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SITUATION ANALYSIS OF GRANTED FACILITIES IN THE ECONOMIC SECTORS OF SHAHR BANK

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ABSTRACT

Profit maximization and risk minimization are considered as objectives that financial institutions and credit agencies are always pursuing. This research was conducted within the framework of the granted facilities of Shahr Bank in Iran during 2012-2014, in which we have applied multivariate generalized autoregressive conditional heteroscedasticity (GARCH) model in the framework of Markowitz method to optimize the portfolio of Shahr Bank facilities. So that, Shahr Bank investment risk was first estimated in various economic sectors during the period of 2012-2014 using the multivariate GARCH model, and accordingly, the risk of Shahr Bank credit portfolio has been calculated for these years. The risk of a credit portfolio is then optimized relative to its return by applying the risk minimization method to the forecasted returns of Markowitz. The research findings show that the optimal portfolio of facilities differs from the current portfolio of the bank and covers the various constraints and policies governing on granting the facilities. In order to minimize risk and achieve specific returns, Shahr Bank should invest in various economic sectors, assigning 44% of the facilities in the commercial sector, 27% of the facilities in the service sector, 11% of the facilities in the industry sector and 18% of the facilities in the housing sector.

Keywords: Facilitate Portfolio, Optimum, Shahr Bank,

INTRODUCTION

Granting facilities is considered as one of the most important functions of banks. The banks, credit and financial institutions, on the one hand, keep money for people as deposits and give them their money rewards (interest) in return (the savings of those who have surplus funds are placed in such institutions). On the other hand, these deposits will be transferred by these institutions to those who need these funds (excess funds deposited in these institutions will be placed in units with savings). The mechanism of this transfer is the same as the process of granting facilities, of which the input is the demand of customers from banks and financial and credit institutions, and its output is the granting funds to them (Eletter et al., 2010).

Granted facilities are among the most important and most valuable assets of the bank, and a large part of the bank's income can occur through granting facilities. Hence, determining the optimal combination of granted facilities and portfolio management in order to increase returns and reduce risk is required in such operations (Mohagheghnia and Shirgholami, 2013).

Considering the above-mentioned facts and the policies related to the granting facilities, the method of allocating credit facilities to various economic sectors and its management approach is one of the main pillars of the bank lending program as the banks encounter the most risks and

various risks associated with the functions due to the nature of the services and the monetary intermediation. This is partly due to managers' decisions and to some extent due to the uncertainty surrounding the occurrence of an event. Banking operations have inherent and inevitable risk, and it is the responsibility of banks' management to handle all risks at an acceptable level in order to maintain the value and profitability of the bank (Khosh-Sima and Shahiki-Tash, 2012).

As a result, one of the important issues in banks that should be considered by banks' managers is the selection of the optimal ratio or weight of a credit portfolio (Malek et al., 2014) to various economic sectors in order to reduce risk. According to the matching principle, the bank forms a demand-driven portfolio of assets that actually represents the share of assets in total assets. Conversely, the bank considering the different profit and risk rates chooses a combination of portfolios to maximize its profit and, ultimately, the utility based on the profit maximization principle (Eletter et al., 2010).

The optimal rationing and allocating bank credits and facilities to the candidate economic sectors can actually direct the credits towards the desired sectors as a monetary policy tool. Managing the portfolio of facilities and optimally allocating bank credits and facilities to various economic sectors can partly reduce the risk of banking operations (Nadya et al., 2012).

In this regard, the present research aims to assess and select the best portfolio of facilities in different economic sectors according to the level of risk and its efficiency in Shahr Bank as one of the private banks in Iran.

RESEARCH MODEL AND HYPOTHESES

Two models have been applied in this research to achieve the research objective. In fact, the method is a two-step method: (1) the risk of granting facilities to various economic sectors should be estimated; and (2) this risk should be minimized to obtain a constant level of returns using a linear programming model. Thus, the optimum weights of grantable facilities to each economic sector are achieved, allowing Shahr Bank to achieve its desired returns with minimal risk.

Main hypothesis:

- The current share of the various economic sectors from the facilities of Shahr Bank has a significant difference with the optimal share.

Sub-hypotheses:

1. There is a significant difference between the available share and the optimal share of the business sector in Shahr Bank's facility portfolio.
2. There is a significant difference between the available share and the optimal share of the service sector in Shahr Bank's facility portfolio.
3. There is a significant difference between the available share and the optimal share of the industry sector in Shahr Bank's facility portfolio.
4. There is a significant difference between the available share and the optimal share of the housing sector in Shahr Bank's facility portfolio.

RESEARCH METHODOLOGY

The regression analysis method is used to study the research topic. To that end, the situation of the portfolio of facilities granted to the various economic sectors of Shahr Bank during 2012-2015 is determined on the basis of monthly information and the facilities with the highest weight. Markowitz model is then used to obtain optimal weights of facilities for various economic sectors in a portfolio. Therefore, it is necessary to have Shahr Bank's facility portfolio efficiency and risk. In the first step, the efficiency of granting facilities to various economic sectors and, as a result, the efficiency of the credit portfolio, were calculated; in the second step, the risk of granting facilities to these sectors was also estimated using the multivariate GARCH model, and Shahr Bank's risk of credit portfolios was calculated accordingly. Markowitz model was ultimately applied to minimize Shahr Bank's risk of credit portfolio in 2012-2015 at a constant level of facility efficiency; and an optimal portfolio consisting of the optimal weight of granted facilities of each economic sector, is determined accordingly. It is worth noting that econometric software such as Eviews8 was used to estimate and analyze the risk, and the MATLAB software was used to solve linear programming. In addition, one-sample t-test was used in order to determine whether or not the available and optimal situations of Shahr Bank have a significant difference in the allocation of resources among different economic sectors, that the test was performed using SPSS.18 software.

RESULTS

The volume of granted facilities has increased during the period 2012-2015 from 246.7 billion Rials in 2012 to 424.56 billion Rials in 2015; i.e., the volume of facilities in 2015 increased by 6 times compared to 2012. The largest change in the amount of granted facilities is related to 2014 with 159% change over the previous period. The share assessment of percentage of facilities granted to economic sectors also shows that the average of 39% facilities was allocated to the business sector during the period, which followed by the service sector with 32%. These two sectors aggregately account for 71% of the total facilities of the bank. In this study, the desired model is based on Markowitz theory of investment to achieve the optimal portfolio. According to this model, optimal risk levels are obtained at a certain level of efficiency based on minimizing the risk of facility portfolio (Chang et al., 2009). The standard form of this model, a linear programming model, is as follows.

$$\begin{aligned}
 & \text{Min } \sigma_{p,t}^2 \\
 & \text{s. t} \\
 & \sum_{j=1}^N X_{tj} Y_{tj} \geq \bar{G}_t \\
 & \sum_{j=1}^N X_{tj} = 1 \\
 & 0 \leq X_j \leq 1, \quad (j = 1, \dots, N)
 \end{aligned}$$

Where, X_{tj} is the weight of economic sector j in Shahr Bank's facility portfolio; $\sigma_{p,t}^2$ is the risk of facility portfolio return; Y_{tj} is the expected returns of the facilities granted to the sector j ; and \bar{G}_t



is the return of facility portfolio. Therefore, it is known that the proposed model is a linear programming whose target function is the risk of facility portfolio return and should be minimized in relation to the facility portfolio return, while the decision variable is also the weights of the economic sectors in Shahr Bank's facility portfolio. Hence, optimum weights are determined by solving this problem. Yet in order to solve this problem, it is necessary to have the return and risk of the portfolio of facilities for the desired period.

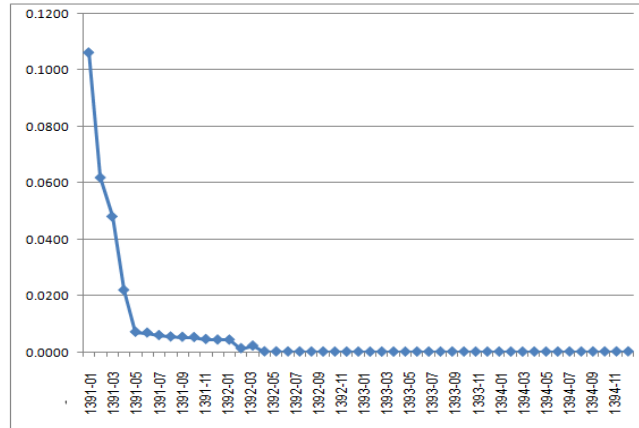


Figure 1: Risk of facility portfolio return of Shahr Bank from April 2012 to February 2015.

It is possible to determine the contribution of each section of granted facilities in investment portfolio over time so that the risk of desired portfolio is minimized to achieve a certain return after identifying the portfolio risk and constant return of facility portfolio consisting four sections with specific return and share. This is in fact the same as the Markowitz optimization problem, which is extracted by linear programming using MATLAB-Toolbox software related to optimization. The optimal shares are presented in Table 15. According to the results of the solution described in Table 1, the optimal shares of each of the economic sectors of facility portfolio of Shahr Bank have been obtained in a way that if Shahr Bank's managers allocate the priorities for resources by 44% to the business sector, 27% to the service sector, 11% to the industry sector and 18% to the housing sector, they can earn their expected returns with minimal risk.

Table 1. The optimal contribution of various economic sectors in Shahr Bank's facility portfolio for the period from April 2012 to February 2015

Date	Business sector	Service sector	Industry sector	Housing sector
12 months of 2012	0.0540	0.2553	0.0417	0.6490
	0.04169	0.1721	0.0320	0.3790
	0.6913	0.1561	0.0311	0.1215
	0.6556	0.1612	0.0302	0.1530
	0.5836	0.2313	0.0346	0.1505
	0.5500	0.2513	0.0421	0.1566
	0.5321	0.2789	0.0489	0.1401
	0.5345	0.2961	0.0591	0.1103
	0.4723	0.3099	0.0793	0.1385
	0.4508	0.3206	0.0888	0.1398
	0.4136	0.3499	0.1223	0.1142

	0.4925	0.3251	0.0865	0.0959
12 months of 2013	0.5011	0.3199	0.0995	0.0795
	0.4809	0.3296	0.1008	0.0887
	0.4911	0.3209	0.0988	0.0892
	0.4737	0.3129	0.1021	0.1113
	0.4728	0.3121	0.1036	0.1115
	0.4921	0.2891	0.1013	0.1175
	0.4805	0.2796	0.1214	0.1185
	0.4709	0.2799	0.1304	0.1188
	0.4811	0.2701	0.1469	0.1019
	0.4301	0.2711	0.1499	0.1489
	0.3971	0.2598	0.1436	0.1995
	0.4311	0.2311	0.1321	0.2057
12 months of 2014	0.4401	0.2203	0.1300	0.2096
	0.4321	0.2122	0.1223	0.2334
	0.4300	0.2178	0.1156	0.2366
	0.4364	0.2145	0.1143	0.2348
	0.4600	0.2049	0.1097	0.2254
	0.4431	0.2126	0.1198	0.2245
	0.4421	0.2132	0.1106	0.2341
	0.4311	0.2213	0.1161	0.2315
	0.4300	0.2293	0.1298	0.2109
	0.4301	0.2278	0.1236	0.2185
	0.4211	0.2409	0.1379	0.2001
	0.4065	0.2635	0.1366	0.1934
12 months of 2015	0.3998	0.2723	0.1281	0.1998
	0.3921	0.2706	0.1321	0.2052
	0.3921	0.2793	0.1386	0.1900
	0.3799	0.2998	0.1312	0.1891
	0.3706	0.3027	0.1416	0.1851
	0.3671	0.3153	0.1399	0.1777
	0.3501	0.3596	0.1321	0.1582
	0.3500	0.3432	0.1351	0.1717
	0.3522	0.3502	0.1301	0.1675
	0.3371	0.3598	0.1331	0.1700
	0.3198	0.3683	0.1398	0.1721
Average period	0.4396	0.2720	0.1080	0.1804



Sub-hypothesis (1) test: There is a significant difference between the available share and the optimal share of the business sector in Shahr Bank's facility portfolio.

For this test, the null hypothesis is in fact the absence of a significant difference, and the other hypothesis is the existence of a significant difference between the available share and the optimal share of the business sector in Shahr Bank's facility portfolio.

$$\begin{cases} H_0: \mu_1 = 39 \\ H_1: \mu_1 \neq 39 \end{cases}$$

A one-sample t-test has been performed for this purpose that the results are presented in Table 2.

Table 2. One-sample t-test of the share of business sector in Shahr Bank's portfolio of facilities

Test value = 39						
Variable	Frequency	Mean	Standard deviation	t-statistic	df	p-value
Business sector share in Shahr Bank's facility portfolio	47	04396	0.093	40.5	46	0.0000

Source: Research findings

As can be seen in Table 2, the significant value is zero and is less than the standard significance level (<0.05), so the null hypothesis- the absence of a significant difference- is not confirmed at 95% confidence level. Therefore, the share of the business sector from the portfolio of facilities was not optimal according to the decision of Shahr Bank's managers from 2012 to 2015.

Sub-hypothesis (2) test: There is a significant difference between the available share and the optimal share of the service sector in Shahr Bank's facility portfolio.

For this test, the null hypothesis is in fact the absence of a significant difference, and the other hypothesis is a significant difference between the available share and the optimal share of service sector in the Shahr Bank's facility portfolio.

$$\begin{cases} H_0: \mu_2 = 32 \\ H_1: \mu_2 \neq 32 \end{cases}$$

A one sample t-test has been performed to that end and the results are presented in Table 3.

Table 3. One-sample t-test of the service sector share in Shahr Bank's facility portfolio

Test value = 32						
Variable	Frequency	Mean	Standard deviation	t-statistic	df	p-value
Service sector share in Shahr Bank's facility portfolio	47	0.272	0.054	-33.21	46	0.0000

Source: Research findings

As shown in Table 3, the significant value is zero and smaller than the standard significance level (<0.05), so the null hypothesis- the absence of a significant difference- is not approved at the 95% confidence level. Therefore, the share of service sector from the portfolio of facilities was not optimal according to the decision of the Shahr Bank's managers from 2012 to 2015.

Sub-hypothesis (3) test: There is a significant difference between the available share and the optimal share of the industry sector in Shahr Bank's facility portfolio.

For this test, the null hypothesis showed insignificant difference, and the other hypothesis, on the contrary, reveals a significant difference between the available share and the optimal share in the industry sector of Shahr Bank's portfolio of facilities.

$$\begin{cases} H_0: \mu_3 = 13 \\ H_1: \mu_3 \neq 13 \end{cases}$$

A one sample t-test has been performed for this purpose and the results are presented in Table 4.

Table 4. One-sample t-test of the share of industry sector in Shahr Bank's facility portfolio

Test value = 13						
Variable	Frequency	Mean	Standard deviation	t-statistic	df	p-value
Industry sector share in Shahr Bank's facility portfolio	47	0.108	0.035	-25.4	46	0.0000

Source: Research findings

As seen in Table 4, the value of the significance is zero and smaller than the standard significance level (<0.05), so the null hypothesis- is not approved according to the absence of a significant difference at the 95% confidence level. Therefore, the industrial sector's share from facility portfolio, developed by Shahr Bank's managers from 2012 to 2015, was not optimized.

Sub-hypothesis (4) test: There is a significant difference between the available share and the optimal share of the housing sector in Shahr Bank's facility portfolio.

Through this test, the null hypothesis indicates that there is no significant difference between the available share and the optimal share of the housing sector in Shahr Bank's facility portfolio, but there is a significant difference between them according to the opposite hypothesis.

$$\begin{cases} H_0: \mu_4 = 17 \\ H_1: \mu_4 \neq 17 \end{cases}$$

A one sample t-test has been performed for this purpose and the results are presented in Tables 4-9.

Table 5. One-sample t-test of share of housing sector in Shahr Bank's facility portfolio

Test value = 17						
Variable	Frequency	Mean	Standard deviation	t-statistic	df	p-value
Housing sector share in Shahr Bank's facility portfolio	47	0.1804	0.089	-12.6	46	0.0000

Source: Research findings

As seen in Table 5, the numerical value of the observed significance is zero and smaller than the standard significance level (<0.05), so the null hypothesis to the effect of the absence of a significant difference at the 95% confidence level is not approved. Therefore, the share of housing sector was not optimal from the facility portfolio, according to the decision of Shahr Bank's managers from 2012 to 2015.

CONCLUSION

The status survey of Shahr Bank's facility portfolio during the period from March 2012 to February 2015 suggests that the largest share of the facilities was allocated to business sector



(39%) during this period, and the least share of the facilities was allocated to industry sector (13%).

In order to minimize risk and achieve a certain return, Shahr Bank must invest in various economic sectors, allocating 44%, 27%, 11%, and 18% of the facilities in business, service, industry and housing sectors, respectively.

Comparison of estimated optimal shares with the available shares of each sector of the facility portfolio indicates that Shahr Bank has harmonically acted with the optimal situation in terms of prioritizing the sectors. In other words, comparing the risk and return of different economic sectors suggests that Shahr Bank has further invested in the sector with the least risk for allocating resources.

A one-sample t-test applied to examine the sub-hypotheses to the effect that “the current share of each economic sector of the Shahr Bank’s facilities is not significantly different from the optimal share” indicates that there is a significant difference between the available situation and the optimal situation; as a result, the main hypothesis of the research is also accepted from this perspective. Therefore, in spite of Shahr Bank’s optimal behavior in prioritizing different sectors for allocation of facilities, considering the process of share of each section of facility portfolio and its estimated risk indicate that Shahr Bank acts as a risk-taker in this case. As well as, the sectors’ share from facilities has been in line with the risk trend for almost all periods. This means that Shahr Bank has allocated the economic sector more facilities in order to obtain more returns from it, in periods where the risk of this sector has increased.

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