

## Bank Lending Behaviour over the Business Cycle in Iran

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This paper studies bank loans over the business cycles in Iran to determine the role of Iranian banks in stabilizing credit. By estimating the long-run relations using dynamic OLS and fully modified OLS estimators, the findings show that real bank lending is positively related to real GDP in the long-run providing evidences of the pro-cyclicality of bank lending in Iran. Hence, Iranian banking system has not operated far away from the conventional banking system in that they have not the ability to stabilize credit over business cycles. The results of Toda-Yamamoto's (1995) Granger non-causality test indicate a unidirectional causality running from real GDP to real bank lending. Moreover, the impulse response functions from estimating vector autoregressive models suggest positive and statistically significant response of real bank lending to shocks from real GDP reaffirming the pro-cyclicality of bank lending in Iran.

**Keywords:** Islamic Banking System, Bank Loans, Business Cycles, Iran

**JEL Classification:** C22, E32, G21

### 1 Introduction

The stability of bank lending behaviour over the business cycle is crucial to stabilize economy. Banks can play a useful role in stabilizing credit over the business cycle as well as during periods of financial instability. The finding that bank lending decreases less during recessions and increases less during expansions would provide evidence that banks stabilizes credit and hence plays a useful counter-cyclical role.

Recent financial theories of business cycle developed by Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) predict a pro-cyclical bank lending behaviour. According to these theories, asymmetric information between lenders and borrowers leads to "external finance premium" in optimal financial contracts to overcome the moral hazard problem that occurs while assessing the credit worthiness of borrowers. Bernanke and Gertler (1995) theorizes that size of the "external finance premium" should be inversely

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related to the borrower's net worth. The fact that borrower's net worth is likely to be pro-cyclical lead to counter-cyclical movements of the "external finance premium". During recessions "the external finance premium" will be relatively high which adds to interest rate charged by banks and hence depress bank lending. During expansions due to relatively lower "external finance premium" bank lending will be propagated.

One of the fast growing banking systems since the turn of the 21st century especially in the Middle East and Southeast Asia is Islamic banking system. The operations of Islamic banks are governed by Islamic laws and principles. The contractual arrangements of Islamic banking transactions are tied fundamentally to Profit-and-loss sharing (PLS) agreements and are confined to activities allowable by Islam (Hussain et al., 2016). One important distinct feature of Islamic banking system is its stability to financial and economic disruptions. As elaborated by Hussain et al., (2016) Islamic banks are more stable than conventional banks in theory. It is because (1) *gharar* considerations in Islamic principles prohibit excessive uncertainty in contracts. (2) The PLS-based contracts promote risk sharing and endorsing investment in wealth creating activities. (3) The asset-based nature of Islamic financing restricts banks from investing in highly leveraged assets and short selling. (4) The direct link between the financial and the real or trade sectors may also prevent technical speculations and potential bubbles. (5) The financing decisions by Islamic banks seems to be less affected by interest rates since they do not engage in interest-based operations. (6) Ability of Islamic banks to share risk with depositors in downturns provides a cushion against a widespread crisis.

Farooq and Zaheer (2015) argued that the relative stability of Islamic banks is due to the prohibition of interest rate, speculative activities and of excessive risk-taking and the fundamental links between Islamic banks' assets and liabilities and real activities. Sadeghi Shahedani and Nasrabadi (2016) believe that Islamic finance will prevent the recurrence of financial crisis through a close relationship with the real economy, financial transparency, supervision and control, distribution of risk between lenders and borrowers, compliance with lending standards, lack of investment in subprime assets and detailed risk assessment.

However, some scholars believe that Islamic banking operations today are far away from the ideal Islamic banking model. In practice, they are not distinguishable from the conventional banks since the PLS-based assets highlighted as a distinct feature of Islamic banks make up only a small fraction of the Islamic banks' assets (Chong and Liu, 2009; Khan, 2010). In a cross-

country study, Abedifar et al. (2013) report no significant differences in terms of stability between Islamic and conventional banks. In addition, as elaborated by Farooq and Zaheer (2015), Islamic banks are more vulnerable to adverse shocks since the Islamic money markets are less developed and hence they have limited access to alternative sources of funds other than deposits. It is also argued by Beck et al., (2013) that the assets of Islamic banks tend to be more concentrated and their hedging instruments are limited due to restrictions by Islamic laws and principles.

Due to these contradicting contentions regarding the stability and resiliency of Islamic banking, we empirically examine bank lending behaviour over the business cycle in Iran, a country with Islamic banking system, to ascertain whether Iranian banks have a role in stabilizing credit. This investigation is of great importance since Iranian banking system after the Islamic revolution in 1979 has been required to operate based on Islamic laws and principles. The findings of the pro-cyclical bank lending in Iranian banking system may provide signals that they have not operated far away from the conventional banking system in their financing decisions. Moreover, to the best of our knowledge, there are limited empirical studies that have investigated the lending behaviour of Iranian banks over the business cycle. For instance, Nazarpur and Salami (2015) by employing Markov switching models investigated the impact of PLS-based contracts on investment and output over business cycle in Iran. Farahanifard et al. (2012) and Naderi and Sadeghi (2003) analysed the efficiency of Islamic banking system during the 2007-2008 global financial crisis. In this research, we contribute to the existing literature by studying the pro-cyclicality of bank lending over business cycle in Iran using time series econometric approaches of co-integration and further assessments of causality and dynamic interactions between variables.

The rest of the paper is structured as follows. The next section explains the framework of Islamic finance. Section 3 reviews the related literature. Then, Section 4 describes empirical models and data. Section 5 tabulates and discusses estimation results. The last section, Section 5, concludes with a summary of the main findings and their implications.

## **2 The Framework of Islamic Finance**

Islamic finance derives from principles rooted in the *Shari'ah* legal codes. Three principles manage Islamic finance. (1) Principle of equity; (2) Principle of participation and (3) Principle of ownership. The first principle is a rationale for prohibition of predetermined payments (*riba*) and prohibition of

excessive uncertainty (*gharar*). The second principle ensures wealth accumulation from productive activities. The third principle mandates asset ownership before transacting. Thus, Islamic finance has been known as asset-based finance with a robust link to real economy (Hussain et al., 2016).

The instruments of Islamic finance falling under one of the four categories: loan (*qard al hasan*), PLS contracts, non-PLS contracts, and fee-based products. *Qard al hasan* loan is a form of financial assistance to the needy to be repaid free of charge (Song and Oosthuizen, 2014). There are two types of PLS financing: *musharakah* and *mudârabah*. *Musharakah* is a contract of joint partnership where two or more partners provide capital to finance a project where profits are distributed according to pre-agreed ratios but losses are shared in proportion to capital contributions. *Mudârabah* is a contract where one party supplies funding and the other provides effort and management expertise with a view to sharing profit (Hussain et al., 2016).

Non-PLS instruments include *murâbahah*, *ijarah*, *salam*, and *istisna*. *Murâbahah* is a deferred payment sale transaction. The bank purchases the goods and delivers them to the customer, while deferring payment to a date agreed by the two parties. The majority of Islamic financing takes the form of *murâbahah* (Demirgüç-Kunt et al., 2013). *Ijarah* is a lease contract where the leaser must own the leased asset for the entire lease period. *Salam* is a form of forward agreement where delivery occurs at a future date in exchange for spot payment. *Istisna* is a contract in which a commodity can be transacted before it comes into existence. It is a forward contract where the obligations of both parties are in the future.

Islamic finance offer three kinds of fee-based contracts including: *wakalah*, *kafalah* and *ju'ala*. In *Wakalah* contracts bank acts as the agent of a customer in a trade transaction or issuing a letter of credit facility. In *Kafalah* contracts bank provide a financial guarantee to a creditor on behalf of the debtor to cover fines or any other personal liability. *Ju'ala* is applicable for rendering a specified service as opposed to the manufacturing of a product (Hussain et al., 2016).

One recently introduced Islamic financing instrument for raising funds in capital markets is *sukuk*. *Sukuk* are *Shari'ah*-compliant investment certificates issued by sovereign and corporate entities to finance their activities. *sukuk* must be associated with a specific asset, service, and/or project with a maturity date. The International Islamic Financial Market (IIFM) defines *sukuk* as a "commercial paper that provides an investor with ownership in an underlying asset". The first *sukuk* was issued in 1990 by a Malaysian company. From 1999 onwards, a number of public and private institutions started issuing

*sukuk*. In the past 10 years, the *sukuk* market has grown rapidly. Despite a temporary slowdown in *sukuk* issuance in the aftermath of the 2008 global financial crisis, the market continues to grow, accommodating new participants and products (Hussain et al., 2016).

### 3 Literature Review

There is a substantial literature on the bank lending behaviour over the business cycle. Various studies have attempted to link bank lending pro-cyclicality to bank-specific characteristics such as bank capital and bank ownership. The main investigation in the literature is that which types of banks (e.g. private versus public banks, domestic versus foreign banks and Islamic versus conventional banks) exhibit more stability in their lending behaviour during business cycle? Micco and Panizza (2006) by utilizing bank-level balance sheet data examined bank ownership (public versus private and domestic versus foreign) in the bank lending behaviour over the business cycle. In particular, they examined the impact of macroeconomic shocks on the lending behaviour of state-owned banks compared with their effect on the lending behaviour of private banks. For this investigation, they utilized standard panel data econometric approach and regressed the growth rate of loans on an indicator variable that is comprised of the growth rate of GDP and a dummy variable indicating bank ownership. They found that the lending behaviour of state-owned banks are more stable during business cycle providing evidences that this group of banks stabilizes credit and hence plays a useful counter-cyclical role. They have provided three possible reasons for more stability of state-owned banks. First, credit stabilization is part of the objective function of state-owned banks. Second, public banks have a more stable deposit base since depositors think that public banks are safer than private banks. Finally, lower cyclicity may be due to the behaviour of “lazy” public bank managers.

They also studied the stability of foreign-owned banks versus domestic banks over business cycle. Here the results are less clear-cut. In particular, in most regressions, they find no significant difference between the lending behaviour of foreign-owned banks and private domestic banks. Using a sample of banks located in 13 Latin American countries, Galindo and Micco (2004) find some evidence in support of higher stability of foreign-owned banks over business cycle. They have offered various possible reasons why the behaviour of foreign-owned banks may differ from domestic banks. On the one hand, during good times foreign-owned banks can increase lending by accessing foreign credit lines, while during bad times they can leave the

country and look for more profitable lending opportunities abroad. On the other hand, foreign-owned banks have more access to foreign funding and hence are less sensitive to decline in deposit in recessions. Furthermore, the deposit base of foreign banks and hence their lending will be more stable if depositors perceive foreign banks to be less risky than private banks.

Bertay et al. (2015) by employing a similar approach with that of Micco and Panizza (2006) studied the bank lending behaviour of state banks versus private banks based on an international sample of 1633 banks from 111 countries for the period 1999–2010. In this study they controlled for possible endogeneity of GDP growth to credit growth by using system GMM estimation. Their findings indicate that the lending by state banks is less procyclical than lending by private banks, especially in countries with good governance. Lending by state banks in high income countries is even counter-cyclical. Cull and Martinez Peria (2013) examined the impact of bank ownership on credit growth in a sample of Latin American and Eastern European developing countries before and after the global financial crisis. They found that state banks in Latin America acted in a counter-cyclical fashion during the crisis, whereas those in Eastern Europe did not. Their findings emphasize regional differences. Brei and Schclarek (2013) Using an international sample of banks from 50 countries over the 1994-2009 period found that state-owned banks lend relatively more than private banks at times of financial crisis.

The stability view of the Islamic banking system has been investigate from several recent studies. However, the empirical evidences are mixed. In a cross-country study, Abedifar et al., (2013) report no significant differences in terms of stability between Islamic and conventional banks. Similarly, Krasicka and Nowak (2012) show that, while Islamic banks in Malaysia hold more capital and are more profitable than conventional banks, differences between them were shrinking during the crisis. In contrast, Baele et al. (2012) find that loan defaults in Islamic banking are less likely to occur than conventional banking. Cihak and Hesse (2010) find small Islamic banks to be more stable than small conventional banks and large Islamic banks by evaluating 77 Islamic banks and 397 conventional banks. Hasan and Dridi (2011) also find Islamic banks to be more resilient at the early stage of the global financial crisis in their examination of 120 Islamic and conventional banks in 8 countries. Using the data from over 100 countries for the period 1995–2007, Beck et al. (2013) conclude that Islamic banks had a relatively higher asset quality, and were better capitalized during financial crisis. Farooq and Zaheer (2015) demonstrate that Islamic bank branches of mixed banks were less prone to

deposit withdrawal in 2008 financial crisis. More recently, Ibrahim (2016) by employing a methodology similar to Micco and Panizza (2006) and Bertay et al., (2015) studied bank lending behaviour over business cycle in Malaysia. Applying dynamic GMM estimators in an unbalanced panel of 21 conventional banks and 16 Islamic banks over the period 2001-2013, the results indicate that Islamic banks are counter-cyclical in their financing decisions providing further support to the stability view of the Islamic banks in that they have the ability to stabilize credit during the time of adverse shocks.

Some scholars believe that Islamic finance contracts, which often involves structuring *Shari'ah*-compliant products, are similar to conventional bank contracts in practice. For instance, according to Krasicka and Nowak (2012) and Chong and Liu (2009), Islamic banks are not different from conventional banks in Malaysia. Beck et al. (2013) and Cihak and Hesse (2010) find few significant differences in business orientation, asset quality, efficiency, or stability between Islamic and conventional banks. Similarities between the two banking models arise from the close competitive rates paid by Islamic banks on investment deposits with deposit rates at conventional banks.

Di Mauro et al., (2013) argue that the efficiency of both banking systems was not significantly different at least for the period before the recent global recession. Recent studies show that the profitability of Islamic banks decreased more than for conventional banks during the financial crisis, mainly because of weaker risk management practices and financial crisis spillovers to the real economy (see for instance, Rashwan, 2012; Hasan and Dridi, 2011). It is stated by Tahir and Haron (2010) that Islamic banks in advanced countries seem to be more efficient than those in other countries. This could be partly explained by well-established regulatory frameworks, more advanced human capital, and better risk management practices in these countries.

Nazarpur and Salami (2015) by employing Markov switching models investigated the role of PLS-based contracts over recessions and expansions in Iran. The results for the period 1984-2012 indicate that these kinds of contracts have a positive impact on investment and output during expansionary periods. Farahanifard et al., (2012) using Data Envelopment Analysis (Correlated Component Regression model) analysed the efficiency of Islamic banking system versus conventional banking system during the 2007-2008 global financial crisis. The results of Correlated Component Regression model for 50 Islamic and 50 conventional banks (located in the Middle East) show that Islamic banks operated more efficiently during the crisis. By employing the same methodology Naderi and Sadeghi (2003) found

that Islamic banks that have operated in a dual banking system in a competitive environment have been more efficient than Islamic banks in countries with single banking systems.

## 4 Methodology and Data

### 4.1 Empirical Approach

To assess bank lending pro-cyclicality we follow the empirical specification from Micco and Zanizza (2006), Bertay et al., (2015) and Ibrahim (2016). In the basic bank lending specification we include CPI-deflated gross loans ( $l$ ), real gross domestic product ( $y$ ), CPI-deflated M2 monetary aggregate ( $m$ ) and index of domestic prices ( $p$ ) measured as consumer price index (CPI) as follows:

$$l_t = \beta_1 + \beta_2 y_t + \beta_3 p_t + \beta_4 m_t + \varepsilon_t \quad (1)$$

In Eq. (1) all variables are expressed as natural logarithm. In this equation,  $y$  and  $p$  capture the macroeconomic conditions of the economy and  $m$  accounts for money supply. In the above specification,  $y$  is the key variable since its coefficient captures the adjustments of bank loans to macroeconomic shocks or cycles. The finding that its coefficient is positive and statistically significant would suggest bank lending pro-cyclicality. Meanwhile, a negative and significant  $\beta_2$ , captures bank lending counter-cyclicality (Micco and Panizza, 2006; Bertay et al., 2015, and Ibrahim, 2016).

Eq. (1) can be viewed as a long-run bank lending function where the vector ( $\beta = \beta_1, \beta_2, \beta_3, \beta_4$ ) is a vector of long-run parameters. In the present study, we have interest in these long-run parameters as well as examination of bank lending dynamic interactions with other variables and their causal interactions. To this end, we adopt time-series econometric techniques in the following steps. As an a priori analysis, we first subject each time series to augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests. In the second step, the co-integration test of Johansen (1988) and Johansen and Juselius (1990) is applied to verify the presence of long-run relations between variables. These steps are necessary to avoid “spurious” regression in the presence of non-stationary variables (Granger, 1986).

In the third step, we estimate long-run coefficients for the co-integrated systems. For this purpose, we adopt the Stock and Watson’s (1993) dynamic ordinary least squares (DOLS) and Phillips and Hansen’s (1990) fully modified OLS (FMOLS) estimators. The DOLS accounts for simultaneity



bias and regressors endogeneity by including leads and lags of the first-differenced I(1) terms in the specification. The FMOLS employs a semi-parametric correction to eliminate the problems caused by the long-run correlation between the co-integrating equation and stochastic regressors innovations. As demonstrated by Maddala and Kim (1998), the single equation estimators, such as the DOLS and FMOLS estimators, are superior to a multi-equation Johansen and Juselius (JJ) estimator since the latter tends to exhibit relatively large variations. We still provide the estimates of JJ estimator to compare the results.

As a further analysis, we also assess dynamic causal interactions between real bank lending and real GDP using Toda and Yamamoto's (1995) non-causality test. The causal interactions can be examined using the following equations:

$$l_t = \alpha_0 + \sum_{i=1}^{k+d_{max}} \alpha_i l_{t-i} + \sum_{i=1}^{k+d_{max}} \theta_i y_{t-i} + \sum_{i=1}^{k+d_{max}} \delta_i p_{t-i} + \sum_{i=1}^{k+d_{max}} \phi_i m_{t-i} + u_t \quad (2)$$

$$y_t = \alpha_0 + \sum_{i=1}^{k+d_{max}} \alpha_i y_{t-i} + \sum_{i=1}^{k+d_{max}} \theta_i l_{t-i} + \sum_{i=1}^{k+d_{max}} \delta_i p_{t-i} + \sum_{i=1}^{k+d_{max}} \phi_i m_{t-i} + u_t \quad (3)$$

where  $k$  is the optimal lag length, selected based on uncorrelated error terms, and  $d_{max}$  is the maximum order of integration suspected in the system. This test is adopted due to its simplicity without the knowledge of the variables' co-integration properties. The test for causal relations is based on Wald-F statistics, testing the null hypothesis of no-causality. For instance,  $H_0: \theta_1 = \theta_2 = \dots = \theta_k = 0$  in Eq. (2) examines the causal relation from real GDP to real bank lending. Rejection of this null hypothesis means that real GDP causes real bank lending. Testing this null hypothesis in Eq. (3) examines the reverse causality from real bank lending to real GDP. From the tests, four patterns of causality from the pair of variables ( $l$  and  $y$ ) can be noted, namely, (i) they are causally independent; (ii) uni-directional causality from  $y$  to  $l$ ; (iii) unidirectional causality from  $l$  to  $y$ ; and (iv) bi-directional causality between  $l$  and  $y$ .

In the final step, with the finding of co-integration, we estimate a level VAR model to further assess their dynamic interactions. The VAR is a system of linear equations that each variable is a function of its own lags and lags of other variables in the system. The goal of VAR analysis is not to obtain parameter estimates, but to assess the interrelationship among the variables. From the estimated VAR, we simulate impulse-response functions (IRF) as a

basis for inferences. The IRF trace temporal responses of a variable of interest to its own innovations and innovations in other variables.

An important consideration in generating the IRF is identification of structural shocks. The traditional strategy is to adopt Sims' (1980) approach by using the so-called Cholesky orthogonalization. The approach requires a pre-specified causal ordering of the variables and the results of the IRF are sensitive to the ordering of the variables. To avoid this problem, Koop et al. (1996) and Pesaran and Shin (1998) develop the generalized IRF that are unique and invariant to alternative orderings of the variables. Due to this advantage, we adopt the generalized IRF in the analysis.

## 4.2 Data

We employ two sets of data. (1) A yearly dataset from 1979 to 2015 and (2) a quarterly dataset from 2000:1 to 2015:4, the spans of which are dictated by data availability. In the analysis, we use domestic credit to private sector deflated by the consumer price index to represent real bank lending. Real output is measured by real gross domestic products (2005=100). Consumer price index is utilized to represent index of domestic prices (2005=100). Money supply is measured using M2 money aggregate comprised of money and quasi money. The source of the data is the economic time series database of the Central Bank of Iran through its official website (<http://www.cbi.ir>).

## 5 Empirical Results

As is imperative in any time series analysis, we first implement ADF and PP unit root and Johansen-Juselius co-integration tests to examine the variables' temporal stochastic properties. The results of unit root tests and co-integration test are given in Table 1 and Table 2, respectively. As may be noted from Table 1, all variables are integrated of order 1, or  $I(1)$ . That is, they are non-stationary in level form but stationary in first difference. This allows us to proceed to co-integration test. In specifying the vector error correction model for the Johansen-Juselius test, we place the requirement of non-correlated errors in all equations. The lag order is set to 1, which we find sufficient to render the error terms uncorrelated. From table 2, the trace statistics and the maximal eigenvalue statistics uncover evidence supporting a unique co-integrating vector among the variables in both yearly and quarterly datasets.

Table 1  
*Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Unit Root Tests*

	Yearly data				Quarterly data			
	level		First difference		level		First difference	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP
<i>l</i>	-2.426	-2.356	-3.408**	-3.418**	-0.761	-0.872	-6.871***	-6.854***
<i>y</i>	-2.336	-2.896	-3.383**	-6.531***	-1.235	-1.035	-10.60***	-10.45***
<i>p</i>	-2.164	-1.806	-3.793***	-4.040***	-1.326	-1.109	-4.278***	-4.290***
<i>m</i>	-1.581	-1.368	-4.366***	-4.336***	-2.912	-2.912	-6.916***	-7.093***

Notes: The ADF and PP test equations include both constant and trend terms for level and constant for first difference. We use Schwartz information criterion (SIC) for setting the lag order in the ADF test. *l*, natural log of real bank lending; *y*, natural log of real GDP; *p*, natural log of consumer price index and *m* is natural log of real M2. \*\* and \*\*\* denote significance at 5% and 1%, respectively. *Source*: research findings.

Table 2  
*Johansen-Juselius (JJ) Cointegration Tests*

Test statistics	Yearly data				Quarterly data			
	$r = 0$	$r \leq 1$	$r \leq 2$	$r \leq 3$	$r = 0$	$r \leq 1$	$r \leq 2$	$r \leq 3$
Trace	78.534***	44.448**	21.316	5.943	49.361**	21.349	4.884	0.080
Max	34.087**	23.131	15.373	5.943	27.584**	21.132	14.265	3.841

Notes: \*\*, and \*\*\* denote significance at 5% and 1%, respectively. *Source*: research findings.

## 5.1 Long-Run Relations

With the finding of co-integration, we estimate the long-run equations using the FMOLS, DOLS and JJ estimation methods. The Schwartz Information criterion (SIC) is used to select the optimal lead-lag order of the DOLS and FMOLS. The results are given in Table 3. As shown in the table, the FMOLS, DOLS and JJ coefficient estimates are qualitatively similar in both yearly and quarterly datasets. In the long-run, real bank lending is positively related to real GDP. These findings provide evidences supporting the pro-cyclicality of bank lending in Iran, which is consistent with Micco and Panizza (2006), Bertay et al. (2015) and Ibrahim (2016). The long-run estimation results from FMOLS estimator for the yearly dataset suggest that a 1 percentage point increase in real GDP is related to 0.640 percentage point increase in real bank lending. In the quarterly dataset, the results from DOLS and FMOLS estimators indicate that a 1 percentage point increase in real GDP is related to 1.4 and 1.3 percentage point increase in real bank lending, respectively. The

long-run coefficients from JJ approach are similar to the DOLS and FMOLS estimators although the results are quantitatively different.

Table 3

*Long-Run Relations*

variables	Yearly dataset			Quarterly dataset		
	DOLS	FMOLS	JJ	DOLS	FMOLS	JJ
<i>y</i>	0.208 (0.383)	0.640*** (0.230)	0.769*** (0.210)	1.424*** (0.261)	1.301*** (0.287)	1.933*** (0.163)
<i>p</i>	-0.617* (0.356)	-0.698*** (0.239)	-0.175*** (0.027)	-0.448** (0.218)	-0.568** (0.248)	-0.125*** (0.038)
<i>m</i>	0.905** (0.382)	0.729*** (0.229)	1.262*** (0.148)	0.404*** (0.140)	0.302** (0.154)	0.446*** (0.117)
constant	-3.053 (2.790)	-7.268*** (1.932)	-12.956	-12.341*** (4.151)	-9.577** (0.014)	19.920

Notes: The numbers in parentheses are standard errors. \*\*, and \*\*\* denote significance at 5% and 1%, respectively. *Source*: research findings.

## 5.2 Further Analyses

To further analyze dynamic causal interactions among the variables, we first implement the Toda-Yamamoto's (1995) Granger non-causality test. Then, we estimate a level VAR model and simulate generalized impulse response functions. Table 4 reports the Granger non-causality test results. These findings from yearly dataset suggest the significant causal role of real bank lending to real GDP. However, the null hypothesis of Granger non-causality from real GDP to real bank lending is rejected at even 10% significant level. In the case of quarterly dataset, the findings indicate a unidirectional causality from real GDP to real bank lending.

Table 4

*Toda-Yamamoto Granger Non-Causality Test*

Dependent variable	Yearly dataset		Quarterly dataset	
	Lagged right-hand side variables		Lagged right-hand side variables	
	<i>l</i>	<i>y</i>	<i>l</i>	<i>y</i>
<i>l</i>		1.391[0.2644]		6.775[0.002]
<i>y</i>	9.851[0.0005]		0.870[0.425]	

Note: numbers in squared brackets are p-values. The optimal lag order for the VARs is 2. *Source*: research findings.

Figure 1 depicts the responses of real bank lending and real GDP to a one-standard deviation shock to other variables considered in the VAR model in

the case of yearly dataset. As may be observed from Figure 1, the response of real GDP to a one-standard deviation shock to real bank lending is positive and statistically significant until the five years after the shocks but reaches a peak at the second year after the shock. The response of real bank lending to real GDP is not statistically significant during the entire forecast horizon considered in the study. These results are in conformity with the findings of causality test indicating a uni-directional causal pattern from real bank lending to real GDP. As may be observed from figure 1, in response to a one-standard deviation shock in domestic prices, both real GDP and real bank lending decrease significantly until 3-4 years after the shock. The response of real bank lending and real GDP to shocks from real M2 is positive and statistically significant up to 4 years and 3 years from the shock, respectively.

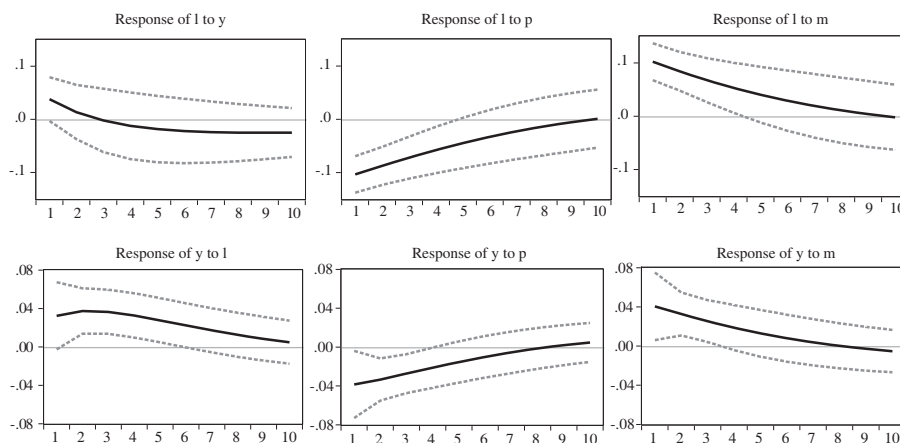


Figure 1. Impulse response functions (yearly dataset). *Source:* research findings.

The impulse responses for quarterly dataset are depicted in figure 2. As may be observed from Figure 2, the response of real GDP to a one-standard deviation shock to real bank lending is positive and statistically significant until 12 quarters after the shocks but reaches a peak at the second quarter after the shock. The response of real bank lending to real GDP is positive and statistically significant until 20 quarters after the shock but reaches a peak at the third quarter after the shock. This finding is in conformity with the findings of causality test indicating a uni-directional causal pattern from real GDP to real bank lending in the quarterly dataset. As may be observed from figure 2, the response of real bank lending to a one-standard deviation shock in domestic prices is negative and statistically significant only in the first quarter

after the shock. The response of real GDP to shocks in domestic prices is negative but not statistically significant during the entire horizon. The response of real bank lending and real GDP to shocks from real M2 is positive and statistically significant up to 5 quarters and 4 quarters from the shock, respectively.

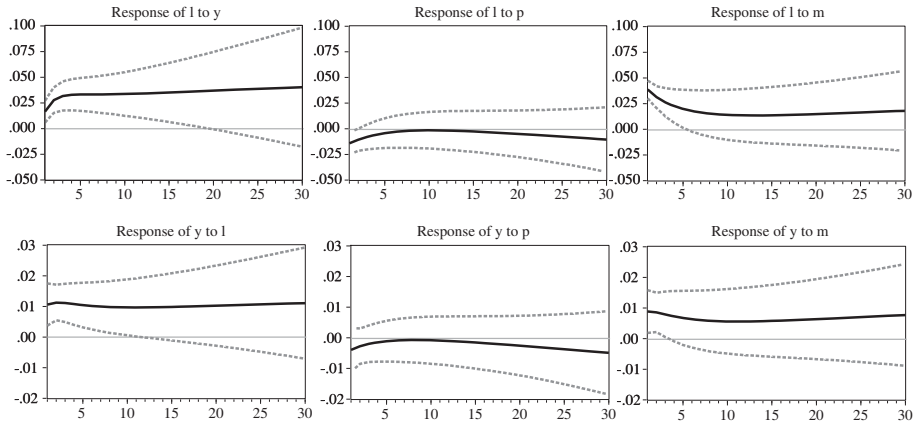


Figure 2. Impulse response functions (quarterly dataset). *Source:* research Findings.

## 6 Conclusion

This paper investigate the relative pro-cyclicality of Islamic bank financing in Iran, a country with Islamic banking system, to determine whether Iranian banks have a role in stabilizing credit over business cycle. To examine pro-cyclicality of bank lending over business cycle in Iran we employs time series econometric approaches of co-integration and further assessments of causality and dynamic interactions between variables. This study employs two sets of data including a yearly dataset spanning from 1979 to 2015 and a quarterly dataset from 2000:1 to 2015:4, the spans of which are dictated by data availability. The results of JJ co-integration tests show that variables considered in the model are co-integrated. With the findings of co-integration, estimating long-run equations using DOLS, FMOLS and JJ estimators indicate that real bank lending is positively related to real GDP in both yearly and quarterly dataset providing evidences supporting the pro-cyclicality of bank lending in Iran, which is consistent with the findings of Micco and Panizza (2006), Bertay et al. (2015) and Ibrahim (2016). The findings of causality tests suggest the significant uni-directional causal role of real bank lending to real GDP in yearly dataset and a significant uni-directional

causality from real GDP to real bank lending in quarterly dataset. Impulse response functions from VAR models designating a positive and statistically significant response of real GDP to a one-standard deviation shock to real bank lending in both datasets. However, the response of real bank lending to real GDP is only statistically significant while using quarterly dataset. In this case, the response of real bank lending to real GDP is positive and statistically significant until 20 quarters after the shock but reaches a peak at the third quarter after the shock. This result reaffirm the pro-cyclicality of bank lending in Iran.

The pro-cyclicality of bank lending in Iran indicate that Iranian banking system has not played a role to stabilize credit over the business cycle and hence has not operated far away the conventional banking system in their financing decisions. One possible explanation as elaborated by Chong and Liu (2009) and Khan (2010) is that the PLS-based assets highlighted as a distinct feature of Islamic banks make up only a small fraction of the Islamic banks' assets. As stressed by Nazarpur and salami (2015) Iranian banking system in implementation of PLS contracts has not shown an acceptable performance. Moreover, along the line of Farooq and Zaheer (2015) limited alternative sources of funds and hedging instruments in the face of adverse shocks may play a role in bank lending pro-cyclicality in Iran. To ensure financial stability Sole (2007) and Hussain et al., (2016) argues that Islamic banks need to be supervised at the same level as conventional banks, especially with respect to addressing moral hazard considerations with a set of comprehensive prudential standards. To enhance the supervision of Islamic banks, Lopez Mejia et al., (2014) recommend ensuring operational independence of the supervisory authority, a sound legal framework and governance structure, and robust accountability practices.

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