Journal Website

Article history:
Received 24 October 2023
Accepted 03 December 2023
Published online 20 December 2023

International Journal of Innovation Management and Organizational Behavior

Volume 3, Issue 5 (Special Issue on Finance and Economics), pp 10-22

E-ISSN: 3041-8992

Examining the Impact of Parallel Market Fluctuations on Penalty Rate Levels with Predictions of Depositors' Behavior Regarding Deposit Failure Rates

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Article Info

Article type:
Original Research

How to cite this article:
Abbasian, A., Chavoshi, S. K., Fallahshams, M., & Gholami Jamkarani, R. (2023). Examining the Impact of Parallel Market Fluctuations on Penalty Rate Levels with Predictions of Depositors' Behavior Regarding Deposit Failure Rates. *International Journal of Innovation Management and Organizational Behavior, 3*(5), 10-22.
https://doi.org/10.61838/kman.ijimob.3.5.2

ABSTRACT

Objective: This research aims to investigate the fluctuations of parallel markets on the level of penalty rates and to propose a conceptual model predicting depositors' behavior regarding deposit failure rates. Theoretically, this study contributes to the development and presentation of factors affecting customers' financial behavior in the banking system (both private and public). From an innovation perspective, the proposed model examines the actual decisions and behaviors of individuals in financial matters.

Method: The research methodology is applied and post-event in nature. This study adopts a quantitative approach. The data used in this research were collected by referring to time series statistics from the central bank, official bank websites, and the country's capital market and were utilized accordingly. The software used for data analysis in this research is Eviews.

Findings: After the necessary data examination and analysis using the software, the results of this research indicate that in the first phase, the optimal portfolio was determined between currency rates, gold coins, real estate, securities, and bank deposits without imposing any penalty on long-term deposits. In this situation, individuals with different risk levels allocate 95%, 57%, and 37% of their portfolio to bank deposits, corresponding to risk-averse, moderate risk, and risk-seeking individuals, respectively. In the second phase, by imposing a penalty equal to 10% of the deposit profit, the optimal basket was determined; even in this case, these three groups of individuals with different risks allocate 88%, 53%, and 36% of their capital to bank deposits, respectively.

Conclusion: It is observed that this decreasing trend in bank deposits continues until the penalty rate equals 25% of the bank deposit rate, beyond which no individual with any level of risk is willing to deposit in the bank.

Keywords: *Penalty Rate for Withdrawal, Long-term Deposits, Model Presentation, Iranian Banking System*

1 Introduction

Banks play a decisive role in the economies of countries and the circulation of money and wealth in society, thus enjoying a special status in countries. Effective banking activity can significantly impact the growth of various economic sectors, increase the quantitative and qualitative levels of production, and reduce inflation (Fattahi et al., 2017).

The experience of the recent financial crisis and the destructive aftermath of the crisis's transfer from the monetary sector to the real economy sector has highlighted the importance of paying more attention to the banking system (Allen & Gale, 2001; González-Hermosillo et al., 1997). In this regard, dynamic stochastic general equilibrium models have played a fundamental role in explaining the effects of banking resource shocks. Dynamic stochastic general equilibrium models provide researchers with appropriate tools for offering a comprehensive framework concerning the relationships between different agents in the economy and analyzing policy outcomes. (Heidari & Molabahrami, 2017) In recent years, due to the prominent role of financial factors in creating macroeconomic fluctuations, financial intermediaries and markets have been the focus of many economists within the framework of dynamic stochastic general equilibrium models (Shahhoseini & Bahrami, 2016). One of the indicators of a banking crisis is when banks face a sudden rush of people withdrawing deposits, putting banks in a difficult position and potentially leading to their bankruptcy. This situation, known as a bank run, occurs when a large number of bank customers, fearing the bank's inability to fully repay their deposits on demand, rush to withdraw their deposits. This phenomenon has occurred in recent years in many developed and developing countries, significantly impacting macroeconomic variables, especially the Gross Domestic Product (GDP) of these countries. In recent years, the country's banking network has seen a declining trend in deposit growth and a shift in banks' deposit portfolios from term deposits to demand deposits, leading to a decrease in resources. To compensate for the shortage of resources, banks have been forced to borrow from the central bank (Pour-Abadolhan Kovich et al., 2017).

What is clear is that in the absence of effective laws and the lack of motivation among executives to enforce banking laws, and with low penalty rates for late withdrawals, customers prefer to maximize the use of their liquidity. Therefore, they prefer to invest their principal capital in markets such as housing, gold, currency, automobiles, and the stock market. Consequently, the return on investment for the investor is higher than the penalty for withdrawing deposits and even delays in loan installment payments. Therefore, customers close their deposits and refrain from paying their loan installments. As a result, banks' non-performing loans increase, the credit risk of banks increases, and an economic shock is administered to the banks (Mirzaei et al., 2012). Thus, banks need to consider macroeconomic variables and employ credit scoring methods instead of judgmental methods to reduce credit risk. Therefore, this research will attempt to present a model for determining the penalty rate for withdrawing deposits before maturity to prevent an increase in credit risks.

In the country's banking system, attracting customers to long-term deposits is made possible through offering higher interest rates compared to short-term deposits. This compensates for the convenience of short-term deposits for the customer with higher interest for long-term deposits. Depositing in the country's banking system competes with other financial markets such as housing, stock market, currency, and gold. Dib (2010) presented a micro-framework in which the banking sector is incorporated into the (DSGE) model. Using the model, the role and importance of the behavior of the banking system and financial shocks in the business cycles of America were examined (Dib, 2010). The behavior of the banking system in providing banking services and transferring funds in the interbank market was studied. In this research, the effects of monetary shocks, credit shocks, and shocks in the amount of capital and bank deposits on the behavior of economic agents were investigated, considering changes in the money volume as monetary shocks, changes in credit supply as credit shocks, and changes in the amount of capital and deposits as factors affecting credit fluctuations. The study shows that the presence of the banking system as a financial intermediary significantly reduces macroeconomic variables' fluctuations, such as economic growth, in the face of monetary, banking, and technology shocks (Gerali et al., 2008) introduced the banking system for European countries with an emphasis on resource shocks and considering collateral constraints into the dynamic stochastic general equilibrium New Keynesian model. Experiences have shown that whenever the interest rate of bank corporate bonds increases, the volume of bank deposit balances decreases. The changes that people have made in their asset baskets have replaced assets with more liquidity with

IJIMOB
E-ISSN: 3041-8992

corporate bonds (Heidari & Molabahrami, 2017; Shahhoseini & Bahrami, 2016).

On the other hand, whenever Gross Domestic Product (GDP) increases, the volume of bank deposit balances increases. This explanation can be considered for the price index of housing, as due to the decreased ability of people to buy housing, some have replaced bank deposits in their asset baskets, and some have made deposits in banks to benefit from housing loans, leading to the mentioned result. The relationship between the inflation rate and the volume of bank deposits is negative. Bank deposits have shown the highest sensitivity to the interest rate of corporate bonds. This means that among the variables discussed, attracting more deposits was associated with reducing the interest rate of corporate bonds (Abbasian & Saniee, 2017).

Therefore, it is suggested that the government and the central bank, by adopting monetary and banking policies, including increasing the interest rate on deposits and providing various types of fixed-term investment accounts that allow easier access to deposit profits in a more appropriate time frame, guide capitals towards long-term deposits. As it is clear, the main goal of writing this article is to determine the penalty rate with an accurate prediction of depositors' behavior regarding the deposit failure rate. In other words, in this research, we intend to examine the impact of parallel market fluctuations on the penalty rate with an accurate prediction of depositors' behavior regarding the deposit failure rate, which itself is a significant knowledge increase in the economy of the country and the banking system of the Islamic Republic of Iran.

From a theoretical perspective, this research contributes to the development and presentation of factors affecting customers' financial behavior in the banking system (both private and public) and from an innovation perspective, the proposed model examines the actual decisions and behaviors of individuals in financial matters.

The most important innovations of the current research are as follows:

1. Identifying a set of rules, variables, and factors that influence the formation of customers' financial behavior in the banking system (both private and public) and helps improve bank performance in the area of monetary policies.
2. Identifying the optimal policy tool for determining the penalty rate for long-term bank deposits.
3. Estimating the impact of parallel financial markets and macroeconomic variables on the penalty rate and vice versa.

Research questions are as follows:

1. What impact do the returns and fluctuations of parallel markets have on the penalty rate for deposit failures?
2. What is the optimal penalty rate for encouraging individuals to deposit in banks?
3. Does the interest rate affect the penalty rate in banks?
4. What is the penalty rate for public and private banks?

2 Methods and Materials

This research is applied in terms of its objective, as the aim of this research is to study the deposit failure rate and its optimum amount, thus this study is descriptive. This is because the research aims to describe every aspect of a situation or a series of conditions (Naderi & Seif Naraghi, 1996) and since the desired data is collected through sampling from the population to examine the distribution of characteristics of the statistical population, this research is of the survey (field study) type. Furthermore, as mentioned, the research in question, considering it studies data related to a specific period of time, is cross-sectional.

The research in question, considering it studies data related to a specific period of time, is cross-sectional. In this research, library resources and articles published on reputable scientific sites such as ScienceDirect and Google Scholar were used to collect and review the theoretical foundations of the research area. Additionally, the methods of collecting information in this research are based on reports available in systems. The reports obtained for collecting data of this research have been used from the library method, and data have been prepared from reports published by banks, capital markets, and the central bank on the websites of these organizations. The data used in this article are panel data over a 10-year period from 2009 to 2019 for banks of the Islamic Republic of Iran. Research data have been extracted from the reports of the Central Bank of the Islamic Republic of Iran and the financial statements available on the banks' websites. The method of analyzing the collected information is based on VAR and VECM statistical analyses. EViews software has been used for the analysis of this information.

3 Findings and Results

In this study, the selection of the optimal failure rate for investors using the Conditional Value at Risk (CVaR)

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model, as well as the impact of changes in this failure rate on the volume of deposits using the Vector Autoregression (VAR) method, will be addressed. From the model analysis perspective, Value at Risk analysis is a type of time series correlation analysis, where the goal of correlation research is to examine the pairwise relationship of variables present in the study.

In recent years, a risk measurement criterion based on percentiles known as "Conditional Value at Risk (CVaR)" has been developed due to its attractive computational properties. This criterion measures the expected loss when the loss exceeds a determined Value at Risk (VaR). For example, a Conditional VaR with parameters of a 99% confidence level and a 10-day holding period represents the average amount expected to be lost over a 10-day period, assuming that the worst 1% of cases occur.

In the current article, the required data have been collected annually. This information includes:

The return rate of long-term deposits

The yield of the stock market index

The growth rate of land and housing prices

The growth rate of currency prices in the free market

The growth rate of the Full Gold Coin (Bahar Azadi gold coin)

All the quarterly information from the beginning of the second quarter of 2009 to the end of the first quarter of 2019 has been extracted.

The research method was conducted in such a way that, in the first phase, the optimal portfolio (CVar) of the above five assets was selected based on return and risk using the Conditional Value at Risk method. In the second phase, a 10 percent shock to the return rate of long-term deposits was applied as the failure rate for the second portfolio selection. Similarly, shocks of 15, 20, and 25 percent were applied, and in each phase, the optimal portfolio was selected.

Optimal Model Selection in the CVaR Approach

The research approach in calculating Conditional Value at Risk does not impose any specific assumption on the distribution of asset returns and allows the data to speak for themselves as much as possible. In other words, the estimation of CVaR uses the latest empirical distribution of returns, not a theoretical distribution. The calculation of Conditional Value at Risk (CVaR) is such that it can be obtained by minimizing a more controllable function without the need to determine VaR (or a) a priori as a by-product. Moreover, this approach, since it does not require the calculation of a variance-covariance matrix, does not encounter operational problems when dealing with large-dimensional problems.

$$min\left\{a+\frac{1}{1-\alpha}\sum_{j=1}^{n} Z_j\right\}$$

$$S\,T: Z_j \geq f(x,y)-a\,, \quad Z_j \geq 0$$

$$E(R_p)=\sum_{i=1}^{n} E(R_i)$$

$$\sum_{i=1}^{n} X_i = 1$$

Estimation of the CVaR Model In this phase, we aim to determine the optimal stock portfolio using the Conditional Value at Risk (CVaR) model, utilizing quarterly return data of the assets under study in the statistical sample. This model has been programmed and minimized using MATLAB software. In each series, 100 optimal portfolios are determined by dividing the entire efficient frontier from the lowest to the highest expected return into 100 equal parts, and for each level of expected return, an optimal portfolio is calculated. With the weights of the portfolio components, the expected return of each portfolio and its risk are obtained.

Plotting the Mean-CVaR Efficient Frontier In this scenario, we execute both portfolio optimization models for different expected return rates using MATLAB software. The output of both models is the optimal combinations from the perspective of the respective risk criterion. With the weights of the portfolio components, the expected return matrix for each portfolio and its expected risk are calculated as follows:

Rp=*W*×ExpReturn

Rp: Expected return matrix

ExpReturnExpReturn: Matrix of expected returns of assets in the portfolio

W: Weights of assets in the portfolio

Then, a graph can be plotted where the horizontal axis is CVaR (risk) and the vertical axis is the expected return of the portfolio, to draw the Mean-CVaR efficient frontier.

Figures below present the Mean-CVaR efficient frontier for five different failure rates, provided at a 95% confidence level. What is evident from these charts:

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Figure 1

The Results of Initial Qualitative Analysis

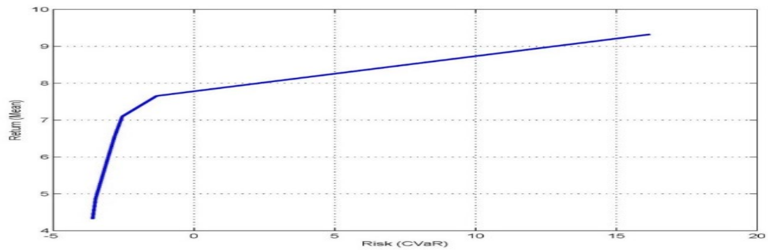


Figure 2

The Results of Initial Qualitative Analysis

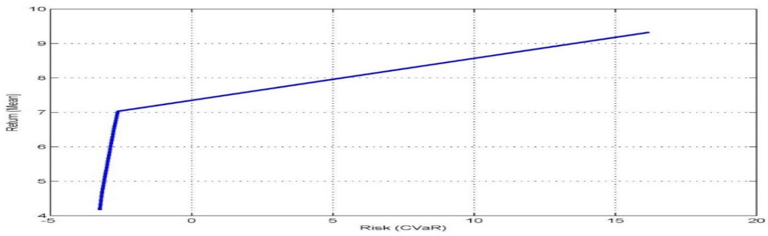


Figure 3

The Results of Initial Qualitative Analysis

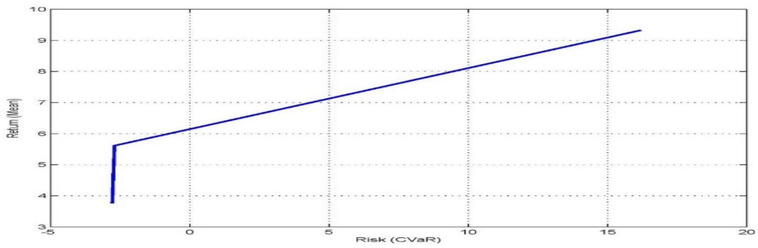
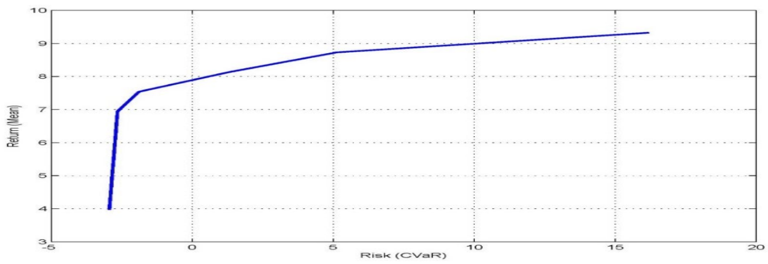


Figure 4

The Results of Initial Qualitative Analysis



In the visual representation of return versus risk, optimal portfolios are located on the upper left of the chart for identical levels of return or identical risk (CVaR), and points below the minimum variance point are not part of the efficient frontier. Here, the points on the curve are efficient points where an individual can choose portfolios that yield the highest return for the lowest risk.

If an investor seeks a higher return; by increasing the CVaR index (their risk tolerance level), which actually indicates the portfolio's risk level, they reduce the diversity of stocks in the portfolio to achieve the desired return, moving towards stocks with higher expected returns. In this case, as the selected portfolio's return increases, so does the risk. The numerical results of the portfolios related to the above charts are reported in Table 1, showing portfolios on the efficient frontier at different risk levels.

Next, considering individuals' risk tolerance, we seek to find the optimal failure rate that individuals with different risk rates are willing to accept.

Table 1

Risk Level Scenarios

Scenarios	Low Risk	Medium Risk	High Risk
Without Failure Rate	95%	57%	37%
With a Failure Rate of 10% of Deposit Profit	88%	53%	36%
With a Failure Rate of 15% of Deposit Profit	85%	52%	36%
With a Failure Rate of 20% of Deposit Profit	84%	51%	34%
With a Failure Rate of 25% of Deposit Profit	84%	36%	36%
With a Failure Rate of 30% of Deposit Profit	0%	0%	0%

As seen in Table 1, if there were no failure rate, risk-averse individuals would allocate 95% of their investment portfolio to long-term deposits, and individuals with medium and high risk would respectively allocate 57% and 36% to such deposits. Now, if the failure rate is equal to 10% of the total deposit profit, in this case, risk-averse, medium-risk, and high-risk individuals would allocate 88%, 53%, and 36% of their capital to depositing, reducing their investment volume in long-term deposits compared to before. This increase in the failure rate up to 25% of the deposit profit causes a reduction in the share of long-term deposits in individuals' investment portfolios, but after imposing a failure rate of 25% of the deposit profit, individuals with different risk statuses will no longer include any deposits in their asset portfolios. In fact, if the penalty rate for deposit profit is equal to a quarter of the long-term deposit profit, no individual is inclined to choose deposits for investment against other investment options, including stock market shares, currency rates, Full Gold Coin, and real estate, and even individuals with very low risk will allocate a zero share of this type of investment in their asset portfolios.

Model Estimation

The impact of independent variables (deposit interest rate, currency return rate, gold coin return rate) on the dependent variable (percentage growth of bank deposits) is analyzed using the CVAR model over short and long-term periods. For this purpose, quarterly data from 2009 to 2019 have been used. Considering that the model's prerequisite is examining the stationarity of variables and determining the optimal number of lags for variables, we will proceed to examine the mentioned aspects. It should be noted that due to strong collinearity between the real estate price index variable and the currency rate as well as the real estate index and the return rate of the Full Gold Coin, one of these variables had to be removed from the model for unbiased results; hence, the real estate index variable is not included in the model.

Unit Root Test

Before conducting any test, we first examine the stationarity or non-stationarity of variables. For this purpose, the Dickey-Fuller unit root test is used, and the Dickey-Fuller test for each of the variables of interest is conducted using EViews software, with results observed in Table 2.

Table 2

Testing for Stationarity at the Initial Level

Variables	t-Test	Significance Level	Result
Deposit Growth Percentage	-7.18	0.000	Stationary
Currency Return Rate	-5.09	0.000	Stationary
Full Gold Coin Return Rate	-3.52	0.000	Stationary
Deposit Profit	-0.25	0.581	Non-stationary
Stock Index Return Rate	-1.14	0.22	Non-stationary

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Here, the null hypothesis H0 is based on non-stationarity. As observed, for the variables of deposit growth percentage, currency return rate, and gold coin return rate, the significance level is less than 10%, rejecting the null hypothesis for these variables, concluding that these variables are stationary at the level. For the variables of deposit interest and stock index return, since the significance level is more than 10%, there is no reason to reject the null hypothesis, indicating these variables are non-stationary; therefore, we will proceed to examine the stationarity at the first difference of variables.

Table 3

Testing for Stationarity at the First Difference

Variables	t-Test	Significance Level	Result
Deposit Growth Percentage	-3.98	0.000	Stationary
Currency Return Rate	-7.27	0.000	Stationary
Full Gold Coin Return Rate	-6.85	0.000	Stationary
Deposit Profit	-3.61	0.000	Stationary
Stock Index Return Rate	-8.02	0.000	Stationary

In Table 3, which examines the stationarity at the first difference of variables, we see that all significance levels are less than 10%, rejecting the null hypothesis of non-stationarity at the first difference, concluding that all variables are stationary at their first difference, hence no problem exists for their estimation using the vector autoregression model. Determining the Appropriate Number of Lags in the Model In the model introduced in this study, the growth in deposit volume is a function of the deposit interest rate, stock price growth rate, currency rate growth, and gold coin price growth. Before estimating this specified equation using the VAR method, it's necessary to determine the optimal length of lags. For this purpose, the Akaike information criterion, Bayesian information criterion (Schwarz criterion), Hannan-Quinn criterion, likelihood ratio tests, and final prediction error are used. Bayesian information criterion, Hannan-Quinn criterion, likelihood ratio tests, and final prediction error suggest an optimal lag length of = P 3, and Akaike's information criterion suggests = P 5. Considering the VAR model's tendency towards more parameters and not losing information, taking into account the number of data available for estimation and also tests conducted on the residuals, we conclude to choose lag P=2. Table 4 shows information related to these criteria.

Table 4

Testing for Stationarity at the Initial Level (Lag Order)

Lag Order	Likelihood Ratio	Prediction Error Final	Akaike	Schwarz	Hannan-Quinn
0	NA	52077226	31.95	32.17	32.03
1	*111.51	*5591902	29.71	*31.07	*30.17
2	28.04	7942444	29.98	32.37	30.83
3	30.400	8916640	29.88	33.37	31.11
4	23.77	12335383	29.75	34.32	31.36
5	25.13	12359446	*28.81	34.48	30.81

*Indicates the optimal lag length in each criterion.

Johansen-Juselius Cointegration Test Given that some model variables are stationary at the first difference, we use the Johansen-Juselius cointegration test to determine the cointegration vectors. Based on selecting an optimal lag of two as the optimal lag for the vector autoregression model, using the trace test and maximum eigenvalue test, we determine the number of cointegration vectors and the rank of cointegration or the number of long-term equilibrium relationships in the model. Table 6 and Table 7 show the results related to the number of cointegration vectors by these two tests. According to the trace test results, the null hypotheses of zero and at most one long-term relationship are rejected as the significance level is less than 10%, and the opposite hypothesis of at most two long-term relationships is not rejected. Therefore, according to the trace test, we have two long-term relationships. The maximum eigenvalue test results are similar to the trace test, concluding that we have two long-term equilibrium relationships. In this section, the cointegration test using the Johansen-Juselius method is conducted to find long-term equilibrium relationships among the variables introduced in the previous section and estimate the long-term demand function for money in Iran. In this method, first, the maximum eigenvalue test and the trace test are used to determine the number of cointegration vectors. Johansen-Juselius state that in case of a discrepancy between the results of these two tests in determining the number of cointegration vectors, since the maximum eigenvalue test has a more decisive alternative hypothesis, this test is preferred over the trace test. Then, if the existence of a cointegration relationship is proven, normalization is performed on the vectors with respect to one of the desired variables, and based on economic theory, cointegration vectors that have an economic interpretation are selected. After that, the significance of each coefficient can be examined using the likelihood ratio (LR) test.

Table 5

The List of Variables

D(ASS)	1.070695	0.353596	0.243146	-0.462733	0.379063
D(EXE)	-9.776724	-4.893714	11.88393	0.190870	-1.115250
D(FUND)	-0.115075	0.037069	-0.011336	5.54E-05	0.022628
D(GOLD)	-4.599360	4.933143	3.426747	0.907272	-1.677972
D(STOCK)	1.612140	-0.352883	-0.960172	-4.315252	-1.221976

Table 6

Results of the Trace Test

H_0	H_1	statistics	trace	p
$r = 0$	$r = 1$	97.17	65.81	0.0001
$r \leq 1$	$r = 2$	48.07	44.49	0.0477
$r \leq 2$	$r = 3$	22.29	27.06	0.2823
$r \leq 3$	$r = 4$	12.14	13.42	0.1503
$r \leq 4$	$r = 5$	3.56	2.70	0.0589

Table 7

Results of the Eigenvalue Test

H_0	H_1	statistics	eigenvalue	p
$r = 0$	$r = 1$	49.09	31.23	0.0004
$r \leq 1$	$r = 2$	25.77	25.12	0.0836
$r \leq 2$	$r = 3$	10.15	18.89	0.7299
$r \leq 3$	$r = 4$	8.57	12.29	0.3234
$r \leq 4$	$r = 5$	3.56	2.70	0.0589

As seen in Table 6 and Table 7, based on the results of the trace test and eigenvalues, two cointegration vectors among the model variables have been confirmed. Estimation of the Long-term Relationship Between Variables At this stage, given that the existence of cointegration vectors among the variables has been confirmed, it is necessary to estimate the long-term relationship between the model variables and select the normalized vector relative to the first endogenous variable. In selecting the long-term vector among the model variables, it's important that the normalized vector relative to the first endogenous variable should have coefficients signs consistent with economic theories and that the coefficients of the vector are statistically significant. The optimal vector selected in this study is as follows:

$$ASS= -0.01EXE + 1.21\ FUND - 0.01\ GOLD - 0.04\ STOCK$$

This vector can be considered as representing a long-term financial relationship. This vector is normalized on the deposit volume to indicate a long-term financial policy equilibrium relationship between the deposit volume and the returns of various financial markets. As observed, the interest rate has a positive and significant impact on the

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E-ISSN: 3041-8992

deposit volume, indicating that the interest rate is cointegrated with deposit volume, stock returns, currency rate, and gold coin rate. Also, with the increase of this variable, the volume of deposits in banks increases. In VAR models, the numerical value of the coefficients does not have a particular meaning, and only the sign of these coefficients is interpretable. Regarding the impact of other variables, i.e., stock returns, currency returns, and gold coin returns, it's observed that the impact of these variables in the long term on the amount of deposits is negative, and as the returns in these markets increase, the volume of deposits in banks decreases. The Table 8 shows the software output regarding the cointegration vector.

Table 8

Software Output for Cointegration Vector

ASS	EXE	FUND	GOLD	STOCK
1.000000	-0.013085	1.211768	-0.017163	-0.041684
	(0.01735)	(0.09472)	(0.02429)	(0.02579)

Impulse Response Functions (IRF) Analysis After estimating the vector autoregression model with the optimal lag and testing for cointegration, we proceed to analyze the impulse response functions and the variance decomposition of forecast errors. To predict the impact of the return of each asset on changes in deposit volume over time, we generate IRFs. These functions model by applying a shock to one of the variables while keeping the conditions of the other variables constant, allowing us to observe the impact of each variable from the applied shock to the initial variable. Thus, the nature and intensity of the relationship, and even whether the impact of the shock is short-term or long-term, can be interpreted. The magnitude of the applied shock can vary, typically being a standard deviation of the target variable. Impulse response functions essentially show the dynamic behavior of the system's variables over time when a shock of one standard deviation occurs. Based on these functions, the reaction of endogenous variables in the system can be examined in the event other variables face a shock.

Figure 5

Impulse Response of Deposit Interest Rate Shock on Deposit Volume

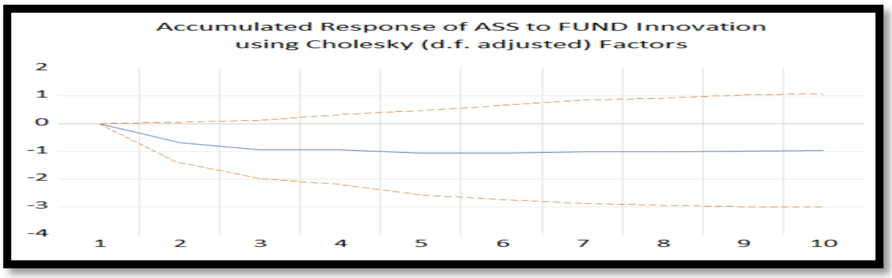

Figure 5 examines a shock to the deposit interest rate and its impact on the volume of deposits, showing that a shock to the deposit interest rate causes a decrease in the volume of deposits for up to 3 periods, after which it stabilizes but never returns to its initial investment volume. Thus, a negative shock to the currency rate causes a one percent decrease in the volume of deposits over three years, continuing at that volume thereafter.

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Figure 6

Impulse Response of Currency Rate Shock on Deposit Volume

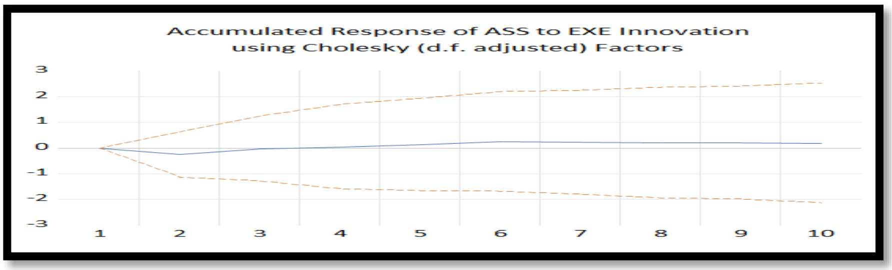

Figure 6 shows the impact of a shock to the currency rate on the volume of deposits in banks. The chart indicates that a negative shock to the currency rate causes a very slight decrease in investment volume for up to 2 periods, but in the long term, this decrease is compensated, ultimately reaching a higher ratio than the initial volume of deposits and stabilizing from the sixth year onwards.

Figure 7

Impulse Response of Gold Rate Shock on Deposit Volume

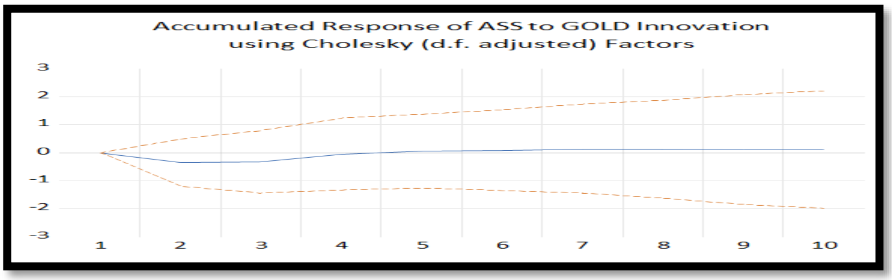

Figure 7, demonstrating the dynamic changes in investment volume if a shock is applied to the return rate of gold coins (such as Full Gold Coin), shows that the initial periods' shock leads to a decrease in investment in long-term deposits, but after a few periods, this rate increases and stabilizes.

Figure 8

Impulse Response of Stock Market Shock on Deposit Volume

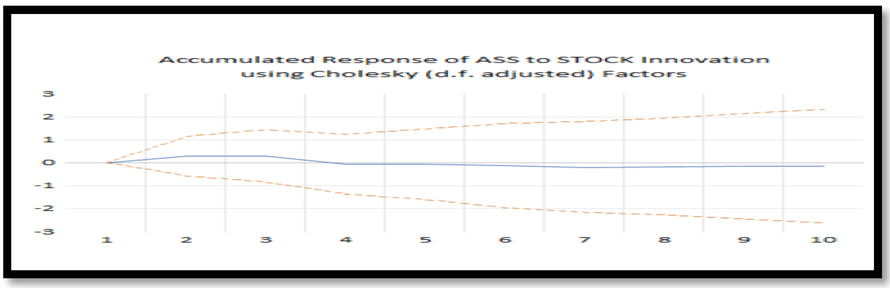

Figure 8 reveals that a negative shock to the stock market has a completely opposite effect on the volume of deposits compared to shocks applied to the return rates of gold coins and currency. In this case, an initial shock to the stock market return rate increases the volume of deposits in banks, but in the long term, the cumulative effect of this shock is negative. This could be because the stock market does not serve as a substitute market for bank deposits, and people who trade in

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E-ISSN: 3041-8992

this market are financial analysts who trade stocks and have no motivation to participate in bank deposits, not redirecting their capital towards banks and deposits when a shock affects the stock market return rate.

4 Discussion and Conclusion

The banking system plays a significant role in economic development, hence the stability of the banking system can play an essential role in economic stability. In our country, banks are the largest financial institutions, and credits, as the lifeline of the banking system, are affected by macroeconomic policies, especially in the financial and monetary domains. Considering factors related to macroeconomic and financial conditions not only helps control financial crises but also serves as a managerial tool for bank regulators in advanced economies. Attracting resources is a key, fundamental, and strategic objective of banks and credit financial institutions, playing a special role in providing bank services and is an important indicator in evaluating banks' success (Beshears et al., 2020; Safari & Rafti, 2018).

This research aims to select the optimal failure rate using the Conditional Value at Risk (CVaR) model and to study the change in deposit interest rate due to the application of the failure rate and its impact on the volume of deposits. Conditional Value at Risk, a measure from the family of downside risk metrics, measures the expected loss when the loss exceeds a determined VAR. Traditional risk metrics such as standard deviation and beta do not adequately represent what human experience perceives as risk. The general belief in financial literature is that VAR is a suitable approach for managing and controlling risk. Conditional Value at Risk, by eliminating general assumptions for risk measurement, provides more reasonable estimates of portfolio risk. Despite empirical evidence supporting VAR's efficiency in risk prediction, VAR is only a percentile and has its applications as a percentile but is not satisfying as a risk measure. The Conditional Value at Risk measure, which possesses the property of coherence, thereby has more credibility compared to VAR.

The current research approach in calculating Conditional Value at Risk does not impose any specific assumption on the distribution of asset returns and allows the data to speak for themselves as much as possible. In other words, the estimation of CVaR uses the latest empirical distribution of returns, not a theoretical distribution. The calculation of Conditional Value at Risk (CVaR) is such that it can be obtained by minimizing a more controllable function without the need to determine VAR beforehand and simultaneously obtain VAR as a by-product. In this research, selected portfolios using different levels of penalty rates on long-term deposits were obtained as follows:

In the first phase, the optimal portfolio among currency rate, gold coin, real estate, stock securities, and bank deposits without imposing any penalty on long-term deposits was determined. In this case, individuals with different risk levels allocate 95%, 57%, and 37% of their portfolio to bank deposits, respectively, for risk-averse, moderate risk, and risk-seeking individuals.

In the second phase, by imposing a penalty equal to 10% of the deposit profit, the optimal basket was determined. In this case, these three groups of individuals with different risks allocate 88%, 53%, and 36% of their capital to bank deposits, respectively. This decreasing trend in bank deposits continues until the penalty rate equals 25% of the bank deposit rate, beyond which no individual with any risk level is willing to deposit in the bank.

Subsequently, using a vector autoregression model, the impact of a shock in each of the asset markets on the volume of deposits was examined. In this model, using impulse response functions, it was shown that:

A negative shock to the deposit interest rate causes a decrease in the volume of deposits, and this trend remains stable in the long term. Also, long-term cointegration relationships here indicate a negative relationship in the long term from the deposit interest rate to the volume of deposits.

Impulse response functions related to currency rate returns and gold coin returns also showed that applying a shock to them would cause an initial negative reaction in the short term volume of deposits, but in the long term, this shock leads to an increase in the volume of deposits in banks.

The optimal vector selected in this study is as follows:

ASS = -0.01EXE + 1.21 FUND - 0.01 GOLD - 0.04 STOCK

As stated, this research selects the optimal failure rate using the Conditional Value at Risk (CVaR) model and studies the change in deposit interest rate due to the application of the failure rate and its impact on the volume of deposits.

According to the research findings, we will answer the questions posed in the first chapter:

What is the optimal penalty rate for encouraging individuals to deposit in banks?

As evident from the software output, the optimal penalty rate for encouraging individuals to deposit in banks is 10%.

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E-ISSN: 3041-8992

In this case, these three groups of individuals with different risks allocate 88%, 53%, and 36% of their capital to bank deposits, respectively.

Does the interest rate affect the penalty rate in banks?

Regarding this question, it cannot be directly stated that the interest rate affects the penalty rate in banks, but it is not without effect. If the interest rate and the penalty rate are high, and this increases individuals' inclination to use these deposits, it will lead to an increase in deposit volume.

What is the penalty rate for public and private banks?

As evident from the software output, the optimal penalty rate for encouraging individuals to deposit in banks is 10%. In this case, these three groups of individuals with different risks allocate 88%, 53%, and 36% of their capital to bank deposits, respectively. Usually, this penalty should be higher for private banks than for public banks.

Given the background of research conducted, it should be noted that no research aligned with the present study has been done to date, but studies close to this topic have been reviewed, and comparison with these studies shows that the present research is in alignment with previous research. According to the findings and analyses performed, it should be stated that the results of the previous research (John, 2020; Loloh, 2015; Mazlan et al., 2016; Pour-Abadolhan Kovich et al., 2017) are in alignment with the current research findings.

Practical Recommendations:

To improve the situation of bank deposit failure rates in Iran, modeling methods from successful countries in this area should be used.

Study the parallel markets and gather information in this regard.

Offer other facilities similar to bank facilities, life insurance, etc., on deposit accounts.

Change in the calculation system of profit and failure rate in long-term deposits.

Offer tiered methods regarding the penalty rate for bank deposit profits.

To determine the optimal deposit failure rate in the Iranian banking system, heuristic algorithms can be used, which are associated with minimal error.

To improve the quality of research in this area, mixed (qualitative-quantitative) research can be used, which are more credible and better aligned with reality.

Designing models that minimize the deposit failure rate while maintaining customer satisfaction in this area is very important.

Study and examine the factors affecting the changes in bank deposit failure rates.

Research Recommendations:

Investigate the factors affecting the failure rate of bank deposit profits.

Examine the moderating variables that increase the volume of bank deposits.

Conduct a comparative study between the optimal penalty rate for public and private banks.

Acknowledgments

The cooperation of all participants in the research is thanked and appreciated.

Declaration of Interest

The authors of this article declared no conflict of interest.

Authors Contributions

All authors have contributed significantly to the research process and the development of the manuscript.

Ethics principles

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.

References

Abbasian, E., & Saniee, E. (2017). Banks Income Forecasting Based on Deposits Composition Using Response Surface Methodology. *Financial Research Journal*, *19*(4), 579-594. https://doi.org/10.22059/jfr.2018.248037.1006569

Allen, F., & Gale, D. (2001). Bubbles and Crises. *The Economic Journal*, *110*(460), 236-255. https://doi.org/10.1111/1468-0297.00499

Beshears, J., Choi, J. J., Harris, C., Laibson, D., Madrian, B. C., & Sakong, J. (2020). Which early withdrawal penalty attracts the most deposits to a commitment savings account? *Journal of Public Economics*, *183*, 104144. https://doi.org/10.1016/j.jpubeco.2020.104144

Dib, A. (2010). *Banks, credit market frictions, and business cycles*. https://www.econstor.eu/handle/10419/53873

Fattahi, S., Rezaei, M., & Jahed, T. (2017). The Effect of Banking Soundness on the Profitability of Commercial Banks: Threshold Panel Regression Approach. *Journal of financial management strategy*, *5*(16), 29-50. https://journal.alzahra.ac.ir/article_2791_cbf789a212affa7b75e04ae1722123d4.pdf

Gerali, A., Neri, S., Sessa, L., & Signoretti, F. M. (2008). Credit and Banking in a DSGE Model. *unpublished, Banca d'Italia*. http://www.douglaslaxton.org/sitebuildercontent/sitebuilderfiles/gerali.creditandbanking.paper.pdf

González-Hermosillo, B., Pazarbaşioğlu, C., & Billings, R. (1997). Determinants of Banking System Fragility: A Case Study of Mexico. *Staff Papers*, *44*(3), 295-314. https://doi.org/10.2307/3867561

Heidari, H., & Molabahrami, A. (2017). The impact of credit shocks on dynamics of financial and macroeconomic variables using a DSGE model for the Iran economy [Research]. *Quarterly Journal of Economic Research and Policies*, *24*(80), 85-118. http://qjerp.ir/article-1-1390-en.html

John, A. (2020). When Commitment Fails: Evidence from a Field Experiment. *Management Science*, *66*(2), 503-529. https://doi.org/10.1287/mnsc.2018.3236

Loloh, F. W. (2015). Measuring Banking Sector Fragility for an Early Warning System in Ghana. *Available at SSRN 2627152*. https://doi.org/10.2139/ssrn.2627152

Mazlan, N. F., Ahmad, N., & Jaafar, N. (2016). Bank Fragility and Its Determinants: Evidence From Malaysian Commercial Banks. In J. Pyeman, W. E. Wan Rashid, A. Hanif, S. J. A. N. Syed Mohamad, & P. L. Tan, *Proceedings of the 1st AAGBS International Conference on Business Management 2014 (AiCoBM 2014)* Singapore.

Mirzaei, H., Falihi, N., & Mashadiyan Melki, M. R. (2012). The uncertain effect of macroeconomic variables (exchange rate and inflation) on the credit risk of legal customers of Tejarat Bank. *Journal of Financial Economics*, *6*(18), 113-137. https://sanad.iau.ir/journal/ecj/article_511610.html

Pour-Abadolhan Kovich, M. A. P., Hossein , Falahi, F., & Sattar Rostami, H. (2017). Measuring the fragility of Iran's banking system based on the BSFI index. *Journal of Financial Economics*, *12*(45), 1-26. https://journals.iau.ir/article_665839.html

Safari, S., & Rafti, M. (2018). Investigating the impact of economic factors on the volume of deposits of selected private banks in Iran. *Financial Economy Journal*, *13*(47), 199-216. https://journals.iau.ir/article_668632.html

Shahhoseini, S., & Bahrami, J. (2016). Assessment of Macroeconomic Fluctuations and Monetary Transmission Channel in Iran; Dynamic Stochastic General Equilibrium Approach. *Economics Research*, *16*(60), 1-49. https://doi.org/10.22054/joer.2016.4200

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E-ISSN: 3041-8992