Impact of Electronic Banking Innovations on Bank Deposit Market Share

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Abstract

Development and diversity of electronic banking services is one of the aspects of financial innovation of banks. In Iran's banking system, the development of multiple channels representing electronic banking services such as SWIFT system, ATM, POS, PIN pads, internet banking, mobile banking and telephone banking are made for more facility in paying money, so today, the development of this channels is one of the most competitive areas between banks for attracting resources. The main purpose of this study is to evaluate this innovation, which needs a heavy cost in terms of money and time, on the share of each bank in attracting deposit as one of the most important goals and competitive tools of a bank. By using Panel Data Vector Autoregressive methods (Panel-VAR) and Granger causality test, data of 23 Iranian banks in the 7 years (2007-2013) has been studied. The results show that based on the Granger Causality Test,

the number of ATM machines, POS, PIN pad, SWIFT system and amount of banking facilities provided by each bank, has causal relation in explaining the increase of the bank's share in attracting deposits; but the Market Share was recognized as the cause of the innovation. Also, the causality direction of deposits' share and the amount of facilities were noticed to be bilateral.

INTRODUCTION

It is of prime importance for banks to develop e-banking systems, which are easy to use, secure, and private for their users [1]. Development of electronic banking tools is one of the important aspects of banking innovation in order to create facility in different methods of money transfer. Such facility can have a positive effect on customer satisfaction and motivational factors in using them. The banks will also use several advantages, such as facility in banking operations and increasing transparency, which lead to improvement in bank performance. One indicator of better performance is increase the share of bank in attracting deposits, which in several studies the interactions between financial innovation and market share has been studied theoretically; But this issue gained less attention in scope of Iran's banking system studies.

This new mode allows the user to access to financial services in any time, place and context, thereby changing the rules of competition in the inter-bank. The banks are no longer just concerned about the number of outlets and coverage, but more focused on providing professional and personalized service [2].

In the last two decades with the approval of the automated banking system, establishment of Iran's IT services and SWIFT systems in 1993, the deployment of POS machines, ATM and Interbank Information Transfer Network (SHETAB) in 2002, using Real-time gross settlement (RTGS) in November of 2006, Automated Clearing House (ACH) in August of 2009 next to setting up new methods like telephone banking, internet banking and mobile banking in 2000s, are effective steps towards electronic banking development in this country.

The country's banks at first stepped into electronic banking because of the central bank's commitment to provide convenience for the customers. Currently these banks are trying to diversify and update their channels for their electronic banking services in order to maximize their deposits' recourses as one of their most important goals. On the other hand for bank's competition in attracting deposits, changing interest rates is

strictly prohibited by the Central Bank (Appendix).

In this study the impact of these innovations in the field of electronic banking on the share of each bank on attracting deposits in the country is examined by Panel Data Vector Autoregressive (Panel-VAR). For this purpose the data of 23 banks in the 7-year period of 2007-2013 is used. With this method the causal relation between variables of electronic banking such as ATMs, POS, PIN pads, number of SWIFT branches and variables of the amount of providing facilities with the share of each bank from attracting deposits can be examined.

LITERATURE REVIEW

Major changes in the financial products are part of financial innovation. A wave of financial innovation started in the early 1960s in the United States and then in other developed countries and developing countries respectively. Although, this wave is different among various countries, cases such as the development of new financial products and markets, securitization (diversification of financing tools), liberalization, globalization and more competition between firms is common among them.

In general financial innovation can be divided in two areas; the first one is innovation in the area of retail that includes new paying methods and shipping money and credit and the second one is innovation in the area of wholesale, which mostly is about the innovation in financial markets.

Following Trajtenberg's study economists found that the benefits of financial innovation can be quantified. Theoretically we can study the impact of innovation on social welfare, benefits of costs for new financial product development, expansion of economic rent seeking behavior and the desire to increase market share in competition with other firms [3].

In regard to the connection between financial innovation and market share, interacting relation can be imagined. Interpreting the impact of market share, many researchers expect expanding of strategic motives to expand the firm's power in market. Numerous empirical researches such as Scherer shows that the dominant firms on the market, are more willing to do Research and Development (R&D) and innovation (for example the Gilbert and Newbery studies in 1982 argued that monopolists have higher motivation in searching for innovation, because when more firms enter an industry, their total profit will be reduced. The entry of new firms has an externality effect that is often ignored by the entrants to the industry; while the ones that are already in the industry consider this effect important. The monopolists have a higher tendency to innovation and industry assessment in order to extend its dominant position on the market. Therefore the monopolists have a higher tendency to more innovation and industry assessment in order to extend their dominant position on the market. Meanwhile some studies claim theoretical reasons to argue about the negative relationship between innovation and market share [4]. For example, Reinganum [5] believes that a monopolist in a market

thinks he is without rival and considers his victory a permanent thing, therefore he feels no need to create innovation [5].

In the study of Blundell et al. [6] theoretically introduced the function of innovation as the following:

$$I_{it} = f\left(x_{it}, u_{it}\right) \qquad for \qquad i = 1,\ldots,N \qquad t = 1,\ldots,T \qquad (1)$$

In relation (1), Iit is the amount of innovation of firm i at time of t, xit is a vector of a firm's features (like lagged of market share), industry features and macroeconomic conditions and uit is non-visible factors. Since it is assumed that innovations in the coming periods will be searched by one firm, xit include lagged variables.

Blundell et al. [6] used panel data of 340 firms, active in the London Stock Exchange and reached to the conclusion that the market share has positive effect on innovation due to the strengthening of motivations; They have also considered retrocausality and come to the conclusion that the impact of innovation on market share for firms that have a higher market share, is more than others. The reasoning behind retrocausality is that the innovator firm wants its growth and therefore is looking for a higher market share [6]. A large body of literature in the field of financial innovation supports the impact of innovation on firm performance. Related to this various studies such as Damanpour and Ivan, Damanpour et al. Khan and Manopichetwattana, Zahra et al. and Agarval et al. can be named. Han et al. [7] believe that more innovator firms probably will have a better performance. In these studies for the performance, several indicators such as Return on Assets (ROA), Return on Equity (ROE), Gross Profit Margin, etc. are used, but in the market share, the market is considered as one of the performance indicators of the bank.

Usually service firms are developing new products and services, restructuring the existing products, changing in production methods, changing distribution channels, exploring new approaches in management or new competitive strategies [8]. Banks as financial service provider organizations are always looking for financial innovation. Financial innovations adopted by Banks are considered as a strategic variable for overtaking the rivals and an important tool for improving the performance and maintaining the effectiveness of the Bank on the market [9]. The adoption of innovation results in success, which is creating a unique competitive position for the bank that leads to financial performance improvement [10]. So this can achieve product creation processes by keeping the pace of innovation and improvement [11].

In this regard, over the past decade several studies has measured the impact of various tools and channels of electronic banking such as ATM, POS, electronic credit cards or debit cards, mobile banking, etc. as variables of bank's financial innovation on their performance indicators. For example the survey of Hasan et al. [12] has examined the Italian bank's performances from 1993 to 2003, and came to the conclusion that the use of Internet Banking by banks in that country has a positive impact on the bank's performance and is a factor in reducing risk. Hernando [13] have discovered a positive relation between the use of Internet Banking with profitability and earnings of Spanish

Banks in the period of 1994 to 2002. DeYoung [14] studied some internet banks in the United States between 1997 and 2001. According to him internet banks on average had lower profitability than their competitors in banking centers but have achieved higher economic cost, because over time they have become more competitive financial institutions. Delgado [15] have reached to same results as DeYoung [16].

DeYoung [16] studied the performances of United States Community Banks[1] as a result of adopting Internet Banking services from 1999 to 2001, using estimation methods by panel data and discovered profitability indicators - ROA and ROE - are affected by Internet Banking because with the expansion of internet services on deposits, the banks' commission incomes have increased. Muiruri et al. [17] did a research on the effect of financial innovation on the performance of commercial banks in Kenya using panel data estimation method. They found the impact of each variable - credit cards, mobile banking and internet banking - on the banks' financial performance positive. Muhammad et al. [18] in their research estimated the impact of investment in ATM and other electronic banking services on profitability indicators of ROA and ROE in Nigerian banks by panel data model in the period of 2001-2011, and found that such investments don't have a significant impact.

In general previous studies have shown that the relation between innovation and market share in the banking industry has gained special attention. Therefore studies on the banks' market share and financial innovation and interaction between these two in Iran can be a remarkable topic for the banking system.

RESEARCH METHODOLOGY

Vector Autoregressive (VAR) Liner Dynamical method was represented by Sims. Sometimes, it is possible that an economic theory does not have enough power to determine the specific relation between variables; in such situation VAR models can be useful. In addition, according to the theories of Pindyck and Rubinfeld, in some cases, it seems more logical to explain the dynamics of data in an equation. Therefore, while VAR method requires just little hypotheses for the structure of a relation in a model, it can also help researchers to study dynamic interactions between econometric variables. However many econometrics topics and issues are addressed in a way, in which data in the form of a long-term time period for conventional analyzes of VAR time models, cannot be reached. On the other hand, in some of the issues, discussion on the effects of economic variables (particularly financial variables) is at a level between countries or firms. These issues' analysis is possible by Panel-VAR models.

The general equation of Panel-VAR (P-VAR) with two variables (x and y) is as follows:

$$y_{i,t} = \alpha_0 + \alpha_1 y_{i,t-1} + \ldots + \alpha_p y_{i,t-p} + \beta_1 x_{i,t-1} + \ldots + \beta_m x_{i,t-m} + \eta_i + u_{i,t} \qquad (2)$$

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[1] These banks are often referred to as community banks, which do the banking activities in a specific geographic region and often have local customers and do services for small businesses and families.

In equation (2) t and y respectively represents time and sections, and values of α and β are model parameters and η_i is non-visible effects among banks. It is assumed that the Error Term (ui,t) has the Standard Normal Distribution and Serial Correlation.

According to theoretical arguments in the previous section and the purpose of this study by using an modified model of Muiruri et al. [17] the casual relations between innovation in electronic banking and the share of banks in attracting deposits can be adjusted as below; the general PVAR model in this study is as follows:

$$MS_{i,t} = \alpha_0 + \sum_{k=1}^{K} \gamma_k MS_{i,t-k} + \sum_{k=1}^{K} \beta_k X_{i,t-k} + \sum_{k=1}^{K} \lambda_k LO_{i,t-k} + \eta_i + e_{i,t}$$

$$X_{i,t} = \alpha_0 + \sum_{k=1}^{K} \gamma_k X_{i,t-k} + \sum_{k=1}^{K} \beta_k MS_{i,t-k} + \sum_{k=1}^{K} \lambda_k LO_{i,t-k} + \eta_i + e_{i,t}$$

$$LO_{i,t} = \alpha_0 + \sum_{k=1}^{K} \gamma_k LO_{i,t-k} + \sum_{k=1}^{K} \beta_k MS_{i,t-k} + \sum_{k=1}^{K} \lambda_k X_{i,t-k} + \eta_i + e_{i,t}$$

$$for \qquad i = 1,\ldots,N \qquad\qquad t = 1,\ldots,T \qquad\qquad (3)$$

In the equations above in MSi,t (Maret Share), i is the bank's share in year t in attracting deposit and Xi,t is a vector of variables of innovation in electronic banking services, which contains innovation variables like ATM, POS, PIN Pad and SWIFT[2]. Also LOit (Loan) is the mass of loans granted by the country's banking network, which is considered as one of the most important factors in affecting the Bank's share in deposits along with other innovation variables.

There are several methods to explore the causal relation between the variables of a VAR model, such as Granger, Sims, and etc. For explaining Granger's method it should be mentioned that if the effect of past values of the variable X in predicting the future values of variable Y has more significant effect than the past values of Y itself, then X is the cause of Y. The main condition in using the Granger causality test is having Stationary Data [19]. However, when analyzing causality by panel data, examining the homogeneity of sections or time periods is also important. If the F Leamer Test and determining the lack of homogeneity is being done, then the Granger causality test cannot be used.

If the data is not stationary the other methods of causality can be used, such as Hsiao, Toda and Yamamot only if the model's variables are integrated. When the data is stationary and the model is non-homogeneous in sections (not time periods) non-causal heterogeneous panel data methods of Hurlin can be used. So at the beginning of estimating it is necessary to ensure the stationary of variables and a homogeneous model.

Furthermore in order to smooth the data of bank's variables, natural logarithm of all

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[2] Society for Worldwide Interbank Financial Telecommunication

variables in this model has been taken; considering that most economic variables are non-residents in variance and this problem should overcome by Cox Box Transformation, and also that the best transformation for economic variables is to take natural logarithm from them, therefore by taking logarithm this big problem will be solved.

The data used in this study is gathered from annual statistics published by the Iran Banking Institute, which according to available data, the period of 6 years (2007-2013) is considered. The data from 23 public and private banks of the country has been used; the basis for selecting them was their information completeness of during that time period. It's important to notice that while determining the variable of the bank's market share, all types of deposits received by the country's banks except long-term investment deposits have been considered; the reason is that, long-term deposits don't have many e-banking services.

EMPIRICAL RESULTS AND DISCUSSION

As previously stated in the research methodology, it is necessary to first ensure the stationary of variables. Levin, Lin and Chu (LLC), Im, Pesaran and Shin (IPS), ADF - Fisher and PP – Fisher, Breitung and Hadri have recognized tests in researching stationary of panel data. The null hypothesis of all these tests except Hadri's is the existence of a unit root, with this difference that in LLC, Breitung and Hadri, it is assumed that unit root process is the same among all sections; But in other tests this process is considered with diversity [20].

In this study LLC test has been used as one of the valid tests for stationary panel data, and its results can be seen in the Table 1 below. The results show that all variables are stationary.

Table 1: The results of stationary variables test*

The variable	Statistic	Integration	Result
LMS	-6.5515*	I(0)	The process is stationary, with Y-intercept and no process
LLO	-17.4372*		
LATM	-19.4200*		
LPOS	-26.2454*		
LPIN	-77.7789*		
LSW	-23.0510*		

Being significant with 1% error

After checking if the variables are stationary, it is necessary to also examine the homogeneity of time periods and sections based on F Leamer Test. In this test the null hypothesis indicates the homogeneity in sections and time periods. This test is represented in Table 2.

Table 2: Homogeneity test results in sections and time periods

Homogeneity	F Statistic	P-Value	Result
section	1.297	0.276	Existence of homogeneous sections
time	0.662	0.580	Existence of homogenous time periods
section and time	0.327	0.569	Existence of homogenous sections and time periods

As Probability Values show, F-statistic is not significant in any error level. And there is a possibility of considering a joint Y- intercept for all sections and there are periods of time. Therefore, considering stability and homogeneity, Granger causality test method can be used. In order to perform this test, it is necessary that in the beginning select the optimal lag length of PVAR model. In Table 3 Akaike information criterion (AIC), Schwarz information criterion (SBC), Hannan-Quinn information criterion (HQC), Final prediction error (FPE) and Likelihood Ratio (LR) is calculated and based on their optimal value, maximum of lag length for the model has been chosen.

Table 3: Determining optimal lag length test

Lag	FPE	LR	AIC	SC	HQ
0	0.294454	-	15.80459	16.04078	15.893470
1	0.00000013	64.57783	1.192049	2.845373*	1.814206*
2	0.00000021	38.354550	1.595889	4.666347	2.751323
3	0.00000008*	75.58029*	1.81406*	4.916100	2.117219

*Amount of optimal lag length in each test

Optimal lag based on standards of Akaike, Schwarz Bayesian, Hanan Queen and final prediction error is the lowest level, and for LR statistic is the highest in each lag. As can be understood from Table 3, most of the tests implicate on three lags as optimal lag. Based on the resulted optimal lag, Granger causality test of PVAR model has been done in Table 4 and the results are presented.

Granger causality test results show that financial innovations in electronic banking services are the reason of changes in the share of banks in attracting deposit resources. Iranian banks in order to maintain their current position and promoting their attraction of deposits as one of the most important goals, have always sensed the need to increase the number of electronic channels, such as ATM, PoS, PIN pad and SWIFT and included this in their plans.

In the meantime, the amount of loans provided by banks next to the innovations is a significant factor in explaining the variables of banks' shares in attracting deposits. Also as it can be seen in row 6 of Table 4, the financial innovation variables in electronic banking along with loans are all the cause of the variable of banks' share in attracting deposits.

Table 4: Results of granger casuality test

Hypothesis	χ^2 Statistic	Hypothesis Result
LATM is not the cause of variable LMS	6.974360*	It is rejected
LPOS is not the cause of variable LMS	8.9323885**	It is rejected
LPIN is not the cause of variable LMS.	7.632909*	It is rejected
LSW is not the cause of variable LMS.	9.896304**	It is rejected
LLO is not the cause of variable LMS.	6.487764*	It is rejected
LMS, LPOS, LPIN, LSW & LLO are not the cause of LATM	27.11542**	It is rejected
LMS is not the cause of variable LATM.	1.507167	It is not rejected
LMS is not the cause of variable LPOS.	0.585757	It is not rejected
LMS is not the cause of variable LPIN.	1.864447	It is not rejected
LMS is not the cause of variable LSW	0.199529	It is not rejected
LMS is not the cause of variable LLO.	8.390879**	It is rejected

* and ** are being significant in error level 5% and 10% respectively

Moreover, the results of studies on banks' share on innovation show that banks' share in attracting deposits, is not a Granger cause for financial innovation, as can be seen the banks' share in attracting deposits is the only cause of variable loan. Development of banks' share and growing their power in Iran's economy, have led to offering more loan, because in addition to increasing the available resources for banks to provide the loan, there have also been profitability motivation by them. However it seems that the increased power of a bank only tend to increase its profitability tendency and is not effective on the development of electronic banking services channels.

CONCLUSION

This study has been done by the purpose of researching the effect of financial innovation of Iran's banks in the field of electronic banking services, based on Panel Data Vector Autoregressive and a search for causal relations. By studying literature of financial innovation and banks' share, it has been shown that development of market share and following that, growth of a firm's power can lead to strengthening that firm's motivation for more research, development and innovation. This motivation support shapes with the goal of maintaining their shares and accessing to more market share for the firm in future.

By selecting a sample of 23 public and private banks of Iran in time period of (2007-2013) an estimation of PVAR model has been done. The results of the study of causal relations between the variable of bank's share of deposit as dependent variable and banks' financial innovation in the field of electronic banking (number of ATM, PoS, PIN pad and SWIFT) as the explanatory variables, has shown that financial innovation next to loans provided by the banks, are the reason for changes in banks' share in attracting deposit resources.

Banks in this country, in their competition in order to survive, maintain the current position or promote in attracting deposits and in general for better performance, have developed the number of ATM, PoS, PIN pad and SWIFT. These results are consistent with the results of most previous studies in the topic literature section, in which innovation is recognized as an important factor in improving bank's performance and increasing firm's market share.

Also the study results on effects of bank's share on innovation have shown that the bank's share is the only cause for variable of loan and has no effect on innovation. Banks' share and a growth of a bank's power in Iran's economy has led to offering more loan, because in addition to increasing the available resources for a bank, in order to provide loan, there has been profitability motivation, derived from the same place. But it seems that the increase of a bank's power has only caused the increase of the bank's tendency for more profitability and has no effect on development of channels for electronic banking services. In fact, by increasing the power of a bank one can imagine a limit stop for financial innovation. These results are compatible with Reingaum's ideas about lack of necessity for innovation by powerful firms in the market.

So from the one-way causal relation of financial innovation to market share in the banking system and the interactions between the deposits share and loan, it can be concluded that in the Iranian banking system, financial innovation by banks leads to an increase of their market share for attracting deposits sources, and this in its turn is effective in increasing the market power of a bank. Such power with the intention of gaining more profits helps the expansion of loan, and eventually interests of society and the banks' grow together.

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