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**Original Research Article**

# The Effects of Asset Securitization on Banks' Performance (Case Study: Bank Saderat Iran 2005-2015)

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The purpose of this study is to investigate the effects of "Asset Securitization" on banks' performances. Asset securitization is generally defined as the "financial process by which an owner of an asset, such as a portfolio of loans, receives cash upfront in exchange for the future cash flows from the asset without selling the asset in a normal contractual sales agreement." (Menzi et al., 2018). Asset securitization has not been applied in Iranian banks so far. Therefore, we have devised an approach to examine the variation in performance in the presence or the absence of a securitized portfolio by using a "Propensity Score Matching" method. In this study, the effect of "Asset Securitization" is hypothetically assessed for Bank Saderat Iran. To show the meaningfulness of the difference between two states, "variance equality F-test" as well as "couplet-test" is used. The results show that "Asset Securitization" has a positive and meaningful effect on the net profit of the Bank Saderat Iran. Moreover, to study the relationship between profitability and non-performing loans, the Bayesian Vector Autoregressive model is applied, and the results show that non-performing loans harm the bank's profitability.

**Keywords: Asset Securitization, Banks' Operation Criteria, Matching Estimator Approach, Couple t-Test.**
**JEL Classification*:* G21, G23, E37, E47**

## 1 Introduction

Iran's financial system suffers from several malfunctions, which have made it a hurdle instead of a ladder to facilitate economic growth. It suffers from financial repression, a negative interest rate, lack of sufficient resources to grant loans. Insufficiency of resources is mostly due to granting long term credits such as home and industry loans. When resources are locked in long

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term loan contracts with low or negative interest rates in an inflationary environment, financial institutions become stuck in a vicious circle of the inefficiency of funds and losses. The real value of banks' financial assets diminishes as inflation soars. To avoid this miserable situation, banks may decide to reduce loanable fund capacity and engage in activities outside of their charter. Thus, it seems crucial to devise financial innovation to improve system performance. One candidate that could enhance the banks' performance is financial securitization.

Asset securitization is a financial innovation that began in the 1970s and has developed considerably since then. Before the financial crisis of 2007-2009, the asset securitization market enjoyed a high level of growth, which has continued globally as the investment opportunities developed. On the one hand, investment companies' demand for low-risk asset-based securities resulted in pouring funds to increase loan volume and to decrease the interest rates. For example, the mortgage-based securities market rose from $2.5 thousand billion in 1996 to $8.6 thousand billion in 2006. Moreover, the volume of asset-based securities increased from $400 billion in 1996 to $2.1 thousand billion at the end of 2006.

On the other hand, the practice of asset securitization has evolved, and necessary corrections have been made along the way. For instance, after the events of 2007-2008 in the subprime mortgage market, the participants of the market realized the need for regulatory and precautionary regulations on Banks' securitization activity. The Basel Committee made changes to the securitization sector to strengthen the Basel (II) structure. These changes advised are as follows:

1) Increase the risk of securitization activities and therefore raise the minimum capital requirement for such assets,
2) Identify the balance sheet and off-balance sheet securitized assets within the structure of capital adequacy, regulation, and valuation.
3) Improve disclosure of securitization activities, whether in balance or off-balance sheet items, to increase transparency

Due to improvements made, the market experienced a 33% growth over the years 2015 to 2017. The total volume of assets securitized increased from $701 billion to $931 billion (Menzi et al., 2018). Thus, this financial innovation has an immense capacity to help any economy, especially our Iranian economy.

In this paper, we will show that the implementation of asset securitization could enable financial firms to change the course to become the conduit of growth and property. When banks intend to facilitate asset securitization, they



[ DOI: 10.29252/jme.15.1.1 ]

will increase the interest rate, avoid grating loans to risky customers, and speed up the loanable fund circulation. This paper consists of 5 sections. Section (2) deals with the research background, section (3) provides the theoretical framework of securitization, section (4) presents the methodology, section (5) contains the empirical results, and finally, section (6) concludes the research.

## 2 Research Background

In the absence of empirical data on asset securitization in Iran, most of the studies cover theoretical and feasibility aspects of asset securitization.

Panachi (1988) suggests that funding through the sale of loans is less costly for banks than traditional methods of deposit funding or issuing equity because banks are no longer engaged in capital adequacy and reserve taking.

Rosenthal and Ocampo (1988) also found that the securitization helps banks to reduce their cost of funding by separating the credit risk of their securitized assets from other risks of the bank.

Minton, Saunders, and Strahan (2004) also reached the same conclusions in their studies and confirmed the funding hypothesis. They assumed that the financial firms that have more limitations in terms of financing, for example, institutions with high leverage ratios (having high debt-to-asset ratios) and riskier assets, should use the asset securitization more than other institutions.

Karaoglu (2005), reviewing the data of US banks holding company between 1997 and 2000, found that those banks who sell their loans or use the asset securitization have a higher loan-to-deposit ratio. The expected growth rate[1] is higher in these banks and creates a positive attitude in the investors to increase their investment. Besides, these banks are more motivated to avoid low-value investments.

Gorton and Souleles (2005) also argued that using asset securitization reduces the cost of funding because there are no costs associated with potential bankruptcy. Costs for the off-balance sheet liabilities incurred by the "Specific Purpose Vehicle," because the "Specific Purpose Vehicle" is legally independent of originating institutions.

Mousavian (2010) first looks at the history of converting bank assets into securities in conventional and Islamic banking system. Then he deals with designing an appropriate financial instrument for converting bank assets into securities and explaining its essential features in the Iranian banking system.

[1] The ratio of the equity market value to the equity book value



[ DOI: 10.29252/jme.15.1.1 ]

Le, Narayanan, and Van Vo (2016) investigated whether the relation between securitization and bank risk changes after the financial crisis of 2007 to 2009. Using accounting-based measures of credit risk and some on-balance sheet ratios, they found that before 2007, the securitization increased the bank risk. There was no evidence that the securitization increased the bank risk in the post-crisis period. These results were robust to different characterizations of securitization, the periods used to measure the changes in bank risk, and different estimation approaches. Their findings suggested that the economic losses that the banks suffered during the financial crisis and the new rules put in place in the aftermath of the financial crisis have diminished the incentives for the banks to engage in risk-taking via securitization.

Boesel, Kool, and Lugo (2017) raised the question of whether banks still issue ABSs as a way to receive funding. They considered the decline in the issuance of asset-backed securities (ABSs) since the financial crisis and the comparative advantage of covered bonds (CBS) as a funding alternative to ABSs. By applying double hurdle regression models to a dataset of 134 European banks observed during the period from 2007 to 2013, their study revealed that banks with a covered bond program (CBP) securitize less of their assets. The estimated difference in ABS issuance is driven mainly by banks being more likely to issue ABSs as a funding tool rather than trying to manage their credit risk exposure or to meet regulatory capital requirements. Consistently, a worse liquidity/funding position results in higher levels of securitization only for banks without a CBP.

Bedin, Billio, Costola, and Pelizzon (2019) also investigated the default probability, recovery rates, and loss distribution of a portfolio of securitized loans granted to Italian small and medium enterprises. They studied two pool cut-off dates: during 2011 and 2012 and from 2014 to 2016 by Italian banks. They indicated that bank securitized loans are less risky than the average loans to small and medium enterprises (SMEs). They used loan-level data information provided by the European Data Warehouse platform and employed a logistic regression to estimate the company default probability. Due to the non-existence of any analytical research, we have gathered mostly international literature.

## 3 Theoretical Framework

In the financial market, borrowers can obtain resources directly from depositors or through financial intermediaries. Financial intermediaries' liabilities are almost liquid, while their assets are illiquid. Thus liquidity management plays a vital rule in financial institutions' supervision, especially



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banks. Loans and other financial assets are typically long-term assets, freezing the banks' resources for extended periods. So banks and other financial institutions have come up with innovative solutions to solve this problem. Along the way, they have been inspired by the insurance industry regarding financing and transferring risks.

Insurance contracts cover the risk of unforeseen perils facing individuals and firms. Insurance companies were not able to cover many properties or people if they did not transfer risk and also premium to others. Since the early days of the insurance industry in the 16 century, insurers decided to share insured peril. These secondary insurers are called reinsurers. The primary insurers lower their risk exposure by ceding covered risk to other parties. Ceding parties' residual share enables them to cover sums of the insured properties several times greater than their capital. In reselling the insurance contracts, primary insurers receive a commission from reinsurers, which is part of their income. Suppose an Iranian insurance company in a competitive market, insures a refinery against fire hazards. The first insurance company may hold a maximum of 5% of the insured sum in its portfolio and assign the remaining 95% to reinsurers. Generally, 25% of any insurance policy issued in Iran goes to the Central Insurance Company of Iran.

Other reinsurers share the remaining 70% in various percentages. Reinsurance participation may be mandatory or voluntary reinsurance. Suppose a European reinsurance company will have to accept a share of the insurance sums under a specific contract. The reinsurer usually specifies for the primary insurer to comply with specific terms and conditions in issuing the insurance policies regarding acceptance of a risk, determining the premium and claims settlements. These conditions provide the necessary assurance to the reinsurers that their interest is taken care of by the primary insurance company. Compliance with the reinsurance policy may leave the primary insurance company with no reinsurance cover at all. Therefore Reinsurance oversight improves primary insurance company performance. We will show that a similar benefit exists under the securitization scheme.

In the securitization process, the originator bank acts as the primary insurance company by presenting its loan portfolio. The difference is that loans are sold either directly or through securitization. If the originator bank decides to prepare an attractive loan portfolio to assign, it would consider loans with lower risks, higher rates, and generally secure conditions. Thus a collection containing high-risk, cheap loans will not be welcomed. The originator bank gatherers homogenous loans in a specific pool and either offer



[ DOI: 10.29252/jme.15.1.1 ]

them directly to the applicants or, based on their value, new securities are published and presented to buyers. This process is called asset securitization.

### 3.1 The Concept of Securitization

In general, securitization refers to a structured process in which a bank converts its non-cash assets into marketable securities. Financial asset securitization collects a cluster of homogeneous loans with similar rate and cash flows and then transfers them into an SPV to deliver. Within this structure, there is a risk control unit that provides the funds needed to buy assets through the issuance of securities backed by the initial set of financial assets. Often, the SPV acts as a portfolio manager, i.e., it will place loans with different degrees of risk, various maturities in different bundles. Making bundles allows the SPVto separate loans based on their credit risk and place them in the bundles which the investors are willing to own. To guarantee a high credit rating for mortgage-backed securities, the originator bank's SPV guarantees a proper credit limit.

Asset securitization benefits Banks in many ways, including the followings:

1) Diversifies the bank's loan basket (Pavel & Phillis, 1987),
2) Banks would move toward activities in which they have a comparative advantage (Pavel & Phillis, 1987; Thomas, 1999),
3) Banks create a financial network for ongoing operations and acquiring new assets (Karaoglu, 2005),
4) Banks can reduce the cost of financing (Pennacchi, 1988) through securitization procedures.
5) Originating Banks can enhance their Credit Risk Management (Cantor & Rouyer, 2000),
6) Banks can improve their overall performances (Wolfe, 2000) by entering in Securitization contracts.

Securitization could also generate adverse results in practice:

7) Originating Banks may assign loan contract haphazardly since they think they will sell or cede later on through securitization (agency Problem). Alternatively, banks may surrender the proper asset utilizing securitization, thus leaving weak quality assets in Banks' portfolios.
8) Banks may miss behaving after securitizing their assets in risk-taking and credit supply (Panetta & Pozzolo, 2018).

In asset securitization, a group of homogeneous financial assets with similar maturities and cash flows are pooled and transferred to an SPV. The SPV is independent of the investor or the originator bank to ensure that in the



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event of originators bankruptcy, the credit status of the pooled loans will not be affected. To finance the purchase of such assets, the SPV shall issue securities backed by those assets and sell them on the open market. Thus, the SPV, which converts the asset into securities, receives a sum of money initially paid to acquire the said assets and uses the proceeds for the acquisition of new assets and covering the operational costs.

Securitization of the pooled loan differs from selling a loan portfolio by originating banks. The first difference is related to the structure of these two processes. Thus, if one decides to securitize, it is necessary to follow the five steps of the structuring process as the following suggests:

Receiving the assets from the originators who are the primary Banks.

Forming a SPV and transferring the pooled assets to it to issue securities.

Evaluating the creditworthiness of the pooled assets.

Issuing the securities which will be backed by the pooled assets.

Preparing a channel for funds transmission.

Now we will elaborate these steps further to see how going through them could enhance the banks' performance.

Receiving the assets from the originator

The originator bank identifies the loans that it chose to cede and transfer loans to SPV for bundling.

Forming a SPV and transferring the financial assets

The originator transfers the selected assets to the SPV to issue new securities backed by these assets. The legal nature of the SPV can be a non-public limited partnership, a limited liability company, a trust, or a joint-stock company. In general, the SPV operates with small sum capital, and it manages the input-output of the portfolio in hand. Finally, the legal structure of the SPV should be designed in a way that minimizes the probability of bankruptcy.

Evaluating the creditworthiness of the pooled loans

- It is necessary to upgrade the credit ranking of the SPV to reduce the investors' risk. To enhance the credit ranking of the SPV, one has to ask the ranking agency and the guarantor to examine the characteristics of the assets backing the securities. Features such as credit ranking, credit ceiling, claim at the balance, underline volume and cash flow, geographical distribution, performance history, and transaction structure should be considered. The credit ranking upgrade process can be done internally, externally, or a combination of both.
- Issuing the securities



[ DOI: 10.29252/jme.15.1.1 ]

- Payment for securities backed by revolving loans such as credit cards, receivable accounts, and credit lines for house purchasing (Pay-Through) has two stages: 1) revolving period and 2) depreciation period.
- Preparing a channel for funds transmission
- The last stage relates to the allocation of proceeds from the securitized assets among the beneficiaries. The payment of proceeds depends on the type of securities issued, which depends on the nature of the underlying loans

## 4 Methodology

### 4.1 Analyzing the banks' performance using Propensity Score Matching (PSM)

Comparing the Banks' performance before and after the "securitization" may provide us with biased estimates. Since the change in the performance may be due to other visible and invisible factors besides securitization. To solve the problem, we have used the "Propensity Score Matching" method. The PSM method is a standard nonparametric method widely used to investigate causal effects, especially in analyzing the policymaking effects.

The PSM is new in financial literature, while it has been employed widely in sciences such as statistics, economics, and medicine over the past three decades. For example, Persson (2002) used this method to examine the effects of monetary entities' integration on corporate business growth. Hutchinson (2004) has also studied the effect of IMF partnerships on output growth using the Score Matching Method. As Caliendo and Kopeinig (2008) suggest, the matching methodology can be applied to any evaluation case where the following conditions are met:

1) There is a "selected policy."
2) One group is exposed to the chosen policy (target group).
3) The other group is not exposed to the chosen policy (control group).

The present study also uses a score matching method to investigate the effects of asset securitization on banks' performance.

#### 4.1.1 The framework of the Propensity Score Matching (PSM) method

Rosenbaum and Rubin (1983) introduced the technique for statistical analysis of observable data. This method tries to minimize the deviations caused by the disturbing variables during the estimation process. Accordingly, the researcher provides two samples of subjects. One group is exposed to "selected policy," and the other is not exposed to it. Thus these two groups are similar in every aspect, except that one is subjected to the policy introduced.



[ DOI: 10.29252/jme.15.1.1 ]

The conventional methods commonly used to control disturbing variables, including matching, classification, and regression models, all have the limitation that they can control a limited number of auxiliary variables. So while it seems natural to find the identical samples, it is often difficult to find samples similar across all important disturbing variables. As a result, the PSM method is used. The matching score for each factor is defined as the conditional probability that the policy will be selected on the condition that the prerequisite factors are specified, namely:

$$e(x_i)=pr\ (Z_i=1\ |X_i\ = x_i) \quad (1)$$

Accordingly, for factor i, if it belongs to the target group, $Z_i = 1$ and if it is in the control group, $Z_i = 0$. Conventionally in econometrics, the effects of a policy are estimated through virtual endogenous repressors that allow individuals and institutions to be classified into two distinct groups: target and control.

Although the basic concept of the PSM method is simple, it is not easy to apply because it is difficult to match two or more firms with the same multidimensional characteristics, especially when the number of variables is large. The PSM method solves this problem by reducing multidimensional matching to one-dimensional matching. Thus, multidimensional features are conceived as one-dimensional probability, and again the requirements for other similarities are met. Rubin and Thomas (1992) have shown that using the Propensity Score Matching method can overcome selection bias (a form of extroversion problem).

## 4.2 Analyzing the banks' performance using Bayesian Vector Autoregressive Model (BVAR)

One way to study economics data is to use an autoregressive vector model. However, there is a critical problem using these models: many parameters must be estimated using a finite set of data. One way to solve this problem is to use more sets of data or try to reduce parametric set by imposing limitations on parameters. The Bayesian vector autoregressive model is a useful structure in this respect. The prior Bayesian functions provide a rational and consistent algorithm to impose constraints on model parameters (Litterman, 1986).

The Bayesian analysis method considers prior, likelihood, and posterior distribution functions. In fact, in this structure, any uncertainty about the correct value of a phenomenon (e.g., model parameters) is treated as though the variable under consideration is a random variable. Therefore, a probability



[ DOI: 10.29252/jme.15.1.1 ]

distribution can be assigned to it. The prior distribution function is the same set of additional information added to the set of model parameters. The likelihood function contains information from the data set. Finally, using Bayes' rule, the prior distribution function is combined with the likelihood function, and the result would be the following distribution function.

According to Bayes' rule, if $\theta = (\beta, \Sigma)$ is the vector of the model parameters $y$ is the observation vector, $\pi(\theta)$ is the prior distribution function, and $l(y|\theta)$ is the likelihood function. The function of the posterior distribution $\pi(\theta|y)$ is:

$$\pi(\theta|y) = \frac{\pi(\theta)l(y|\theta)}{\int \pi(\theta)l(y|\theta)d\theta} \quad (2)$$

Since the denominator of the fraction is an integral and therefore a constant, so the posterior distribution function will be the product of the likelihood function and the prior distribution function:

$$\pi(\theta|y) \propto \pi(\theta)l(y|\theta) \quad (3)$$

To relate this structure to the Bayesian Vector Autoregressive Model (BVAR), we first consider the autoregressive vector pattern with p intervals:

$$y_t = a_0 + \sum_{j=1}^{p} A_j y_{t-j} + \epsilon_t \quad (4)$$

Where $\epsilon_t$ is the error vector with the normal distribution, i.e., zero mean and Σ variance. The compact form of the above relationship is:

$$Y = XA + E \quad (5)$$

This form is equivalent to:

$$y = (I_m \otimes X)\theta + e \quad (6)$$

Where m is the number of dependent variables of the model, Y and E are matrices consisting of T observations of m dependent variable and a matrix $X = (x_1 \ldots . x_t)'$ with $T \times (mp + 1)$ dimension where each component of the matrix X is $x_t = (1. y'_{t-1} \ldots . y'_{t-q})$. Also $I_m$ is the unit matrix and $\theta = vec(A)$. The value of the disturbing variable is defined as $e \sim N(0, \Sigma \otimes I_T)$. Moreover, considering the relation (6), the likelihood function will be:



[ DOI: 10.29252/jme.15.1.1 ]

$$l(\theta.\Sigma) \propto |\Sigma \otimes I_T|^{-\frac{1}{2}} \exp\{-\frac{1}{2}(y-(I_m \otimes X)\theta)'(\Sigma \otimes I_T)^{-1}(y-(I_m \otimes X)\theta)\} \quad (7)$$

To illustrate how to derive the posterior distribution moments, we assume, based on prior information, that the value of Σ is specified and that the vector $\theta$ has a multiple normal prior distribution function as follows:

$$\Pi(\theta) \propto |V_0|^{-\frac{1}{2}} \exp\{-\frac{1}{2}(\theta-\theta_0)'V_0^{-1}(\theta-\theta_0)\} \quad (8)$$

Where $\theta_{0,}$ is the prior mean and $V_0$is the prior variance. By combining the prior distribution function (8) with the likelihood function (7), the posterior distribution function is:

$$\Pi(\theta|y) = \exp\{-\frac{1}{2}((V_0^{-\frac{1}{2}}(\theta-\theta_0))'(V_0^{-\frac{1}{2}}(\theta-\theta_0)) + \{(\Sigma^{-\frac{1}{2}} \otimes I_T)y - (\Sigma^{-\frac{1}{2}} \otimes X)\theta\}'\{\left(\Sigma^{-\frac{1}{2}} \otimes I_T\right)y - \left(\Sigma^{-\frac{1}{2}} \otimes X\right)\theta\})\} \quad (9)$$

by defining the following vectors:

$$\omega = \left[V_0^{-\frac{1}{2}}\theta_0 \ .\left(\Sigma^{-\frac{1}{2}} \otimes I_T\right)y\right] W = \left[V_0^{-\frac{1}{2}} \ .\left(\Sigma^{-\frac{1}{2}} \otimes X\right)\right] \quad (10)$$

then we can rewrite relation (9) as follows:

$$\Pi(\theta|y) \propto \exp\{-\frac{1}{2}(\omega - W\theta)'(\omega - W\theta)\} \propto exp\{-\frac{1}{2}(\theta-\bar{\theta})'W'W(\theta-\bar{\theta}) + (\omega - W\bar{\theta})'(\omega - W\bar{\theta})\} \quad (11)$$

Where $\bar{\theta}$ is the mean of the posterior distribution and estimated as:

$$\bar{\theta} = (W'W)^{-1}W'\omega = [V_0^{-1} + (\Sigma^{-1} \otimes X'X)]^{-1}[V_0^{-1}\theta_0 + (\Sigma^{-1} \otimes X)'y] \quad (12)$$

Given that $\Sigma^{-1}$ is a definite value, then we can write the distribution function as:

$$\Pi(\theta|y) \propto exp\{-\frac{1}{2}(\theta-\bar{\theta})'\bar{V}^{-1}(\theta-\bar{\theta})\} \quad (13)$$

The posterior variance-covariance matrix ($\bar{V}$) is calculated as:



[ DOI: 10.29252/jme.15.1.1 ]

$$\bar{V} = [V_0^{-1} + (\Sigma^{-1} \otimes X'X)]^{-1} \quad (14)$$

As the above equations indicate, the Bayesian estimation starting point defines the initial point for the parameters of the prior distribution function. Various methods have tried to define the parameters of this distribution function. In this paper, we have used the Sims and Zha (1998) approach. In this method, first, the variance-covariance matrix Σ is subdivided as follows:

$$\Sigma = A_0^{-1\prime} A_0^{-1} \quad (15)$$

Then the matrix $\tilde{A}$ is defined as the coefficients matrix of the interruption of the variables:

$$YA_0 - X\tilde{A} = E \quad (16)$$

Accordingly, the prior distribution function will be:

$$\pi(A_0)\pi(\tilde{A}|A_0) = \pi(A_0)\varphi(\theta_0, H_0) \quad (17)$$

Where $\pi(A_0)$ is the marginal distribution of $A_0$ and $\varphi(\theta_0, H_0)$ is the normal distribution with the mean of $\theta_0 = \tilde{A} - \mu(A_0)$ and the variance-covariance matrix of $H_0 = H(A_0)$.

Accordingly, in this paper, a Bayesian vector autoregressive model based on the Sims and Zha (1996) approaches estimated, with three variables: net profit of Saderat Bank, allowance for doubtful debts, and non-performing loans.

## 5 Empirical Results

As mentioned above, this paper deals with the effects of asset securitization on the performance of Saderat Bank using the Propensity Score Matching method and the Bayesian Vector Autoregressive Model. The PMS method is utilized in two approaches. In the first approach, the question is, how far can Saderat Bank increase its financial profit if it cedes its non-performing loans? Moreover, does this increase in profits significantly affect the bank's performance? In the second approach, we assume that Saderat Bank, under the current instructions of the Central Bank of the Islamic Republic of Iran and the government resolution dated 1397/04/06, assigns a percentage of its current loans through securitization. In this case, what can be expected of the bank's profit? Each of these two approaches is described below and then statistically analyzed.



[ DOI: 10.29252/jme.15.1.1 ]

## 5.1 Approach One: The Effect of Securitizing Bank's Non-Performing Loans

According to our surveys of Iranian banks, so far, no bank has performed securitization, so it is impossible to have a control sample. Thus we have to select a target sample of loans that Saderat Bank is eager to offload. In more reasonable conditions, Banks bundle well-assigned loans and cede them through SPVs. The control unit is similar loans that banks keep in their portfolio. These two sample performance will be compared to check for the outcome of securitizations. However, since we do not have a target sample as explained before, we have decided to choose a sample of non-performing loans the bank wants to get rid of. In such a situation, a non-performing asset should be ceded at a reduced price. If so, they suffer loss; however, the bank's loss could decrease from a total loss to partial loss. By this policy, banks increase the interest in ceding loans. So we compare the situation when junk loans are kept with the condition that they are not.

To recover the loans, banks can cash the collateral of bad loans. Banks can outsource the collateral collection to other professional firms and earn a percentage from refundable loans. Those who buy these junk loans through issued bonds accept the risk by receiving higher interest rates.

In the present environment of the banking industry in Iran, Banks are required to maintain a reserve for non-current loans[1], which reduces the bank's capacity to lend further. Transferring non-performing loans will reduce the risk associated with these junk assets, even under Bazzel (3) programs. In case that reimbursement period is extended to 18 months or more, the bank is required to make an allowance for doubtful debts from 50% to 100% of the loan capital. Based on the data of Bank Saderat Iran, we have selected the target (equivalent to the sums of the non-performing loans) and control unit with similar size to check for the effects of securitization on the bank's profit and performance. Accordingly, the first variables used in this study are non-performing loans and allowance for doubtful debts, the trend of which during the period of 2006-2015 is shown in Table (1):

[1] Loan whose installment have not been reimbursed for 2 to 6 months.



[ DOI: 10.29252/jme.15.1.1 ]

Table 1
*The direction of non-performing loans and allowance for doubtful debts in Saderat Bank in the period 2006- 2015 (billion Rials)*

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Allowance for Doubtful Receivables | 29 87 | 34 54 | 61 7 | 75 4 | 28 53 | 59 29 | 76 24 | 37 53 | 69 11 | 68 02 |
| Non-Performing Loans | 29 86 | 34 91 | 23 16 | 14 93 | 33 99 | 59 29 | 76 24 | 37 53 | 69 11 | 93 02 |

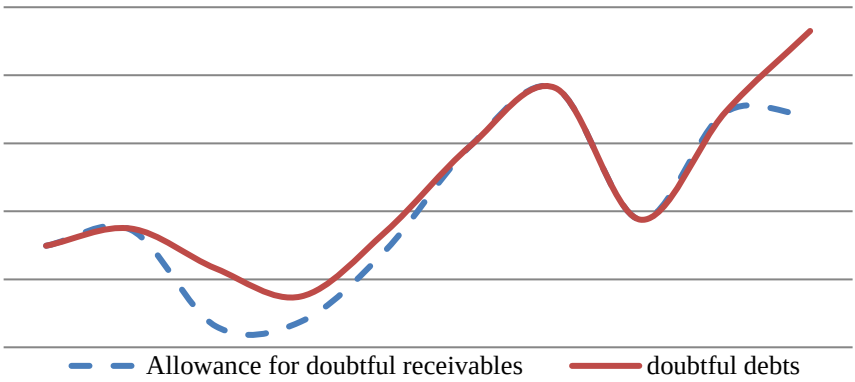


*Figure 1*. The trend of non-performing loans and allowance for doubtful debts in Saderat Bank in the period 2006- 2015 (billion Rials).

According to Figure (1), the volume of allowance for doubtful debts and non-performing loans has shown an upward trend over time, with a 127% growth rate at the end of the period (2006-2015).[1]

Allowance for doubtful debts and non-performing loans have reduced the Saderat Bank profitability, and proposed securitization could improve the situation. Now we will present the model to enhance the profitability of the bank. A hypothetical change in profit of the control unit where loans are not subject to securitization is shown by $\Delta y_{t+1}^{0}$. Notation $\Delta y_{t+1}^{1}$ represents an improvement in bank target group profit when securitization is utilized at period t. Accordingly, we would have$\Delta y_{t+1} = y_{t+1} - y_{t-1}$. Thus, the effect of securitization can be defined as follows:

[1] Except for years 2008 and 2013



[ DOI: 10.29252/jme.15.1.1 ]

$$\hat{\alpha} = E(\Delta y_{t+1}^{1}|S = 1) - E(\Delta y_{t+1}^{0}|S = 1) \quad (18)$$

In Equation (1), S = 1 means the first time that the bank has utilized securitization. But the problem here is that one can observe the value of $\Delta y_{t+1}^{0}$, but not $\Delta y_{t+1}^{1}$. To solve this problem, we need to set a proxy for $E(\Delta y_{t+1}^{1}|S = 1)$. Since the bank has not performed securitization, thus in state S = 0, Equation (18) can be written as follows:

$$\hat{\alpha} = E(\Delta y_{t+1}^{1}|S = 0) - E(\Delta y_{t+1}^{0}|S = 0) \quad (19)$$

Except for the situation where a variable is similar at S = 0 and S = 1, in other cases, the relation (19) is a skewed estimator of Equation (18) whose degree of skewness is equal to "choice skew" (Heckman-Smith, 1995). The "choice skew" stems from the fact that first-time securitization and non-securitization may be systematically different from the securitization period. In other words, banks' behavior may change from t-1 to t + 1.

To eliminate "choice skew," one can use (1) an instrumental variable estimator, (2) Heckman two-stage estimator, and (3) a matching estimator.

The matching estimator approach is a nonparametric approach to determine the effect of behavioral change. The main idea behind this approach is to find a control group and a large group similar in all aspects except for the implemented change (Rawlinson, 2003). Thus the target group includes the bank using securitization. However, before applying securitization, the bank should behave like those not exercising securitization.

$$\hat{\alpha} = E(\Delta y_{t+1}^{1}|S = 1.X_{t-1}) - E(\Delta y_{t+1}^{0}|S = 0.X_{t-1}) \quad (20)$$

That $X_{t-1}$ is a visible variable that can explain the change in bank behavior. In this study, this variable is the volume of the allowance for doubtful debts and non-performing loans, which are considered a benchmark of securitization and affect the bank's performance.

The first step in analyzing a matching estimator is to compare the securitized-state characteristics with the non-securitized state. Since our focus is on the financial indicators of the Saderat Bank, we compare the present state of Saderat Bank (with allowance for doubtful debts and non-performing loans) with the state in which Saderat Bank has got rid of both. Table (2) shows this comparison:



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Table 2
*Comparison of financial ratios in securitized and not- securitized state*

| Variable | Definition | Securitized State (%) | Not-Securitized State (%) |
|---|---|---|---|
| **Interest Expenses Ratio** | Interest Expenses/Liabilities | 0.8 | 0.8 |
| **Liquidity Ratio** | Liquid Assets/ Total Assets | 47 | 46 |
| **Loans Ratio** | Loans/ Total Assets | 52 | 50 |
| **Deposit Ratio** | Deposits/ Total Assets | 68 | 68 |
| **Equity Ratio** | Equity/ Total Assets | 8 | 7 |
| **Return on Assets** | Net Profit/Assets | 2 | 0.7 |
| **Return on Equity** | Net Profit/Equity | 22 | 10 |

Before analyzing the above ratios, we will explain the procedure through which they are calculated. First, current assets here only consist of cash balances, other accounts receivable, central bank receivables, other banks and corporate receivables, 46% non-government receivables, bonds, equity, and securities. Second, assuming that the volume of allowance for doubtful debts and non-performing loans can enter into the bank's resources, thus banks can use these resources to improve its performance through securitization.

By transferring the allowance for doubtful debts from other assets heading, the ratio of interest expense will not change, but the current assets will increase. Therefore the ratio of existing assets to total assets will increase[1] too, and as the bank's lending capacity increases, the ratio of loans to assets increases by 2%. With the increase in bank loan capacity, the bank's earnings will expand equally. According to the data obtained from the central bank time-series database, the interest rates on the participatory loans in national banks in the period of 2005 to 2015 were 16%, 14%, 12%, 12%, 12%, 14%, 15%, 15%, 15%, 22%, and 21%, respectively. As a result of new income from additional credits, the equity ratio, return on assets, and return on equity increase to 1%, 2%, and 22%. As expected, securitization will help net profit, equity, and other related indices of the bank.

If we base the performance on net profit, then the net profit of Saderat Bank in non-securitization and securitization state are shown in Table (3):

[1] Utilizing this new resource, the bank can grant facility to non-governmental section and therefor equal to 46% of these allowance would be added to current assets.



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Table 3
*Comparison of net profit of Saderat Bank in non-securitization state and securitization (billion Rials)*

| Year | Profit in Securitized State | Profit in Non-Securitized State | The Effect of Securitization ($\hat{\alpha}$) |
|---|---|---|---|
| **2005** | -3152 | -14458 | 11306 |
| **2006** | 16525 | 8228 | 8297 |
| **2007** | 14506 | 9888 | 4618 |
| **2008** | 16501 | 7887 | 8614 |
| **2009** | 11763 | 5031 | 6732 |
| **2010** | 12870 | 8596 | 4274 |
| **2011** | 6169 | 3562 | 2607 |
| **2012** | 6292 | 2484 | 3808 |
| **2013** | 6642 | 2064 | 4578 |
| **2014** | 8106 | 2942 | 5164 |
| **2015** | 8456 | 4049 | 4407 |

In Table (3), according to Equation (20), the effect of securitization ($\hat{\alpha}$) is obtained. However, we need to elaborate further on the effects of securitization on the overall performance of Saderat Bank. In other words, will the transfer of the non-performing loans to the headings of revenue-generating sources have a significant effect on the net profit of the Saderat Bank? To answer this question, one needs to examine the significance of the impact of securitization ($\hat{\alpha}$). If this effect is significant, we can conclude that the securitization policy has affected its performance. Since the sample size used in this study is 11 cases and is less than 30, the proposed method of matching estimator requires a statistical test that is suitable for a few data points.

To test the viability of our result, we have used T-pair statistics. This statistic is useful when a variable is studied under two different conditions. In other words, this test is performed to determine whether the variable response in the first group is distinct from the variable behavior in the second group. The variable examined in this research is the net profit of Saderat Bank during the period of 2005-2015.

The test of the above hypothesis is defined as follows:

$$\begin{cases} H_0: d_i = \mu_{1i} - \mu_{2i} = 0 \\ H_1: d_i = \mu_{1i} - \mu_{2i} \neq 0 \end{cases}$$

In the above test, the notation $\mu_{1i}$ is the net profit before securitization and $\mu_{2i}$ is the net profit after securitization. Therefore, the null hypothesis confirmation indicates that the securitization does not affect the net profit of the Saderat Bank. While-confirmation of the null hypothesis implies the effect



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of the securitization on the net profit of Saderat Bank. The statistic used in this test is t-statistic. It is worth noting that the above test could be done with two prior conditions: variance equivalence or variance non-equivalence. Table (4) shows the results of this test:

Table 4
*F-variance equality test result*

| Statistic | Degree of Freedom | Calculated F | Critical F | Probability |
|---|---|---|---|---|
| **Value** | 9 | 2.06 | 3.17 | 0.14 |

According to Table (4), the calculated F value is less than the critical value, so the null hypothesis is confirmed, and it implies that the net profit variances under the two states of securitization and non-securitization are not significantly different. After determining the equality of variances, the t-test of the net profit non-equality, subject to equality of variances, is performed, and the result of this test is reported in Table (5):

Table 5
*Net profit equity test before and after securitization*

| Statistic | Degree of Freedom | Calculated t | Critical t | Probability |
|---|---|---|---|---|
| **Value** | 18 | -3.13 | 2.1 | 0.003 |

According to Table (5), at a significant level of 5%, the absolute value of calculated is more than the critical value. So the net profit after securitization is significantly different from the net profit before securitization.

## 5.2 Approach Two: The Effect of Securitizing a Percentage Point of the Banks Current Loans

This approach assumes that the bank behaves like an insurance company. An insurance contract covers the assets and business interests of corporations and individuals against the insurable perils. Insurers will compensate for possible losses by receiving premiums based on the average mathematical expectation of possible losses. Since the beginning of the insurance industry, primary insurers have always thought of distributing the insurable risks among a larger number of insurers. These secondary insurers are called reinsurers. They would share the damage burden by receiving a proper portion of the premium of the insurance contract. In securitization, the originating bank can act as the



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primary insurance company by ceding its portfolio. Naturally, as the bank plans to create attractive loan portfolios, it will choose customers with lower risks, higher credit scores, and willingness to pay a reasonable rate of interest. Banks try to avoid collecting bad loans in their loan portfolio.

Recently the Central Bank of Iran has issued instruction No. 96/382373 dated 2017/02/17 to allow credit institutions to engage in securitization. It has enabled banks to issue bonds backed by mortgage loans. The law provides an environment for banks to cede their current loans in the capital market and obtain new liquidity. The buyers buy bonds backed by the loan portfolio at a fixed rate determined by the capital market. The bank receives a commission for the initial issuance of the bonds and the collection of the installments. Therefore, the bank's benefits are from two sources: the first one is from the proceeds of securitization. The second tire of benefits comes from the ceding the bundle of loans to other investors, those who are interested in purchasing bonds backed by mortgages. Hence Banks who sell bonds in the market can collect resources and recycle them again as new loans. This procedure can offer the banks an escape route to avoid resource suffocation in long term loans. Thus Banks can increase their capacity to generate new loans and treat even long-term loans as short-term ones.

Because of securitization, banks can expect to add and change income source as the following suggests:

- Bank obtains commission fees from the sale of bonds in the capital market and management of the loan bundle.
- Banks can earn money from newly produced loans after securitization.
- Whenever banks decide to relinquish their loans at a lower bond coupon rate, this rate should be high enough to attract investors; thus, banking system efficiency should increase to meet the additional requirement of securitization.

In this section, we will construct two bundles of loans to check for the effect of securitization. In preparing the bundles, the Central Bank's instructions are executed as far as it is possible.

In the first bundle, which is the target one, the following assumptions are considered:

1) Loan selection is fully randomized.
2) Credits are classified in terms of customer activity and credit duration.
3) Credits are classified in terms of their collateral nature, which may take the form of real estate or financial assets.
4) Customers' credit evaluations are performed in a traditional manner.



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There exists a spread of at least 5 to 6 between the loan interest rate and coupon rate on bonds in the capital market. The profit after deducting the bank's financial expenses changes as follows:

Table 6
*Comparison of net profit of Saderat Bank (after and before selling the loans in the market) (billion Rials)*

| Year | Profit After Selling Loans | Profit Before Selling Loans |
|---|---|---|
| **2005** | 29 | -14458 |
| **2006** | 18968 | 8228 |
| **2007** | 18231 | 9888 |
| **2008** | 14816 | 7887 |
| **2009** | 11463 | 5031 |
| **2010** | 14233 | 8596 |
| **2011** | 8447 | 3562 |
| **2012** | 6229 | 2484 |
| **2013** | 5411 | 2064 |
| **2014** | 5426 | 2942 |
| **2015** | 5881 | 4049 |

To test the effect of securitization, one has to investigate the difference between target and control bundles; the following hypothesis test is employed here. $\begin{cases} H_0: d_i = \mu_{1i} - \mu_{2i} = 0 \\ H_1: d_i = \mu_{1i} - \mu_{2i} \neq 0 \end{cases}$

In the above test, $\mu_{1i}$ is the net profit before selling the securities and $\mu_{2i}$ represents the net profit after selling the securities. Therefore, the confirmation of the null hypothesis indicates the ineffectiveness of the sale of loans on the net profit of Saderat Bank, and the alternative theory suggests the effectiveness of debt securities issuance. The statistic used in this test is t-statistic. Before conducting this study, the result of the variance equality test is presented in Table (7):

Table 7
*F-variance equality test result*

| Statistic | Degree of Freedom | Calculated F | Critical F |
|---|---|---|---|
| Value | 10 | 0.84 | 0.3 |

According to the results of Table (7), the calculated F value is higher than the critical F value, so the null hypothesis is not valid; thus, one can conclude



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that the net profit variance under the two conditions is significantly different. As the inequality of variances is determined, the t-test is performed to distinguish the net profit values contingent on the equality of variations, which results in the following Table (8):

Table 8
*Net profit equality test before and after loan sales*

| Statistic | Degree of Freedom | Calculated t | Critical t |
|---|---|---|---|
| **Value** | 20 | 2.31 | 2.08 |

According to Table (8), at the significant-level of 5%, the absolute value of the calculated t is higher than the critical t, so the net profit after selling the loan is significantly different from the net profit before that.

## 5.3 Analyzing the Relationship between Profitability and Non-Performing Loans of the Bank

To study the relationship between profitability and non-performing loans, the Bayesian Vector Autoregressive model is applied in this paper based on the Sims and Zha (1996) approaches estimated with three variables: net profit, allowance for doubtful debts, and non-performing loans. So one can estimate the net profit immediate response to the shocks of the allowance for doubtful debts and non-performing loans, as shown in Figure (2):

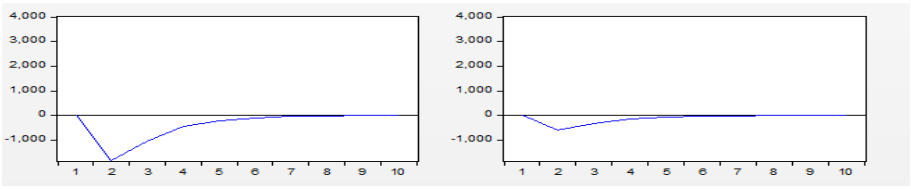


*Figure 2.* The Response of Profit to the Allowance for Doubtful Debts and Non-Performing Loans.

As shown in the Figure (2), in the event of the one-unit shock of increasing allowance for doubtful debts, the bank's net profit declines, which shows the most significant decrease in the two post-shock periods. Then, in a time horizon of approximately six periods, its effect disappears from profit function. This period reflects the same rule of the banking system that eliminates doubtful debts after six years of the bank's balance sheet and profit



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cycle. Accordingly, allowance for doubtful debts also harms bank profitability. Therefore, based on the simulation derived from the Bayesian autoregressive model, securitization that improves bank liquidity status can have a positive and incremental effect on bank profitability. Table (9) shows the analysis of the variance of net profit of Saderat Bank for the first, third, and sixth periods.

Table 9
*Net profit variance analysis*

| Period | Net Profit | Allowance for doubtful debts | Non-performing Loans |
|---|---|---|---|
| 1 | 100 | 0 | 0 |
| 3 | 77 | 21 | 2 |
| 6 | 76 | 22 | 2 |

As Table (9) shows, in the first period, debts do not affect the bank's net profit, as shown in the graphs of the instantaneous reaction functions. Nevertheless, in future periods, on average, about 23% of profitability is related to debts, and thus it has a significant effect on bank profitability.

## 6 Conclusion

In this essay, we intended to investigate the effect of securitization on the performance of Saderat Bank from 2005 to 2015. In theory, one expects that banks that practice securitization have a lower cost of funding, lower credit risk exposure, and higher profitability than the ones that do not securitize loans. So far, securitization has not been practiced in our country. The Propensity Score Matching method with two samples (hypothetical target sample of securitized loans and control sample) is used to compare the difference profitability after introducing securitization. To this end, based on the audited financial statements of Saderat Bank, vital financial ratios are extracted and summarized for the period under investigation. Through applying the simulation model, we provided convincing evidence of the positive effects of issuing bonds backed by mortgages.

Then we decided to examine whether the difference is significant. In other words, is net profit in the securitization state different from the non-securitization one? Given the volume of available data, a method compatible with this approach is known as paired t-statistics. Analysis of the above statistic shows that if the policy of securitization is applied, the net profit of the Saderat Bank will increase significantly.



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Finally, the Bayesian vector autoregressive model investigates the relationship between net profit and doubtful debts. The approach of selecting prior distribution functions is based on the Sims and Zha (1996) model. In this model, the instantaneous reaction functions show that a debt shock causes the bank's net profit to decrease for about six periods. Then after six periods, its effect on the net profit would vanish. Also, to investigate the effect of debts on bank's net profit, the variance analysis method has been used. Based on the results, doubtful debts, over a horizon of more than one year, significantly affect bank profitability fluctuations.

## References

Bedin, A., Billio, M., Costola, M., & Pelizzon, L. (2019). Credit Scoring in SME Asset-Backed Securities: An Italian Case Study. *Journal of Risk and Financial Management*, *12*(2), 89.

Boesel, N., Kool, C., & Lugo, S. (2018). Do European Banks with a Covered Bond Program Issue Asset-Backed Securities for Funding? *Journal of International Money and Finance*, *81*, 76–87.

Caliendo, M., & Kopeinig, S. (2008). Some Practical Guidance for the Implementation of Propensity Score Matching. *Journal of Economic Surveys*, *22*(1), 31–72.

Le, H. T. T., Narayanan, R. P., & Van Vo, L. (2016). Has the Effect of Asset Securitization on Bank Risk Taking Behavior Changed? *Journal of Financial Services Research*, *49*(1), 39–64.

Mousavian, A. (2010). Converting Banking Assets into Securities Banking. *Journal of Money and Economy*, *1*(2), 113-79.

Panetta, F., & Pozzolo, F. A. (2018). Why Do Banks Securities Their Assets? Bank-Level Evidence from Over One Hundred Countries in the Pre-Crisis Period. Bank of Italy Temi di Discussion (Working Paper) No.1183/2018.

Persson, T. (2002). Do Political Institutions Shape Economic Policy? *Econometrica*, *70* (3), 883-905.

Sims, C. A., & Zha, T. (1996). *Bayesian Methods for Dynamic Multivariate Models*. Federal Reserve Bank of Atlanta Working Paper 96-13.



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