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Original Research Article

Investigation of Factors Affecting Banking Leverage in Selected Iranian Banks (Random-Coefficients Approach)

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This study investigates the effect of intra-organizational and macroeconomic factors on banking leverage in selected Iranian banks. For this purpose, after calculation of the Banking Leverage for each bank, by using Random-Coefficients Approach (Swamy model), the impact of explanatory variables during the period of 1999-2016 was examined separately by 10 selected Iranian public and private banks. Based on calculations, Melli, Saderat, Refah, and Tejarat Bank had the highest and Sanat-va-Madan, Eghtesad-Novin, and Sepah had the lowest level of banking leverage. Furthermore; the results of estimations show that "organizational" and "structural-variables" of each bank have different effects on their banking leverage. For example, "credit risk" has a positive and significant effect on bank leverage in "Tejarat", "Saderat", "Refah" and "Sanat-va-Madan" banks. The effect of "liquidity risk" is the same as "credit risk". In general, due to banks' dissimilar structures, organizational and structural variables hold a varying impact on their banking leverage.

Keywords: Banking Leverage, Structural Factors, Organizational Factors, Financial Crisis, Swamy Model.
JEL Classification: C33, D23, F62, G21

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1 Introduction

The economic literature deems the banking system, along with the stock market and insurance, a field underpinning the financial markets, serving an important role in attracting and navigating depositors' funds to the production of goods and services, as well as the cyclical flow of the economy. Banking has got used to being more important in the Iranian economy because the absence of a developed capital market[1], in practice, leaves banks as the only option to hold responsibility for long-term financing (Kordbacheh & Nooshabadi, 2012). Among the banking system challenges, banking leverage is an important indicator in the banking management sector, which refers to how resources are used in the balance sheet to finance assets. Banking leverage identifies the bilateral relationship between resources and assets in banks' balance sheets, and with its proper application, an appropriate amount of profitability can be gained and many of banks' problems in dealing with risks appeased (Shahchera & Valizadeh, 2018; ZalbgiDarestani, 2014). According to the trade-off theory of capital structure, tax, agency cost, and financial distress are the three major factors that influence firms' optimal financial leverage. Companies use a large quantity of debt in their financial leverage; because debt brings them a tax shield and ameliorates their profitability (Shah et al., 2019). The trade-off theory of capital structure is based on the idea that firms, by balancing costs and benefits, choose how much of their financing is seen as debt and equity.

To recognize the cause of the crisis in banks, the magnitude of banking leverage is regarded as the first undeviating banking indicator. Deciding on to what extent banking leverage is exerted is one of the most important and challenging issues banks face. The leverage enables a financial institution to increase potential profits and losses on a specific financial position from an investment source. Of course, the above-mentioned profits and losses include those that can be much more realized than what is possible directly through investing in the institution's financial resources (Shahchera & Valizadeh, 2018). Following the financial crisis in 2008 and 2009, the world's central bank governors and senior lawmakers agreed on a series of new banking regulations to prevent a recurrence of the recent global financial crisis, one of the major causes of which was the banks' low level of capital relative to assets. According to Basel Committee on Banking Supervision's regulations and

[1] Recently, however, the development of the capital market has come to the attention of governments and economic policymakers.

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standards, there have come up with unbearable conditions for commercial and corporate investments, which practically force banks to withdraw from these types of investments. Speaking differently, in Basel III, resources for gigantic investments in commercial companies have to be supplied by the bank's shareholders themselves, not the depositors' funds, implying the need to reduce the bank's leverage ratio and control it.

Relying on the literature review, the factors affecting banking leverage can be divided into two intra-organizational and extra-organizational categories. Credit and liquidity risks, the amount of short-term and long-term deposits, costs, assets, and the bank's size are among the most primary variables measured according to the bank's conditions and performance and can impress the banking leverage in a varying fashion. It can be expected that the level of banking leverage may see an increase in a situation where a bank is confronting credit and liquidity risks while ascending its costs; contrastingly, it appears to decline when the bank's assets increase, and credit and liquidity risks are well controlled, (Beltratti & Paladino, 2015). Trade cycles, inflation rate, interest rate, and exchange rate lie also among the structural (macroeconomic) factors that affect the banking system's level of banking leverage (Chordia & Shivakumar, 2002). According to studies, the Iranian economy does not currently comply with any specific standard frameworks for managing the country's banks' banking leverage, which has culminated in making the profitability of the country's banks unforeseen and uncontrollable. This shortcoming entangles the country's banking system in fundamental challenges. In this regard, identifying and modeling parameters that drive the banking leverage remains a needed condition for efficient banking policy-making and hampering financial and banking crises. In recent decades, the country's banking system has faced issues such as the imposition of mandatory policies and government notes, government management, and the command control of bank interest rates. On the other hand, Iranian banks perform differently due to their characteristics and mission, making their function and way of operation vary. As a result, it can be argued that organizational and structural factors affect each bank's banking leverage diversely. Considering the above-mentioned statements, this study investigates the effect of organizational (banking) and structural (macroeconomic) factors on the leverage of separately selected Iranian banks for 1999-2016, using Swami Model and Random-coefficients regression. The current research has been organized to respond to the following two important questions: 1) what is the type and intensity of organizational and structural variables affecting the banking leverage of selected banks in the country? 2) Are the estimated

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coefficients of the research's econometric model heterogeneous between sections (banks of the country)? To answer these questions, Swamy model in the context of panel data was used, in which a separate coefficient is estimated for each section in a panel, and through this, group heterogeneity is modeled at the panel level. Therefore, this research's contribution is met both in the title and in the methodology and econometric model.

The rest of this study is arranged as follows; the second section deals with the research literature review; the third section comprises the research model and data analysis method, in which first the banking leverage variable and also the indicators of intra-organizational variables under study are calculated, and then the econometric model is explained. In the fourth part, research findings are presented, and at the end, conclusions and policy and research recommendations are expressed.

2 Research Literature Review

In the economic literature, an accurate association between financial and production systems in any country makes up the most leading factor of economic growth and development. In this regard, a profitable and robust banking network can withstand negative market shocks and stabilize an economy's financial network (Athanasoglou et al., 2008 and Seyed Nourani et al., 2012). Owing to the nature of their activities, banks have been encountering all kinds of risks since the very beginning and trying to identify and manage these risks, albeit incoherently. Furthermore, banks choose many different methods and strategies for the acquisition of proper banking efficiency, of which banking leverage is the most fitted one (De Angelo & Stulz, 2015; Baikzad et al., 2015). According to the trade-off theory of capital structure, tax, agency cost, and financial distress account for the three main factors affecting firms' optimal financial leverage. Companies use a large portion of debt in their financial leverage; because debt grants them a tax shield and improves their profitability (Shah et al., 2019). The cornerstone of the equilibrium theory of capital structure considers that firms choose how much of their financing works as debt and equity, with a trade-off between costs and benefits. According to pecking order theory, the cost of financing increases with asymmetric information. It works in a way that from three sources of financing (domestic sources, debt, and new shares), companies prioritize their sources of financing by initially preferring domestic financing, then debt (leverage), and finally the issuance of shares as the "last resort." This theory holds that firms follow a hierarchy of financing sources and, if any, prefer domestic financing, and if external financing is needed, debt is

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preferred to equity (Khaleghi Moghaddam & Baghomian, 2008; Frank & Goyal, 2003). Suitably handling assets and liabilities require appropriate tools to measure either the costs associated with the portfolio of assets and liabilities or the cost of managing assets and liabilities (Marques & Santos, 2004). Choosing the right banking leverage as a criterion for capital structure is very important because it can significantly impact the competitive advantages in the banking industry.

Hence, making strategic financial decisions needs special attention to the factors affecting the success and failure of competitive strategies, such as leverage structure and changes. The banking leverage remains aligned with the business cycle, as the speed of expansion and receipt of banks' balance sheets, despite acting in reverse, exacerbates the credit cycle-governing trend. It happens because, over the business cycle, banks expand and collect their balance sheets through collateral-supported borrowing. When monetary policy is expansionary relative to key macroeconomic variables, banks are constantly expanding their balance sheets, which in turn increases liquidity. In contrast, when monetary policy gets tight and contractionary, banks shrink their balance sheets, leading to a reduced total liquidity supply. To minimize the business cycle's effects, especially when the economy is booming, banking regulators can limit the strengthening of the leverage ratio by setting a cost floor and the leverage by establishing an asset ceiling. Also, the leverage ratio limit can be defined as a range by targeting at a long-term level. Alternatively, a mechanism can be established to prevent a sharp decline in the leverage ratio during a recession, as determining a permanent constant for the leverage ratio (or setting a permanently fixed floor for it) could speed up the impacts of the business cycle by encouraging banks to de-leverage their balance sheets during recessions and vice versa (Beltratti & Paladino, 2015).

Based on the research literature review, the factors affecting banking leverage can be divided into intra-organizational and extra-organizational. Credit and liquidity risks, short-term and long-term deposits, costs, assets, and bank size are among the most significant variables measured according to the bank-specific conditions and performance and can affect banking leverage differently. Business cycles, inflation rate, interest rate, and exchange rate are structural (macroeconomic) factors that influence the level of banking leverage in the banking system (Chordia & Shivakumar, 2002). Theoretical foundations that address the relationship between macroeconomic conditions and banking leverage refer more to the patterns of business cycles and GDP fluctuations (Carvallo & Pagliacci, 2016). If the country's macro-economy faced stagflation, banks would often turn to higher debt (higher leverage ratio)

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to maintain the share of shareholders' assets. Macroeconomic policy transformations that occur due to a recession or economic boom can also, through interest rates, affect bank financing decisions and, consequently, the performance of banking leverage. According to the theoretical literature, banks will be adversely leveraged if the recession takes place. In this case, the government is incentivized to pursue an expansionary monetary policy to improve the economic situation. The implementation of this policy leads to lower interest rates and exposes banks to credit risk, which in turn prompts an increase in banking leverage (Opler & Titman, 1994).

Similarly, under inflation, the government may pursue a contractionary monetary policy to curb inflation and stabilize prices, resulting in increased interest rates. In such circumstances, the cost of borrowing for banks will see growth and, as a result, the incentive to increase the bank's debt will decrease, and so will the banking leverage (Bandyopadhyay & Barua, 2016). A number of studies suggest that macroeconomic variables usually affect banks' financial variables in such a way that rising inflation and unemployment or reduced economic growth begets a crisis in banks and increases banking leverage (Gambera, 2000). Among the points becoming highlighted in the decisions of financial managers are inflation-induced changes and fluctuations. Given that in the long run, an increase in inflation will accompany an increase in liquidity, or in other words, overwhelmed cash inflows to the bank, the bank's savings and undistributed profits will increase as well (Salas et al., 2007). Since the bank's accumulated profits are among the bank-financing sources, lending through accumulated profits will lessen the banking leverage (Fosu, 2013).

On the other hand, uncertainty in the macroeconomic environment can affect the volume and quality of credit. Because asymmetric information makes credit be extended to unjustified and high-risk applicants. This disadvantage has made loans to spend for non-priority purposes and also foster financial indiscipline, which has ultimately precipitated overdue debts to banks (Mehrara & Sehati, 2011). For most banks, lending is the gravest source of credit risk. Of course, other sources of credit risk in the activities of banks, including banking or commercial operations, can be bound up with both balance sheet and off-balance sheet items. Credit risk is one of the most important intra-bank variables affecting banking leverage because the bank encountered with greater credit risk is expected to increase its banking leverage. Capital is considered as anti-shock to the bank against the loss of default. Hence, the more capital the bank has, the greater the bank's ability to deal with defaults, and consequently, the possibility of bankruptcy and

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banking leverage decreases (Bichsel & Blum, 2004). Large banks usually possess better ability, skills, capital, and direct and indirect tools to conduct research and development on a variety of banking risks; these banks consequently, by building coherent customer databases and using skilled manpower, maintain higher know-hows in assessing the credit quality of customers and ultimately less banking leverage. In other words, the higher the bank size, the more the bank's lending standards and the lending process is implemented more accurately and expertly, accordingly reducing the banking leverage. On the other hand, the second group of studies believes that smaller banks are more capacitated in controlling their customers due to their ability to identify customers on a small scale and better control banking leverage (Espinoza & Prasad, 2010).

Examining the relationship between banking leverage and macroeconomic variables (represented by economic growth, unemployment, inflation, and exchange rate) in European countries' banks over 2005-2011, Beltrati & Paladino (2015) adopted the GMM method and concluded that inflation and economic growth affect banking leverage negatively, yet unemployment and exchange rates do it positively. Using the FMOLS method, Larbi-Siaw & Lawer (2015), in a study, investigated the effects of macro-variables on the resources and consumption of Ghanaian banks during the period 2000-2013. The authors showed that the inflation rate, both in the long term and short term, relates negatively and significantly to the volume of bank deposits; their results also unveiled that money supply growth has a negative and significant relationship with the volume of bank deposits in the short term and a positive and significant relationship in the long run. This evaluation showed that all variables were significant at the significance level of 5%. Only the economic growth variable at the significance level of 10% had a significant effect on the dependent variable. In another study, Carvalho & Paglisi (2016) examined the impact of macroeconomic shocks on banking financial stability and housing prices in Venezuela over the 24 years ending 2013. They used a factor error correction model to check the impact of macro-shocks on banking instability and housing prices and found that the growth of banking GDP contributes to banking financial instability and increased housing prices. Besides, fiscal policies and exchange rates also have a direct impact on banking financial instability. Checking out the effects of systematic risk (market risk) on banking leverage using data panel method with pooled data of 97 European banks from 2006 to 2016, Beltram et al. (2018) provided a comprehensive indicator for systematic risk, which includes the status of macroeconomic variables and each country's structural state of the market and economy; the

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authors concluded that systematic risk (market instability) had a negative and significant effect on banking leverage of case study.

3 Research Model and Method

3.1 Research Econometric Model

In the previous chapter, resting on the theoretical foundations and research literature, we identified the banking leverage factors. The econometric model of the research, derived from the studies of Carvallo & Pagliacci (2016), Beltram et al. (2018) and Beltratti & Paladino (2015) and its modification according to the context of the Iranian economy and existing statistical limitations, can be defined as follows:

$$BLEV_{it} = \beta_{io} + \beta_{i1}CR_{it} + \beta_{i2}LDC_{it} + \beta_{i3}SIZE_{it} + \beta_{i4}RIR_{it} + \beta_{i5}INF_{it} + \beta_{i6}GR_{it} + \beta_{i7}MC_{it} + \beta_{i8}EXR_{it} + \varepsilon_{it} \quad (1)$$

Where[1]:

BLEV stands for ist banking leverage of a bank in the tth period, which is calculated based on the following relation (Beltratti & Paladino, 2015 and Beltram et al., 2018):

$$BLEV_{i,t} = \left(\frac{TD_{i,t}}{TA_{i,t} - TC_{i,t}}\right) \quad (2)$$

In which:

TD_{it} = Total liabilities of the ist bank in the tst period

TA_{it} = Total assets of the ist bank in the tst period

TC_{it}: Cost of equity of the ist bank in the tst period

The equation's independent variables also include:

CR represents the credit risk of the ist bank in the tst period. The following formula is used to calculate credit risk (Waemustafa & Sukri, 2015):

[1] Given that in addition to the independent variables mentioned in the research model, other variables (intra-organizational and macroeconomic) such as; the ratio of short-term deposits to long-term deposits, profit margins, rate of return on assets, taxes and liquidity also affected banking leverage, the model was estimated in different stages with different and classified variables, and finally after estimating the model with diverse variables, the estimation results of the present model are considered as the most matched model.

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$$CR_{it} = (\frac{NPL_{it}}{TA_{it}}) \quad (3)$$

Where, NPL is total non-performing loans, past and precarious maturity of the ist bank in the tst period
(TA): Total assets of the ist bank in the tst period
LDC: Liquidity risk of the ist bank in the tst period, which is calculated as follows (Misman et al., 2015):

$$LDC_{it} = (\frac{Cash_{it} + Securities\ for\ Sale_{it} - Demand\ Desposit_{it} - Shortterm\ Depoait_{it} + ShortTermLoan_{it}}{TA_{it}}) \quad (4)$$

Where,
(Cash): cash of the ist bank in the tst period
(Securities for Sale): short-term investments and corporate bonds of the ist bank in the tst period
(Demand Deposit): demand deposits of the ist bank in the tst period
(Short-term Deposit): short-term deposits of individuals in the ist bank in the tst period
(ShortTermLoan): total short-term loans of the ist bank in the tst period
(TA): total assets of the ist bank in the tst period
SIZE denotes the size of the ist bank in the tst period. The natural logarithm of the total assets of the ist bank in the tst period at the end of the period is used to compute it (Carvallo & Pagliacci, 2016).
Cost Management Index (MC): this variable is obtained from the ratio of the bank's administrative and personnel expenses to the total income of the ist bank in the tst period (Beltratti & Paladino, 2015).
RIR: Bank's real bank rate in the tst period
INF: Inflation in the tst period
GR: Economic growth in the tst period
EXR: The real free market exchange rate in the tst period

This study's statistical population consisted of selected public and private banks (EN Bank, TEJARAT, Refah, Sepah, Saderat, Industry and Mine, Agriculture, Maskan, Mellat, and Melli) over the period 1999-2016 on an annual basis. It should be noted that in 1999, only the mentioned banks were in use in the Iranian banking system. The reason for choosing these banks is that they hold complete statistics and information in terms of their activity duration over the period under review. Besides, the methodology for garnering statistics and information covered documents, library (Central Bank website,

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Statistics and Information Office of the Central Bank and Statistics Center) and in person visiting of the Central Bank of the Islamic Republic of Iran.

3.2 Estimation Method

Because the study's statistical sample includes 10 banks in a window of 18 years, the current study data is classified as panel data. The application of panel data advantageously contributes to controlling heterogeneous features and considering each section's characteristics; contrarily, cross-sectional and time-series studies do not consider this heterogeneity. Panel data helps differentiate and measure effects that are not easily identifiable in absolutely cross-sectional data and time series. Overall, panel data bears many advantages over cross-sectional or time-series data (Baltagi, 2005). The model presented in the previous part of the current study, additionally, exhibited that the coefficients pertaining to the independent variables vary according to each bank's behavior. In other words, the coefficient of each of the independent variables changes during different sections, thus making the traditional estimation method unable to provide an accurate estimate of the model. Due to the model's nature, we in this study adopted the Random-Coefficients Approach and Swamy technique to analyze the data and estimate the coefficients.

A needed explanation is that simple data panel models build upon a premise in which the heterogeneity in the nature of sections can be incorporated into the form of specific fixed or random cross-sectional (temporal) effects in specifying the model. Although most applied studies have confirmed this type of nature heterogeneity specification's adequacy, there are many cases in which such a statement remains insufficient for the natural heterogeneity in the model. In addition to specific fixed or random cross-sectional (temporal) effects as y-intercept, the model needs the coefficients of explanatory variables to vary from one section to another (or one period to another). This method was first used by Swamy (1970) based on panel data, in which the heterogeneity (nature) of the sample sections has been translated to a set of coefficients of regression pattern variables. The random-coefficients approach is generally presented as follows. Thus, it can be seen that the Swami model is, in fact, a multivariate regression model with self-correlated components and heterogeneity of variances. To estimate the coefficients of such a model, an FGLS estimator is used (Ranjpour & Karimi, 2013):

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$$Y_{nt} = \beta_{0xt} + \sum_{K=1}^{K} \beta_{Kn} X_{Knt} + \omega_{nt} \quad (5)$$

$$Y_{nt} = \beta_{0n} + \varepsilon_n + \sum_{K=1}^{K} (\beta_K + \varepsilon_{Kn}).X_{knt} + \omega_{nt} \quad (6)$$

$$Y_{nt} = \beta_0 + \sum_{K=1}^{K} \beta_K .X_{knt} + \sum_{K=1}^{K} \varepsilon_{Kn} .X_{knt} + \omega_{nt} + \varepsilon_n \quad (7)$$

Where, ε_n denotes the special cross-sectional effects and ω_{nt} is the error component of the random-coefficients model[1]. The formula for calculating the coefficients based on the FGLS estimator (Swamy Estimator) will be as follows:

$$\hat{\beta}_{FGLS} = (X'\varphi^{-1}X)^{-1} X'\varphi^{-1}Y \quad (8)$$

In the above equation φ represents the covariance matrix of error terms and is a definite-positive matrix. Considering that in the process of calculating the coefficients, the matrix φ must be estimated, and then the beta coefficient must be projected; therefore, the Swamy method is referred to as a two-step estimator, that the former uses the ordinary least squares method to estimate the following relation for each section:

$$Y_{nt} = \alpha_0 + \theta Y_{t,n-1} + \sum_{K=1}^{K} \beta_K .X_{knt} + u_{nt} \quad (9)$$

The matrix φ elements get singled out, and in the second step, the coefficients are estimated using the following equation:

$$Y_{nt} = \alpha_{0n} + \theta_n Y_{t,n-1} + \sum_{K=1}^{K} \beta_{Kn} .X_{Knt} + u_{nt} \quad (10)$$

In Equation (9), the estimation encompasses all sections and renders an overall coefficient for the whole statistical population and all sections per each variable; but in Equation (10), the estimation coefficients vary with the change of each section. Therefore, this research applies a flexible model to analyze the data to obtain a separate coefficient for each section (banks)[2]. By doing so,

[1] For further study, refer to (Ranjpour & Karimi, 2013, pp. 263-228).

[2] The software used in this study is stata 14. Data and software outputs can be provided to applicants if required.

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each variable's effects in each specific section on the dependent variable can be measured, so can different sections thus be comparable.

4 Research Findings

As mentioned, the dependent variable in the present study contains banking leverage that is calculated according to Equation (2). Figure (1) demonstrates the ranking of banks in terms of banking leverage, based on which Melli, Saderat, Refah, and Tejarat banks had the highest average banking leverage during the period 1999-2016, and in contrast, those of Industry and Mine, EN Bank and Sepah saw the lowest level of banking leverage at the same period.

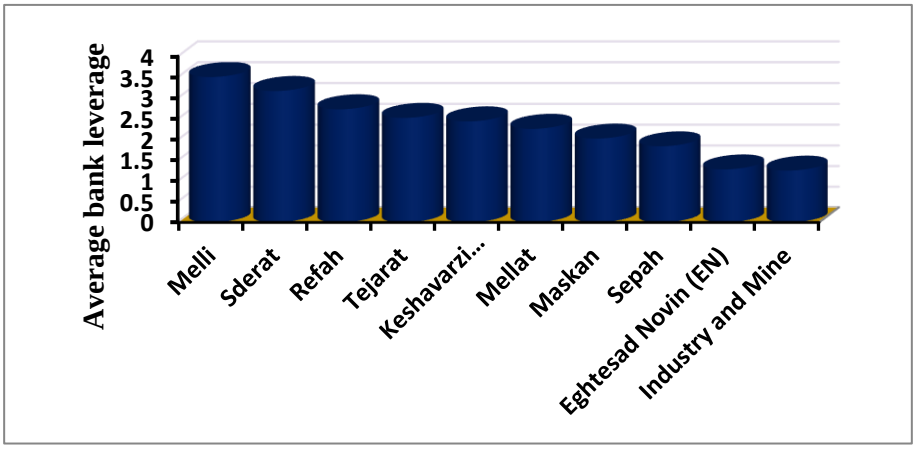


Figure 1. Ranking study banks in terms of the average banking leverage variable over 1999-2016.
Source: Research Findings

4.1 Panel Unit Root Test Results

As the years studied outnumber sections (banks), so in the first step, the variables have to be subjected to the stationary test. Table (1) presents stationary of variables by LLC (Levin–Lin–Chu) and IPS (Im-Pesaran-Shin) panel unit root tests:

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Table 1
Panel unit root test results of research variables

Variables	LLC test	IPS test
BLEV	-3.626 (0.0001)	-3.213 (0.0007)
CR	-11.673 (0.0000)	-12.114 (0.0000)
RER	-9.341 (0.0000)	-6.650 (0.0073)
GR	-2.958 (0.0015)	-2.501 (0.0062)
INF	-5.353 (0.0000)	-5.983 (0.0000)
RIR	-5.686 (0.0000)	-6.076 (0.0000)
LDC	-9.025 (0.0000)	-4.414 (0.0000)
MC	-10.398 (0.0000)	-30.437 (0.0000)
SIZE	-96.09 (0.0000)	-77.32 (0.0000)

Source: Research Findings. The numbers in parentheses indicate the level of probability corresponding to the statistic.

According to Table (1), stationary test results show that all research variables are stationary (static) at the level. Because the level of probability corresponding to all research variables in the LLC and IPS tests revokes the null hypothesis (non-stationary).

4.2 Pairwise Correlation Coefficients

Pairwise correlation coefficients can provide a rudimentary understanding of whether a linear relationship exists between variables. Table (2) shows the results of the pairwise correlation coefficients of the model variables. As can be seen, correlation coefficients between banking leverage and credit risk, liquidity risk, and bank size are positive and significant and are in line with theoretical expectations. Also, the correlation coefficient between banking leverage and cost management index is negative and significant. The correlation coefficients between banking leverage and macro-variables of inflation, economic growth, real interest rate, and real exchange rate are not statistically significant. It is worth noting that correlation coefficients continue to be inefficient when simultaneously modeling the effects of explanatory variables, and econometric methods should be used to address this weakness.

Table 2
Pairwise correlation coefficients of research variables

	BLEV	CR	LDC	SIZE	MC	INF	GR	RIR	RER
BLEV	1								
CR	0.717***	1							
LDC	0.727***	0.891***	1						
SIZE	0.606***	0.901***	-0.898***	1					
MC	-0.487***	-0.696***	0.822***	-0.715***	1				
INF	0.043	0.023	-0.007	0.023	-0.066	1			
GR	-0.038	-0.019	0.003	-0.032	0.071	-0.757***	1		
RIR	-0.057	-0.027	0.011	0.003	0.021	-0.964***	0.699***	1	
RER	0.093	-0.125*	-0.196***	-0.240***	0.193***	-0.0003	0.065	-0.056	1

Source: Research Findings. Note: * significance at the level of 10%, ** significance at the level of 5% *** significance at the level of 1%.

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4.3 Research Econometric Model Estimation

For specifying each variable's effect on the banking leverage by different banks, the model is estimated with a random-coefficients (Swamy) approach. Table (3) presents the results of the research model estimation.

Table 3

Results of Swamy model estimation for the entire panel - dependent variable of banking leverage

Variables	Coefficients	Standard deviation	t-value	Probability value
CR	2.80148	2.02865	1.38	0.201
LDC	0.84202	0.45026	1.87	0.094*
SIZE	-2.41672	0.92232	-2.62	0.028**
MC	-8.89030	9.48893	-0.94	0.373
INF	0.10240	0.03264	3.14	0.012**
GR	-0.02249	0.00995	-2.26	0.05*
RIR	0.10688	0.03652	2.93	0.017**
RER	-0.00003	0.00002	-1.41	0.193
_cons (intercept)	8.09412	2.97111	2.72	0.023**
Heterogeneity test of coefficients in the panel (Null hypothesis: Homogeneity of coefficients in the panel)			334.71	0.000***

Source: Research Findings. Note: * significance at the level of 10%, ** significance at the level of 5% *** significance at the level of 1%.

According to the results reported in Table (3), the liquidity risk variable affects banking leverage positively and significantly, so that a one-unit increase in liquidity risk will increase the banking leverage by 0.84 units. The bank size has a significant and negative impact on the banking leverage; this stems largely from scale-induced economies, in which an increase in magnitude leads to reduced expenditures and thus a reduction in liabilities and banking leverage. The cost management index does not convey a significant effect on banking leverage, and it can be said that administrative and personnel costs do not significantly affect an increase or reduction of banking debts. Consistent with the economic literature, inflation has a positive and significant effect on banking leverage, and with increasing inflation, banks try to maintain their liquidity value as well as profitability by increasing leverage. Economic growth and real interest rates also have a significant negative and positive effect on banking leverage, respectively. The real exchange rate also does not have a significant impact on banking leverage. This result could be due to the closure of Iran's economy and monetary and banking sanctions, which have isolated the banking system.

On the other hand, considering the result of the coefficient heterogeneity test, the null hypothesis of coefficient homogeneity in the panel is rejected, and yet the assumption counteracting coefficient heterogeneity is accepted. Therefore, it is necessary to estimate the coefficients separately by sections.

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Table (4) shows the estimation results of the econometric research model by sections (banks).

Table 4
Estimation results of the research model using Swamy method by banks – a dependent variable of banking leverage.

Variables→ / Banks ↓	CR	LDC	SIZE	MC	INF	GR	RIR	RER	_CONS
Melli	-1.67	-0.57	- 2.06***	-17.85	0.16***	-0.04**	0.17***	-0.00004	12.10***
Mellat	-2.94	0.53	-0.28	14.33	0.03	-0.02**	0.04	0.00004***	2.59*
Tejarat	9.34***	2.49***	- 5.69***	-13.02	0.17***	-0.04**	0.20***	-0.00008**	17.84***
Keshavarzi	-1.37	-0.33	- 2.23***	-1.75	0.13***	-0.03***	0.14***	-0.00002	8.53***
Maskan	-2.03	0.28	-0.30	-5.05	0.01	-0.02*	0.01	0.00004**	2.46*
Saderat	9.01***	2.24 ***	- 5.81***	-38.05**	0.17***	-0.06***	0.21***	-0.00008 ***	23.006***
Sepah	-1.06	-0.87	- 1.85**	-20.77	0.08**	-0.01	0.08**	-0.00002	6.005***
Refah	7.29***	0.62	-0.63 ***	-36.81**	0.05	0.03***	0.02	-0.00005***	1.21
Industry and Mine	10.50***	3.003***	- 5.28 ***	16.69	0.10**	-0.02	0.10***	-0.00004**	7.76***
EN Bank	0.93	1.01*	0.01	13.39	0.05*	0.01	0.05	-0.00001	-0.599

Source: Research Findings. * Significance at the level of 10%, ** significance at the level of 5%, *** significance at the level of 1%. Software outputs can be provided from the responsible author if request.

According to the results of Table (4), credit risk in Tejarat, Saderat, Refah, Industry, and Mining banks has a positive and significant effect on banking leverage, and with increasing credit risk, their banking leverage ramps up. The effect of liquidity risk works the same as credit risk and is corroborated in the four banks of Tejarat, Saderat, Industry and Mining, and EN BANK. Bank size in all banks except Mellat, Maskan, and EN BANK has a negative and significant effect on the banking leverage and indicates the activation of scale-induced economies in these banks. The variable of cost management index has a negative and significant impact on banking leverage only in two banks of Saderat and Refah and stays insignificant on other banks.

The inflation rate has positively and significantly affected banking leverage in all banks except Mellat, Maskan, and Refah and increased with the banking leverage rise. As pointed out, abiding by the economic literature, inflation has a positive and significant effect on banking leverage, and by increasing inflation, banks seek to sustain the value of their assets and also profitability by increasing leverage. The rate of economic growth in Melli, Mellat, Tejarat, Agriculture, Maskan, and Saderat banks has had a negative and significant effect on banking leverage. Yet, this impact was positive and significant in Refah bank. The real interest rate has positively and significantly influenced the banking leverage of Melli, Tejarat, Agriculture, Sepah, Industry, and Mining banks.

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On the other hand, it does not significantly impact that of Mellat, Maskan, Refah, and ENBANK banks. The real exchange rate (degree of competitiveness) has a negligible and close-to-zero effect and holds different and asymmetric effects on the banks under review. The coefficient closest to zero of the real exchange rate can be attributed to the country's banking system's closure due to banking and monetary sanctions. A lot of evidence that organizational and structural variables (macro) affect Iranian Banks differently are extant; therefore, their banking leverage management should be performed according to the type of bank and its organizational characteristics. As it was observed, the leverage of each bank understudy receives varying impacts of structural and organizational variables and bears specific disciplines.

5 Conclusion and Policy Recommendations

According to the Basel Committee's rules and standards, banking leverage management and monitoring the leverage of banks account for one of the most important monetary institution tasks and policymakers to thwart financial and banking crises. In this regard, various structural (macro) and organizational factors have been affecting the banking leverage, the identification, and modeling of which become a necessary condition for effective banking policy-making and prevention of financial and banking crises. In the present study, using a random-coefficients approach, we investigated the impact of organizational and structural factors on each of the selected Iranian banks' banking leverage during the period 1999-2016. The research model got estimated using the Swamy technique generally and by segregating each bank. The results obtained from the coefficient heterogeneity test were significant in panel sections, and it is necessary to consider the characteristics of sections (here banks) in estimating coefficients. The results uncovered that some banks have behaved similarly to each other, and others have shown different behavior in the face of macroeconomic and intra-organizational factors. In summary, the outcomes of the model estimate show that:

– Credit risk in Tejarat, Saderat, Refah, and "Industry and Mining" banks has a positive and significant effect on banking leverage, and with increasing it, banking leverage also rises. The impact of liquidity risk obeyed that of credit risk and was verified in the four banks of Tejarat, Saderat, "Industry and Mining," and EN BANK banks. Therefore, in Tejarat, Saderat, "Industry and Mining" banks, harnessing banking leverage needs a mechanism for controlling credit risk and liquidity risk. It is also necessary for banks to evaluate their customers and classify and

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rank them in terms of risk-taking and information acquisition in such a way that all obligatory information, including their approved financial statements, gets reviewed, and the bank be committed to taking into effect this action. On the other hand, to maintain banking health and prevent the occurrence of the banking crisis, bank managers should try to satisfy the rule of positive growth in the ratio of cash assets to total assets.

- Bank size in all banks except Mellat, Maskan, and EN BANK affects the banking leverage negatively and significantly, indicating the active effect of scale-driven economies in these banks. The variable of cost management index has a negative and significant effect on banking leverage only in two banks of Saderat and Refah and does not work significantly on other banks. Therefore, it can be stated that the selected banks in the present study can pay special attention to the size of the bank to improve the management of their assets and liabilities and take effective measures to increase their assets and enjoy economies of scale. This result also justifies the merger of small banks in terms of size (for example, merging military banks and financial institutions in Sepah Bank) and needs to be expedited.
- The inflation rate in all banks except Mellat, Maskan, and Refah has a positive and significant effect on banking leverage and increases with a ramp-up in leverage rate. As mentioned, this finding is consistent with economic literature, and with increasing inflation, banks try to maintain the value of their assets and profitability by increasing leverage. When inflation becomes overwhelming in the country's economy, people use their savings to offset the effects of inflation on their current lives, which reduces investment in the economy as a whole and in the bank in particular. So it is expected that people will withdraw their savings from banks and spend them on consumer spending. It will reduce the power to manage the bank's debts and assets, and it seems reasonable to expect the banking leverage to increase. Accordingly, economic policymakers and macroeconomic officials are advised to take practical measures to control and reduce inflation to retain stability in the banking and increase banks' leverage.
- The economic growth rate in Melli, Mellat, Tejarat, Agriculture, Maskan, and Saderat banks has had a negative and significant effect on banking leverage, unlike Refah bank that was influenced positively and significantly.
- The real interest rate has a positive and significant effect on the banking leverage of 6 Melli, Tejarat, Agriculture, Saderat, Sepah, Industry, and

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Mining banks. In contrast, it does not significantly affect that of 4 Mellat, Maskan, Refah, and EN BANK banks.

- The real exchange rate (degree of competitiveness) had a small and close-to-zero effect on banking leverage and held different and asymmetric impacts on the banks under review. The coefficient close to zero of the real exchange rate can be the result from the closing of the country's banking system due to banking and monetary sanctions.
- The research results on how economic growth, bank interest rate, and exchange rate affect the banking leverage in each of the banks under study are different, so it is recommended to bank managers that according to these findings, take into account economic growth, bank interest rate and exchange rate for asset and liability management. In other words, they are worth carrying out their banking activities and actions with regard to macroeconomic factors in order to be able to manage their assets and liabilities better.

This study's results correspond directly to the policy decisions of monetary and banking policymakers in the country. In this regard, it is proposed that the monetary and banking regulator act heterogeneously in its policy decisions to control and monitor the banking leverage and consider the specific characteristics of banks. Also, it is necessary to accelerate the merger of small banks to take advantage of the economies of scale.

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