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# Oil Shock, Monetary Policy and Collateral Effect in Iranian Economy

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## Abstract

The 2007 financial crisis clearly demonstrate the role of capital assets in the emergence of economic fluctuations and business cycles. Physical assets with a dual role as a factor in production and use as collateral to obtain loans from the banking system in two separate channels affect the real sector of the economy and lead to intensification of product fluctuations and business cycles. Emprical evidence of Iran's economy indicates that the price of capital assets has been rising and fluctuating over time for various reasons, the most important of which are the role of oil revenues and related shocks. Accordingly, with regard to the collateral effect channel, there is an expectation that by creating a positive oil shock and increasing oil revenues, government spending and, consequently, liquidity, the price of private equity assets, as a acceptable collateral for the banking system, will increase. This issue will lead to an increase in the amount of loans received by the private sector, the volume of investment and output. For this purpose, this study has examined this important issue using data related to the period of 1966- 2017 of the Iranian economy and the model of structural Vector Autoregressive (SVAR). The results of the model confirm the effect of collateral in short periods. Therefore, it is suggested that if the policymaker seeks to stabilize the product in the short term, then it is necessary to adopt an appropriate countercyclical policy on how to pay loans to the private sector in order to control the volume of private sector investment and stabilize the output.

**Keywords:** Physical Asset, Collateral Effect, Oil Shock, Private Investment, Business Cycle, Iran's Economy.

**JEL Classification**: Q41, E52, D25, O16.

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## 1. Introduction

According to the financial literature, the agency problem can affect bank lending outcomes in the presence of information asymmetry. In other words, if a borrower's information is either "concealable" by the loan officer (or other bank agents) or "unverifiable" by the bank, the loan officer's monitoring and screening efforts will affect the lending outcomes.

In fact, there are reasons that may prevent the bank's agents in the lending process from doing their best to screen and monitor the borrower (see Udell 1989). According to Holmstrom (1979) and Shavell (1979), the conventional solution to the agency problem is to agree to an employment contract that aligns bank interests such as those of the principal, the loan officer, and the agent by making compensation contingency plans for ex-post outcomes. In this regard, some studies have examined the effect of monetary incentives and Career concerns of loan officer on lending outcomes.

Following these studies, this paper analyzes the effects of "changing the bank compensation system" and "replacement of retirees by young people in the BCC" on "quality of micro-lending" in an Iranian commercial bank. In fact, the studied bank has 2 unique features that have made this research possible; (1) in this bank until 2013 the compensation system for members of the BCCs was only based on lending volume but from the beginning of 2014 onward, their compensation system has been based on both "lending volume" and "performance". And (2) in the years under review, the members of the BCC are combination of "retirees" and "youth"; in fact this bank has been active for nearly 20 years and to start the banking business, it has employed retirees from older Iranian banks for important positions such as "branch manager", "assistant branch manager" and even "loan officer". According to the bank's plan, retired employee gradually dismiss after transferring their experiences to the bank's younger employees.

## 2. Literature Review

Agarwal and Wang (2009) tested the model predictions showing that incentive compensation (based on loan origination or lending volume) would increase loan origination but might induce the loan officers to book riskier loans. Also their findings indicated that loans was approved by older loan officers are higher risk than younger ones, due to more career concerns of young people compared to older ones.

Cole et al. (2015) analyzed the effects of variable compensation on loan officers' approval decisions. They conducted an experiment on loan officers at a commercial bank in India. According to their results, incentives that rewarded lending volume led to high acceptance rates, low efforts, and high default. By contrast, high-powered incentives were effective at generating efforts, leading loan officers to correctly identify and screen out bad loans, and raising the

overall profitability of lending. They also concluded that "loan officers who are closer to retirement age" make less effort in the lending process.

Agarwal and Ben-David (2018) exploited a change in the compensation structure of a U.S. bank and showed that volume incentives led to greater risk-taking and deterioration in loan performance. They also explored the correlations between loan-officer characteristics and lending outcomes. They found that applications handled by more tenured loan officers and male loan officers were more likely to be approved; and the probability of default of their lending is more than that of their younger and women counterparts.

## 3. Theoretical Framework

This paper benefits from the theoretical framework proposed by Cole et al. (2015). Their simple theoretical framework highlights how changes in loan officer incentives affect screening behavior and lending decisions. Their model encompasses firms, loan officers, and the bank. Their theoretical framework and model predict five propositions, which 2 cases of them are related to the subject of this paper are: (1) An origination piece rate (lending-volume incentives) leads to low efforts, indiscriminate lending, and a high probability of default. By contrast, high-powered incentives based on lending performance lead to greater efforts, more conservative lending, and a lower probability of default. And (2) if a loan officer is motivated by career concerns, she/he will exert nonzero screening efforts in the absence of monetary incentives; thus, the screening effort decreases in age or distance to retirement.

## 4. Description of Data, Variables and Methodology

### 4.1. Data

The data used in this paper are 266320 micro-loans approved by BCCs of a commercial bank in Iran during the years 2011 to 2018.

### 4.2. The Variables

The dependent variable is the micro-loan quality, which is an ordinal variable with five levels (5= loans without overdue, 4= up to 2 months of overdue, 3= 2 to 6 months of overdue, 2= 6 to 18 months of overdue, and 1= more than 18 months of overdue). These five loan quality domains are hierarchically structured. This is a standard classification of loans in the Iranian banking system and is used in giving instructions for collecting overdue loans. Also, there are four groups of explanatory variables: (1) loan specifications including amount, maturity, and interest rate; (2) borrower specifications including customer type, relationship history, type and value of collateral, and income; (3) characteristics of the BCC members including gender, age, education, and "being young or retired"; and (4) the compensation system.

### 4.1.4. Methodology

The dependent variable, *i.e.* loan quality, is an ordinal variable. The most well-known model for estimating an ordinal outcome variable is the ordered logistic regression model. In this model, the effect of each predictor is assumed to be equal across the categories of the ordinal dependent variables. This restriction is referred to as the proportional odds or the parallel lines assumption. If this assumption is violated, it is misleading and invalid to interpret ordered logistic regression model results. And the generalized logistic regression model should be used.

To address this issue, Fu (1998) and William (2006) developed the generalized ordinal logit model, which model relaxes the PO assumption by allowing the effect of each explanatory variable to vary across different cutoff points of the ordinal outcome variable. The generalized ordered logit model, for an ordinal dependent variable Y with M categories, as proposed by Fu (1998) and Williams (2006), can be written as follows:

$$(Y_i > j) = g(\boldsymbol{X_i\beta_j}) = \frac{\exp(\alpha_j + \boldsymbol{X_i\beta_j})}{1+\exp(\alpha_j + \boldsymbol{X_i\beta_j})}, \quad j = 1, \dots, M-1\,,\ i = 1, \dots, n \tag{1}$$

with

$$P(Y_i = 1) = 1 - g(\boldsymbol{X_i\beta_j})$$

$$P(Y_i = j) = g(\boldsymbol{X_i\beta_{j-1}}) - g(\boldsymbol{X_i\beta_j}), \qquad j = 2, \dots, M-1$$

$$P(Y_i = M) = g(\boldsymbol{X_i\beta_{M-1}}) \tag{2}$$

In this equation, M is the number of categories of the ordinal dependent variable (loan quality), whereas i refers to the loan, and $X_i$ shows the vector of predictors (explanatory variables) for the *i*th loan with $\beta_j$ indicating is the vector of parameters to be estimated.

## 5. Results

The Brant test indicated that the proportional odds assumption across the different categories of loan quality (cutoff points) was significantly violated. Therefore, we estimated generalized logistic regression models. According to this model estimation results and the marginal effects of the explanatory variables on different levels of dependent variable, the most important results of this paper are as follows:

The change of compensation system from a “volume-based system” to a “system based on volume and performance" improved the micro-lending quality. This result indicates that this change in the compensation system has led to an improvement in the BCC credit decisions, which, according to related literature, may be due to increased screening efforts of the BCC to separate high-risk and low-risk customers, after the change of the compensation system.

Replacement of retirees by young people in the Branch Credit Committee (BCC) increased quality of micro-lending. This is because of differences

between youth and retirees in screening efforts and risk-taking levels, which are due to their different career concerns and career prospects.

Increasing the presence of women in the BCC improved the micro-lending quality. This finding is consistent with the related studies (for example, see Eckel and Grossman 2008; Borghans et al. 2009; Montalvo and Reynal-Querol 2020) and is due to that women are generally more risk averse than men, which leads to better compliance of women with credit guidelines and recommendations, more conservatism in lending, and granting loans more restrictively than those of their men counterparts.

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