test statistics	Probability	stationary status
npl	–2.2	0.837	nonstationary
gdpg	–0.503	1.0000	nonstationary
exg	–4.79	0.0000	stationary
loag	–2.2	0.062	stationary
ldr	–2.4	0.964	nonstationary
eqt	–1.516	0.775	nonstationary
hhi	1.95	1.0000	nonstationary
bsh	–261	1.0000	nonstationary
rir	–1.09	0.992	nonstationary
size	–3713	0.090	stationary
oilr	–2.45	0.000	Stationary

The null hypothesis of the unit root test (see Table 2) is that all the series are nonstationary processes under the hypothesis that fractions of the series in the panel are assumed to be stationary. The result shows that a few

variables are first difference integrated at 1% probability value shown in all the unit root tests. After the unit root, panel co-integration is applied in order to analyze the long run co-integration among the series of three models separately.

4.2. Panel Co-integration Test (Westerlund Test)

When cross-sectional correlation exists, co-integration tests such as the Westerlund test are suggested, which are also used in this study. The null hypothesis states that there is no long run co-integration among the series that is rejected at 5% probability against the alternative hypothesis of long run co-integration. Hence, the results of this test are listed in Table 3.

Table 3: Westerlund (2007) panel co-integration test.

Test	Statistic	P-value
Westerlund test	12.67	0.0000

As revealed by the results of the Westerlund test, the null hypothesis, stating that there is no long-run co-integration among the series, is rejected at 5% probability against the alternative hypothesis of the existence of long run co-integration. Therefore, the estimated panel co-integration shows that the considered variables are connected in long-run co-integration.

4.3. Estimation Results of the Generalized Method of Moments

Considering the above statements, results of the estimations of equation (6), using dynamic panel data, are represented in Table 4.

Table 4: Panel GMM long-run estimates

Variable	Coefficient	Standard Error	Z	$P > \|Z\|$
npl(lagged)	0.6891	0.0740	9.30	0.000
oilg	–0.0407	0.0170	–2.39	0.017
gdpg	–0.2216	0.1079	–2.05	0.040
exg	0.1105	0.0458	2.41	0.016
loag	–0.0677	0.0076	–8.81	0.000
ldr	0.0072	0.0068	1.07	0.284
eqt	–11.500	5.1894	–2.22	0.027
hhi	0.0243	0.0099	2.44	0.015
bsh	–0.0167	0.0038	–4.40	0.000
rir	0.1357	0.0569	2.38	0.017
siz	0.4253	1.1168	0.38	0.703
Sargan Test Static (Probability)		Arellano and Bond Test Static (Probability)		
7.5870 (1.0000)		AR(1): –3.1059 (0.0019) AR(2): –0.9341 (0.3503)		

As it is seen in Table 4, *npl* is considered as a dependent variable and the first lag of it, according to the dynamic panel, as an explanatory variable has a coefficient of 0.68. Also, the results of Sargan test confirmed the accuracy of the instruments with probability close to one for the two-step generalized method of moments. The estimation results are interpreted as follows:

The coefficient of changes in the oil price is –0.040 at the level of significance of 5%, which confirms the research hypothesis. Hence, when the price of oil increases, the ratio of bank nonperforming loans decreases, and as a result, bank credit risk drops. Since governmental financial and economic performances are interlinked with oil price variations in oil-exporting countries, including Iran, an increase in oil prices leads to higher oil revenue and thus higher government spending. In this situation, the government can support firms such as banks, and financial repression policy is not used to reduce the government's debt via banks loans.

The positive and significant relation between the nonperforming loans of each period and those of the preceding periods with a coefficient of 0.68, and a probability value less than 0.05 indicates the stationarity and accumulation of nonperforming loans in each period and its transition to the upcoming period. Hence, the credit risk of the preceding period has led to an increase in the credit risk of the current period. It should be explained that this coefficient is larger than the other estimated coefficients, and it is inferred that financial instability and increased bank credit risk in such countries mainly result from the credit risk of the proceeding period.

The coefficient of GDP growth with a probability value less than 0.05, is –0.22. It shows that economic growth effects on the NPLs. Any increase in GDP and economic growth resulting from business improvement leads to the reinforcement of bank resources due to increased levels of merchandise sale as well as economic activities. In such circumstances, the possibility of increasing the loan allocation for banks will be provided; as bank credits increase, companies and economic agents' capability in repaying the facilities received will be increased.

The coefficient of bank stock price with a probability value less than 0.05, is –0.016. It indicates that an increase in the bank stock price leads to an increase in the net worth of corporate assets such as banks. In this situation, "Adverse Selection" and "Moral Hazard" problems will be diminished and bank credit will flourish, which leads to investment and economic growth (Mishkin, 2012). Hence, firms are capable of paying back the loans.

Exchange rate movement has a positive impact on NPLs with a coefficient of 0.11 and a probability value less than 0.05, indicating that inflation is caused by exchange rate appreciation, and the effect of the decrease in households' real income overcomes the devaluation of loans; thus, loan default increases due to borrowers' reduced capability of repaying debts.

On the other hand, increasing fluctuations in the exchange rate and rising expected benefits in the currency market have led to a shift in part of the banking resources in the form of loans to these markets, and have subsequently increased bank NPLs. Because by generating higher expected profits in the currency market, some borrowers are persuaded to use it for speculative purposes rather than the repayment of loans. People who have not yet received the loan are also encouraged to receive the loan from the bank and enter the currency market. Both of these mechanisms have led to the formation of "Adverse Selection" and "Moral Hazard" in credit market, resulting in an increase in banks' nonperforming loans (Mohammedi et al., 2016).

After examining the macroeconomic variables and their impact on the dependent variable, the effect of the specific banking variables will be studied as follows:

The negative significant impact of loan growth on NPLs was estimated with a coefficient of –0.06, which complies with the results of the studies of Khemraj and Pasha (2009) and Boudriga et al., (2010). Banks are more cautious about reducing the problem of information asymmetry in the event of increased credit. On the other hand, the increase in bank credit leads to the injection of financial resources into the firms, which strengthens the ability of economic agents to repay debts.

The ratio of loans to deposits indicates how the bank's resources are managed in order to earn a profit. The high ratio of this variable illustrates a more sensitive asset structure due to not repaying loans (Atikogulari, 2009). The relationship between this ratio and the dependent variable in the Iranian

banking industry does not confirmed, but the positive coefficient is consistent with the theory proposed. It should be noted that due to the policy of financial repression, the non-competitiveness of the business environment, and the forced loans in the country, this ratio will not be effective in managing banks' resources and efficiency.

Equity ratio has a negative (–11.5) impact with a probability value less than 0.05, which is indicative of a significant relation. This result is consistent with the studies of Espinoza and Prasad (2010) and the Moral Hazard hypothesis of Berger and DeYoung (1997). The hypothesis states that low-capital banks tend to increase their receipts by allocating loans to poor qualified borrowers by increasing the risk of their loan portfolios, leading to increased nonperforming loans.

Market concentration in banking industry is a situation in which an industry or market is controlled by a few numbers of leaders or large players. The more unequal distribution of market share among banks leads to the greater market concentration, and the industry becomes more monopolistic. A positive and significant relationship was estimated between the concentration index and the NPLs variable with a probability value of less than 0.05, which means that by increasing concentration in the banking industry, the credit risk of bank or financial stability is threatened. In order to clarify the mentioned relation, it is necessary to examine general views about market concentration.

There is diverse evidence of the effectiveness of concentration on economic growth and banking financial stability. Some consider that the high concentration or monopoly in banking industry eliminates competitive incentives and the effectiveness and efficiency of the resources used. Concentration can make "informational monopoly on customer credit worthiness" for large banks, which leads to higher costs for borrowing, weakening of the credit channel, and consequently a decrease in the cash flow (Shahchara and Keshishian, 2014). Others have explained that competitive conditions are regarded as a risk factor for banks' operations, thereby reducing banks' returns and banks' financial stability (Allen and Gale, 2003). Thus, there are two perspectives, namely concentration stability and concentration fragility.

a. Concentration stability

This view is the dominant theory and has many supporters. Due to concerns about the detrimental effects of competition on financial stability, politicians are trying to prevent banks from over-entering the banks' financial services market (Ajlafi, 2013).

Economists believe that concentration eases credit rationing, and greater banks can reinforce their profit. Moreover, bank's financial stability will survive from macroeconomic and liquidity shocks via capital buffer supplied by banks (Matutes and Vives, 2000).

b. Concentration fragility

This relatively new view has been proposed by Boyd and De Nicolo since 2005 and is known as BDN theory. This view critiques the concepts of the concentration-stability theory and believes that higher bank profits resulting from the strength and concentration of the banking market do not guarantee the financial stability of banks and market power and borrowing costs do not always affect borrowers' behavior. The high interest rates set by banks only impose higher risks on borrowers, which results in higher risk for the banking system (Chang et al., 2008). Therefore, based on the issues raised, the Iranian banking industry confirms concentration-fragility view. This result is also confirmed in the study of Nazarian et al., (2016) and Shahchera and Keshishian (2014).

The coefficient of real interest rate is estimated 0.13 with a probability value less than 0.05, which implies a positive and significant relationship with NPLs. Thus, as the real interest rate rises, banks' credit risk increases. Increasing the rate of profitability of the portfolio raises the risk of adverse selection and moral hazard because applicants for higher interest rates are always risk-taker investors who use the loans generally in speculation activities or less financially viable projects, and the bank will encounter the risk of default. It should be noted that banks generally lower the interest rate for the households and reputable firms that exhibit less risk of default.

On the other hand, raising the real interest rate increases the investment cost, which will have a negative effect on the performance of banks (Osameh, 2017). Increasing real interest rates also leads to reduced investment and economic growth, thereby affecting the ability of firms and economic operators to repay their loans (Meshkin, 2010). Increasing the interest rate on the

loans reduces borrowers' ability to pay and therefore increases the likelihood of default (Diamond, 1991).

The size of the bank is an internal factor related to the structure of the bank, which can be effective in exacerbating or reducing nonperforming loans. There are two views on the size of a bank. The first is that the volume of NPLs in the large banks is much more than that of the smaller banks. Larger banks are more prone to taking part in high-risk activities due to the attraction of more deposits and the availability of resources to allocate credit to companies and to increase revenues and offset the cost of equipping resources. Another view suggests that larger banks have better risk management strategies and more effective oversight of loan portfolios than the smaller ones. Therefore, they are more prudent in granting credit. In this study, the coefficient of the bank size is not significant because none of the Iranian banks uses the rating system in lending procedure, but all the banks use collateral to guarantee loan repayment. Therefore, there is no significant relationship between the bank size and NPLs in Iran.

5. Conclusions and Recommendations

The aim of this study is to examine the impact of oil price movements on bank credit risk using dynamic panel data in the form of generalized method of moments by considering the impact of macroeconomic and bank specific variables on bank nonperforming loans. According to the results, the fluctuations of oil price have a negative and significant impact on the bank nonperforming loans. The result is consistent with studies carried out by Osamah and Mirzaei (2015), Saleh Alodayni (2016), and Khandelwal et al. (2016).

Moreover, some macroeconomic and bank specific variables were used in the study in order to explore impressive factors on credit risk as well as oil price movements. Based on the results obtained, the below recommendations are proposed:

Changes in NPLs are explained by their past values, which means that banks should settle past NPLs in a way that minimizes the impact on subsequent loans.

Considering the positive and significant effect of currency fluctuations, it is recommended that the central bank should design appropriate instruments to cover exchange rate fluctuations and implement a singular exchange rate system.

The rise in real interest rates was identified as a detrimental factor in the banks' credit risk, which enforces the high cost of investment to investors and tightens credit channels. Hence, the policy of financial repression in the form of lower interest rates on bank deposits is not recommended due to pushing investors into the currency and assets markets.

Equity ratio has a negative and significant impact on bank credit risk. Thus, it is recommended that banks should diversify their asset portfolio and evaluate project profitability to ensure the repayment of loans and the avoidance of moral hazard and adverse selection consequences.

Considering the stability-fragility hypothesis and positive relation between the ratio of nonperforming loans and market concentration, the central bank should have strict supervision to prevent the loan allocation concentration in some banks as well as the regulation consolidation to decrease the effect of this variable on banks' financial stability.

As oil fluctuations lead to budget deficits and their adverse outcomes are transferred to the real economy and financial sectors, planning a less oil-reliable governmental budget, avoiding unnecessary goods and service imports based on oil revenues, preventing the conversion of oil revenue from dollar to Rial, which leads to an increase in liquidity, are recommended.

Finally, to remedy the shortcomings of this work and assess the economic consequences of an increase in oil price such as the Dutch disease, the symmetry of the relationship between nonperforming loans and oil price movements should be examined in future studies.

References

Ajlafi, M. (2013). Investigating the relationship between Concentration and Financial Stability of Banks in Iran. MA Thesis, Iran Banking Institute (In Persian).

Al-Khazali, O.M., Mirzaei, A.(2017).The Impact of oil price movements on bank nonperforming loans: global evidence from oil-exporting countries, Journal of Emerging market Review, vol. 31, pp. 193–208.

Alodayni, S. (2016). Oil Prices, Credit Risks in Banking Systems, and Macro-Financial Linkages across GCC Oil Exporters. International Journal of Financial Studies, Vol. 4(4), pp 1–14.

Atkeson, A. and Kehoe, P.J., (1999). Models of energy use: putty-putty vs. putty-clay. American Economic Review 89, 1028–1043.

Ayadi, O.F., (2005). Oil price fluctuations and the Nigerian economy. OPEC Review 29, 3, 199–217.

Berger, A.N.; DeYoung, R. (1997). Problem loans and cost efficiency in commercial banks. J. Bank. Finance, 21, 849–870.

Bernanke, B., Gertler, M. and Watson, M., (1997). Systematic monetary policy and the effect of oil price shocks. Brooking Papers on Economic Activity 1, 91–142.

Berument, M.H., Ceylan, N.B. and Dogan, N., (2010). The impact of oil price shocks on the economic growth of selected MENA countries. The Energy Journal 31, 1, 149–176.

Blundell, R.; Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. J. Econometrics. 87, 115–143.

Bruckner, M., Ciccone, A., Tesei, A., 2012. Oil price shocks, income and democracy. Review of Economics and Statistics 94 (2), 389–399.

Chang, E.J., Guerra, S.M., Lima, E. J. A. and Tabak. B. M. (2008). The stability-concentration relationship in the Brazilian banking system. International financial markets, Inst. And Money, 18, 388–397.

Dayanandan, A., Donker H. (2011). Oil prices and accounting profits of oil and gas companies. International Review of Financial Analysis 20 (5), 252–257.

Diamond, D. W. (1991). Monitoring and reputation: the choice between bank loans and directly placed debt. Journal of Political Economy, 689–721.

Eggoh. J, Bangake, CH, (2011), Energy consumption and economic growth revisited in African countries, Article in Energy Policy.

Elyasiani, E., Mansur, I., Odusami, B. (2011). Oil price shocks and industry stock returns. Energy Economics 33 (5), 966–974.

Esmaeil Nia, A., Shafiee, S. (2009). Assessment the differences between the effects of the recent rise in oil prices and the shocks of the 1970s. Journal of Economic Research and Policies, 17(50), 53–76.

Espinoza, R.A.; Prasad, A. (2010). Nonperforming loans in the GCC Banking System and Their Macroeconomic Effects. IMF Working Papers

Hamilton, J.D. (1996). This is what happened to the oil price–macroeconomy relationship. Journal of Monetary Economics, 38, 215–20.

Hamilton, J.D. (2003). What is an oil shock? Journal of Econometrics, 113, 363–98.

Hamilton, J.D. and Herrera, A.M. (2004). Oil shocks and aggregate economic behavior: the role of monetary policy, Journal of Money, Credit and Banking, 36, 265–86.

Harris, E.S., Kasman, B.C., Shapiro, M.D. and West, K.D. (2009). Oil and the macroeconomy: lessons for monetary policy. U.S. Monetary Policy Forum Report.

Hassan. S.A, Nosheen. M, (2019), Estimating the Railways Kuznets Curve for high income nations A, GMM approach for three pollution indicators, Energy Reports 5 (2019) 170–186.

Heidari, H., Zavarian, Z., and Noorbakhsh, A. (2011). Investigating the effect of macroeconomic indicators on banks' nonperforming loans, Journal of Economic Research, 11(1), 43–65.

Henriques, I., Sadorsky, P., (2008). Oil prices and the stock prices of alternative energy companies. Energy Economics 30, 998–1010.

Herrera, A.M. and Pesavento, E. (2009). Oil price shocks, systematic monetary policy, and the "Great Moderation" .Macroeconomic Dynamics, 13, 107–37.

Husain, A.M., Tazhibyeva, K. and Ter-Martirosyan, A., (2008). Fiscal policy and economic cycles in oil-exporting countries. IMF, Working Paper.

Jesus, S.; Gabriel, J. (2006). Credit cycles, credit risk, and prudential regulation. Int. J. Cent. Bank. 2, 65–98.

Kaminsky, G.L.; Reinhart, C.M. (1999). The twin crises: The causes of banking and balance-of-payments problems. Am. Econ. Rev., 89, 473–500.

Khandelwal, P.M Miyajima, K., Santos, A. (2016). The Impact of oil prices on the banking system in GCC. IMF Working Papers. 2016.

Khermraj, T., Pasha, S. (2009). The determinants of nonperforming loans: An econometric case study of Guyana. Munich Personal Repec Archive. 1–26. Available at: https://mpra.ub.unimuechen.de

Kilian, L. (2008). The economic effects of energy price shocks, Journal of Economic Literature, 46, 871–909.

Kiviet, J., Pleus, M., Poldermans, R., 2017. Accuracy and efficiency of various GMM inference techniques in dynamic micro panel data models. Econometrics 5 (1), 14.

Klein, N. (2013). Nonperforming loans in CESEE: Determinants and impact on macroeconomic performance. IMF Working Papers.

Kourani, H. (2013). Effect of Oil shock on banks' profitability in oil producer countries. Master's dissertation. Islamic Azad University Tehran Branch

Louzis, D.P.; Vouldis, A.T.; Metaxas, V.L. (2012). Macroeconomic and bank-specific determinants of nonperforming loans in Greece: a comparative study of mortgage, business and consumer loan portfolios. J. Bank. Finance, 36, 1012–1027.

Matutes, C., and Vives, X. (2000), Imperfect competition, risk taking and regulation in banking, European Economic Review. 44, 1–34.

Mehrabi, L. (2013). Assessment of bank nonperforming in the Iranian Banking System and Comparing with Other Countries: A review of the Experiences of Other Islamic Countries. (Research Report). Tehran; Monetary and Banking Research Institute.

Mehrabi, l. (2014). Assessing the Status of Nonperforming loans ratio in the Iranian Banking System and comparing it with Other Countries: A Review of the Experiences of Other Islamic Countries. (Research Report). Tehran; Monetary and Banking Research Institute

Mishkin, F. (2012). The economics of money, banking and financial markets. (10th). United States of America: Pearson.

Mohammadi, T., Eskandari, F., Karimi, D (2016). The Effect of macroeconomic variables and special banking characterics on nonperforming loans in Iranian banking system. Journal of Economic Research, 16(62), 81–101.

Moshiri, S., Nadali, M. (2013). Identifying effective factors on Banking Crisis in Iranian Economy. Journal of Economic Research (Islamic-Iranian Approach), 13(48), 1–27.

Nazariyan, R., Golzarian pour, S. and MoradPour, M. (2017). The Relationship between Financial Stability and Concentration in Iran's Banking System. Quarterly Journal of Economics and Modeling Shahid Beheshtei University. 7(28), pp. 108–137.

Nili, F., Mahmudzadeh, A. (2014). Bank Nonperforming Loans or Toxic Bank Asset (Research Report). Tehran; Monetary and Banking Research Institute.

Nkusu, M. (2011). Nonperforming Loans and Macrofinancial Vulnerabilities in Advanced Economies. IMF Working Papers.

Norouzi, P. (2013). The impact of macroeconomic variables on credit risk of banks in Iran. Journal of Monetary Research-Bank, 7(20), 237–257.

Pashaei Fam, R., Pazoki, M., and Amirkhani, P. (2013). Explanation and analysis of the effect of OPEC oil price fluctuations on inflation of selected OECD countries. Journal of Economic Development Research, 3(9), 89–116.

Sadorsky, P. (2008). Assessing the impact of oil prices on firms of different size: Its tough being in the middle. Energy Policy 36(38),54–61.

Sadorsky, P., (2004). Stock markets and energy prices. Elsevier, New York. Encyclopedia of Energy 5, 707–717.

Salimi, F.M Akhondzadeh, T., and Samei, Gh. (2013). Generalized Method of Moments Model for Panel Data and Sagan Test. First International Conference on Political and Economic Epic.

Samadi, S., Yahyabadi, A., and Nasabadi, H. (2009). Relationship between oil shocks and economic growth in OPEC member countries: is this a symmetrical relationship? Journal of Energy Economics Studies, 17(52), 5–26.

Shahchera, M., Keshishian, L. (2014). The simultaneous effect of banking concentration and monetary policy on credit channels in Iranian banking system. Journal of Monetary and Banking Research. 7(19), 27–50.