

The Impact of Regulatory Policies on Volatility under Prudential Framework

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Utilizing finance conceptual framework, this paper applies a Frontier-Volatility analysis to illuminate regulatory policies effects on volatility under Iranian Banking Prudential Framework over the period 2003 to 2015 using the raw database collected, classified and compiled by the Rahavard Novin Co. version 3, Securities and Stock Exchange Organization. Findings portray that volatility is affected by the regulatory policies. Tighter regulatory controls will lead to higher volatility that makes it tough for the central bank to regulate the system for culminating financial stability as well as difficulty of entry for the investors. Regulatory policies' positive variations will also lead to lower share revenues as well as a decrease in the earning per share (EPS) that will make it volatile and also will heighten the liquidity risk causing volatility as well as lower investment and shared revenues fluctuate the performance. Furthermore, economic growth has been ineffective on volatility in the current period although its effect has been positive and significant in the first lag period. Higher assets circulations cause higher and significant volatility. The debt proportion coefficient is positive and significant as expected that financial institutions gain more through higher leverage leading to higher volatilities in earnings.

Keywords: Regulatory policy, Volatility, Industry competitiveness structure, Frontier analysis

JEL Classification: C51, C58, G58, F82, G21

1 Introduction

Financial regulation is evolving as policymakers seek to strengthen the financial system in order to make it more robust and resilient. Changes in the regulatory environment are likely to have an impact on financial system

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This article is organized, extracted and written from the thesis titled as "Analyzing the Relationship between Regulatory Policies and Efficiency, Earning per Share and its volatilities in the Listed Banks at the Iranian Securities and Exchange Organization under Prudential Supervision Framework (Basel Committee Accord)" for receiving the PH.D degree at Monetary and Banking Research Institute, Central Bank of Iran.

structure and on the behavior of financial intermediaries that central banks will need to take into account [BIS, (2015)]. The Basel III international regulatory policies framework, which was produced in 2010 by the Basel Committee on Banking Supervision at the Bank for International Settlements, is the latest in a series of evolving agreements among central banks and bank regulatory authorities to standardize bank regulatory policies, among other measures. The Basel III regulatory reform package revises the definition of regulatory policies and increases cushions holding requirements for financial organizations. The quantitative requirements and phase schedules for Basel III were approved by the 27 member jurisdictions and 44 central banks, supervisory and regulatory authorities on September 12, 2010, and was endorsed by the G20 leaders on November 12, 2010. Basel III recommends that banks fully satisfy these enhanced requirements by 2019. The Basel agreements are not treaties; individual countries can make modifications and customize to suit their specific needs and priorities when implementing national regulatory policies [Geter, (2014)].

The dynamic regulatory policies impact have remarkably been notified by the policy makers to interrelate with the financial systems stability. In the U.S., deregulation of the financial entities in the 1970s and 1980s led to higher competition and deduced lower monopoly rents and oriented the equilibrium risk of failure (Keeley 1990). Three categories of regulation, competition and risk have tightly been interconnected to each other at the theoretical level [Hellmann et al., (2000); Cordella and Yeyati, (2002); Repullo, (2004); Niinimaki, (2004)].

Central financial institutions as regulators in the money market handle reserve requirement as a proxy for regulatory policy and stock market officials are the regulators in the capital market. Financial institutions are the players in both markets. Hence, both regulators decide for the regulatory policies in these markets. A proxy from the stock market official for regulatory policy is legal reserve. Legal reserve is an index which is obligatory for firms who are the members of stock market and constitutes a component of the equity. Article 140 of the amendment of the trade law of Iran emphasizes that five percent of the net annual profit must be considered as the legal reserve. On the other hand, according to the article 238 of the same amendment in trade law, the base of calculating legal reserve is the net profit after subtracting the losses of the previous years. Therefore, in conditions where the firm has annual losses, the net profit must not only be included as base for estimating legal reserve for the current year, but also it would be essential for the firms to subtract the sum of annual losses from the current year's net profit and five

percent of the remaining surplus be calculated and considered as legal reserve to reach 10 percent of the paid capital as a mandatory reserve.

There have been several shortages that could be observed for strengthening the economies by enabling the private sectors. The background of these distortions in any economy would mainly be caused by the problems that the financial systems emanate it since financial entities are the connecting channels of subsectors in a financial system. Therefore, the contagion can be caused by the fluctuations in the financial legal persons to provoke and influence other sectors' malfunctioning and central financial institutions around the globe which attempt to arrange regulatory and supervisory policies to regulate and tune up the financial institutions in order to pay heed on the objectives in line with the inefficiencies in the financial system. These policy making implementations in essence include several interferences that may lead the financial legal entities to slow movement towards their goals.

Based on the prudential regulation framework, it is assumed in this paper that the regulator is following the goal that financial stability can merely and relatively be achieved if the volatility notions are considered as significant and in this regard, the regulatory policies have to be oriented towards fulfilling these indices. On the opposite side, stock market organization is a regulatory official for managing industries. Moreover, the investors who are willing to purchase the shares of the financial institutions have to compare the registered institutions based on their risk and return. Therefore, they have to study these two indices for making decisions. So, the common point between the regulatory official and the investors is risk. Henceforth, the main objective of this research is to investigate whether the regulatory policies have dynamically affected the volatility under prudential banking framework in Iran. Moreover, based on the return volatility conceptual framework, it would be again emphasized that investors in the financial markets consider the deviations of the expected earnings from the actual earnings that the general assembly approves. It is expected that regulatory policies both from the central bank and stock market must regulate the deviations in such a way that shareholders could decide on purchasing the stocks according to the minimum deviations that the financial institutions expect and the actual one that realistically occurs. Therefore, it is expected (as assumed in this study) to find that the volatility of earnings is relaxed by the regulatory policies or not.

Rahavard Novin Co. version 3, Securities and Stock Exchange Organization crude database over the period 2003 to 2015 has been applied for exemplifying the dynamics nexus between the regulatory policies and volatility in gains and risk of the financial institutions. The framework

which has been marginally looked on in this paper is to construct indices to requirements regarding the capital and official supervisory power along with restrictions on financial entities activities via Barth et al., (2001a), (2006), (2008) which has been the first study in describing the relationship between the regulatory policies and volatility in financial institutions' performance. With respect to the fact that single analysis to delineate the framework might not be adequate to intern the dynamics of the changes in policies. Frontier-Volatility Analysis can be applied to additionally employ the relationship. The statistical analysis will be performed smearing the association between the policies and performance. Subdivisions of the paper include the related literature and antecedent studies in section 2 and Section 3 illustrates methodologies where the financial and economic modeling approaches are presented to reach the empirical results in section 4. Ultimately, the concluding remarks will notably be presented in section 5.

2 Literature Review and Antecedent Studies

The financial view on the policy making affairs and their influences on the performance of the financial legal entities could academically been observed in studies by Barth et al. (2004) who targeted financial institutions' stability and development from specific regulatory and supervisory practices in which capital stringencies, official supervisory power, and performance were insignificantly associated with each other. Regulatory and supervisory policies as factors which depicted significant relationship consisted of disclosure resulted from correct information, monitoring empowered by private sector as key beneficiaries and corporate control exposed from incentives for private representative agents. The fact as it is highlighted in finance-oriented articles, strengthen that financial institutions which contribute to more robust regulatory and supervisory regimes are proved to experience lower risk and stronger credit environment. In a sample of ten listed financial institutions studied by Leaven and Levine (2009), capital requirements have little effect on actual risk. Indeed, this requirement has positive impact on stability in the financial systems based on asset pricing. Financial activities restrictions and deposit insurance augment bank risk according to Demirguc-Kunt and Detragiache (2002) and Barth et al. (2004, 2006) while it is theoretically anticipated that financial risk must be dipped as a result of an strength in regulatory and supervisory policy whereas this amplification would raise the gains of the financial institutions.

Valipour Pasha and Ahmadian (2013) investigated the determinants of banking system profitability and illustrated that both bank-specific factors and

macroeconomic factors influence financial institutions' profitability in Iran. Also, bank profitability is significantly influenced by investment to total assets ratio, nonperforming loans to total assets ratio, and time deposit to total assets ratio as well as economic growth rate which has a significant positive impact on financial institutions' profitability.

A collection of information, compiled by Barth et al. (2001), has been utilized by Buch et al. (2008) in a research in which it applies supervisory systems indices for affecting the systemic risk of the financial institutions. They concluded that regulation and supervision respectively reflect positive and negative impacts on the gain and risk of the entities.

The tighter the restrictions on financial activities, the lower their efficiencies will be according to the study implemented by Barth et al. (2010), while capital limitations have positive influence on efficacy. It was also achieved that supervisory authority independence is meaningfully and positively related to the gain of the financial institutions despite the fact that no significant association has been discovered between the gain of the financial institutions and official supervisory power.

Valipour Pasha and Heidari (2014) applied sample selection method to examine the relationship between profitability and capital adequacy ratio of financial institutions of Iran. Findings of the study highlight the fact that financial institutions which do not comply with the minimum capital adequacy ratio requirement would not denote their actual profitability in the profit/loss statement. Even though this information is reflected in their annual financial statement, it could not be justified that financial institutions which are profitable would be able to comply with the capital adequacy ratio. In other words, the bank which does not meet the capital adequacy requirement would not be profitable. Results also indicate that based on the accounting and economic rules which are transparently depicted and applied in the Basel Accords, loss of the financial institutions results in a sudden decrease in financial institutions' equity. Main covariates such as demand deposit to total assets, loans to total assets, saving deposits to total deposits and nonperforming loans to total assets prove to be negatively significant.

A sample of European financial institutions has been investigated to analyze the dynamic relationship between regulatory and supervisory policies and the performance of these financial institutions over the period 2000-2008 via Chortareas et al. (2012) in which the findings emphasizes that more stringent capital requirements in line with official supervisory powers can improve the efficient operations of the financial systems. Moreover, policies which highlight the supervision and regulation as for monitoring and

restrictions for financial entities' activities will raise ineffectiveness. Therefore, higher quality institutions could be reason for the relationships between capital requirements as well as official supervisory powers on the financial entities efficacy. Concentrating on the Asian financial institutions over the period 1994-2008, Lee and Hsieh (2013) discovered a positive relationship between capital and profitability in Asian financial institutions.

Generally paraphrasing, studies regarding the impact of regulatory and supervisory policies on the financial institutions is proved to have various results since the period and sample under which the researches have implemented the study are very different. Another reason for achieving multiple causality effect would be the evolution of these policies during the course of time and changes in economic and financial contexts in various countries.

According to Basel I, minimum capital requirement has been regarded as focal in the context of regulations which is taken into account as vital since higher stability will be resulted from higher regulatory policies in financial institutions. Financial institutions solvency is affected by the capital requirement [Kahane (1977), Kareken and Wallace (1978) and Sharpe (1978)] and in this setting the financial entities will have the increasing motivations to augment the risk appetite with a flat insurance premium in place. Identical outcomes have been concluded from the setting of an incomplete market in examination by Koehn and Santomero (1980), and Kim and Santomero (1988) challenges regulatory policies to heave motivations to take higher risk.

The possibility of failure and the impacts of the deposit insurance are the factors in which the financial institutions raise their portfolio risk using higher capital standards when a flat rate of deposit insurance premium is paid [Furlong and Keeley (1989) and Keeley and Furlong (1990)].

3 Methodology and Factors Descriptions

Frontier estimation method, as an economic modeling approach, stems from the production frontier models presented by Aigner, Lovell and Schmidt (1977) and Meeusen and Van den Broeck (1977). The Production Frontier Model without random component can be written as:

$$Y_{it} = f(x_{it}, \beta) \cdot Tec_{it} \quad (1)$$

where Y_{it} is the observed scalar output of the firm $i=1,..I$ at time $t=1,..,T$, x_{it} is a vector of inputs, $f(x_{it}, \beta)$ is the production function, and β is a vector of technology parameters to be estimated. Tec_{it} denotes the technical efficiency

defined as the ratio of observed output to maximum feasible output. A stochastic component that describes random events can also be added which is denoted by $\exp\{v_{it}\}$. The stochastic production frontier will become:

$$Y_{it} = f(x_{it}, \beta) \cdot Tec_{it} \cdot \exp\{v_{it}\} \quad (2)$$

Where Tec_{it} is considered to be a constant term. $f(x_{it}, \beta)$ takes the log-linear Cobb-Douglas Production Function form and the model can be written as:

$LnY_{it} = \beta_0 + \sum_{i=1}^I \beta_i Ln x_{it} + v_{it}$ (3) In this framework, v_{it} is the "noise" component, which is considered as a two-sided normally distributed variable and constitutes an error term, with a specific distribution to be determined. Frontier Analysis has examined also "cost" and "profit" efficiency (Kumbhakar and Lovel 2003). "Profit Frontier Analysis" examines the case where producers are treated as profit-maximizing agents (both output and inputs should be decided by the firm) and not as cost-minimizers. The "Cost frontier" approach attempts to measure how far is the firm from full-cost minimization (i.e. cost-efficiency). The non-negative cost-inefficiency component is added rather than subtracted in the stochastic specification. The specification here is similar with the "production frontier" one. Frontier Analysis has also been applied in micro data of consumer demand in an attempt to benchmark consumption and segment consumers. In a two-stage approach, a frontier model is estimated and subsequently deviations from the frontier are regressed on consumer characteristics (Baltas 2005).

Measuring the volatilities in financial institutions before, during and after financial crisis has been significantly used and adjusted by nations who have cared about their financial system's stability around the globe. Expected loss and gains makes the subject magnificently highlighted when they make an effort to compare the sustainability and robustness of their financial systems via predicting the entire density of down turns. Having used these models in risk management, derivative pricing and hedging, market making, market timing, and portfolio management results will be interesting from the viewpoint that guessing about the probability of repeating the previous down turns in the economies will be fundraising for the credit scoring institutes. In order to make a proper understanding, risk managers are quite aware that past events regarding the fluctuations in the financial systems must be studied remarkably to adjust volatilities in the upcoming future. Financial contracts are good examples of this case because in Options and Futures, the traders are supposed to estimate the minimum and maximum bandwidth of the volatilities

in their contracts as well as they will check their forecasts by the real statistics in the future. The reason why risk managers are notably interested in adjusting the volatilities is that they are managing the stocks for the financial institutions and in this case, they must sell, e.g., a bank's stock in advance of any likely fluctuation which may ruin their promoting efforts (Engel & Patton, 2001).

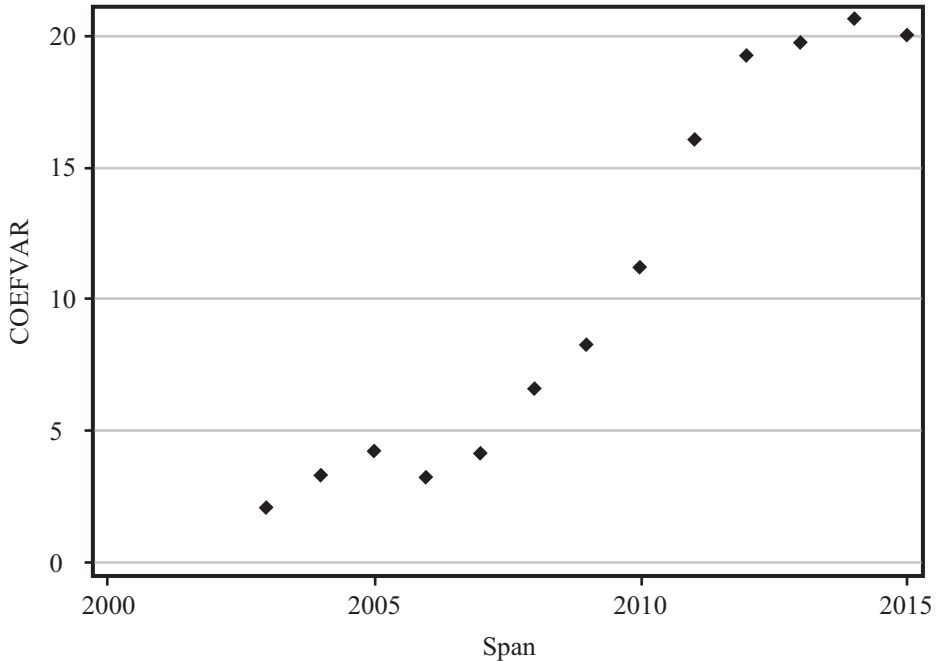


Figure 1. Volatility Coefficient of Variation

As in figure 1, volatility has sharply been increasing throughout the period of study during which three episodes are illustrated. First, the coefficient of variation from 2003 to 2005 is constantly moving upward. The second stage entails 2006 through 2010 which is signposting an accelerating start of fluctuations in the financial institutions in stock market. Finally, the period underlining from 2011 through 2015 which has contained the peak hump of the volatilities and it shows the volatility is dipping since 2014. Overall trend signals that the fluctuations in earning have been increasing throughout the history of the study for the investors that they consider the risk of return in their investments if they are going to trade financial institutions' shares comparing them with other industries in the market.

At the beginning of the volatility models, it is first assumed in Finance studies that r_{it} is the asset price at time t and $Y_{it} = \text{Ln}(r_{it}) - \text{Ln}(r_{it-1})$ is the continuously compounded return on the asset over the period $t-1$ to t . The mean and variance are defined as:

$$m_{it} = E_{t-1}[r_{it}] \quad (4)$$

$$h_{it} = E_{t-1}[(r_{it} - m_{it})^2] \quad (5)$$

Where $E_{t-1}[u]$ is the expectation of some variable u given the data set at time $t-1$ which is often denoted by $E[u|t-1]$. Without loss of generality this implies that r_t is generated according to the following process:

$$r_{it} = m_{it} + \sqrt{h_{it}}\varepsilon_{it} \quad \text{where } E_{t-1}[\varepsilon_{it}] = 0 \text{ and } V_{t-1}[\varepsilon_{it}] = 1 \quad (6)$$

In this paper, we focus on the standard deviation of earning per share as volatility indicator representing risk. Other measures of return rather than earning per share can be used in line with the regulatory policy indicators and data set¹.

Finance theories in the form of a price volatility model is used by Kothari and Zimmerman (1995) and Engle and Patton (2000) in this study. The distribution of ε_{it} is proposed to be $\{\varepsilon_{it}\} \sim i.i.d.F()$ where F is the *cdf* of ε_{it} . The mean and variance are naturally defined as $\mu = E[r_{it}]$, $\sigma^2 = E[(r_{it} - \mu)^2]$. In other words, the volatility model is applied to demonstrate the impact of regulatory policies on the financial institutions' volatility in the stock market under prudential regulation framework using the frontier method of estimation. The model is used would be as follows:

$$\text{Ln}Y_{it} = \alpha_0 + \text{Ln} \sum_{i=1}^n \beta_{it} Y_{it-n} + \text{Ln} \sum_{i=1}^n \gamma_{it} FR_{it} + \text{Ln} \sum_{i=1}^n \theta_{it} FR_{it-n} + \text{Ln} \sum_{i=1}^n \varphi_{it} M_{it} + \text{Ln} \sum_{i=1}^n \omega_{it} M_{it-n} + \varepsilon_{it} \quad (7)$$

Where Y_{it} is the pointer of dependent variable denoting volatility in the financial institutions. FR is regarded as the financial ratios and the required ratios are calculated and M variables stand for the macroeconomic indicators such as the *GDP* growth rate.

The variables used in this paper include *Voleps2* showing the volatility of the earning per share in the twenty financial institutions in the Iran stock market. *Legres* is as the first proxy for regulatory policy which is measured as the ratio of legal reserve to deposits. *Inv1* is the second measure of the

¹ The data set which is used in this study is collected and compiled from Rahavard Novin Co. version 3, Securities and Exchange Organization

regulatory policy and is considered as the ratio of reserve requirement regulated by the central bank to safeguard the financial institutions against unwilling events. GDP growth rate represents the macroeconomic indicator. Industry Competitive Structure (ICS) presents the competitiveness which highlights the subtraction of Herfindahl-Hirschman index from one. As a commonly accepted measure of market concentration, Herfindahl-Hirschman index can range from zero to 10000 showing that the market has a lower competitiveness when it goes up and it is calculated as:

$$HHI = s_1^2 + s_2^2 + s_3^2 + \dots + s_i^2 \quad (8)$$

In which s depicts the share of the financial institution in the financial institution industry in the stock market. The closer a market is to become a monopoly, the higher the market's concentration (and the lower its competitiveness). If, for example, there were only one financial institution in the financial institutions industry, that firm would have 100% market share, and the HHI would equal 10,000 (100^2), indicating a monopoly. Or, if there were thousands of financial institutions competing, each would have nearly 0% market share, and the HHI would be close to zero, indicating nearly perfect competitiveness. In other words, increases in the Herfindahl index generally indicates a decrease in competitiveness and an increase of market power, whereas decreases indicate the opposite. Diversification value which is defined as in formula (8), denotes the measure of Industry Competitive Structure (ICS).

$$ICS = DIV_{it} = 1 - HHI_{it} \quad (9)$$

The major benefit of the Herfindahl index to such measures as the concentration ratio, is that it gives more weight to larger firms. The measure is essentially equivalent to the Simpson diversity index, which is a diversity index used in ecology, and to the inverse participation ratio (IPR) in physics. Liq shows the ratio of financial institutions' liquidity reserves on total assets and $VariA$ demonstrates the ratio of revenue on total assets. Leverage ratio ($debr$) is defined as the proportion of total debts to total assets and liquid assets ratio (Qui) also known as the quick ratio modified by the fraction of highly liquid assets to total assets. According to the Frontier analysis, the variables are used as logarithm in the empirical estimation to make a parallel view on the theoretical literature review.

4 Estimation Result

The zero hypotheses for testing the unit root entails whether all panels contain unit root whereas the opposite hypothesis delineates that at least one panel is stationary. According to table 1, the variables including the dependent, policy and independent variables are stationary at 5 percent significance level.

Table 1

Unit-root Test for Total Variables Based on Augmented Dickey-Fuller Tests

Variables	Statistic	p-value
Legres	55.68	0.0506
Inv1	146	0.0000
GDP	58.9115	0.0273
ICS	7.8417	0.0001
Liq	188.4579	0.0000
VariA	65.9949	0.0060
Voleps2	48.4826	0.0380

Source: Authors' calculations.

Having used Hendry (1985) approach in estimating the model, the variables are shortlisted according to the highest insignificance level as well as the possibility of estimating the regressions using the Frontier method because inclusion of some variables relevant to the model or not, cause an error in estimations and therefore, the model cannot be calculated.

According to table 2, the impact of t-1 volatility on its current measure is positive which represents that a percent volatility increase in the previous period raises the current period volatility by 0.4 percent. Therefore, the investors could easily study the risk of the institutions with one period lag to estimate the risk of shares for the current period in order to make the proper decisions. It would also be expected that gains would be positively affected by the economic growth since appropriate economic conditions contribute well to the financial institutions to make proper intermediary operations leading to higher gains and lower fluctuations. According to table 2, the current and second lag of the variable representing GDP is not significantly influencing the volatility while the first lag is positively and significantly effective. This also emphasizes the fact that financial institutions are generally less likely to consider the economic conditions perspective. In other words, whatever the adjustments which are implemented are based on the internal factors, financial institutions gains that is symbolized by the earning per share in the stock market are probably less affected by the ups and downs of the real

economy because of the fact that speculative outlook governs the decision making process in the stock market and hedging so comprehensively occurs that fluctuations in economic growth does not significantly affect it.

Table 2

Time-varying Frontier Model (Dependent Variable: LogVoleps2)

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
L1.	.4057868	.1382651	2.93	0.003	.1347921 0.676782
L2.	.0940396	.1647681	0.57	0.568	-.2289 0.416979
Loglegres					
--.	.0761469	.0342816	2.22	0.026	.0089562 0.143338
L1.	-.0193089	.0392641	-0.49	0.623	-.0962652 0.057647
L2.	-.05753	.0414282	-1.39	0.165	-.1387279 0.023668
LogICS					
--.	-.0402364	.0264532	-1.52	0.128	-.0920836 0.011611
L1.	-.0361199	.0329814	-1.1	0.273	-.1007622 0.028522
Logliq					
--.	-.2192612	.1335054	-1.64	0.101	-.4809269 0.042405
L1.	.0124901	.064952	0.19	0.848	-.1148135 0.139794
L2.	-.0453052	.0520665	-0.87	0.384	-.1473536 0.056743
LogvariA					
--.	9.316621	5.451396	1.71	0.087	-1.367919 20.00116
L1.	8.03134	4.621759	1.74	0.082	-1.027141 17.08982
GDP					
--.	.0106489	.0087889	1.21	0.226	-.0065771 0.027875
L1.	.0282075	.0142946	1.97	0.048	.0001907 0.056224
L2.	.012591	.0118957	1.06	0.290	-.0107242 0.035906
LogQui					
--.	-4.753291	2.570212	-1.85	0.064	-9.790814 0.284232
L1.	-2.243547	2.056088	-1.09	0.275	-6.273405 1.786311
Loginv1					
--.	1.86881	1.125139	1.66	0.097	-.3364224 4.074042
L1.	.1296605	.8865099	0.15	0.884	-1.607867 1.867188
L2.	-.1882778	.5309469	-0.35	0.723	-1.228915 0.852359
Logdebr					
--.	-1.771012	2.262644	-0.78	0.434	-6.205713 2.663689
L1.	-3.869879	2.122706	-1.82	0.068	-8.030306 0.290548
_Cons	3.951568	1.510198	2.62	0.009	.9916351 6.911501

Source: Authors' calculations.

It is assumed in this study that the volatility of earnings is relaxed by the regulatory policies. According to the return volatility conceptual framework

in line with the frontier estimation approach, it would be again emphasized that investors in the financial markets consider the deviations of the expected earnings from the actual earnings which the general assembly approves. It is expected based on regulatory policies both from the central bank and stock market that they should regulate the deviations in such a way that shareholders could decide on purchasing the stocks according to the minimum deviations that the financial institutions expect and the actual one that realistically occurs. Therefore, the regulatory policies transparently influence the selection and decision-making processes of the investors in the stock market.

There are three channels to interpret the impact of reserve requirement variations on the financial institutions performance through released resources. First, higher reserve requirement will lead to lower released resources which will limit the ability of the financial institutions to provide loans and facilities which will lower the shared revenues resulting a decrease in EPS and that will make it volatile compared to the previous periods. Second, higher reserve requirement resulting in lower released financial resources heightens the liquidity risk which will direct the financial institutions to the inter-bank market or the central bank as the lender of the last resort to raise fund which is expensive causing higher operational cost and lower EPS and makes it volatile attributed to the previous period. Third, higher reserve requirement will lead to lower released resources resulting in lower investment and lower shared revenues directly influencing the earnings per share and higher volatility.

Leverage ratio degree is obviously a good measure to indicate whether financial institutions are taking adventurous risk of increasing their costs for lower returns. Financial institutions should adjust their statements to move towards target leverage ratios. This is because the risk of failure may rocket when financial institutions do not adjust their equity in line with changes in their assets and liabilities which could be interpreted as financial institutions follow their conventional path in financial intermediaries where they make portfolio of assets in order to make profit. The leverage ratio degree shows that both equity and liabilities tend to adjust to move leverage positively without considering the state of the economy of Iran. On the other hand, the index of leverage's coefficient conditioned by the economy state is negative which replicates that financial institutions tend to experience a negative impact of leverage on the return to equity as a result of cost push due to higher ratio of assets to equity in the bust and inappropriate return on investment. Furthermore, leverage ratio during the bust is highlighted as negative which replicates a higher cost for lower return for the banking network that gives an

alarm for credit rating, optimizing financial resources as well as higher quality of portfolio management which reminds us the need for portfolio diversification which appears to be essential so that financial institutions have to adapt their revenue situations with the state of the economy.

Furthermore, one percent increase in the legal reserve (Loglegres) and reserve requirement (Loginv1) as key regulatory policy index in this study has respectively increased the volatility of earning per share significantly by 0.07 and 1.8 percent which highlights the fact that legal reserve requirement adjustments by the central bank is more influential than the legal reserve occasionally is regulated by the stock market as well as the fact that though the first and second period lags are not significantly effective, the current period percentage changes in these policies will influence the volatility leading to a variations in the decisions that the investors might be making to invest in financial institutions or not. It is reemphasized hereby that both potential and dynamic investors in the market consider the deviation of the expected earnings per share from the actual one publicly announced annually and published at the general assembly in order to invest in the stock market or not.

Assets circulation variable (LogvariA) denotes that one percent increase leads to respective nine percent and eight percent increase in volatility at 10 percent significance level. It reinforces the point that revenue caused by assets circulation is more highly influential than other determinants since the source of making gains in the financial institutions is their assets components. Market competition structure (LogICS) and liquidity proportion (Logliq) have insignificant impacts on the volatility which undermine the fact that they have nothing to do with the volatility of earnings in financial institutions though the negative sign of the coefficients shows that these entities could dip their volatilities in gains by increasing these ratios.

Financial institutions can decrease volatility by increasing leverage (Logdebr) because one percent increase in the first period delay of debt ratio will lead to 3.8 decreases in volatility approving that these entities can control their ups and downs in earnings by leverage ratio. The variable defined as the logarithm of total debts to total assets signifies that as financial institutions increase their leverage ratio, they will directly identify return and it will highly improve the entities' earnings. Therefore, the estimation result for this variable is as it was anticipated. Higher debts to assets ratio will lead to higher risk if the assets' components as loans are not reimbursed and on the other hand, it will result in higher earnings if it leads to performing loans. Henceforth, it can be interpreted as the need for further adjustment in financial institutions' asset

portfolio which is the key tasks of the regulators i.e. the central bank on the one hand, and the stock market officials on the other hand. The leverage ratio may also lead to increased volatility for two reasons. First, given that activity levels are expected to fall, liquidity is also likely to be lower, which will tend to push up bid-ask spreads (and reduce the size of the contracts to be traded – “clip size¹”) and lead to an increase in volatility. Second, if banks seek to economize the amount of central bank reserves that they are willing to hold at given levels of interest rates, then smaller reserve buffers may leave them needing to bid up for cash in short-term money markets in response to unexpected shocks, increasing market volatility. This may be particularly relevant for banks within a floor-based operating framework [BIS, (2015)]. Furthermore, the highly liquid assets ratio (LogQui) in the financial statements is negatively effective on volatility because they can be plainly transferred to liquid reserves by the financial institutions to control their fluctuations. Capital restructuring seems to be vital since institutions strive to make the most efficient use of limited finance; the key consideration is where financial institutions expand and scale back. One clear trend is the renaissance of classic finance as unsustainable and over-leveraged structures give way to simpler and more transparent forms of banking business which should include moving away from an originate-to-distribute model towards a renewed focus on credit quality and relationship-driven banking. Effective capital restructuring will help to streamline what are often overly complex and diffuse banking groups.

5 Conclusions

Deregulations of the financial entities have increased competitions in financial markets, but volatilities in the financial institutions performance have oriented the regulators to monitor and control risk. Regulatory policies from the officials could be made in such a way that the beneficiaries especially investors in the stock exchange could better decide on choosing a proper share for investment. From this perspective, this paper investigates the effects of regulatory policies on volatility as an underlying objective that almost all regulators follow to achieve. Rahavard Novin Co. version 3, Securities and Stock Exchange Organization database has been applied for exemplifying the nexus between the regulatory policies and volatility of the financial institutions from 2003 to 2015. Applying an original sample of regulatory and volatility proxies, Frontier-Volatility Analysis has been implemented to investigate the impact of regulatory policies on the financial institutions

¹ Integrated

performance. Having reached to interesting results and extending the literature both theoretically and empirically, findings of the study highlight the facts that volatility of earning per share as a risk measure has been increased by an increase in the legal reserve (Loglegres) and reserve requirement (Loginv1) as key regulatory policy indices which highlights the fact that changes in these policies will influence the volatility leading to a variations in the decisions that the investors might be making to invest in financial institutions. The impacts are interpreted in three channels: First, regulatory policy positive variations will lead to lower released resources which will restrict providing loans and facilities resulting in lower shared revenues as well as a decrease in the earning per share in the financial institutions and that will make it volatile. Second, it will heighten the liquidity risk which will direct the financial institutions to the inter-bank market or the central bank as the lender of last resort to raise fund which is more expensive causing higher operational cost and lower earnings per share and makes it volatile and third, it will result in lower investment and lower shared revenues directly influencing the earnings per share and higher volatility.

Economic growth has been ineffective in current period but positively and significantly influential in first period delay on volatility. As a boom indicator, GDP recovery will amend the investors' perspective in transferring their resources to the stock market to purchase shares of the firms and financial institutions. Positive perspective seems to increase an encouraging atmosphere for the shareholders to both potentially and dynamically receive higher earnings in the market. Therefore, it is anticipated that a positive increase in GDP heightens the volatility in the markets specifically in the first delay period.

As it has been doing as an effective regulatory policy, Central bank is recommended to decrease reserve requirements for the financial institutions because they will have higher access to their resources in order to provide facilities and gain more in this atmosphere. Hence, it will strengthen both regulators of central bank and stock market to culminate financial stability. Better financing conditions will enable the economic agents to have more appropriate business conditions which are expected to invest their resources in financial institutions and that makes it possible for them to allocate more services to the firms.

The financial situation worsens when higher leverage ratio degree which would cause difficulty in responding the deposits they have raised from the depositors and paid capital from the shareholders. Regulatory and supervisory steps have to be taken by the central bank along with the Iranian financial

institutions to at least monitor and manage financial institutions financial resources as well as how they use the funding from expensive deposits which could be a trigger to provide new approaches for raising less expensive financial resources. The ability to build enduring relationships through customer service, understanding and the ability to adapt to tougher regulatory controls will be key competitive differentiators in this environment.

References

- Aigner, D. J., Lovell, C. A. k., & Schmidt, P. (1977). Formulation and Estimation of Stochastic Frontier Production Functions. *Journal of Econometrics*. 6:21–37.
- Baltas, G. (2005). Exploring Consumer Differences in Food Demand: A Stochastic Frontier Approach. *British Food Journal*. 107(9): 685-692.
- Barth, J. R., Caprio, Jr., & Levine, R. (2001). The Regulation and Supervision of Financial Institutions around the World: A New Database, In: Litan, R.E., Herring, R. (Eds.), Integrating Emerging Market Countries into the Global Financial System. *Brookings-Wharton Papers in Financial Services*. Brooking Institution Press, 183–240.
- Barth, J. R., Caprio, G., & Levine, R. (2003). Bank Regulation and Supervision: Lessons from a New Database. *World Bank*. Washington DC.
- Barth, J. R., Caprio, G., & Levine, R. (2004). Bank Regulation and Supervision: What Works Best? *Journal of Financial Intermediation*. 13, 205-248.
- Barth, J. R., Caprio, G., & Levine, R. (2006). *Rethinking Bank Regulation: Till Angels Govern*. Cambridge: Cambridge University Press.
- Barth, J. R., Caprio, G., & Levine, R. (2008). Bank Regulations are Changing: for Better or Worse? 50(4), 537–563.
- Barth, J. R., Lin, C., Ma, Y., Seade, J. & Song, F. (2010). Do Bank Regulation, Supervision and Monitoring Enhance or Impede Bank Efficiency? *Social Science Research Network*. page 19.
- Barth, J. R., Caprio, G., & Levine, R. (2013). Bank regulation and supervision in 180 countries from 1999 to2011, *NBER Working Papers* 18733, National Bureau of Economic Research, Inc.
- Buch, M. C., et al. (2008). Do Weak Supervisory Systems Encourage Bank Risk-taking? *Journal of Financial Stability*. Vol. 4, 23-39.
- Chortareas, G., et al. (2012). Bank Supervision, Regulation, and Efficiency: Evidence from the European Union. *Journal of Financial Stability*. 8, 292- 302.
- Committee on the Global Financial System and the Markets Committee, (2015). *Regulatory Change and Monetary Policy*, Bank for International Settlements, ISBN 978-92-9197-084-1.
- Cordella, T., & Yeyati, E. L. (2002). Financial Opening, Deposit Insurance, and Risk in a Model of Banking Competition. *European Economic Review*. 46, 471-485.
- Engel, R. F. (2000). What Good Is a Volatility Model? *Journal of Quantitative Finance*. Vol. 1, 237–245.

- Demergüç-Kunt, A., & Huizinga, H. (1999). Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence. *World Bank Economic Review*. 13, 379–408.
- Demirgüç-Kunt, A., & Kane, E. (2002). Deposit Insurance Around the World: Where Does It Work? *Journal of Economic Perspectives*. 16(2), 175–195.
- Demirgüç-Kunt, A., & Levine, R. (2009). Finance and Inequality: Theory and Evidence, Annual Review of Financial Economics, *Annual Reviews*. Vol. 1(1), 287-318.
- Demirgüç-Kunt, A., & Detragiache, E. (2002). Does Deposit Insurance Increase Banking System Stability? An Empirical Investigation. *Journal of Monetary Economics*. 49: 1373-1406.
- Furlong, F. T., & Keeley, M. C. (1989). Capital Regulation and Bank Risk-taking: A Note. *Journal of Banking and Finance*. 13, 883-891.
- Hellmann, T. F., Murdock, K. C., & Stiglitz, J. E. (2000). Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements, Enough? *American Economic Review*. 90, 147-165.
- Kahane, Y. (1977). Capital Adequacy and the Regulation of Financial Intermediaries, *Journal of Banking and Finance*. 1, 207-218.
- Kareken, J. H., & Wallace, N. (1978). Deposit Insurance and Bank Regulation: A Partial Equilibrium Exposition. *Journal of Business*. 51, 413-438.
- Keeley, M. C. (1990). Deposit Insurance, Risk, and Market Power in Banking, *American Economic Review*. 5, 1183-1200.
- Keeley, M. C., & Furlong, F. T. (1990). A Re-examination of the Mean-variance Analysis of Bank Capital Regulation. *Journal of Banking and Finance*. 14, 69-84.
- Kim, D., & Santomero, A. M. (1988). Risk in Banking and Capital Regulation. *Journal of Finance*. 43, 1219-1233.
- Koehn, M., & Santomero, A. M. (1980). Regulation of Bank Capital and Portfolio Risk. *Journal of Finance*. 35, 1235-1244.
- Kothari, S. P., & Zimmerman, J. L. (1995). Price and Return Models. *Journal of Accounting and Economics*. Vol. 20, pp 155-192.
- Repullo, R. (2004). Capital Requirements, Market Power, and Risk-taking in Banking. *Journal of Financial Intermediation*. 13, 156-183.
- Sharpe, W. F. (1978). Bank Capital Adequacy, Deposit Insurance and Security Values. *Journal of Financial and Quantitative Analysis*. 13, 701- 718.
- Valipour Pasha, M., & Ahmadian, A. (2014).Determinants of Profitability in Iranian Banking System. *Journal of Money & Economy*. Vol. 9, No. 2.
- Valipour Pasha, M., & Heidari, H. (2015). Can Capital Adequacy Ratio Specify Financial Institutions' Profitability? A Case Study of Iran. *Buletin Teknologi Tanaman, Bil.* 12, Tambahan. Vol 2, 446-450.