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Editor
Asst. Prof. Dr. Musa Gün

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PREFACE

Finance and banking sector has had to adopt a new customer-oriented approach and go beyond traditional practices in the face of rapid changes in technology and increasing competition. Technological development, which is the pioneer of change, brings the financial system to a new level as in every field of economy.

Written in these directions, this book includes current debates in the field of banking and finance. Especially the rapid entry of blockchain technology into all areas of life has caused serious changes in corporate governance mechanisms. In this context, the content of the book answers the question of why corporate governance matters a problem for the banking sector with theoretical aspects. And at the same time, it empirically discusses measures of the potential market value effects of the blockchain systems integration into corporate governance procedures.

Along with these, the banking sector, which constitutes an important part of the financial system, has become more significant after the global mortgage crisis. The evaluation of the banking sector, which is structurally different from other sectors, requires a separate approach. The content of the book draws an overall picture that can be used for banks in terms of valuation methods. Additionally, the determinants of the financial performance of banks, which are the main components of the financial system, are analysed specifically in the Turkish banking sector.

On the other hand, financial problems such as portfolio optimization, which is one of the important topics of financial decisions, and its applications are examined specifically for the Turkish stock market. Approaches and new methods of optimization are tested.

I would like to thank all my colleagues who contributed to the emergence of this book, which was written within the scope of the aforementioned issues. And with my belief, the book will serve as a resource for academic studies as well as contribute to market participants and decision-makers.

Asst. Prof. Dr. Musa Gün

Editor

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CHAPTER I

AN ARTIFICIAL BEE COLONY ALGORITHM APPROACH FOR CARDINALITY CONSTRAINED MEAN- VARIANCE MODEL*

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INTRODUCTION

People look for a way to evaluate even the smallest thing they can get. The investor can use his / her money in any real estate sale or enter the stock market and buy and sell stocks. But it is well known how money should be utilized. This situation made the subject an important research topic and led to the emergence of the concept of Portfolio Optimization Problem, which is one of the important optimization problems. The mean-variance model method was first proposed by Markowitz (1952, 1959) to the portfolio optimization problem. Although it is a successful method, the increasing diversity of the portfolio makes the solution of the method more complex. The complexity of the method has led researchers to develop other methods. However, the proposed methods fell short in situations where immediate decisions had to be made. In this case, heuristic techniques that do not give exact results but produce values close to definite results have started to be used. Heuristic techniques are used to solve many optimization problems. Being easy to apply and producing fast, effective results play an important role in their preference by researchers. Heuristic techniques are divided into two, evolutionary-based and swarm intelligence-based heuristic techniques. Evolutionary-based techniques are methods in which there is continuous improvement and the best is kept. Swarm intelligence-based techniques, on the other hand, include methods of collective action and communication.

When we look at nature, we can witness the struggle of living things to survive. The struggle of living things, especially animals with

* This study was produced from the doctoral dissertation titled "Financial Portfolio Optimization with Artificial Bee Colony Algorithm", which was financially supported by TUBITAK BİDEB 2211A- Domestic Doctorate Scholarship, and presented in 2015 at Istanbul University, Institute of Social Sciences, Department of Business Administration, Department of Quantitative Methods.

swarm intelligence, in the race to find food and the solutions they produce in the face of an obstacle have led researchers to examine this issue in detail. As a result of the studies carried out, they have seen that living things optimize their daily lives. This situation posed a question in the minds of the researchers: "Can we find solutions to very complex problems by modelling the food-seeking behaviours of living things?" The foraging behaviours of animals and the herd intelligence they use during searches have inspired researchers to find new methods. The best-known methods that use swarm intelligence are the Ant Colony Algorithm, which uses ants' foraging behaviours, Particle Swarm Optimization, which involves birds' foraging and migration movements, and the Artificial Bee Colony Algorithm, which is inspired by the foraging behaviours of bees. These methods have been tested on many optimization problems and produce very effective and fast results.

In this study, a method using Artificial Bee Colony Algorithm is proposed for the Portfolio Optimization problem, which is one of the important optimization issues. The proposed model, well-known standard benchmark datasets, and BIST30 were tested and performance analyses were made.

Markowitz mean-variance model and artificial bee colony algorithm will be mentioned in the first stage of the study. After mentioning the literature on the subject, the improved version of the Markowitz model, the cardinality constrained portfolio optimization model will be introduced. After the section applied by the artificial bee colony algorithm regarding the relevant model, the results and recommendations will be stated.

MARKOWITZ MEAN-VARIANCE MODEL

The Mean-Variance Model deals with the expected return and risk of the portfolio. The expected return of the portfolio is the weighted average of the expected returns of the stocks in the portfolio. Portfolio risk is explained by the standard deviation of the portfolio. Standard deviation, on the other hand, is calculated by multiplying the covariance values between securities in the portfolio. Markowitz aims to find a portfolio with minimum variance, i.e. risky, for the expected return level that must be reached. In this case, the purpose of the model is to minimize portfolio variance, in other words, portfolio risk. There is a constraint in the standard Markowitz model. The first of these is to meet the expected return level that should be reached. The second constraint is that the total weight of all securities in the portfolio is 1. The weights of the securities in the portfolio can't be less than zero. Therefore, these weights take a value between 0 and 1. When this situation is added to the model as a constraint, the general

mathematical expression regarding the Mean-Variance Model suggested by Markowitz is shown in Equation-1 (Markowitz, 1952).

$$\begin{aligned}
 & \text{Min.} \quad \sum_{i=1}^M \sum_{j=1}^M w_i w_j \sigma_{i,j} \\
 & \text{s. t.} \quad \sum_{i=1}^M w_i \mu_i = \mu \\
 & \quad \quad \sum_{i=1}^M w_i = 1 \\
 & 0 \leq w_i \leq 1, \quad i = 1, \dots, M
 \end{aligned} \tag{1}$$

- w_i : weight of asset i .
- $\sigma_{i,j}$: covariance between asset i and asset j
- μ_i : expected return of asset i .
- μ : max expected return
- M : number of assets

ARTIFICIAL BEE COLONY ALGORITHM

The efforts of animals and insects to exist in nature have attracted the attention of many researchers. In particular, the intelligent behaviours they use in the food search process have inspired researchers who are closely interested in optimization techniques. One of these techniques is the Artificial Bee Colony Algorithm (ABC), which has been brought to the literature, inspired by the behaviour of bees. The algorithm was modelled by Karaboğa in 2005 (Karaboğa, 2005). It simplified the model by simplifying the complexity of the foraging processes of real bees. This new model put forward contains some assumptions. One of them is that the nectar of the food source is collected by only one bee. In this case, the number of food sources is equal to the number of employed bees. The other assumption is that the number of onlooker bees is equal to the number of employed bees. While the locations of the food sources correspond to the possible solutions in the optimization problem, the nectar richness in the source corresponds to the quality of the solutions (Karaboğa, 2011:206). ABC is a population-based algorithm developed for the solution of multidimensional and multi-peak optimization problems. There are three types of bees in ABC, namely, employed bees, onlooker bees, and scout bees. Half of the colony consists of employed bees and the other half consists of onlooker bees. The number of employed bees is also equal to the number of food sources, i.e. the number of possible solutions. On the other hand, scout bees appear when the onlooker bees in charge are done. Since they find new food sources randomly without prior knowledge, they

can find rich food sources that the algorithm has not previously discovered, that is, a set of high fidelity possible solutions (Tapkan, 2010:29).

ABC uses four different selection methods in the search for possible solution values of food sources. These are the global selection process used in the selection of the food source for the onlooker bees, the regional probability-based selection process used in the calculation of the neighbourhoods of the food sources, the greedy selection process used in the comparison of the suitability values, and the random selection process used in the selection of the new food source of the scout bees (Akay, 2009: 62-63).

The basic steps for ABC are listed below.

Step 1: Food sources are generated randomly. Employed bees and onlooker bees are created as much as the number of food sources. Limit values to be used in releasing the food source are defined, an upper limit value is determined and finally, the counter variable that constitutes the number of cycles is defined.

Step 2: Possible solutions to the obtained food sources are calculated according to the problem-specific objective function.

Step 3: In this step, the cycle begins. For this, the maximum number of cycles is determined and the employed bees in charge are sent to food sources. Employed bees process this resource and measure its quality. Thus, solution values are formed. The best of these values is compared with the previous solution value. If the new solution value is better than the previous one, the best solution is kept in memory and the limit value is reset. Otherwise, the limit value is increased by one. It is checked whether the limit value exceeds the upper value or not, and the algorithm is prevented from entering an infinite loop.

Step 4: After step 3, onlooker bees are directed to food sources. Which food source the employed bees will go to is determined by probabilistic values calculated according to the information provided by the assigned bees. The onlooker bee measures the quality of the source it goes to and calculates the solution values. The best of these values is compared with the previous solution value. If the new solution value is better than the previous one, the best solution is kept in memory and the limit value is reset. Otherwise, the limit value is increased by one. It is checked whether the limit value is exceeded or not.

Step 5: After step 4, the scout bee stage is started. Scout bees identify entirely new food sources. In this way, the algorithm is prevented from stuck on the local minimum and maximum points. Solution values of new food sources are calculated and compared with the previous solution. If the new solution value is better than the previous one, the best solution is kept in memory and the limit value is reset. Otherwise, the limit value is increased by one. It is checked whether the limit value is exceeded or not.

Step 6: Step 3, 4, and 5 are repeated until the maximum number of cycles is reached.

The algorithm consists of four parts. These are producing initial food sources, sending employed bees to food sources, sending onlooker bees to food sources obtained by the probabilistic selection, abandoning exhausted food sources and producing new food sources by scout bees.

Producing Initial Food Sources

The algorithm is first started by determining the locations of food sources. Locations of food sources expressing possible solution values are calculated by Equation-2.

$$x_{ij} = x_j^{min} + rand(0,1)(x_j^{max} - x_j^{min}) \quad (2)$$

Where i is the number of food sources; j represents the number of parameters. Here, with the max and min values, it is ensured that the food source is produced within certain limits, that is, it remains within the search space.

Sending Employed Bees to Food Sources

Employed bee determines a new food source in the neighbourhood of the food source and calculates the solution values. If the obtained new solution value is better than the previous one, it is memorized. Equation-3 is used to determine the new resource.

$$v_{ij} = x_{ij} + \phi_{ij}(x_{ij} - x_{kj}) \quad (3)$$

Here, a new food source (v_{ij}) is obtained by changing one of its parameters for each food source (x_{ij}). Equation-4 is used to keep the new food source in the solution space.

$$v_{ij} = \begin{cases} x_j^{min} , & v_{ij} < x_j^{min} \\ v_{ij}, & x_j^{min} \leq v_{ij} \leq x_j^{max} \\ x_j^{max}, & v_{ij} > x_j^{max} \end{cases} \quad (4)$$

The fitness function value of the food source is calculated by Equation-5

$$uf_i = \begin{cases} 1/(1 + f_i), & f_i \geq 0 \\ 1 + abs(f_i), & f_i < 0 \end{cases} \quad (5)$$

Here, the fitness function value of the food source is represented by f_i . The fitness function varies according to the type of problem. Solution values are calculated with these fitness function values. If the solution is better than the previous solution, the counter is reset and the new solution values are memorized. If there is no improvement, the counter is incremented by one.

Sending Onlooker Bees to Food Sources Obtained By Probabilistic Selection

Employed bees provide information on food sources to onlooker bees. Before onlooker bees turn to these resources, all solution values go through a probabilistic selection process. There are many different selection methods. ABC uses the roulette wheel selection mechanism (Akay, 2009:61). Each segment in the wheel corresponds to the fitness function. Therefore, food sources with high suitability have a high chance of being selected. The probability of choosing the food sources for onlooker bees is determined by Equation-6. ρ_i is calculated by proportioning the calculated fitness value to the total fitness value.

$$\rho_i = \frac{f_i}{\sum f_i} \quad (6)$$

Onlooker bees choose their food sources according to the selection possibilities of the food sources and calculate the fitness function value. The new value is compared with the previous value. If there is an improvement, the solution is taken into memory and the counter is reset. Otherwise, the counter is increased and the cycle continues. This cycle continues until all the onlooker bees have chosen their food source.

Abandoning Exhausted Food Sources and Producing New Food Sources by Scout Bees.

After employed bees and onlooker bees phase, counter values of food sources are checked. Food sources that exceed the limit value should be abandoned. In other words, nectars in the food source decreased or exhausted. In this case, scout bees seek new food sources. The new food sources found by scout bees are evaluated and their fitness function value is calculated. If the values provide improvement, the solution values are memorized and the counter value is reset, otherwise, the counter is incremented by one.

As a result, ABC is a flexible algorithm based on herd intelligence. It is an algorithm that models real bees well, although it has some assumptions. It contains a few parameters. Although it is produced for

continuous optimization problems, it can also be used in discrete optimization problems. The algorithm has the capability of both global searches by scout bees and regional search by employed bees and onlooker bees (Karaboğa, 2011:213).

LITERATURE REVIEW

It can be said that the use of heuristic techniques in the solution of the Portfolio Optimization problem started in the 2000s. When the methods used are examined, most of the studies have been found with Genetic Algorithm (GA), Simulated Annealing (SA), Particle Swarm Optimization (PSO), Ant Colony Optimization Algorithm (ACO) and Artificial Bee Colony (ABC) in recent years. For more detailed information about the methods used in the portfolio optimization problem, Metaxiotis and Liagkouras (2012) and Ertenlice and Kalaycı (2018) studies can be examined.

To the Genetic Algorithm (GA) studies, Chang et al. (2000), Buseti (2006), Moral-Escudero et al. (2006), Chang et al. (2009), Li (2009), Soleimani, Golmakani, and Salimi (2009), Ruiz-Torrubiano and Suarez (2010), Thomaidis (2010), Sadjadi, Gharakhani, and Safari (2012), Ackora-Prah, Gyamerah, and Andam (2014), Sabar and Song (2014); to Simulated Annealing (SA) studies, Chang et al. (2000), Maringer and Kellerer (2003), Ruiz-Torrubiano and Suarez (2010), Thomaidis (2010), Mozafari et al. (2011), Fogarasi and Levendovszky (2013); to Particle Swarm Optimization (PSO) studies, Cura (2009), Deng and Lin (2010a), Thomaidis (2010), Golmakani and Fazel (2011), Deng et al. (2012), Sadigh et al. (2012), Cui, Cheng, and Bai (2014), Yin, Ni, and Zhai (2015); To the Ant Colony Algorithm (ACO) studies, Deng and Lin (2010b), Bastiani et al. (2015) can be given as an example.

Examining the studies using Artificial Bee Colony (YAK), Wang, Liu, and Kong (2011) proposed a bee colony algorithm for the cardinality constrained mean-variance model in their studies. The algorithm was tested on the standard benchmark dataset obtained from the OR-Library, and the study was compared with the results of Cura (2009). It has been stated that the algorithm performs well for this type of problem. Although some of the functions they use in their studies are similar to the model proposed in this study, there are differences in the functions used in generating variable values. Chen et al. (2012) proposed a bee colony algorithm for cardinality constrained portfolio optimization problem. In their work, they tested the proposed model with three different performance measures. The results of the proposed model are compared with the results of Chang et al. (2000) and Liang et al. (2009). They found that the proposed model had a better performance in terms of diversity, convergence and effectiveness. Chen et al. (2013) proposed a new artificial

bee colony algorithm by developing the model proposed in Chen et al. (2012). According to the results, they determined that with the low number of stocks selected from the portfolio, the proposed model reached the efficient frontier that provides low risk and high return faster. Chen (2015) proposed the modified artificial bee colony algorithm for the new possibility mean-semi absolute deviation model, which includes transaction costs, cardinality and quantity constraints. They used the chaotic initialization approach and a hybridization method of ABC and PSO in the steps of the algorithm. They tested the proposed model for various parameter values. They compared the results with GA, SA, PSO, DA, and ABC. It was said that the proposed model performs better than these methods. Ge (2015) proposed an improved artificial bee colony algorithm (IABC) for a semi-variance model with cardinality constraints. The proposed model is compared with ABC and stated that it gave better results in terms of convergence speed and iterative numbers. Sutiwong and Sodanil (2016) proposed an improved quick artificial bee colony algorithm for the cardinality constraint portfolio optimization problem. The proposed algorithm is compared with GA, FA, ABC and qABC algorithms. Kalaycı (2016) proposed the artificial bee colony algorithm for the cardinality constrained portfolio optimization problem. The proposed model was tested on benchmark dataset obtained from OR-Library. Kalaycı et al. (2017) proposed two different artificial bee colony algorithms for cardinality constrained portfolio optimization. The proposed models differ in terms of repair, evolution and selection functions. They tested their models according to the performance measures criteria in the literature and compared their models with many studies. Kumar and Mishra (2017) proposed Multi-objective Co-variance based ABC (M-CABC) for portfolio optimization. They tested the proposed model on benchmark problems obtained from the OR-Library. They argued that the proposed algorithm was very successful in terms of providing simultaneous trade-off solutions. Strumberger et al. (2018) adapted Genetically inspired ABC (GI-ABC) algorithm for solving hard cardinality constrained mean-variance (CCMV) portfolio optimization problem. They tested the proposed model on a standard benchmark set obtained from OR-Library and compared it with some studies in the literature. The GI-ABC generates more precise and more effective guidelines for the investment strategy than other algorithms. Kalaycı et al. (2020) proposed an efficient hybrid metaheuristic algorithm for cardinality constrained portfolio optimization. The proposed model includes ABC, GA and ACO algorithms. They made performance tests for different parameter values for the proposed model. Also, they compared the results they obtained with the standard benchmark set obtained from OR-Library with many studies in the literature. They showed that the proposed model can compete with the state-of-the-art algorithms used for this problem. Sahala et al. (2020) proposed an

improved quick artificial bee colony algorithm for portfolio optimization problems with constraints. They tested the model for different parameter values.

CARDINALITY CONSTRAINED MEAN-VARIANCE MODEL

In this study, the "Cardinality Constrained Mean-Variance Model" (Chang et al., 2000), which was obtained by developing the known Markowitz Mean-Variance Model (Markowitz, 1952), was used. To observe the values received by the objective function against various μ values, the λ parameter, which is called the risk prevention parameter, is added to the standard model. If the λ parameter takes the value 0, the model tries to maximize the average return of the portfolio without considering risk. On the contrary, if the parameter λ takes the value 1, the model will try to minimize the risk of the portfolio, regardless of the return. This means that the value of the λ parameter changes according to the investor's sensitivity to risk. When the return and risk values found with each different λ value are marked on the chart, a continuous function curve emerges. This curve is called "Efficient Frontier" in Markowitz theory (Markowitz, 1952:87). Each point on the efficient frontier shows the optimal combination of risk and return.

To define the Cardinality Constrained Mean-Variance model, some constraints should be added to the existing standard model. The first is that the number of stocks that can be selected in the portfolio is equal to a value expressed by K . In the mathematical expression of this constraint, there is a decision variable z_i that can take a value of 0 or 1. If this value takes the value 0, the stock i is not in the portfolio, if it takes the value 1, it is said that the stock i is in the portfolio. The second constraint is that the weights of all stocks in the portfolio must be between a certain lower limit (ε_i) and an upper limit (δ_i). As a result of these definitions, the cardinality constrained mean-variance (CCMV) model is as follows (Chang et al., 2000).

$$\begin{aligned}
 \text{Min. } & \lambda \sum_{i=1}^M \sum_{j=1}^M w_i w_j \sigma_{ij} - (1 - \lambda) \sum_{i=1}^M w_i \mu_i \\
 \text{s. t. } & \sum_{i=1}^M z_i = K \\
 & \sum_{i=1}^M w_i = 1
 \end{aligned} \tag{7}$$

$$\varepsilon_i z_i \leq w_i \leq \delta_i z_i, \quad i = 1 \dots M$$

$$z_i \in \{0,1\}, \quad i = 1 \dots M$$

$$0 \leq \lambda \leq 1$$

M : The number of available assets

w_i : weight of asset i . ($i = 1, \dots, M$)

μ_i : expected return of asset i . ($i = 1, \dots, M$)

K : The desired number of assets in the portfolio

z_i : Decision variable indicating whether the asset is selected or not

ε_i : The lower limit of asset i

δ_i : The upper limit of asset i

σ_{ij} : covariance between asset i and asset j ($i, j = 1, \dots, M$)

AN ARTIFICIAL BEE COLONY ALGORITHM TO CARDINALITY CONSTRAINED MEAN-VARIANCE MODEL

The proposed model includes 3 basic functions. The first one is the main program function for which the ABC approach is applied for the CCMV model, the second is the calculate function with the objective function values, and the third is the arrange function where the proposed candidate solutions are adapted to the constraints. The algorithm first starts to randomly generate w_{ij} , which indicates the weights of assets in the portfolio, and z_{ij} , which indicates whether the asset is in the portfolio or not.

Here i values denote the index of the food source, and the total number of food sources are denoted by BS . Values for j indicate the assets, while the total number is expressed as M . In addition to these, the trial counter (ds_i) as many as the number of food sources is defined and its value is reset. Candidate portfolios obtained in each iteration are sent to the editing function to be compliant with the constraints. The solutions made available are sent to the calculate function to calculate the objective function values (f_i). The best solution among these values is memorized. After this stage, the phase of employed bee, onlooker bee and scout bee are passed respectively until a certain stop criterion. The algorithm continues until the stop criterion is met. Also, to calculate the algorithm according to different λ values, it has been run from 0 to 1 with a certain increment value ($\Delta\lambda$). Here it is determined as $\Delta\lambda=0.02$.

In the employed bee stage, random neighbours are selected for all food sources (set of portfolios) and then the weight (w_{ij}) of a randomly selected asset is changed. If the new weight obtained is greater than 0, the z_{ij} value of this weight is set to 1 and that stock is included in the portfolio. After this step, the arrange and calculate function is run. Then the result obtained is best compared with the value of f_i . If a better result is stored, the trial counter is reset, otherwise, the trial counter is incremented. This process is repeated as many as the number of food sources.

In the scout bee stage, probability values used to determine which food sources to choose should be calculated. Before calculating probabilities, all objective function values must be positive. Because when calculating probability, the sum of the objective function values will be taken. In cases where the risk is lower than the return, the probability values cannot be calculated since the value of the objective function will be negative. Before f_i are made positive, the value of f_{min} is found. If $f_{min} \leq 0$ then f_i values are in Equation-8. It is recalculated with the help. Adding a small number such as 0.01 here is to ensure that the portfolio with f_i value is also included in the probability calculation.

$$f_i^{new} = f_i + |f_{min}| + 0,01 \quad i = 1, \dots, BS \quad (8)$$

Probability values (p_i) that determine which food sources the onlooker bees choose are calculated by Equation-9.

$$p_i = \frac{1}{f_i} / \sum_{i=1}^{BS} \frac{1}{f_i} \quad (9)$$

The reason for using $1/f_i$ instead of f_i here is to increase the selection of portfolios with low f_i values.

After the probabilities are calculated, the process of determining the food sources for all onlooker bees starts. The p_i values are compared with a random number. If the p_i value is higher, the operations performed at the employed bee stage are repeated; otherwise, the i value is increased by 1 and the search for a food source is continued. This process continues until all onlooker bees are completed.

In the scout bee phase, if the trial counters of all possible solutions exceed a certain limit value, the exceeding solution is completely deleted and a new solution determined randomly is replaced. The solution obtained is compared with the best solution. A better solution is to memorize.

The pseudo-code for the proposed ABC approach for the CCMV model is shown in Figure 1.

The objective function of the CCMV model is used in the calculate function that contains the objective function values for the candidate

solutions. The objective function (f_i) used by the algorithm is shown in Equation-10.

$$f_i = \lambda \sum_{j=1}^M \sum_{k=1}^M z_{ij} w_{ij} z_{ik} w_{ik} \sigma_{jk} - (1 - \lambda) \sum_{j=1}^M z_{ij} w_{ij} \mu_j \quad (10)$$

The proposed portfolios ensure that they do not violate the CCMV model constraints by the arrange function. This function consists of two stages. The first step is to equalize the number of K^* stocks selected to the number of K stocks. The second is to ensure that the w_{ij} values, which show the weights of the selected assets in the portfolio, remain between the pre-determined lower limit of ε_i weight value and the upper limit of δ_i weight value. For the test data sets, it is assumed that all assets have the same lower and upper bound values. In the algorithm, $K = 10$, $\varepsilon_j = 0,01$ and $\delta_j = 1$. The pseudo-code for the arrange function is shown in Figure 2.

In the first step, as long as $K^* > K$, the asset with the lowest w_{ij} value is determined and the z_{ij} value of the relevant stock is reset and the K^* value is calculated again. As long as $K^* < K$, a value of w_{ij} is chosen at random. If the z_{ij} value of the relevant stock is zero, this value is set to 1 and the K^* value is calculated again.

In the second step, first of all, the w_{ij} values of the selected assets are normalized. Then the sum of the weights above the upper limit is calculated and assigned to the variable η . Likewise, the sum of the weights below the lower limit is calculated and assigned to the variable θ . The fact that η and θ values are zero indicates that the weights of all assets are within the lower and upper limits. If one of the two variables is not zero, there is a violation. In this case, the amount that can be increased (t_j) and the amount that can be reduced (e_j) and their sum are calculated for the weight of the asset j in the portfolio ($\delta^* = \sum_{j \in Q} t_j$, $\varepsilon^* = \sum_{j \in Q} e_j$). Because of the new w_{ij} values of stocks with excess or underweight value are calculated by proportionally multiplying the number of gaps that can be increased or decreased by the values above the total upper limit or below the total lower limit. Thus, the asset with more deficiencies gets more shares than the assets with a shortage. Likewise, the less surplus asset gives fewer shares than the more surplus asset.

If the w_{ij} value of the asset j in the portfolio is less than the upper limit value ($t_j > 0$), the new w_{ij} value of this asset is calculated by Equation-11. Otherwise, the new w_{ij} value for this asset is set to the upper limit $\delta_j = 1$. If the w_{ij} value of stock j is greater than the lower limit value ($e_j > 0$),

the new w_{ij} value of this asset is calculated by Equation-12. Otherwise, the new w_{ij} value for this asset is set to the lower limit $\varepsilon_j = 0,01$.

$$w_{ij} = w_{ij} + (t_j/\delta^*) * \eta; \quad (11)$$

$$w_{ij} = w_{ij} - (e_j/\varepsilon^*) * \theta; \quad (12)$$

Figure 1. Pseudo-Code of The Proposed ABC For The CCMV Model

<p>Begin $\lambda=0$ While ($\lambda \leq 1$) Calculate randomly w_{ij} and z_{ij} values $i = 1, 2, \dots, BS$; $j = i, 2, \dots, M$. $ds_i=0$; Arrange (w_{ij}, z_{ij}) $f_i = \text{Calculate}(\lambda, w_{ij}, \mu, \sigma)$ $f_i^{best} = \text{Best } f_i$ $w_{ij}^{best} = \text{Best } w_{ij}$ count=1 While(count \leq stop criteria) for i=1 to BS Assign k and m values randomly $w_m^{ge} = w_{i,:}$; $z_m^{ge} = z_{i,:}$; $w_m^{ge} = w_{im} + \phi_{im}(w_{im} - w_{km})$ if $w_m^{ge} > 0$ then $z_m^{ge} = 1$ End if Arrange (w_m^{ge}, z_m^{ge}) $f^{ge} = \text{Calculate}(\lambda, w_m^{ge}, \mu, \sigma)$ if ($f^{ge} < f_i$) then $w_{i,:} = w_m^{ge}$ $z_{i,:} = z_m^{ge}$ $f_i = f^{ge}$ $ds_i = 0$ Else $ds_i = ds_i + 1$ End if End for $f_{min} = \min(f_i)$, $i = 1, \dots, BS$ if $f_{min} \leq 0$ then $f_i = f_i + f_{min} + 0,01$ $i = 1, \dots, BS$ End if $p_i = \frac{1}{f_i} / \sum_{i=1}^{BS} \frac{1}{f_i}$ $i = 1$ onlooker= 0 while (onlooker<OC) if (rand<p_i) then onlooker=onlooker+1</p>	<p>Assign k ve m values randomly $w_m^{ge} = w_{i,:}$; $z_m^{ge} = z_{i,:}$; $w_m^{ge} = w_{im} + \phi_{im}(w_{im} - w_{km})$ if $w_m^{ge} > 0$ then $z_j^g = 1$ End if Arrange (w_m^{ge}, z_m^{ge}) $f^{ge} = \text{Calculate}(\lambda, w_m^{ge}, \mu, \sigma)$ if ($f^{ge} < f_i$) then $w_{i,:} = w_m^{ge}$ $z_{i,:} = z_m^{ge}$ $f_i = f^{ge}$ $ds_i = 0$ Else $ds_i = ds_i + 1$ End if End if $i = i + 1$ if ($i = BS + 1$) then $i = 1$ End if End while $f_i^{best} = \text{Best } f_i$ $w_{ij}^{best} = \text{Best } w_{ij}$ penalty=$ds_i > \text{limit}$ for yy=1 to BS if (penalty (yy)=1) then $ds_{yy} = 0$ Assign w^* ve z^* values randomly. Arrange (w^*, z^*) $f^* = \text{Calculate}(\lambda, w^*, \mu, \sigma)$ $w_{yy,:} = w^*$ $z_{yy,:} = z^*$ $f_{yy} = f^*$ End if End for count=count+1 End While $\lambda = \lambda + \Delta\lambda$ End While End Begin</p>
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Figure 2: Arrange Function

<p>Arrange(w,z) $K^* = \sum z_{ij}$ Begin While ($K^* > K$) $j = \text{Select the index of the stock}$ with the lowest w_{ij}, $j \in Q$ $z_{ij} = 0$ $K^* = \sum z_{ij}$ $Q = Q - [j]$ End while While ($K^* < K$) $j = \text{Select the index of the stock}$ with a random w_{ij}, $j \notin Q$ if $z_{ij} = 0$ then $z_{ij} = 1$ $K^* = \sum z_{ij}$ $Q = Q \cup [j]$ End if End while while(true) $\chi = \sum_{j \in Q} w_{ij}$ $w_{ij} = w_{ij} / \chi \quad \forall j \in Q$ $\eta = \sum_{j \in Q} \max(0, w_{ij} - \delta_j) \quad \forall j \in Q$ $\theta = \sum_{j \in Q} \max(0, \varepsilon_j - w_{ij}) \quad \forall j \in Q$ if $\pi == 0$ and $\theta == 0$ then stop arrange function</p>	<p>$t_j = \max(0, \delta_j - w_{ij}) \quad \forall j \in Q$ $\delta^* = \sum_{j \in Q} t_j$ $e_j = \max(0, w_{ij} - \varepsilon_j) \quad \forall j \in Q$ $\varepsilon^* = \sum_{j \in Q} e_j$ for $j=1$ to M if $z_{ij}=1$ then if $t_j > 0$ then $w_{ij} = w_{ij} + (t_j / \delta^*) * \eta$; else $w_{ij} = \delta_j$ end if if $e_j > 0$ then $w_{ij} = w_{ij} - (e_j / \varepsilon^*) * \theta$; else $w_{ij} = \varepsilon_j$ End if End if End For End While End Begin</p>
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An experimental design is made to determine the parameter values that produce the best results. The parameters involved in the problems are the number of assets, the number of employed bees, the number of onlooker bees, the number of scout bees, the number of a food source, the limit, and the number of iterations. The number of assets varies according to the benchmark problems. The limit parameter refers to the maximum number of improvements. The number of assets is represented by M . Tested values and preferred parameter values for parameters are included in Table 1.

Table 1: The Result of Experimental Design

Parameters	Tested Values	Selected Value
Number of total bees	15, 25, 35	25
Number of employed bees	10, 15, 20	20
Limit	M/2, M, 2xM	M
Number of Iteration	Mx500, Mx1000, Mx1500	Mx1000

The total number of bees in the colony is the sum of the employed and onlooker bees. As a result of the experiments, the most suitable parameter values were determined as 25 bees in total, 20 employed bees, 5 onlooker bees, limit M and iterations as Mx1000. The number of scout bees is equal to the number of food sources that exceed the limit value.

RESULTS AND CONCLUSIONS

The benchmark datasets in the literature include weekly data from March 1992 to September 1997 on Hang Seng in Hong Kong, DAX100 in Germany, FTSE 100 in England, S&P 100 in America and Nikkei 225 in Japan. These datasets are taken from a dataset library that contains data on many optimization problems. These datasets can be accessed at <http://people.brunel.ac.uk/~mastjjb/jeb/orlib/portinfo.html>. There are different numbers of stocks in the datasets. Information on the number of stocks can be found in Table 2.

Table 2: Number of Assets in the Benchmark Dataset

Index	Number of Assets
Hang Seng	31
DAX100	85
FTSE 100	89
S&P 100	98
Nikkei	225

BIST30 data set includes the weekly closing prices of assets traded in the index between January 2012 and June 2014. The data were obtained as corrected data from www.finnet.com, where Recep Tayyip Erdoğan University has an agreement. The number of assets traded between these dates was determined as 24 and 6 stocks were eliminated. The names of these 24 assets are shown in Table 3.

Table 3: Assets Traded On the BIST 30 Index

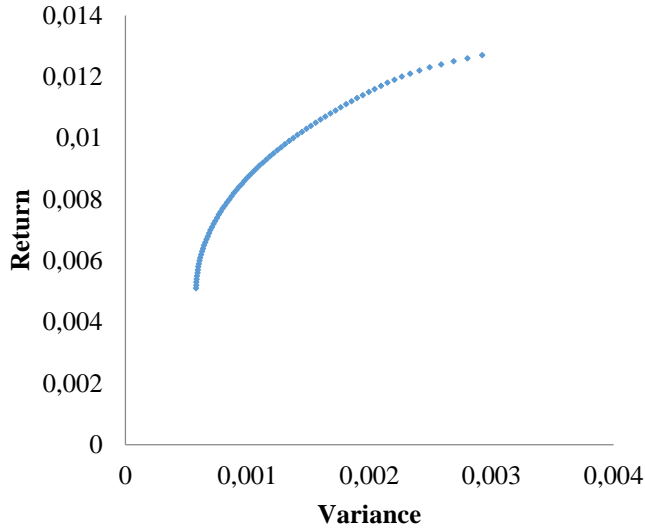
Assets		
Akbank	İş Bank	T. Halk Bank
Arçelik	Kardemir	Tofaş Automotive
Asya Participation Bank	Koç Holding	Turkcell
Bim Stores	Koza Gold	Tüpraş
Emlak Konut Real Estate	Migros Trafde	Turkish Airlines
Enka Construction	Petkim	Turkish Telecom
Ereğli Iron and Steel Inc.	Sabancı Holding	Vakıflar Bank
Garanti Bank	Şişe Glass	Yapı Kredi Bank

Periodic returns are calculated from the weekly closing prices of these 24 stocks. Average return, standard deviation and covariance matrix was obtained from the data obtained. Also, the effective limit for the BIST 30 index was calculated. When the obtained results are examined, it is observed that it gives optimal results between 0.0015 and 0.013 return levels. For these data to be compared with heuristic techniques, the number of point pairs between these values should be increased. For this reason, the return levels were increased by 0.0001, and 113 different return levels and risk values were found. However, the first 36 of them were removed from the application because they were not effective. The efficient frontier was drawn with the remaining 77 point pairs (Figure 3).

All results were found by assuming $K = 10$ stocks, the lower limit for these stocks $\varepsilon_j = 0,01$ and the upper limit as $\delta_j = 1$ ($j = 1, \dots, M$). The returns and risks to be used in drawing the effective boundary have been obtained by running the algorithm with different λ values. By increasing $\Delta\lambda=0,02$, $Y = 51$ returns and risk values between 0 and 1 were found.

All algorithms for comparisons were run on a PC running a Windows 7 operating system. The PC is quad-core with a 2.4 GHz clock rate and has 4 GB of memory.

Figure3. Efficient Frontier (BIST30)



In this study, the standard efficient frontier of test data is compared with the heuristic efficient frontier found by heuristic algorithms. This comparison was made according to the mean Euclidean distance (MED), percentage participation rate (PPR), percentage return error (PPE), percentage variance error (PVE) and calculation times in seconds. The results of five heuristic techniques for all data sets are shown in Table 4. The results of the GA, TA, TB and PSO algorithms given in the table were reconstructed using the algorithms in Cura (2009) study. The comparative graphics of the standard efficient frontier of the test data and the heuristic efficient frontier found by all heuristic techniques are shown in Figure 4- Figure 9.

$(r_i^s, v_i^s)(i = 1, \dots, 2000)$ represents the return and variance pairs on the standard efficient frontier; $(r_j^h, v_j^h)(j = 1, \dots, Y)$, represents the returns and variance pairs at the heuristically efficient frontier. The closest $(r_{i_j}^s, v_{i_j}^s)$ point to the (r_j^h, v_j^h) point is found by Equation-13. The point $(r_{i_j}^s, v_{i_j}^s)$ found here was used to find the mean Euclidean distance. Mean Euclidean Distance (MED), Percent return error (PRE), and Percent variance error (PVE) are calculated with Equation-14, 15 and 16 respectively as shown below.

$$i_j = \underset{i = 1, \dots, 2000}{\arg \min} \left(\sqrt{(r_i^s - r_j^h)^2 + (v_i^s - v_j^h)^2} \right) \quad j=1, \dots, Y \quad (13)$$

$$MED = \left(\sum_{j=1}^Y \sqrt{(r_{i_j}^s - r_j^h)^2 + (v_{i_j}^s - v_j^h)^2} \right) / Y \quad (14)$$

$$PRE = \left(\sum_{j=1}^Y 100 |r_{i_j}^s - r_j^h| / r_j^h \right) x \frac{1}{Y} \quad (15)$$

$$PVE = \left(\sum_{j=1}^Y 100 |v_{i_j}^s - v_j^h| / v_j^h \right) x \frac{1}{Y} \quad (16)$$

While finding the participation rates, the objective function value of the CCMV for each λ value was calculated with the results obtained by all heuristic techniques. Among these five heuristic techniques, the heuristic technique with the smallest objective function value was selected. The return and variance values for the relevant objective function are stored. Combined with the obtained $Y = 51$ pairs of data, the efficient frontier was drawn (Figure 10). The heuristic technique's total selection number was divided by the total number of data pairs obtained and multiplied by 100 to find participation rates. The combined efficient frontier was introduced by Fernández and Gómez (2007).

Table 4: Computational Results Compared With Results of Cura (2009)

Index	M	Performance Measures	GA ¹	TA ¹	TB ¹	PSO ¹	Proposed Model
Hang Seng	31	MED	0.0000	0.0000	0.0000	0.0000	0.0001
		PPR (%)	68,62	29,41	13,72	1,96	15,68
		PVE (%)	1,646	1,656	1,662	2,242	2,704
		PRE (%)	0,607	0,610	0,623	0,742	0,888
		Time (s)	15	8	9	31	28
DAX 100	85	MED	0.0001	0.0001	0.0001	0.0001	0.0001
		PPR (%)	62,74	5,88	9,80	3,92	33,33
		PVE (%)	7,218	9,031	8,542	6,859	7,212
		PRE (%)	1,279	1,908	1,283	1,589	1,716
		Time (s)	88	37	46	160	141
FTSE 100	89	MED	0.0000	0.0000	0.0000	0.0000	0.0000
		PPR (%)	60,78	17,65	25,49	17,65	27,45
		PVE (%)	2,866	4,012	3,821	3,060	4,763
		PRE (%)	0,328	0,330	0,330	0,364	0,545
		Time (s)	93	38	49	169	148
S&P 100	98	MED	0.0000	0.0000	0.0000	0.0001	0.0001
		PPR (%)	60,78	0,00	5,882	13,73	25,49
		PVE (%)	3,480	5,714	5,425	3,910	5,182
		PRE (%)	1,226	0,713	0,842	1,405	1,643
		Time (s)	112	45	58	192	168
Nikkei	225	MED	0.0000	0.0000	0.0000	0.0000	0.0000
		PPR (%)	76,47	5,88	9,80	15,68	15,69
		PVE (%)	1,206	1,243	1,202	2,427	3,035
		PRE (%)	5,327	0,421	0,413	0,800	0,970
		Time (s)	659	207	256	814	727
BIST 30	24	MED	0.0000	0.0000	0.0000	0.0000	0.0000
		PPR (%)	66,67	9,80	13,73	1,96	37,26
		PVE (%)	2,550	2,671	2,567	3,519	3,884
		PRE (%)	0,780	0,803	0,780	0,813	0,754
		Time (s)	16	8	9	30	29

The result of the proposed model is compared with the results of Mozafari et al. (2011), Sadigh et al. (2012), Baykasoğlu et al. (2015), and Kalaycı et al. (2020). Mozafari et al. (2011), Sadigh et al. (2012), Baykasoğlu et al. (2015) did not use ABC in their proposed model. Kalaycı et al. (2020) propose a hybrid model including ABC. The results of the comparison are shown in Table 5. The result of the proposed model is also compared with the results of Wang et al. (2011), Tuba and Bacanin (2014), Kalaycı et al. (2017) and GI-ABC (Strumberger et al., 2018). All articles have used a kind of the ABC algorithm. The results of the comparison are shown in Table 6.

¹ It has been recalculated using the algorithms in Cura (2009).

Table 5: Computational Results Compared With Results of Mozafari et al. (2011), Sadigh et al. (2012), Baykasoğlu et al. (2015), Kalaycı et al. (2020)

Index	M	Performance Measures	PSO-SA (Mozafari et al.,2011)	PSO-HNN (Sadigh et al., 2012)	GRASP-QP (Baykasoğlu et al., 2015)	ABC-GA-KKA (Kalaycı et al., 2020)	Proposed Model
Hang Seng	31	MED	0.0001	0.0001	0.0001	0.0001	0.0001
		PVE (%)	1.6388	2.5908	1.6400	1.6395	2,70439
		PRE (%)	0.6059	0.7335	0.6060	0.6085	0,88867
DAX 100	85	MED	0.0001	0.0000	0.0001	0.0001	0.0001
		PVE (%)	6.7806	5.7585	6.7593	6.7806	7,2117
		PRE (%)	1.2770	0.1466	1.2769	1.2780	1,7164
FTSE 100	89	MED	0.0000	0.0000	0.0000	0.0000	0.0000
		PVE (%)	2.4701	5.4141	2.4350	2.4350	4,7625
		PRE (%)	0.3247	0.3095	0.3245	0.3186	0,5449
S&P 100	98	MED	0.0001	0.0000	0.0001	0.0001	0.0001
		PVE (%)	2.6281	5.1456	2.5211	2.5255	5,1818
		PRE (%)	0.7846	0.2925	0.9063	0.7044	1,6434
Nikkei	225	MED	0.0000	0.0000	0.0000	0.0000	0.0000
		PVE (%)	0.9583	4.7779	0.8359	0.8191	3,0353
		PRE (%)	1.7090	0.7040	0.4184	0.4233	0,9693

Table 6: Computational Results Compared With Results Of Wang et al. (2011), Tuba & Bacanin (2014), Kalaycı et al. (2017), Strumberger et al. (2018)

Index	M	Performance Measures	ABC (Wang, Liu & Kong, 2012)	ABC-FA (Tuba & Bacanin, 2014)	ABC (Kalaycı et al., 2017)	GI-ABC (Strumberger et al., 2018)	Proposed Model
Hang Seng	31	MED	0.0000	0.0004	0.0001	0.0002	0.0001
		PVE (%)	1.4805	1.3952	1.6432	1.2295	2,70439
		PRE (%)	0.5372	0.5289	0.6047	0.4703	0,88867
DAX 100	85	MED	0.0001	0.0009	0.0001	0.0009	0.0001
		PVE (%)	8.139	7.2649	6.7925	7.1981	7,2117
		PRE (%)	1.3511	1.3523	1.2761	1.2885	1,7164
FTSE 100	89	MED	0.0001	0.0003	0.0000	0.0003	0.0000
		PVE (%)	2.7629	2.6721	2.4397	2.6354	4,7625
		PRE (%)	0.3114	0.3187	0.3255	0.3109	0,5449
S&P 100	98	MED	0.0000	0.0001	0.0001	0.0001	0.0001
		PVE (%)	3.2092	3.7598	2.5260	3.5991	5,1818
		PRE (%)	0.6844	0.9529	0.8885	0.8810	1,6434
Nikkei	225	MED	0.0000	0.0000	0.0000	0.0000	0.0000
		PVE (%)	3.8087	1.6982	0.8396	1.2011	3,0353
		PRE (%)	0.9802	0.6719	0.4127	0.4713	0,9693

When Table 4 is examined, the proposed model can produce results that can compete with other heuristic methods for the CCMV model. It produced results very close to the GA method, which is the best in this field. Especially when evaluated in terms of participation rates, the proposed model became the best method after GA. It is seen that especially PSO's participation rate has decreased significantly and this has mainly shifted to the proposed model. It is thought that this is because of the proposed model and the PSO method use the same arrange function. The proposed model produced better results than PSO.

When Table 5 is examined, it is observed that there is a dominant situation in the solutions containing PSO for the CCMV problem. The reason for this is thought to be that the arrange functions used are effective. When Table 6 is examined, it is seen that the proposed model is still a competitive method.

When the heuristic efficient frontier of the FTSE 100 index is examined, it is observed that the proposed model produces results close to the standard efficient frontier for each return level. For the other benchmark dataset, the proposed model produces values close to the standard efficient frontier when the risk is low, while it is observed that it moves away from the standard efficient frontier as the risk increases. As a result, the proposed model is a competitive method for the CCMV model, and it will be a useful method for researchers and managers who will work on this subject.

Figure 4: Standard and Heuristic Efficient Frontiers For The Hang Seng

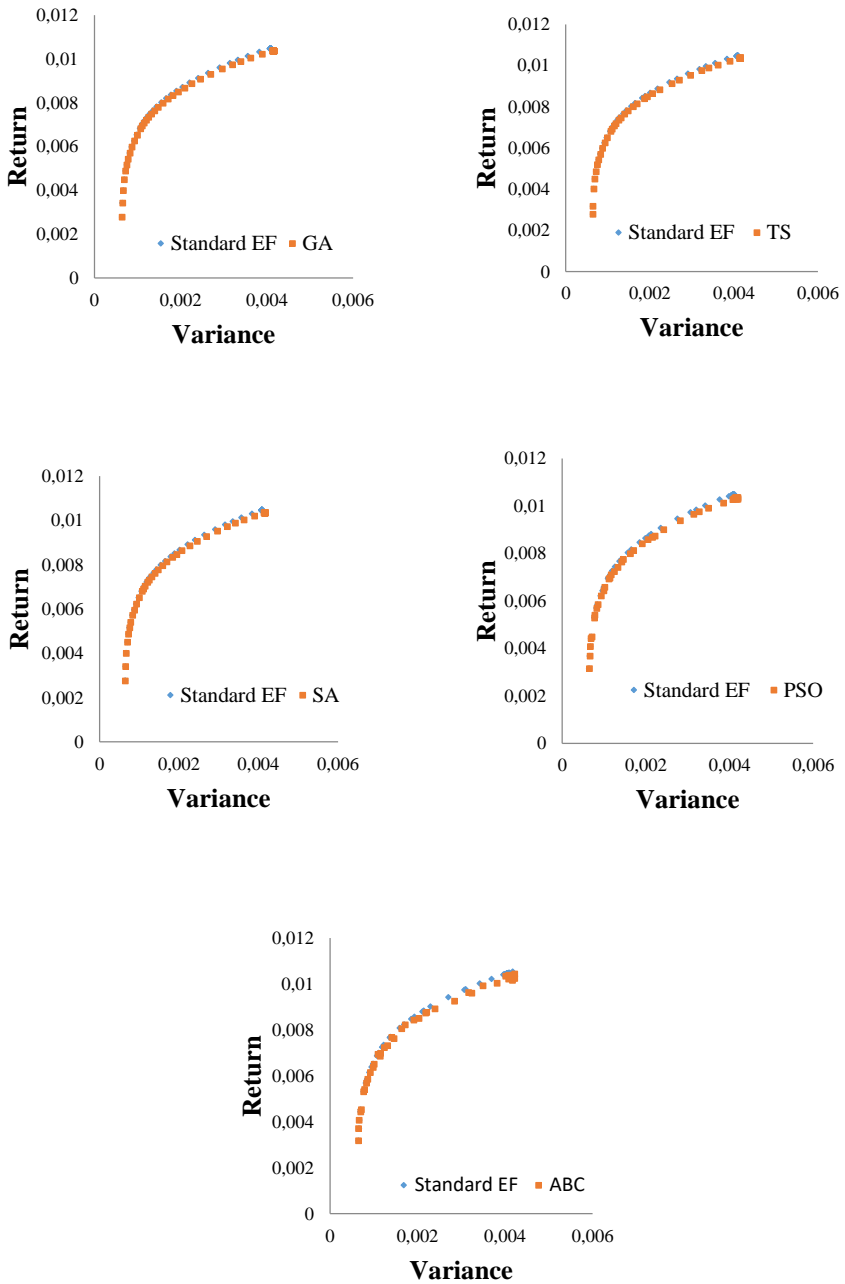


Figure 5: Standard and Heuristic Efficient Frontiers For The DAX100

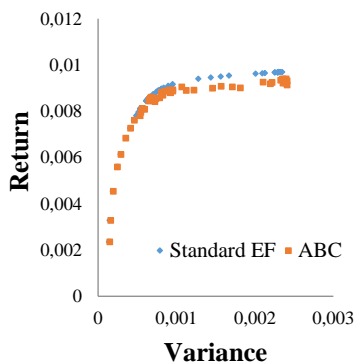
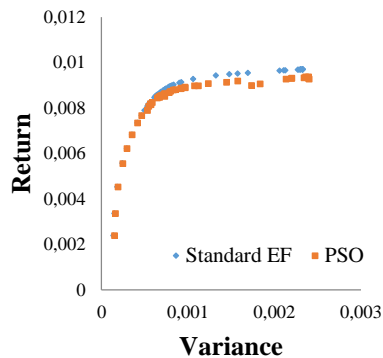
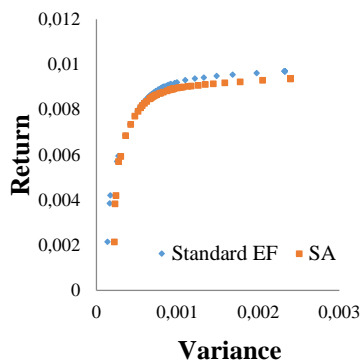
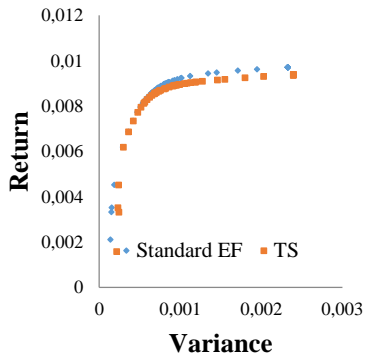
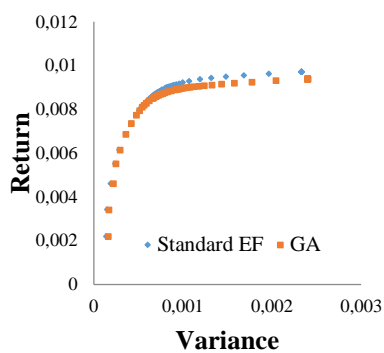


Figure 6: Standard and Heuristic Efficient Frontiers For The FTSE100

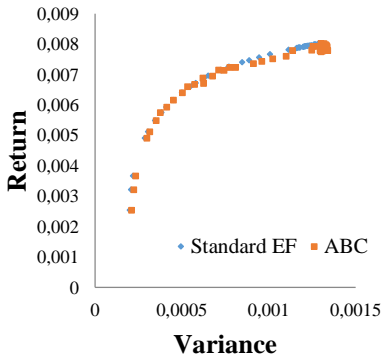
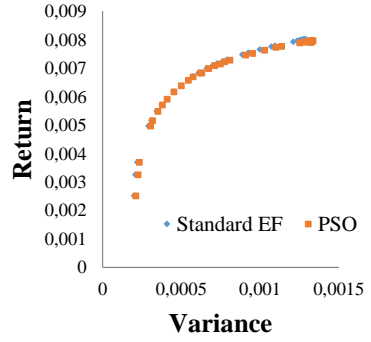
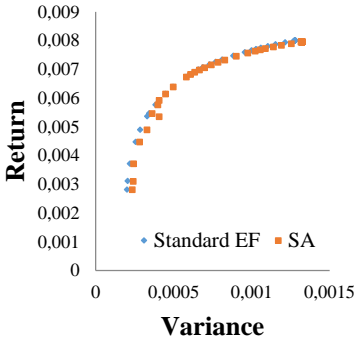
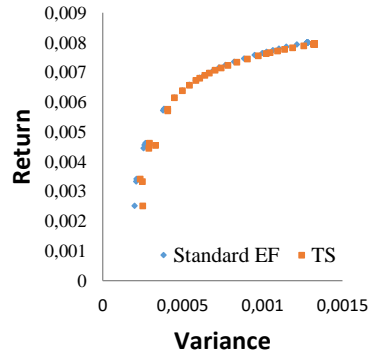
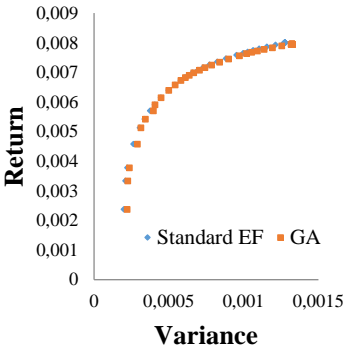


Figure 7: Standard and Heuristic Efficient Frontiers For The S&P 100

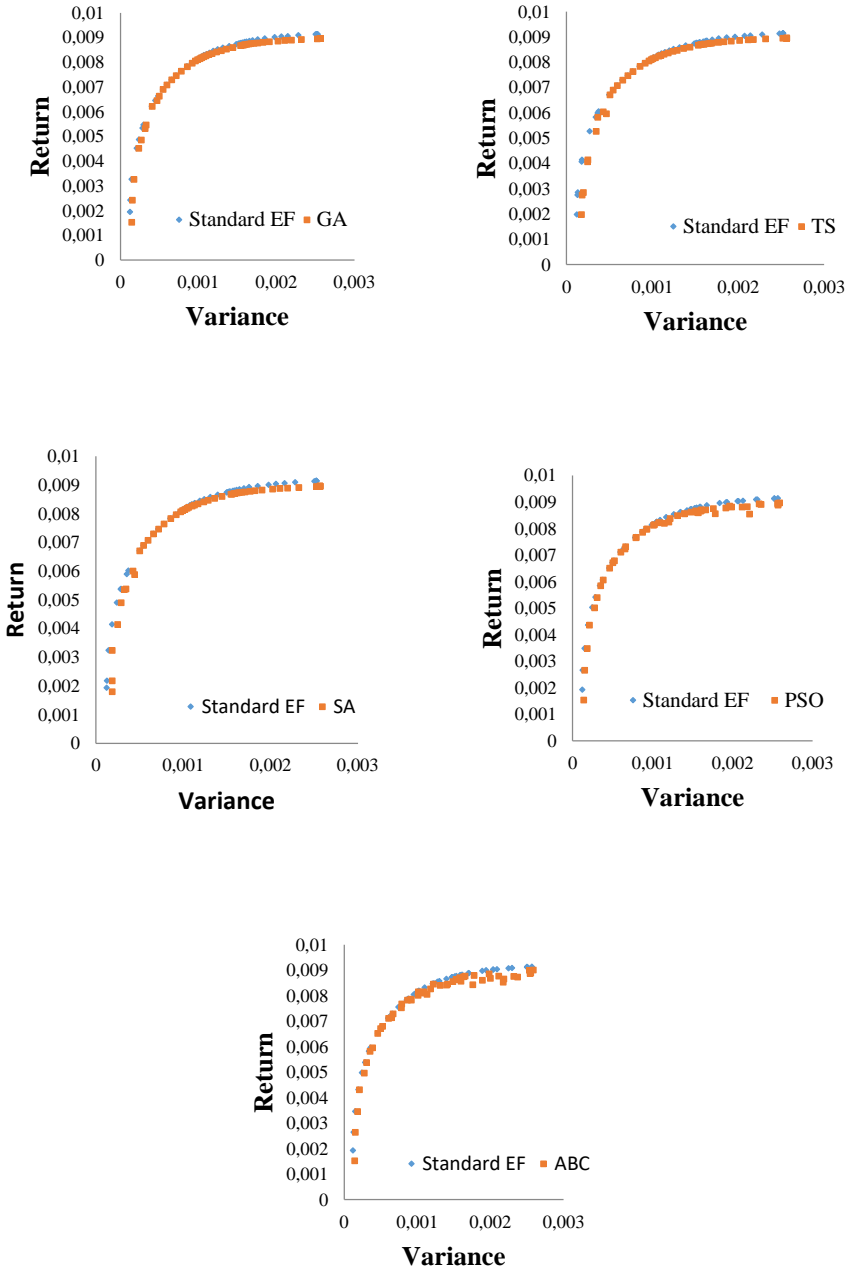


Figure 8: Standard and Heuristic Efficient Frontiers For The Nikkei

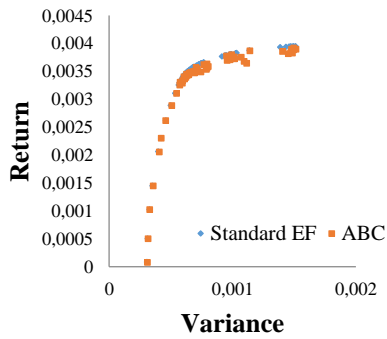
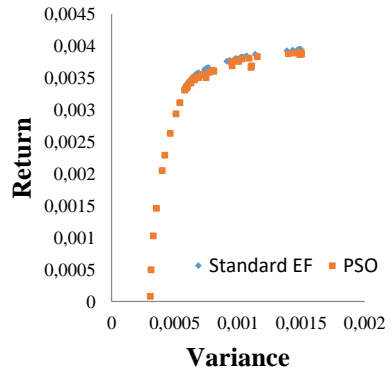
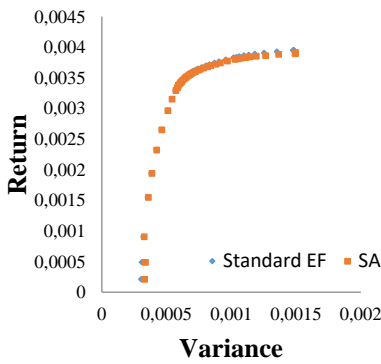
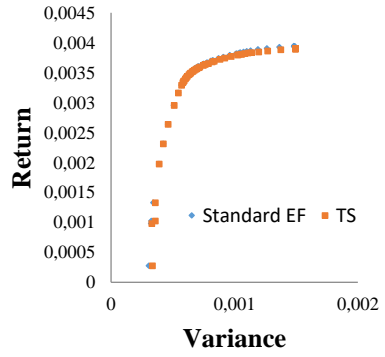
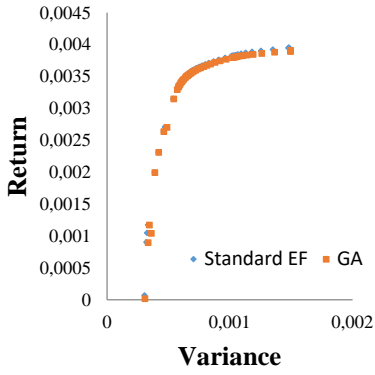


Figure 9: Standard and Heuristic Efficient Frontiers For The BIST30

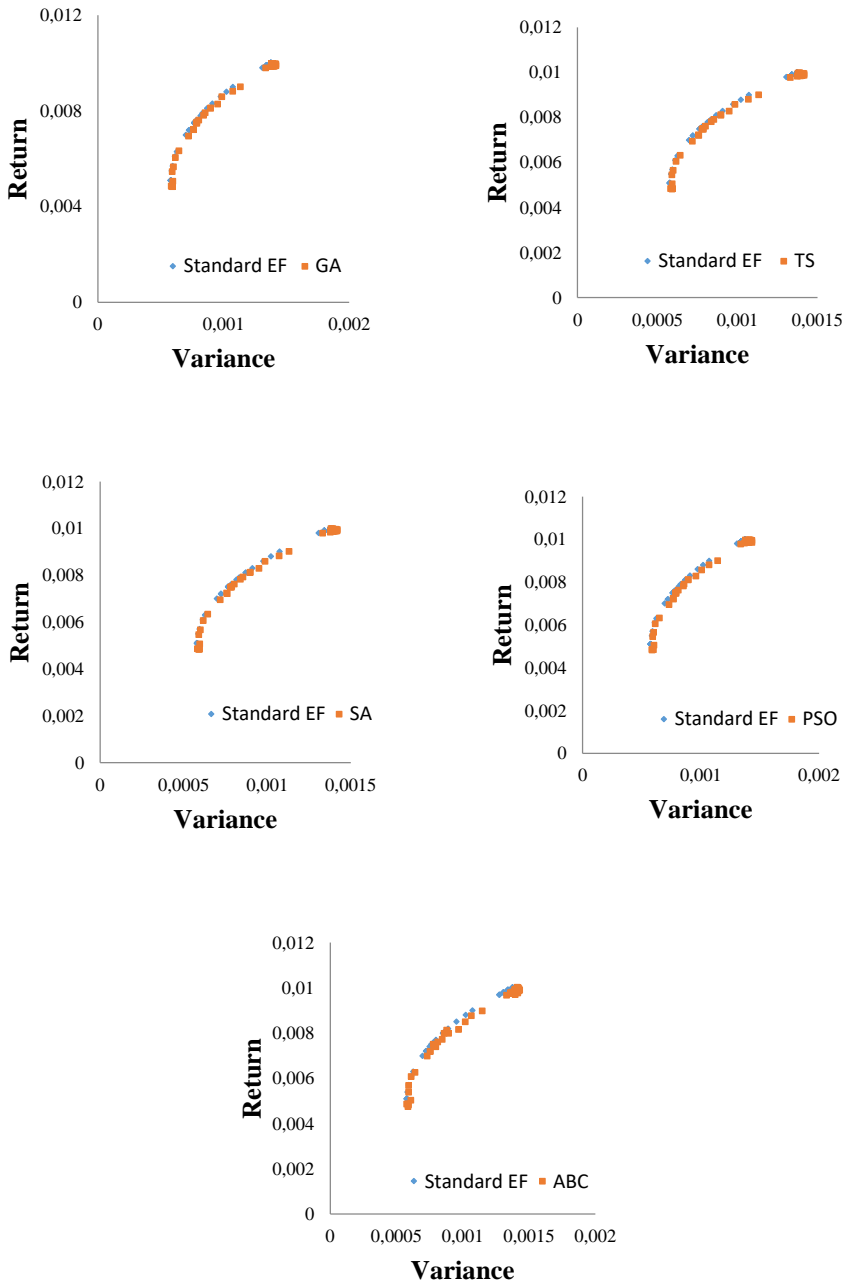
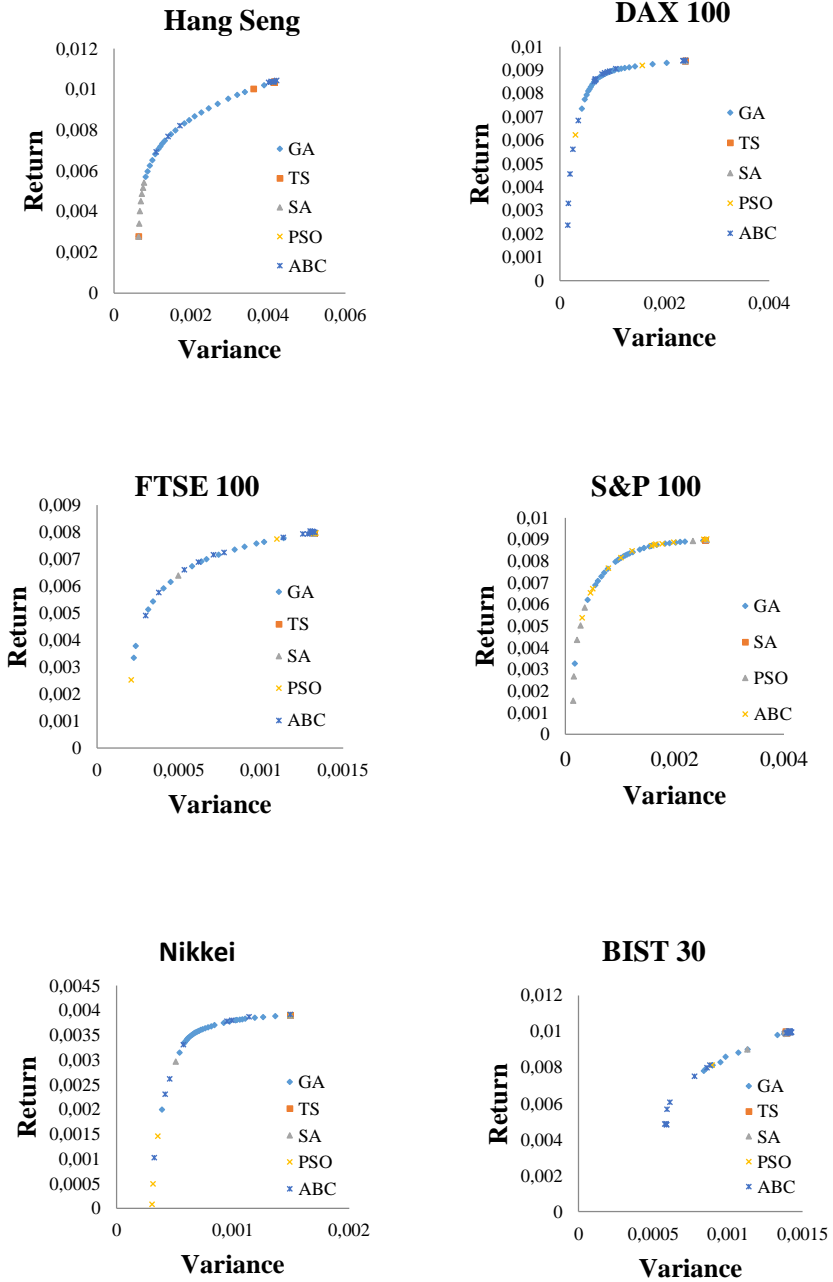


Figure 10: Contributions to The Merged Efficient Frontiers



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CHAPTER II

DETERMINANTS OF FINANCIAL PERFORMANCE OF DEPOSIT BANKS IN TURKEY

Determinants of Financial Performance of Deposit Banks in Turkey

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1. INTRODUCTION

The banking sector, which has the largest share in the financial system, has experienced major transformations and developments around the world in recent years (Aka, 2019: 22). Banks, one of the building blocks of the financial system, have grown in parallel with this system. In terms of turkey is seen as having an important share of the banking sector within the financial system. When evaluated in terms of efficiency and productivity, it can be said that the most important institutions in the financial system are banks. Especially the increasing growth and consumption trend motivated businesses and individuals to borrow more. In this case, it has prompted both businesses and individuals to establish closer relationships with banks. In addition to their deposit collection and lending functions, that it offers other banking services by expanding it has made the banks more functional. On the other hand, the increasing competition in the sector motivates banks to be more innovative and to make more profit by reducing transaction costs (Samırkas et al., 2014: 119).

Recently, the Turkish banking sector has experienced significant developments and changes due to various internal and external factors. The Turkish banking sector has experienced significant structural changes both after the 2000-2001 banking crisis and after the 2008-2009 global economic crisis (Aydın, 2019: 182). Especially the recent global financial crisis has shown that a well-functioning financial system is extremely important for economic stability and sustainable growth (Taşkın, 2011; Demirhan, 2013; Işık et al., 2017). After the 2000-2001 banking crisis in Turkey, restructuring of the banking sector and effective risk management policies has led Turkish Banks to be less affected relative to the 2008 global economic crisis, compared with banks in other countries. (Gurbuz

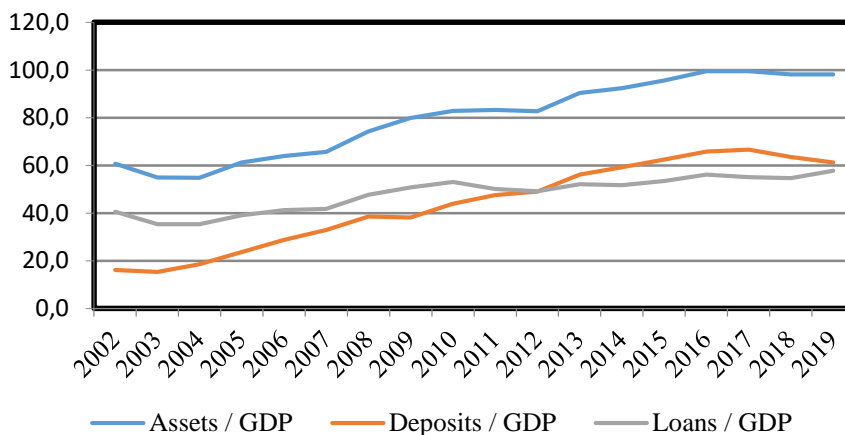
et al., 2013; Lightning, 2014 ; Akhmedjonov and Balcı-Izgi, 2015; Işık et al., 2017).

It is important that banks, which are the main components of the financial system, reach the appropriate level of profitability in terms of both the stability of the financial systems and the increase in resistance against negative shocks in the economy (Aydın, 2019: 182). Likewise, the fact that the Turkish banking and finance sector was relatively less affected by the recent global economic crisis has once again demonstrated the importance of determining the factors that affect the profitability of banks. In this context, study aims to examine bank-specific and macroeconomic factors that affect asset, equity profitability and net profit margin of deposit banks. For this purpose, the reachable data, collected from 18 deposits operating in Turkey banks between the years 2002 to 2019, constitutes the scope of the study. In this context, the introduction part of the study will be given first. Then in the second part, the Turkish banking system will be summarized. In the third part, empirical studies on the factors affecting the profitability of banks will be summarized. In the fourth section, the methodology and data part of the research will be explained. In the fifth part, the analysis results of the research will be explained. In the sixth and last part, an evaluation will be made and the study will be completed by explaining the result.

2. TURKISH BANKING SYSTEM

In general, the financial system can be defined as the mechanism that enables the transfer of funds from economic units with fund surplus to economic units in need of funds. These systems have started to become more complex with increasing economic activities, constantly renewed technology and especially increasing financial liberalization since the 1980s. Many actors have begun to play a role in the system, apart from those who offer and demand funds. Especially with globalization, the need for capital has increased even more. Many criteria such as the increasing need for capital, the realization of fund supply and demand in different regions both led to the formation of fund pools and increased the importance of the institutions that will transfer these funds. This situation provided both service and institutional diversity in the financial system (Samırkas et al., 2014: 119). The assets, loans and deposit ratios of the banks which are located in the Turkish financial sector are shown in Figure 1.

Graphic 1: Ratio of Banking Sector Assets, Loans and Deposits to GDP (2002-2019)



Source: Banks Association of Turkey

When Graph 1 is examined, it is observed that the bank, which holds a significant part of the financial system, has increased its share in the national economy. While the ratio of asset size to GDP was 60.7% in 2002, this ratio increased from 82.9% in 2010 to 98.2% in 2019. Although the ratio of asset size to GDP has decreased in certain periods, it can be said that it has increased in general. This situation indicates that the sector has gained acceleration towards growth as a result of the structural changes experienced especially after the 2001 banking crisis. When the ratio of deposits to GDP is analysed, it is seen that this ratio has increased gradually, especially despite the decrease in crisis periods (2009-2018). This rate, which was 16.1% in 2002, increased from 43.9% in 2010 to 61.2% in 2019. This situation shows that the economy of the country grows and the stakeholders who get a share from the growth turn to savings. In other words, it can be said that the developments in the real sector are a result of their reflection on the financial sector. When the ratio of loans to GDP is analysed, it can be said that there is no high increase between years in general and follows a line close to horizontal. This ratio, which was 40.6% in 2002, increased to 53% in 2010 and 57.8% in 2019. Although the increase in the ratio of loans to GDP is not generally high, the increase in banks' assets indicates that the diversity of services has increased. In this case, it can be interpreted that due to increasing economic activities and constantly renewed technologies, banks have started to provide various other services besides their main field of activity.

Numerical information of deposit banks operating in Turkey between the years 2002-2019 is given in Table 1.

Table 1: Annual Number of Banks Operating in Deposits in Turkey

Years	State Ownership Deposits Banks	Private Capital Deposit Banks	Deposit Banks Under the Management of the Savings Deposit Insurance Fund	Foreign Capital Deposit Banks	Total Deposit Banks
2002	3	20	2	15	40
2003	3	18	2	13	36
2004	3	18	1	13	35
2005	3	17	1	13	34
2006	3	14	1	15	33
2007	3	11	1	18	33
2008	3	11	1	17	32
2009	3	11	1	17	32
2010	3	11	1	17	32
2011	3	11	1	16	31
2012	3	12	1	11	27
2013	3	11	1	12	27
2014	3	11	1	13	28
2015	3	9	1	15	28
2016	3	9	1	15	28
2017	3	9	1	16	29
2018	3	9	1	16	29
2019	3	9	1	16	29

Source: Banks Association of Turkey (Accessed: 31.10.2020)

With the impact of the crises experienced the operating licenses of many banks with weak financial structures, especially in 1999, 2000 and 2001, were revoked and transferred to the SDIF. On the other hand, the banking system has been tried to reach a more robust financial structure with increased audits and internal controls (Samırkas et al., 2014: 121). When Table 1 is analysed, it is seen that the number of banks has been stable in recent years. Also, the majority of deposit banks operating in Turkey are foreign-owned. Between the years of 2017-2019, 16 of the total 29 deposit banks, that is 55%, are foreign capital banks.

The total assets and equities of the deposit banks included in the scope of the research as of 2019 and the rates of these totals by sector are given in Table 2.

Table 2: Total Assets, Equity, Loans, Deposits and Net Profit/Loss of the Deposit Banks in the Scope of Research in 2019 (Million TL)

Bank	Total Assets	Total Equity	Total Loans	Total Deposits	Net Profit/Loss
Ziraat Bank	649.756	70.065	447.983	447.251	6.187
Turkey Halk Bank	457.045	32.197	309.208	297.734	1.720
Vakıflar Bank	419.426	33.026	292.091	251.531	2.802
Akbank	360.501	54.382	203.834	224.055	5.417
Anadolubank	17.558	2.777	12.861	13.629	387
Şekerbank	30.596	1.977	21.822	24.548	-684
Turkish Bank	1.465	212	1.096	1.027	0,00
Türk Ekonomi Bank	107.350	9.721	69.218	72.194	1.070
Turkey İş Bank	468.059	58.873	289.244	295.922	6.068
Yapı Kredi Bank	387.496	41.188	240.464	222.790	3.600
Alternatifbank	28.945	2.345	18.033	16.124	172
Arap Türk Bank	4.958	1.053	1.730	2.456	166
Citibank	12.852	2.523	4.185	9.927	740
Denizbank	156.478	17.720	105.801	100.299	1.336
Deutsche Bank	2.742	741	1.042	1.533	146
HSBC Bank	34.947	3.080	17.568	27.801	470
QNB Finansbank	181.681	16.685	118.972	105.626	2.622
Turkey Garanti Bank	391.152	53.766	251.165	248.751	6.159
TOTAL AMOUNTS	3.713.007	1.354.378	2.406.317	2.363.198	1.433.981

Source: Banks Association of Turkey (Accessed: 31.10.2020)

In Table 2, of the deposit banks included in the scope of the research as of 2019; total assets, total equity, loans and deposits, and period net profit loss totals are given. When the table is examined, it is seen that

Ziraat Bank is in the first place in all totals. It represents 17.5% of total assets, 5.17% of their funds, 18.6% of total loans, 18.9% of total deposits and 0.4% of total period net profit loss in all participating banks for the research. It is seen that Turkey Is Bank which is one of the private deposit banks ranked second in terms of assets and equity size. It constitutes 12.6% of the total assets of banks and 4.3% of their total equity. If the banks assessed in terms of size of assets and equity, Turkey Halk Bank, Turkey Vakıflar Bank, Yapı ve Kredi Bank and Turkish Bank are ranked from 3 to 6 respectively. The only bank that closed 2019 with a loss is Şekerbank. The total asset size of the banks is 3.713.007 million TL, and the equity size is 1.354.378 million TL. Loan size is 2.406.317 million TL and deposit size is 2.363.198 million TL. Although these two sizes are close to each other, the amount of loans given by banks is more than depositors' deposits. The total profits of the deposit banks within the scope of the research in 2019 are 1,433,981 million TL.

3. LITERATURE REVIEW

Banks can be affected by many factors. For example, increasing loan and deposits volumes, innovations in technology, revenues from banking services and alternative distribution channels can be given. Besides, considering its place in the economic system, it is normal that bank profits are affected by macroeconomic variables such as inflation, interest rates and growth. Due to the increasing interest on both the competitiveness of banks and the flexibility of the banking sector, the profitability of banks and the factors affecting this profitability have become a subject that attracts the attention of researchers (Samırkas et al., 2014: 123). Numerous studies have been conducted in the national and international literature on factors affecting bank profitability. Most of these studies are empirical studies, and it is aimed to determine the determinants of profitability of banks through an econometric model. When the literature is examined, as the determinants of bank profitability; it has been observed that bank-specific, sector-specific and macroeconomic variables are used.

Le and Ngo (2020) examined the determinants of bank profitability with system generalized method of moments using data between 2002-2016 period data in 23 countries. The results of the study revealed that the number of bank cards issued, the number of automated teller machines (ATMs) and the number of point of sale (POS) terminals can improve bank profitability. Also the results of the study revealed that negative impact of market power on bank profitability, implying that competition improves bank profitability. Further the results of the study revealed that positive relationship between capital market development and bank profitability. From these studies; Aka (2019) examined the effect bank profitability of bank-specific, industry-specific and macroeconomic factors with panel data analysis using data using data between 2010-2018 period quarter data

of participation banks operating in Turkey. The results of the study revealed that statistically significant relationship bank profitability between banks' asset size, leverage ratio, ratio of non-performing loans, loan to deposit ratio, operational efficiency and bank market density.

Güzel and Iltas (2018) examined the determinants of profitability in banks with panel data analysis using data between 2003-2016 periods of 13 commercial bank with the highest share in Turkey. The results of the study revealed that statistically significant and positive effect the ratio of liquidity and non-operating income is on the return on assets and equity. On the other hand have been determined statistically significant and negative effect non-performing loans and other operating expenditure on return on assets and equity. Kohlscheen et al. (2018) examined the determinants of banks profitability with System GMM estimation using data between 2000-2014 period data of 534 banks from 19 emerging market economies. The results of the study revealed that higher long-term interest rates tend to boost profitability, while higher short-term rates reduce profits by raising funding costs. Also the results of the study revealed that normal time's credit growth tends to be more important for bank profitability than GDP growth. Also, determined that increases in sovereign risk premium reduce bank profits in a significant.

Işık (2017) determine the internal factors affecting the bank profitability with panel data analysis method using data between 2009Q1-2016Q3 period quarterly data of 26 public operating in Turkey, private and foreign-owned commercial banks. The results of the study revealed that, in general, bank profitability (return on assets) is positively affected by variables such as income diversification, deposit level, bank scale and bank stability level, but it is negatively affected by variables representing credit risk, lending level, operating expenses and capital adequacy. Bank profitability has determined that the variable is affected by all bank-specific variables. Belke and Aydin Unal (2017) examined the effect bank profitability of bank-specific, industry-specific and macroeconomic factors with panel regression analyzes and mean-median tests using data between 2005Q1-2015Q4 period quarterly data of 23 deposit bank in Turkey. The results of the analysis revealed that there are significant differences between the banks included in the stock exchange and the banks not included in the stock exchange in terms of the variables of the internal factors of the banks. The regression results also revealed that bank profitability is significantly affected by factors such as the internal factors of the bank, capital, bank size and liquidity risk, as well as non-bank factors such as economic growth, inflation, exchange rate, political exchange rate and market density. It determined that the factors affecting profitability significantly differ according to whether the banks are traded at the Borsa Istanbul.

Saldanlı ve Aydın (2016) examined the determinants of profitability in banks with panel fixed effects model using data between 2004 and 2014 periods of deposit bank in Turkey. The study results revealed that equity / total assets, liquid assets / short term liabilities, non-interest income (Net) / total assets, interest income / interest expenses have a significant effect on ROA. At the same time, the results of the study revealed that non-interest net income / total assets have a significant effect on ROE. Menicucci and Paolucci (2016) examined the relationship between bank-specific characteristics and profitability with regression analysis using data between 2009-2013 period data of the best 35 banks in European. The results of the study revealed that determinant all variables included in the research have statistically significant impacts on European banks' profitability.

Petria et al. (2015) examined the main determinants of banks' profitability with regression analysis using data between 2004 and 2011 period over in EU27. The results of the study revealed that, management efficiency, credit and liquidity risk, the market concentration-competition of the business diversification, and the economic growth ratios have impacts on banks profitability, ROA and ROE. It is an interesting and valuable result that the effect of competition on bank profitability in the EU27 is positive. Rahman et al. (2015) examined the effect banks profitability of bank-specific factors and macroeconomic factors with GMM system of estimator technique using data between 2006-2013 period data of commercial bank in Bangladesh. The results of the study revealed that the capital and credit concentration has a positive and significant effect on the profitability of the bank. The results also revealed that cost effectiveness and off-balance sheet activities significantly but negatively affected bank profitability. They also found that non-interest income, credit risk and GDP are important determinants of NIM. It has been determined that size has a positive and significant impact on ROA. Finally, they determined that inflation has a negative and significant impact on ROA and ROE.

Samırkas et al. (2014) examined the effect banks profitability of bank-specific factors and macroeconomic factors with multiple linear regression analysis using data between January 2003 to June 2012 period data of deposit bank in Turkey. The results of the study revealed that banks' return on assets and return on equity; is positively affected by the ratio of non-interest income to total assets and the ratio of equity to total assets. On the other hand, it is concluded that a change in interest rates on deposits negatively affects the return on asset. Davydenko (2011) examined the determinants of bank profitability with GMM system of estimator technique using data between 2005-2009 period data of bank in Ukraine. The results of the study revealed that Ukrainian banks suffer from low

quality of loans and do not manage to extract considerable profits from the growing volume of deposits.

4. DATA AND METHODOLOGY

In this part of the study, explanatory information about the data set and method of the research, the research model, and the variables within the scope of the research are given.

4.1. RESEARCH DATA SET AND METHOD

The study aims to examine the bank-specific (internal) and macroeconomic (external) determinants of the performance of deposit banks operating in the Turkish banking sector. In line with this purpose, the study covers 18 deposit banks that were continuously operating in the Turkish Banking sector between 2002 and 2019 and whose financial data can be accessed. The data of the study were gathered from the Banks Association of Turkey (TBB), the official web page, macroeconomic data, GDP, inflation data and, World Bank development indicators. The interest rate data were obtained from the official website of Central Bank of the Republic of Turkey (CBRT). Linear multiple regression model and Generalized Least Squares method were used in panel data to estimate panel data.

4.2. RESEARCH MODEL

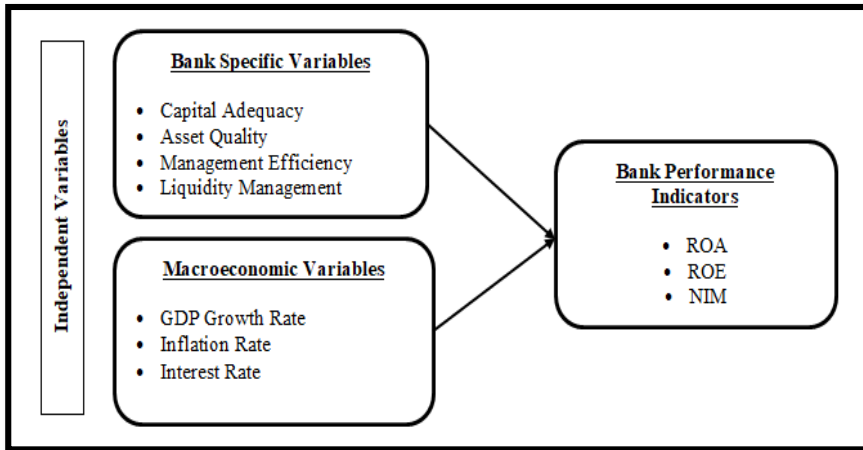


Figure 1: Research Model

In the study, using the studies of Ongore and Kusa (2013), three different basic panel regression models were created and these models are shown below.

$$\text{Model 1: } ROA_{it} = \beta_0 + \beta_1 CA_{it} + \beta_2 AQ_{it} + \beta_3 ME_{it} + \beta_4 LM_{it} + \beta_5 GDP_{it} + \beta_6 INF_{it} + \beta_7 IR_{it} + \mu_{it}$$

Model 2: $ROE_{it} = \beta_0 + \beta_1 CA_{it} + \beta_2 AQ_{it} + \beta_3 ME_{it} + \beta_4 LM_{it} + \beta_5 GDP_{it} + \beta_6 INF_{it} + \beta_7 IR_{it} + \mu_{it}$

Model 3: $NIM_{it} = \beta_0 + \beta_1 CA_{it} + \beta_2 AQ_{it} + \beta_3 ME_{it} + \beta_4 LM_{it} + \beta_5 GDP_{it} + \beta_6 INF_{it} + \beta_7 IR_{it} + \mu_{it}$

Where:

• ROA_{it} , ROE_{it} and NIM_{it} = Show the performance of bank i at time t .

- β_0 = Intercept
- CA_{it} = Capital Adequacy of bank i at time t .
- AQ_{it} = Asset Quality of bank i at time t .
- ME_{it} = Management Efficiency of Bank i at time t .
- LM_{it} = Liquidity Ratio of Bank i at time t .
- $\beta_1 - \beta_7$ = Coefficients parameters
- GDP_t = Gross Domestic Product (GDP) at time t .
- INF_t = Average Annual Inflation Rate at time t .
- IR_t = Average Annual Interest Rate at time t .
- μ_{it} = Error term where i is cross-sectional and t time identifier

4.3. DESCRIPTIVE INFORMATION OF VARIABLES

Descriptive information about the variables within the scope of the research is summarized in Table 3.

Table 3: Descriptive Information of Variables

Variables	Measurements
ROA	Net profit to total assets ratio
ROE	Net profit to total equity ratio
NIM	The remaining amount after deducting the loan or investment costs from the interest income earned from investment or loan, divided by the total assets.
Capital Adequacy	The ratio of total capital to total assets
Asset Quality	The ratio of non-performing loans to total loans
Management Efficiency	The ratio of total profit to total operating income
Liquidity	The ratio of total loans to total customer deposit
GDP	GDP per capita growth (% per year)
Inflation	Yearly average Inflation
Interest	Weighted average interest rates applied to deposits opened by banks

Return on Assets (ROA): Return on assets is an important ratio that indicates bank the profitability of indicator. ROA is an ability of the

banks to make a profit by using their existing assets effectively and efficiently (Saddique et al. 2016: 380). It is a ratio of Income to its total asset (Khrawish, 2011; Ongore and Kusa, 2013). ROA is the percentage earn at total assets. ROA, it shows how effectively and efficiently banks use their available resources to generate profits.

Return on Equity (ROE): ROE is a financial ratio that refers to how much profit a company earned compared to the total amount of shareholder equity invested or found on the balance sheet (Ongore and Kusa, 2013: 239). ROE is net income to total equity. ROE is the percentage earn at equity (Saddique et al. 2016: 380).

Net Interest Margin (NIM): NIM represents the net interest margin and it is calculated by dividing the difference between the interest income and interest expenses of each bank in each period to total assets (Kansoy, 2012).

Capital Adequacy: Capital is one of the bank-specific factors that influence the level of bank profitability. Capital adequacy ratio shows the internal strength of the bank to withstand losses during the crisis. In the study, capital adequacy will measure with ratio total equity to total assets.

Asset Quality: Generally, banks' loans are assets that make up the largest share of bank revenues. Because loans are the most important assets from which commercial banks generate income. The loan portfolio quality has A direct bearing on bank profitability. The highest risk of facing a bank is the losses derived from delinquent loans (Dang, 2011; Ongore and Kusa, 2013). Thus, nonperforming loan ratios are the best proxies for asset quality. In the study, Asset Quality will be measured by the ratio of non-performing loans to total loans.

Management Efficiency: Management efficiency is one of the key internal factors that determine bank profitability. In the study, the efficiency of the management was calculated as the ratio of the total profit to the total operating income. It is known that the ratio of operating expenses to total assets by business management has a negative effect on profitability. For this reason, management quality determines the level of operating expenses and affects profitability (Athanasoglou et al., 2005).

Liquidity Management: Liquidity is another factor that determines the level of bank performance. Liquidity refers to the ability of the bank to fulfill its obligations, mainly of depositors (Ongore and Kusa, 2013). Dang (2011) stated in his study that sufficient liquidity level affects the profitability of banks positively. In his study, Dang (2011) stated that the most common financial ratios reflecting the liquidity status of banks are the ratio of customer deposits to total assets or the ratio of total loans

to total deposits. In this study, the ratio of total loans to total deposits is used as a liquidity management variable.

Gross Domestic Product (GDP): One of the macroeconomic variables that affect the performance of banks is the Gross Domestic Product. Gross domestic product (GDP is the economic measure of the market value of all final products produced in a given period. As Ongore and Kusa (2013) state, the GDP trend affects the demand for banks' existence. It can be said that there is a correct relationship between GDP and bank profitability. For instance, when the rate of GDP drops, the demand for loans falls, which negatively affects the profitability of banks. On the contrary, credit demand increases and the profitability of banks is positively affected.

Inflation Rate: Changes in general price levels can affect both banks' profits and costs (Samırkaş et al., 2014: 127). Inflation causes interest rates to rise as a positive effect on bank profitability is called. Consumer price index was used as inflation data to represent this situation.

Interest Rate: Increasing the interest rate will increase the amount individuals deposit in banks and cause a decrease in people's consumption expenditures (Taşkın, 2011: 294). This situation shows that there is a correct relationship between interest rate and bank profitability. As an indicator of interest rate, the weighted average interest rate applied to the deposits opened by the banks is used.

5. EMPIRICAL FINDINGS

In the study, we used ten regression analyses which are categorized into three main models and applied. Analysis results are given in tables below.

5.1. DESCRIPTIVE STATISTICS INFORMATION OF VARIABLES

Statistical information about the variables included in the study is summarized in Table 4.

Table 4: Descriptive Statistics of Variables

Variables	Number of Observations	Mean	Standard Deviation	Min.	Max.
ROA	324	0.0180 3	0.01931	-0.065	0.215
ROE	324	0.1337 7	0.10469	-0.972	0.463
NIM	324	0.0427 7	0.03171	-0.21698	0.19287
Capital Adequacy	324	0.1297 9	0.05978	0.03265	0.49213
Asset Quality	324	0.0630 5	0.12067	0,00000	0.94620
Management Efficiency	324	0.2502 8	0.14177	-0.51161	0.56204
Liquidity	324	0.8526 2	0.38123	0,00000	3.32796
GDP	324	3.8892 2	3.61180	-5.91073	9.42377
Inflation	324	0.1467 0	0.47922	0.06251	8.59826
Interest	324	0.1680 8	0.11438	0.0705	0.53000

Table 4 presents the descriptive statistics of the bank specific factors and macroeconomic factors that determine the financial performance of deposit banks in Turkey. When the table is examined, deposit banks in Turkey was average return on assets ratio of 0.018, average return on equity ratio of 0.134 and average net interest margin of 0.043. As indicated in the table 2, the average capital ratio of deposit banks in Turkey was about 0.13. The average asset quality of the deposit banking sector in the stated period was 0.063. This indicates that there is no high credit risk. Deposit banks the average management efficiency ratio is the 0.250. This situation indicates that 25% of the revenues of deposit banks are generated as a result of conventional intermediation (operating) function. Another important factor liquidity, average total loans to total deposit was 85.2%. This indicates that deposit banks in Turkey use 85.2% of customer deposit for on lending. When macroeconomic factors are examined, it is seen that the average GDP's 3.88%, inflation of about 16% and the interest rate of about 17%.

5.2. TEST FOR ROBUSTNESS OF THE MODEL

Multiple linearity problem is an important issue in terms of correct and interpretation of the results. Whether there is a linearity problem among the independent variables within the scope of the study was tested by using correlation and VIF values. Table 5 shows the correlation values for the independent variables. Table 6 shows the for the VIF values.

Table 5: Correlation Coefficient between Independent Variables

	CA	AQ	ME	LM	GDP	INF	IR
CA	1.000						
AQ	0.367	1.000					
ME	0.154	-0.024	1.000				
LM	-0,047	-0.247	-0.102	1.000			
GDP	-0.034	0.001	-0.043	-0.086	1.000		
INF	0.025	0.022	-0.019	-0.181	0.064	1.000	
IR	0.091	0.268	-0.068	-0.457	0.030	0.193	1.000

According to Gujarati (2007), having a correlation above 0.8 between the independent variables within the scope of the study indicates that there is a multiple linearity problem among these variables. When Table 5 is examined, it is seen all the correlation coefficients between the independent variables were less than 0.8. In this case, it shows that there is no multi-linearity problem between variables.

Table 6: Variance Inflation Factor of Variables

Variables	VIF	1/VIF
CA	1.20	0.832560
AQ	1.28	0.781476
ME	1.07	0.935786
LM	1.36	0.736304
GDP	1.01	0.986337
INF	1.06	0.945856
IR	1.35	0.740236

The VIF value should be less than 5 to avoid multiple linearity problems between variables (Hair et al., 2014). When Table 6 is examined, it is seen that the VIF values of all variables are less than 5. This situation shows that there is no linearity problem among the variables included in the model.

5.3. THE RELATIONSHIP BETWEEN BANK PERFORMANCE AND ITS DETERMINANTS

Table 7 shows the relationship between the dependent and independent variables.

Table 7: Correlation Coefficient between Variables

Variables	ROA	ROE	NIM
Capital Ratio (CA)	0.5499	0.0510	-0.1975
Asset Quality (AQ)	0.1478	0.0179	-0.2380
Management Efficiency (ME)	0.5669	0.7558	-0.0431
Liquidity (LM)	-0.2589	-0.2048	0.0965

GDP	0.0074	-0.0216	-0.1033
Inflation (INF)	-0.0331	-0.0411	0.0335
Interest (IR)	0.1337	0.1555	0.0995

When Table 7 is examined, the capital ratio; it is seen that there is a positive relationship with ROA and ROE, a negative relationship with NIM. This situation shows that as the ratio of equity capital within total assets increases, deposit banks will positively affect their return on assets and equity profitability. However, as the ratio of their own funds within total assets increases, the net interest margin of deposit banks is adversely affected. Asset quality which is expressed as non-performing loans to total loans is positively associated with ROA and ROE and negatively correlated with NIM. This indicates that as the asset quality increases, it will increase the return on assets and return on equity and decrease the net interest margin. Similarly, there is a positive relationship between management efficiency and ROA and ROE, negative relationship with NIM. This indicates that as management efficiency increases, it will increase the return on assets and return on equity and decrease the net interest margin. The other explanatory variable, liquidity management is positively related to NIM, negatively related to ROA and ROE. This indicates that as the ratio of total loans to total customer deposits increases, the return on assets and return on equity will be negatively affected, the net interest margin will be positively affected. This may be due to the fact that liquidity management is more related to fulfilling depositors' obligation (safeguarding depositors) than investment (Ongore and Kusa, 2013: 247). When the macroeconomic variables are examined the type of relationship between gross domestic product and bank performance is mixed. When the table is examined, it is seen that GDP affects ROE and NIM negatively, ROA positively. However, in ROA and ROE with the relationship is not significant. However, it is significantly negatively related to NIM. Inflation is negatively associated with ROA and ROE, and NIM is positively associated with the province. This indicates that as the inflation ratio increases, the return on assets and return on equity will be negatively affected, the net interest margin will be positively affected. The other macroeconomic variable, interest is positively related to all the three performance. Particularly more strongly related to ROE. This indicates that as the interest ratio increases, the return on assets, return on equity and net interest margin will be positively affected.

5.4. REGRESSION RESULTS

Table 8 given in the regression analysis results of the study.

Table 8: Regression Results of Bank Specific Factors

Variables	Model 1 (ROA)	Model 2 (ROE)	Model 3 (NIM)
Capital Ratio (CA)	0.1603334 [12.57]*	-0.1570296 [-2.38]**	-0.0725176 [-2.37]**
Asset Quality (AQ)	-0.0139018 [-2.13]**	0.003545 [0.11]	-0.0567896 [-3.63]*
Management Efficiency (ME)	0.0645462 [12.73]*	0.5744102 [21.94]*	-0.0002946 [-0.02]
Liquidity (LM)	-0.0094799 [-4.46]*	-0.0126516 [-1.15]	0.0115005 [2.26]**
GDP	0.0001688 [0.87]	0.0000803 [0.08]	-0.0009192 [-1.98]**
Inflation (INF)	-0.003414 [-2.29]**	-0.0158534 [-2.06]**	0.0019116 [0.53]
Interest (IR)	0.0125041 [1.77]***	0.1906709 [5.22]*	0.0639249 [3.77]*
Constant	-0.0122327 [-3.53]*	-0.0091135 [-0.51]	0.0385836 [4.65]*
Observation	324	324	324
Prob > F	0.0000	0.0000	0.0000
R ²	0.5901	0.6281	0.1265
Adjusted R ²	0.5810	0.6199	0.1072

Note : The figures in parentheses are t-Statistics; * statistically significant at the 1% level; ** statistically significant at the 5% level; *** statistically significant at the 10% level.

When Table 8 is examined, for all dependent variables specific factors affect the performances of deposit banks with a minimum of 95% confidence level. Among the macroeconomic factors, it is seen that only the interest rate belonging to the ROE dependent variable affects the bank performance at the 90% confidence level and the others at the 95% confidence level.

When Model 1 is examined, it is seen that the effect of all bank-specific factors on return on assets (ROA) is statistically significant in different aspects. Among these factors, capital ratio, management efficiency and liquidity management are found to have an effect of 0.160, 0.064 and -0.009, respectively, at 99% significance level. Asset quality is seen to be approximately -0.014 effective at 95% significance level. Among the macroeconomic factors, it is seen that the interest rate has an effect of approximately 0.013 on the ROA at the 90% significance level, and the inflation is -0.003 at the 95% significance level. It is seen that GDP does not have any significant effect on ROA. According to the F value, which shows the significance values of the model, since this value is less than 0.05 (Prob> F, 0.0000), H₀ is accepted as H₁ is rejected, in this case, the model is significant. R² value is the value that indicates what percentage of the dependent variables explain the independent variables. If

this value is 0.25, it is considered weak, if it is 0.50, it is considered medium, and if it is 0.75, it is considered strong (Henseler et al., 2009; Hair et al., 2011). When we look at R^2 and Adjusted R^2 values, it is seen that they are 0.59 and 0.58, respectively. This shows that the independent variables explain ROA moderately.

When Model 2 is examined, it is seen that one of the bank-specific factors, management efficiency has an effect of 0.574 at 99% significance level on return on equity (ROE), and the capital ratio has -0.157 at 95% significance level. Asset quality and liquidity management, on the other hand, has no significant effect on ROE. Among the macroeconomic factors, it is seen that the interest rate has an effect of approximately 0.190 on the ROE at 99% significance level, while inflation has approximately -0.016 at the 95% significance level. It is seen that GDP does not have any significant effect on ROE. According to F value, which shows the significance values of the model, since this value is less than 0.05 ($\text{Prob} > F, 0.0000$), H_0 is accepted as H_1 is rejected, case, it indicates that the model is significant. When R^2 and Adjusted R^2 values are examined, it is seen that they are approximately 0.63 and 0.62, respectively. This shows that the independent variables explain the ROE at a medium level.

When Model 3 is examined, it is seen that bank-specific factors, capital ratio and liquidity management, have an effect of approximately -0.073 and 0.012, respectively, on the net interest margin (NIM) at a 95% significance level. As it is seen that asset quality has an approximately -0.057 effect at the 99% significance level. Management effectiveness does not seem to have any significant effect on NIM. Among the macroeconomic factors, it is seen that the interest rate has an approximately 0.064 effect at 99% significance level and that the GDP has approximately -0.001 at 95% significance level on NIM. It is seen that the inflation rate does not have any significant effect on NIM. According to F value, which shows the significance values of the model, since this value is less than 0.05 ($\text{Prob} > F, 0.0000$), H_0 is accepted as H_1 is rejected, in this case, the model is significant. When R^2 and Adjusted R^2 values are examined, it is seen that they are approximately 0.13 and 0.11, respectively. This shows that the independent variables weakly explain NIM.

6. CONCLUSION

The purpose of this study, bank-specific (internal) and macroeconomic factors (external) that impact on the financial performance of the bank deposits in Turkey is to examine empirically. For this purpose, the annual data of 18 banks between 2002 and 2019 are used. Linear multiple regression model and Generalized Least Squares method are used in the panel data to estimate the parameters within the scope of the study. Three different models are created to analyse the relationship between the

variables. The first of these models examine the impact of bank-specific factors and macroeconomic factors on ROA. As a result of analysis conducted for this model, the capital ratio of the bank-specific factors and management's effectiveness has a statistically significant and positive effect on the performance of the bank's liquidity management while the asset quality has a significant and negative impact on the liquidity management. It has been determined that GDP, one of the macroeconomic factors, does not affect ROA and ROE, but it negatively affects the NIM. On the other hand, it is found out that the inflation rate, one of the other macroeconomic variables, does not affect NIM but it negatively impacts ROA and ROE. The financial performance of banks in Turkey with interest rates on deposits has been identified as having a relatively strong positive relationship. This situation shows that the deposit interest rates increased the financial performance of the banks between the periods examined. In other words, increases in deposit interest rates increase the performance of deposit banks. When all these three models for assessing macroeconomic variables created, the impact on the performance of the interest rate of deposits among banks in Turkey it is possible to say that except the period under review remained inconclusive. As a result of the analysis for the second model, it is determined that the effect of management efficiency on ROE, one of the bank-specific factors, is statistically significant and positive. This situation shows that the developments in management efficiency positively affect the return on equity. The capital ratio shows how much of the assets are financed by equity. According to the analysis results, the higher this ratio, the lower the return on equity. In this case, the deposits of banks in Turkey is possible to conclude that they benefit from the leverage of debt for the period studied. On the other hand, asset quality and liquidity management could not have any significant effect on ROE. As a result of the analysis make for the third model, it is determined that the effect of liquidity management on NIM, one of the bank-specific factors, is statistically significant and positive. This situation indicates that the increase in the ratio of total loans to total deposits will increase the bank's performance. In this case, to protect the highly liquid assets for the period under review the performance of bank deposits in Turkey is not possible to conclude. The effect of asset quality on NIM is found to be statistically significant but negative. As Ongore and Kusa (2013) stated, the low relationship between asset quality and bank performance indicates that the reason is related to total assets. In this case, it is possible to say that banks with high asset quality and low non-performing loan are more profitable than the other banks. It is determined that the effect of capital ratio on NIM is statistically significant and negative. No significant effect of management effectiveness on NIM is detected.

The results support the study of Ongore and Kusa (2013) for commercial banks in Kenya. When the results of the analysis as general,

bank-specific factors (factors under the control of managers) are the important determinants of the financial performance of deposit banks in Turkey. The result supports the "Efficiency Structure Theory", which states that enhanced management efficiency leads to higher performance, as stated by Ongore and Kusa (2013).

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CHAPTER III


THEORETICAL ASPECTS OF CORPORATE GOVERNANCE: WHY IT MATTERS IN BANKING SECTOR*

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1.INTRODUCTION

After the global financial crises, corporate bankruptcies and frauds reached to a great extent, it has been concluded that the necessary attention is not given to corporate governance practices on a country or firm basis. Application of corporate governance principles is of great importance in terms of the companies' ability to operate in both domestic and foreign markets and of keeping up with economic or technological changes. Corporate governance; in line with the principles of transparency, accountability, responsibility, and fairness, is a set of rules and practices that put the relations between company management and all stakeholders in a certain order. The company management has to shape its relations with stakeholders within the framework of the four principles mentioned. The countries or companies whose corporate governance practices are not considered effective are greatly likely to lose their appeal to investors and these losses reach significant dimensions. Therefore, corporate governance practices should have an effective structure, especially in the banking sector, which guides the economy to a large extent and provides financing to the real sector.

In addition to the financial crises and corporate scandals resulting from ineffective corporate governance policies, developments such as the markets becoming interdependent as a result of globalization, the increasing weight of corporate investors in company investments, and the acceleration of privatization activities drew attention to the importance of

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corporate governance practices in both the real sector and the banking sector. At this point, corporate governance emerges as a concept that aims to resolve the negative situations and to keep up with the developments.

Due to the functions of banks to stabilize the financial system and contribute positively to economic growth, the scope of corporate governance in banks differs from corporate governance practices in companies operating in the other sectors. The recent realization of large-scale reforms in the banking sector and the fact that banks have an important place in the economies of developing countries have increased the importance of effective corporate governance practices in banks. Considering the emergence process of the concept of corporate governance; it is seen that the negative effects of financial crises, which are one of the most important factors in the emergence of the so-called process, are felt in the banking sector first and then in the real sector. It is possible to express that the importance of corporate governance in the banking sector differs compared to other sectors due to the functions of banks to provide capital financing to companies operating in the real sector and to realize effective resource allocation. In this context, the first step in implementing the effective corporate governance practices in the banking sector in Turkey was taken after the 2001 banking crisis, which negatively affected first the financial sector and then the real sector.

The rest of this chapter is organized as follows: First of all, various definitions related to corporate governance are given, the factors that are effective in gaining importance of corporate governance are clarified, basic principles and objectives of corporate governance are mentioned, and corporate governance structures in different types of ownership are discussed. Then, the study is terminated by addressing the general situation and the importance of corporate governance in banks. Finally conclusion section is presented.

2. CORPORATE GOVERNANCE

In this section, general information about the concept of corporate governance will be presented. In this context, after defining this concept and expressing its common elements, the factors that are effective in the residual importance of corporate governance, and its practices in different ownership structures will be discussed.

2.1. DEFINITION OF CORPORATE GOVERNANCE

It is possible to come across different definitions regarding the concept of corporate governance in the literature because this concept shows difference from country to country. However, the following elements appear as common criteria in all definitions related to the concept of corporate governance (Dogan, 2007: 42):

- Control mechanisms within the company,
- Close relations among the company's directors, the board of directors, shareholders and stakeholders,
- Management of the company by considering interests of all stakeholders,
- More transparent and accountable information produced within the company.

The narrowest definition of the concept of corporate governance was made by Shleifer and Vishny (1997). According to Shleifer and Vishny, corporate governance is a set of activities that will enable the funders to trust the company to get the return they expect from their investments (Shleifer and Vishny, 1997: 737). According to the OECD, the concept of corporate governance is taken from a wider perspective, and the relationship among the board of directors, shareholders, and other stakeholders is expressed as a whole. According to the Cadbury report, corporate governance is a set of practices that allow the balance between economic and social goals. (Dinc and Abdioglu, 2009: 160).

It may be concluded from the suggested definitions that corporate governance is a subject that has been handled carefully all over the world as a concept that covers both internal control and the relationship between the firm and stakeholders (Mallin, 2007: 5). Corporate governance is a concept that clarifies the relationship between shareholders and managers. It is tried to find solutions to proxy problems arising from the differences between corporate governance practices and ownership and control structures (Tarraf, 2011: 95). Effective corporate governance requires a talented and experienced management structure, consistent strategies and business plans, and clear limits of accountability (McDonough, 2002: 1). With a successful corporate governance practice, firms can reduce their capital costs, increase their financing opportunities and liquidity, and find more funding opportunities than capital markets (Ozturk and Demirgunes, 2008: 395).

2.2. CORPORATE GOVERNANCE PRINCIPLES

With the rapid innovations in technology and the establishment of new industries, financial problems in businesses started to grow and with the increasing need for funding, issues such as liquidity and financing of investments started to gain importance. At this point, the interaction between financial performance and corporate governance started in the early 90s, and effective corporate governance practices were seen to be an important factor on financial performance (Usta, 2008: 19). At the same time, corporate governance is of great importance in terms of managing companies well and maintaining their activities at an optimum level of

effectiveness. In this context, it is possible to express some of the basic characteristics of corporate governance as follows (Mallin, 2007: 5-6):

- With corporate governance, an appropriate and robust control system is established within the company and thus companies have the opportunity to protect their assets,

- Corporate governance prevents a single person from having a say in the decisions that should be taken in companies,

- Corporate governance; regulates the relationship between company managers, board of directors, shareholders and other stakeholders,

- Corporate governance focuses on managing firms, shareholders and other stakeholders in a way that meets their interests at the highest level,

- It encourages the application of transparency and accountability concepts that investors place the utmost importance on both corporate governance and corporate performance.

While corporate governance practices differ due to the legal regulations of the countries in which they are located and the company's unique characteristics, all corporate governance models consist of four main principles: fairness, transparency, accountability, and responsibility. These principles are described briefly below (Dogan, 2007: 50):

The principle of fairness; this principle contributes to the determination of internal duties and responsibilities by minimizing representation costs, and reducing conflicts of interest.

The principle of transparency refers to the process of making information about the current situation and events in companies accessible, concrete, and understandable. Transparency contributes to the effective distribution of resources by enabling market participants to obtain the information needed to separate one firm or one country from another and recognize risks (Banks Association of Turkey, 1999: 7). It is possible to express what companies need to do to improve their understanding of transparency within the framework of corporate governance as follows (Baraz, 2007: 96):

- Adopting and implementing a transparent management approach as 'corporate culture',
- Raising awareness about corporate governance and making efforts to create public opinion,
- Managing companies with a sense of responsibility for their work,
- Taking unregistered transactions into the register,
- Forming an audit committee that reports to senior management,

- Preparing understandable and reliable financial statements according to international standards,
- Using the corporate website to share information and keep it up to date,

The principle of accountability refers to the responsibility of the people to whom the resources are allocated or delegated to demonstrate how effectively they use these resources and powers. In firms where corporate governance practices are effectively carried out, company management has several responsibilities towards shareholders and all stakeholders. First of all, shareholders who are partners in the ownership of the company have the right to monitor and control the effective use of the funds invested in the company. It is more appropriate for the board of directors of the company to bind the responsibility and obligation of accountability to certain rules rather than for shareholders to protect their rights individually (Aktan, 2006: 65).

The principle of responsibility refers to the compliance of all activities carried out by the management of the company on behalf of its legal entity with the relevant legislation, articles of Association, Internal Regulations, social and ethical values and its supervision (Pamukcu, 2011: 135). This principle aims to set and implement the right goals to ensure compliance with laws and social values (Dinc and Abdioglu, 2009: 161).

2.3. FACTORS AFFECTING THE EMERGENCE OF CORPORATE GOVERNANCE

Financial crises that have negatively affected the entire world economy led to bankruptcy and caused an economic recession in several countries. This situation have made corporate governance practices the focus of resolving the problems by banks to stop lending operations. The high quality of corporate governance practices has special importance for both companies and countries. Considering the companies; effective corporate governance allows for low capital costs, increased financing opportunities and liquidity, and easier crisis recovery. In terms of countries, corporate governance practices have a certain quality; it enhances the image of the country, prevents capital from going abroad, promotes foreign investments, increases the competitiveness of the economy and capital markets, and enables more efficient use of resources (Solomon and Solomon, 2004: 11).

Many factors play a significant role in the application of principles of corporate governance. Enron scandal in 2002 and various firm scandals may be considered as the so-called factors. The mentioned company collapse adversely affected the large-scale investments of shareholders, employment opportunities in the relevant country, and many managers. The mentioned company scandals in the USA and other developed

countries have not been limited in themselves; they have also affected the developing countries and have negatively reflected on the markets by shaking the trust of investors (Ozsoy, 2011: 11). On the other hand, recent financial crises, the increase in the weight of the institutional investors, and the competition conditions intensified as a result of globalization are also among the main factors in the importance of corporate governance (Gurbuz and Ergincan, 2004: 3). In this section, the effects of the mentioned factors on corporate governance will be emphasized.

2.3.1. CORPORATE SCANDALS AND COLLAPSES

Economic crises and large-scale corporate scandals play an important role in the development of corporate governance. The 'South Sea Bubble', which was experienced in the 1700s and which has gone down in history as the first known management fault, has been very effective in making new laws and regulations in England. In the United States, the issue of corporate governance was first raised after the Asian crisis in 1929, and it was aimed to bring confidence to the business world. The collapse of 'Bank of Credit and Commercial' and 'Baring Bank' accelerated the operations as to corporate governance. Therefore, it is possible to describe the bankruptcy events experienced in these two firms as the events that have the most impact on the development of corporate governance (Uyar, 2004: 154).

Companies have to attract the interest of investors to protect their existing assets and to ensure a certain growth. Investors, on the other hand, pay attention to the companies' financial soundness, profitability, and management quality before investing in a particular area or company. Therefore, the fact that the annual reports, financial statements and other published reports reflect the accuracy and truth one-to-one is of great importance for investors to make an objective and accurate assessment. Although its annual reports and financial statements look pretty good, in the 2000s a large number of large-scale companies in America, Britain, and many other countries faced the risk of bankruptcy. As a result of the corporate scandals in question, the value of shareholders' investments greatly reduced, many employees lost their jobs, and the sectors in which bankrupt firms operate, and finally the economies of the country, were negatively affected by this situation (Mallin, 2007: 1).

Corporate scandals that emerged as a result of accounting frauds allegedly carried out by senior executives of large-scale companies such as Enron, Parmalat, WorldCom, Adelphia, Xerox and Tyco, played a major role in questioning the effectiveness of corporate governance practices. Besides, the bankruptcy of companies that were publicly held in the UK in the early 1990s also made it possible to bring many suggestions on

corporate governance and to conduct various researches on more effective corporate governance practices (Dogan, 2007: 40).

2.3.2. GLOBAL FINANCIAL CRISES

Inadequate corporate governance policies implemented in countries and companies are among the main reasons for the outbreak of recent global financial crises (Gurbuz and Ergincan, 2004: 3). It is stated that the most important factor in the occurrence of system-based crises affecting first the company, then the sector in which the company is located and then the whole country's economy is the ineffective corporate governance practices (Sakarya et al., 2012: 234). In the Asian crisis that started in the Far East in 1997 and spread rapidly all over the world, companies experienced management problems and audit deficiencies, weaknesses in accounting systems and structural problems in shareholder ownership (Karayel, 2006: 37). The Asian crisis became more important with the scandals of Enron in the United States and Parmalat in Europe, leaving all companies to reconsider their existing corporate governance practices (Kula, 2006: 12).

As the main reason for the emergence of the 2008 global financial crisis; aggressive (unconscious or excessive) risk-taking strategies have been shown. Ineffective risk management activities carried out by the managers and boards of directors have also accelerated the collapse of the markets and led to the outbreak of the so-called financial crisis (Tarraf, 2011: 93). Additionally, the regulations and standards for misconduct in accounting by the senior managers of some firms following their interests has also hastened the process of emergence of crises (Gokgoz, 2012: 313).

2.3.3. INSTITUTIONAL INVESTORS

Institutional investors have an important role for the financial institutions that play an important role in fulfilling the functions of financial system, managing the savings of small investors at an acceptable risk level to achieve the objectives of return maximization and maturity matching. Mutual Funds, Private Pension Funds, Investment Partnerships, Life Insurance Companies, Real Estate Investment Trusts and Venture Capital Investment Trusts are described as the institutional investors. As a result of the merger of individual savings under mutual and pension funds managed by corporate investment companies, great financial power has occurred. In the face of the demands of this power, it has become imperative to act more fairly, more transparently, more reliably, and more responsibly within the framework of corporate governance principles. Effective corporate governance enables the company risk and therefore the rate of return demanded by investors to decrease. As a result of this situation and with the increase in the weight of institutional investors in firm investments, institutional investors have the opportunity to follow the

company operations more closely and criticize the company management when necessary, and they can be effective in the formation of company management in general assembly meetings (Mentes, 2009: 59).

The change in the characteristics of shareholders, the increase in the share of institutional investors, and in the number of investments made by pension funds and insurance companies are among the factors that have an effect on the development of corporate governance all over the world. Furthermore, institutional investors' tendency to make profitable overseas investments to diversify their portfolios has also been effective in the emergence of corporate governance (Dogan, 2007: 43).

2.3.4. THE ROLE OF THE PRIVATE SECTOR AND PRIVATIZATION ACTIVITIES

Privatization practices, which have become widespread all over the world since the 1980s, have been indirectly effective in gaining the importance of corporate governance. This situation is mostly due to the public enterprises, which are publicly owned, have moved to financial markets for capital supply and have turned to firm marriages after they have become private (Stone et al., 1998: 2-3). Compliance with corporate governance principles makes the companies within the scope of privatization more efficient and transparent, thereby increasing the demand in both block sales and public offerings. When effective corporate governance is implemented in the companies operating in the public or private sector, especially companies within the scope of privatization; inefficiency and losses arising from bad management and unfair gains disappear and the economy gains dynamism (Ozsoy, 2011: 50-51).

The fact that public trusts private sector firms in terms of evaluating their savings on their behalf and securing their investments is another factor for the residual importance of effective corporate governance. On the other hand, the private sector is seen as the main element of global economic growth and it is stated that the privatization programs implemented in many countries, the developing competition policy, and the liberalization efforts of the capital market are also effective. With increasing confidence in the private sector around the world, the quality of corporate governance becomes more and more important in terms of compliance with the law and establishes public trust. Effective corporate governance affects the private sector and thus the performance of the shareholders, which positively affects economic growth. In this context, both the public sector and the private sector should create and develop more successful corporate governance practices to provide investor confidence (Sehirli, 1999: 13-14).

2.3.5. GLOBALIZATION AND FIERCE COMPETITION ENVIRONMENT

The circulation of capital becomes easier with globalization and this has a positive effect on economic development. Additionally, capital moves abroad faster in times of crisis and causes crises to spread faster as a result of globalization. Therefore, in addition to the fact that corporate governance practices differ from country to country, some similarities have begun to emerge in the operations and management styles of the firms with the globalization of markets. In addition to areas such as price, cost, quality and obtaining financial resources, it is observed that companies compete with each other in terms of corporate governance practices. Due to the aforementioned competitive factors, which reduce investment risk and capital cost, companies try to take the lead in having effective corporate governance practices (Dogan, 2007: 46-47).

As a result of international capital movements accelerating with globalization, institutional investors have started to seek more trust and stability in the countries or companies they invest in. Today, while investors invest in stocks, they are not only limited to the companies in their own country, they are interested in investment tools all over the world. As a result of this situation, investments, income and exports increase, financial markets deepen and international capital movements accelerate. Increasing economic dependency markets make it sensitive to international funding sources, portfolio investments, and market fluctuations. Therefore, companies should adopt reliable and generally accepted corporate governance principles to attract capital (Aktan, 2006: 63).

Corporate governance practices are supported by the capital market regulations, corporate law, accounting and auditing standards, bankruptcy law, legal sanctions, and the seizure of firms by other firms. At this point, both developed and developing countries have taken various measures to prevent undesirable situations that arise as a result of inadequate corporate governance policies and have solved a large part of the problems that have occurred. For example; The Sarbanes-Oxley Act was enacted to prevent financial information manipulation that led to firm scandals in the United States, and various regulations were passed by the SEC and the exchanges. Germany has legislated and enforced corporate governance principles. On the other hand, Russia has made public its corporate governance principles, European Union countries have made corporate governance arrangements, and many developing countries have adopted corporate governance principles as well (Kucuksozen and Kucukkocaoglu, 2005: 84).

2.4. OBJECTIVES OF CORPORATE GOVERNANCE

Corporate governance practices are carried out to protect the investments of the funders. Therefore, in the companies where the corporate governance practices are carried out effectively, investors not only examine the company activities on a periodical basis but also continuously control the managers engaged in dispossessing activities (Kula, 2006: 12). It is possible to list some objectives of corporate governance as follows (Aktan, 2006: 61):

- Protecting and securing the rights of all stakeholders in a direct or indirect relationship with the company,
- Preventing arbitrary use of the powers owned by the senior management of the company,
- Ensuring that shareholders of the company are treated equally,
- Avoiding the danger of large shareholders confiscating minority shares,
- Trying to control the conflict of interest between the risk-taking investors and the decision-making professional managers,
- Establishing an atmosphere of trust for institutional investors who are making long-term investments, reducing the cost of capital and, ensuring easy access to financing opportunities through the issuance of shares of the company.

2.5. CORPORATE GOVERNANCE IN DIFFERENT OWNERSHIP STRUCTURES

The concept of corporate governance was first raised within the scope of problems specific to multinational companies and then started to be discussed in non-public companies and public institutions (Deloitte Corporate Governance Series, 2006: 3). Looking at the companies out of the stock market in many countries; the substantial amount of stock belongs to a family, an industrial enterprise, or the public. In the stock market companies, the share of the shareholders holding the control generally does not exceed 50%. Although there are many similarities regarding problems and solutions in both company groups, companies that are not traded in the stock exchange require a different approach than public companies. Non-public companies; it is possible to group them as family firms, public-owned organizations, group firms, firms owned by private investors, joint venture firms, and heavily privatized firms. However, the companies that are emphasized the most in terms of corporate governance are family companies but not public companies (Ozsoy, 2011: 54).

2.5.1. MANAGERIAL OWNERSHIP

The managerial ownership structure shows that a shareholder holds a large part of the firm's ownership, and the remaining shares are shared among the investors called “minority shareholders” and expresses the ownership density. In companies where ownership is concentrated, the dominant shareholder is more willing and has more opportunity to audit the company management due to the size of the investment. Therefore, with this type of ownership structure, the lack of supervision in companies with scattered ownership is prevented. On the other hand, the managerial ownership structure may cause some corporate governance problems. In companies where ownership is dominant, it may be possible for large shareholders to use the assets of the company against small shareholders in cooperation with the company management. This problem occurs more frequently in countries where minority rights are not sufficiently protected (Deloitte Corporate Governance Series, 2006: 3). The fact that management ownership affects important firm decisions for the firm, the direction and size of this effect has also been the subject of research (Mentes, 2009: 123). Holderness (2003) stated that three important decisions that may affect managers in firms where executive ownership prevails, i.e., those with a high share of shareholders, are top executive pay and incentives, the firm's leverage (indebtedness) ratio and takeover activities. It has been stated that there is not a very large difference between firms with executive ownership and firms with scattered ownership concerning top executive pay and incentives (Holderness, 2003: 56-57).

Regarding the situation between the firm's leverage ratio and the density of ownership, it is not possible to reach a single judgment. In some studies testing the relationship in question; while there is a positive relationship between executive ownership and leverage ratio, some mentioned a negative relationship; some have not found any relationship. It is stated that a situation similar to the relationship between the firm's leverage ratio and executive ownership is valid for the relationship between the takeover of the firm and the executive ownership. In some of the studies, it is stated that there is an inverse relationship between the management of the company and the acquisition of the company, it is stated that firms with managerial ownership are taken over more frequently in some (Stulz, 1988; Holderness et al., 1999; Mikkelsen and Partch, 1989).

2.5.2. FAMILY FIRMS

Family firms refer to firms where two or more people from the same family work in the same firm and one or more of them have a majority stake in the firm (Mentes, 2009: 125). Corporate governance principles that ensure the establishment and maintenance of the trust element within the

firms clarify whether or not there is a proxy problem in family firms, where ownership and management are held in the same hand. Corporate governance in family firms refers to a process of change and differentiation. To be able to determine whether the change in question is at a level that meets the planned and targeted expectations, corporate governance needs to be supported with internal audit and internal control systems. Therefore, it is possible to express that corporate governance in family firms is a collective process, not a process that only the founding family elders and family members can perform (Deloitte Corporate Governance Series, 2007: 13). In Turkey, it is stated that foreign investors are investing largely in family firms. However, in this context, it is important that the family firm in question has a certain background, has a certain consistency in corporate governance and has some credibility arising from past practices (Ararat, 2003: 93).

2.5.3. STATE OWNERSHIP

Although there are many similarities between corporate governance practices in the public and the private sector, and although a principle applicable to one can be easily applied to the other, there are some differences in the basis of corporate governance in the public sector. The concept of shareholders in the public sector and the relationship of the board of directors with the shareholders differ according to the private sector. There is a government in the public sector where the board has to work together and the government has the power to fundamentally and directly influence the issues the board is working on. Even though the boards of directors in the private sector often have to deal with institutional investors who demand a lot, it is stated that working with the government for boards causes more and different problems than institutional investors. Moreover, the fact that the public sector offers a rather complicated legal framework for the boards of directors compared to the private sector reveals the difference between the two sectors within the scope of corporate governance (Sendt, 2002: 5).

Corporate governance principles play an important role in assessing how public-owned companies with a significant share in the economy are managed and improving their management processes. However, it is possible to mention two fundamental problems in the implementation of corporate governance in public-owned companies. First of all, it is not easy to strike the right balance between the responsibility of performing the public ownership function and avoiding improper political interference in the management of the company. Secondly, there may be difficulties in providing an environment in which private sector companies can compete on an equal footing with those public-owned in the markets they operate, and there may be distortions in the competitive environment when governments use their regulatory and supervisory powers. Therefore,

it is stated that corporate governance practices can yield effective results in solving the mentioned problems. Similarly, the separation of the ownership structure of the public and its regulatory functions also provides convenience for public companies in this context (Turkish Industry & Business Association, 2006).

3. CORPORATE GOVERNANCE IN BANKS

Corporate governance practices in the world were first introduced in 1999 by the OECD corporate governance principles and in Turkey for the first time in 2003 by the Capital Markets Board (CMB)'s Corporate Governance Principles (NemliCaliskan and Turan Icke, 2009: 121). In recent years, there have been significant changes in the views of almost all developed and developing countries, as well as OECD and the World Bank, on the extent to which the organization and management structures of large-scale industrial companies should be institutional. Contrary to the general interest in the concept of corporate governance, it was seen that the current corporate governance practices in banks were not given due attention at the beginning and the fact that banks play a very important role in the operation and management of other types of companies was ignored (Macey and O'Hara, 2003: 91). The importance of corporate governance has been understood since the 90s and the Basel Committee on Banking Supervision has emphasized that corporate governance practices in financial institutions are extremely important and emphasized that the management structure in banks should be composed of the board of directors and senior management. Thanks to effective corporate governance practices, it becomes possible to positively affect both the soundness of the financial system and the level of economic development throughout the country (Andres and Vallelado, 2008: 2570).

3.1. OVERVIEW OF BANK CORPORATE GOVERNANCE

The structure of corporate governance plays an active role in realizing the corporate goals of banks, maintaining their daily operational activities, protecting the interests of shareholders and protecting corporate activities and the rights of depositors. Therefore, it is possible to express the corporate governance of the bank as a structure where the business and activities of the institutions are managed by the board of directors and senior managers (Tuna, 2005: 9-10). Banks' proprietary structure, frequent fluctuations in financial markets, intense competition and increasing investment alternatives expose banks to a variety of risks and require measures to be taken to address this situation. Moreover, the fact that the banking sector is subject to very strict regulations and under constant control in almost every economy also reveals the fact that banks should apply the corporate governance practices in line with their structure (Ungureanu, 2008: 1).

Corporate governance practices in banks are different from the corporate governance practices adopted in non-financial firms. The first reason for this is that banks are accountable to many stakeholders. Banks with more than 90% client accounts (this ratio is around 40% in non-financial firms) have more stakeholders (shareholders, depositors, holders of secondary debt) than non-financial firms. Additionally, the expectations of shareholders differ according to the expectations of other stakeholders. Shareholders focus on the risk-oriented and short-term objectives, while depositors and other stakeholders avoid risk and concentrate on long-term objectives. The other reason for this differentiation is that banks have an opaque structure than other types of firms. Having a non-transparent (opaque) and complex structure plays an important role in the interaction between the bank's management and the board of directors, as well as between the bank and the banks' regulatory bodies. The extent to which the board effectively represents shareholders depends on the extent to which it knows the internal functioning of the bank. On the other hand, independent board members play a more active role in conducting the Foreign Relations of the banks, as they are more familiar with the financial markets. Therefore, the corporate governance practices in banks differ from those of other types due to the non-transparent and complex nature of banking activities and the risk composition of banks' assets changes at any time compared to non-financial firms (Mehran et al., 2011: 3-5).

In addition to the existence of some differences in the banking sector compared to the real sector, banks are of great importance for the development of the real sector, corporate governance practices and efficient resource allocation. Efficient resource allocation of banks provides benefits in lowering capital costs, strengthening capital formation and increasing their productivity. If bank executives have a strong corporate governance mechanism, this plays an important role in the efficient allocation of resources and effective corporate governance on the funded companies. Therefore, corporate governance practices in banks directly affect the activities of companies and the national economy (Levine, 2004: 2).

3.2. IMPORTANCE OF CORPORATE GOVERNANCE IN BANKS

Effective corporate governance practices are of great importance in creating and maintaining a sound trust environment between the public and the banking sector (Basel Committee on Banking Supervision, 2006: 3). Since the banking sector has a very important place in almost every economy in the context of financial intermediation, the corporate governance practices of banks have become a subject of more attention than other sectors. The lack of corporate governance practices in the banks causes the banks to lose the ability to manage their assets and liabilities

properly and to create a liquidity crisis. As an inevitable consequence of this situation, an economic crisis occurs throughout the country. Therefore, corporate governance practices applied in banks are one of the issues that all stakeholders should focus on (Htay et al., 2012: 3).

Corporate governance practices in the banking sector are also of great importance in developing countries' economies for many reasons. One of the reasons for this situation is that banks have a very dominant share in the financial systems of developing countries and are an important trigger for economic growth. Second, since financial markets are often not able to reach adequate levels of economic development, banks are an important source of financing for most firms in developing countries. Third place; banks are seen as a means of payment adopted by all parties, and therefore they are a highly trusted depository institution for the savings of stakeholders. Fourth, the economies of many developing countries are looking to privatize, unload portfolios or reduce the role of economic regulation, making banking systems freer. Therefore, the bank managers in these economies have the opportunity to take more initiative in the management of the banks (Arun and Tumer, 2004: 372).

It is stated that if effective corporate governance cannot be implemented, banking surveillance and control mechanisms will not function at the expected level (Dogan, 2007: 110). Therefore, effective corporate governance in banks is also critical for banking surveillance and supervisory authorities. Effective corporate governance that is clearly defined and implemented both facilitates the ability of auditors to perform their duties and increases the cooperation between the bank's management and the supervision authorities (Basel Banking Audit Committee, 1999: 3). Considering corporate governance practices, some conflicts may arise between shareholders and managers regarding their risk-taking preferences, and the attitudes of shareholders towards taking risks may not be welcomed by managers. In this context, the effectiveness of corporate governance practices in banks is of primary importance in resolving the conflict between the bank's shareholders and managers (Anginer et al., 2018: 330).

Another reason why corporate governance is so important in the banking sector is the possibility of ineffective corporate governance practices in the sector leading to the bankruptcy of banks. The bankruptcy of banks significantly increases public expenses due to the negative impact it creates on valid deposit insurance systems, fee payment systems, and various macroeconomic indicators (Basel Committee on Banking Supervision, 2006: 3).

Finally, the lack of free entry into the banking sector, the need to obtain a license to carry out banking operations, the fact that deposits in

the banking sector have a greater share than equity, the rapid and intense interaction of the banking sector with macroeconomic factors and the fact that the sector is open to systematic risks are among the factors increasing the importance of corporate governance in banks (Tanrioven et al., 2006: 91).

3.3. THE BASIC DIFFERENCES OF CORPORATE GOVERNANCE PRACTICES BETWEEN BANKING AND NON-FINANCIAL FIRMS

Corporate governance practices in banks have some differences compared to non-financial companies. The reasons for this situation generally include the number of shareholders, the level of competition in the administrative labour market and the product market, the executive compensation, strict regulations, and high leverage level (Adams and Mehran, 2003: 124-126). For instance, banks are subject to strict regulations since they are obliged to protect the rights of depositors and to reduce systemic risk (Sanchez et al., 2020: 53). Additionally, banks are strictly regulated because of their critical position in financial intermediation and payment systems, which lead to many negative macroeconomic externalities. These may create adverse effects on the functioning of the general economy (Haan and Vlahu, 2005: 229).

The fact that the majority of the capital in banks is provided by the depositors and bondholders significantly increases the leverage ratio. While the leverage ratio in banks generally varies between 87% and 95%, in non-financial companies this ratio is around 20-30%. A high leverage ratio increases both the bankruptcy possibilities of banks and the conflicts of interest between shareholders and depositors. If the interests of the top management in banks and the interests of the depositors are in harmony, top management may be encouraged to invest even in the projects whose net present value is not positive. This strong equity governance increase conflicts between shareholders and creditors. Increasing agency costs lead to a decline in firm value (John et al., 2016: 305). Although the majority of the capital in banks is provided by depositors and bondholders, decisions are mostly taken by managers, shareholders and boards of directors. Therefore, bank managers do not have to get permission from depositors while making decisions about risk profiles (Becht et al., 2011: 438). On the other hand, banks occupy an important position in the real economy, because they are the main creditors. Therefore, in the case of ineffective corporate governance practices in banks, the capital allocated to non-financial companies cannot be used in the efficient areas (Leaven, 2013: 67). For executive compensation, there may be also some differences in corporate governance practices. In the case of a remuneration to increase shareholder value, managers are willing to make decisions to increase firm

value, which also increases their willingness to take risks. But it is not appropriate to choose a share-based pricing path to protect the rights of depositors who are not shareholders of the firm, such as banks (Díaz et al., 2018: 40).

CONCLUSION

Corporate governance emerges as a concept that regulates the relations between the board of directors of companies and the stakeholders and enables companies to be managed and controlled effectively. Especially in developing countries, effective corporate governance policies play a major role in the success of company management, and they attract the attention of foreign investors by allowing companies with weak corporate governance practices to strengthen their capital structures. Although corporate governance practices vary among companies or countries according to many factors such as ownership structure, accounting standards, protection levels of minority shareholders, control power of board members, the main purpose in the implementation of these policies is to ensure the separation of ownership and control.

Undoubtedly, corporate governance is a concept that is considered to be extremely necessary for both financial and non-financial companies. Agency costs and opportunistic behaviours of managers are defined as two main factors that negatively affect the effectiveness of corporate governance practices. The main reason for the emergence of agency costs is the inability of the company owners to control and the conflicts of interest between managers and company owners. Financial scandals such as Enron, WorldCom and Parmalat, which resulted from the reasons such as lack of control and fraudulent activities of executives, emphasized the necessity of corporate governance at this point. Although it is stated that minority shareholders have to bear more agency costs than controlling shareholders, it is possible to state that corporate governance is a concept that aims to protect all shareholders.

Since the banking sector plays an important role in the national economy, keeping the corporate governance level in the sector at high levels is of great importance for lenders, company owners, managers, potential investors and supervisory institutions. Due to the capital structure they have and the high risk they bear, banks are subject to very strict audits and some compelling regulations and these differences are also reflected in the corporate governance practices of banks. Also, banks provide significant resource transfer to companies operating in the real sector and play an important role in the development of national economies. At this point, the restructuring process initiated within the framework of corporate governance, especially as a result of the 2001 banking crisis, encouraged banks to make radical changes in their financial, administrative and capital

structures, and these innovations had a positive impact on the sector. Therefore, effective corporate governance practices are considered as one of the factors that should not be ignored in the banking sector, as in many other sectors.

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CHAPTER IV

BANK VALUATION METHODS

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1. INTRODUCTION

Before the global crisis, the topic of bank valuation had been discussed relatively few in the academic world and mainly in the real-life, some bank valuation techniques were offered to be used by analysts & professionals. After the crisis, the importance of banks have been noticed and since then academic studies in bank valuation techniques also increased. Although banks stand for only a tiny portion of the entire extent of the industry, banks form the base of the financial and economic system, and a substantial portion of the all market capitalisation of the chief developed states (Beltrame & Previtali, 2016: 1).

Valuation attained its place and importance in Western literature in the 1960s and it is sloganised that the main objective of the corporation is to maximise the value rather than maximise the profit. It is started to emphasize on the importance of valuation in Turkey since the 1990s in both academic and practical studies (Küçükkaplan, 2008: 1). In the past, in US finance books the main objective of the firm was mentioned as profit maximisation but later it is lost its significance since profit maximisation is subjective. For example, as mentioned in Ercan and Üreten (2000), in the article of Robert Antony in Harvard Business Review in December 1960 with the name of “The Trouble with Profit Maximisation” it is mentioned that profit does not have a meaning in solitary sense and it is not clear whether the profit to be maximised is short term, long term, profitability ratio or profit amount. In today’s world, the objective of a corporation is defined as maximising the value in shareholder perspective (Küçükkaplan, 2008: 4).

According to Damodaran (2009) analyst having the purpose of valuing a bank faces three main difficulties. Firstly, the character of banks’ facilities create obstacles to specify re-investment (net capital expenditure and working capital) and debt and this makes it tough to estimate cash flows (banks’ debts are more close to staple rather than a capital source). Secondly, banks are usually under intemperate regulations and this may

cause notable outcome on value. Thirdly, accounting principles governing banks are quite dissimilar from the accounting principles applied in other non-financial corporations and assets of the banks are mostly marked to the market-place. Assets of banks are usually financial instruments such as securitised obligations, bonds and they usually have dynamic market-place. Accounting standards are built up by considering the fact & tendency that banks usually achieve a profit for long intervals and usually have heavy losses for short intervals.

The intention of valuing an investment instrument is determining its price. Market price does not always reflect the true value of an asset. Investors need to find the true value which has to be. Different techniques are employed in the valuation process. In the literature, these techniques are used easily for manufacturing and commercial firms but they are quite difficult to employ for financial corporations (banks, insurance, leasing, factoring companies etc.). These difficulties arise from the different structure of financial corporations' financial statements and the excessive sensitivity of these corporations to macro-economic decisions. It is quite tough to value a bank for both theoretical and practical sense. For some techniques, it is quite difficult to reach the required data needed for valuation (Küçükkaplan, 2008: 1). Common conceptions like income from operations and working capital happen to specify and account. As a result of this, there is a need to value a bank from a quite different perspective which has advantages and disadvantages (Dime Trader, 2012). Valuing banks by internal bodies mostly focus on stockholders' objective-creating value, improving cash and profitability. However valuing banks by external bodies is various-sided and mostly focuses on risk (Strumickas & Valanclene, 2006: 22).

Banks are to a great extent controlled by regulations every place in the world, although the size of the control changes from state to state. Generally, this regularization happens in three kinds. Firstly, bank corporations are expected to achieve some capital proportions which are asked by the regulators and which are calculated according to their book values of equities and their performance in order not to stretch beyond their capacities and risk the position of the shareholders or depositors. Secondly, banks are commonly restrained in terms of where they can venture their reserves. For example, at the beginning of 2000s, the Glass Steagall Act which is enacted in the USA, restrained banks operating in commercial facilities from seizing effective equity-related places in non-financial corporations and involving in investment banking facilities. Thirdly, the entrance of new banks in the sector and merging requests between the corporations are usually checked & controlled by the regulatory bodies. All these issues affect valuation calculations because suppositions related to growing are concatenated to suppositions surrounding re-investment. In

terms of banks, those suppositions must be scrutinized to assure that they meet regulation restrictions. These issues may also affect the framework where the risk of the bank is quantified. If regulation related constraints are varying or they are expected to vary, this then might increase the risk (uncertainty) for the future facilities and affect the bank's value. Simply, we must be conscious of the governing regulatory forms in the valuation process (Damodaran, 2009: 5).

Beltrame and Previtali (2016) mention that usually bank regulators impact several features of banks' facilities both from asset and liability perspective. They acknowledge that the Basel framework which imposes some capital restraints is one of the most crucial components that impact bank value. It is mentioned that the concentration is on bank capital due to the undermentioned reasons:

- The character of bank facility that conducts with payments, investments, credits and savings needs a stable type of safeguard from market failure.
- Lofty level of capital shields claim holder from failure (default) and they promote to strengthen bank sector's resiliency to likely systematic financial crisis.
- Bank capital possesses an unlike function in comparison with the other non-financial corporations. In the banking sector, capital hinges on the aggregate of asset and its risk.

These likely capital stipulations which are imposed by Basel are peculiarly important in bank valuation process since capital additions and their inner form may create an explicit restraint on growth chances. A capital shortage diminishes the bank's potential to extend assets or even to handle their interior mixture by considering the inherent risk. This kind of rigidity in asset and capital supervision may impact the bank's capability to achieve earning and to give out a dividend. Hence, it is believed that when the bank is valued, in addition to asset growth and earning, also bank's plan to encounter the required increase in the capital should be assessed (Beltrame & Previtali, 2016: 9-10).

Cash flows generated by banks are usually quite volatile and are connected to macro-economic conditions. For this reason, it is quite difficult to forecast cash flows of banks and it is easier to make a fault. For most of the corporations, their balance sheets are heavily influenced by presumptions made by the managers and past events. For instance, the judgment made between FIFO (First in first out) and LIFO (Last in first out) stock valuations may affect the results of a corporation with a high level of stock and in high inflation environment. As a result of this, for non-banks, equity of stockholders is quite gratuitous evaluation and it is quite tough to contrast across corporations with divergent business tactics

& strategies, grand and ages. Fortunately, in most cases, this is not an issue for banks. Banks utilise accountancy of mark to market and this enables us to see almost assets and liabilities at a valuation which are at a fair level determined by the market rather than historical cost. By this way, unrealized gains and losses are in actuality recognised. The stockholders' equity on the balance sheet of the bank becomes to a greater extent of net deviation between the existing marketplace of assets and liabilities (Dime Trader, 2012).

Another notable point which should be considered is the loan loss provision (LLP). Banks make loan loss provisions to confront a possible twisting in the quality of their credit portfolio and this can be noted as one of the primary accrual expenses. Usually, loan loss provisions are discretionary and they should be normalised when the analyst calculates the expected earning of the bank. The main targets of provision can be listed as below (Beltrame & Previtali, 2016: 14-15):

- Taxes: Executives can modify provision with the purpose to report a targeted net profit (when more provision is made, yearly tax expense is lowered).
- Capital adequacy: Executives may utilise provision to achieve the capital requirement.
- Income smoothing: When there is an intention to stabilise net profit over time-period, this pursuit is made.
- Signalling: Substantial loan loss provisions are thought to be a signal to the market that profitability will increase in the future rather than a credit loss.

When we examine capital expenditures in banks, it is noticed that since mostly the bank's investment is not a tangible asset, banks have a low grade of amortization. Bank's investment in a brand name, I&T technology, process and procedure improvement and human capital are usually accounted as operational cost (rather than fixed investment). Some academicians defend that to estimate capitalisation, the primary difficulty faced by an external analyser is to distinguish distinct elements of investment from operational cost. Therefore, adjustments made in capital expenditure in nonfinancial corporations are not suitable for banks due to the unlikeness in fixed investment concept (Beltrame and Previtali 2016, 16).

To obtain efficiency and reliability in capital markets one of the crucial issues is to value the firm correctly. At first, determining the value of the firm correctly is needed in the initial public offering and at the time when the decision to buy the stock is made. The degree of reflecting the true price in the market is very important for investors. On the other hand,

it is crucial to determine the value of the corporation that is in the privatisation process in a true way (Küçükkaplan, 2008: 1).

Assets can be marked to market but despite this, the analyst should carefully and independently assess the value. Otherwise, there are two reasons for failure in precise value estimation. Firstly; believing that the market will form accurately can be misleading, it can make mistakes and these mistakes will then pass to the book value. For example, after the crisis in 2008, it was understood that markets overvalued the assets. Secondly, assets are usually valued by the market by the use of models utilised by appraisers and this evidently causes the lag in noticing the change in the value and sometimes causes to overvalue (Damodaran, 2009: 12).

2. BANK VALUATION MODELS

2.1 EXCESS RETURN MODEL

Because of the reason that banks' equities' book values are to a greater extent true and cash flows of banks are quite volatile and to a lesser extent precise for measuring the managers' performance due to larger effect of macro-economic factors rather than micro-economic factors) compared to other types of firms, some of the analysts who are interested in the value of banks, depend on stockholders' equities. This technique is known as 'Excess Return Model' and reaches to equities' values by summing the existing equities capitals and present economic values of expected excess returns to equities (Dime Trader, 2012). Also discounted cash flow measures do not provide any info about the value created. Therefore to examine if banks accomplish higher return than the cost of capital, this model; the excess return model is quite practical and is a different approach to value measurement. This model is also known as residual income model or abnormal earnings model in the literature. This approach originates from the study of Marshall in 1890 and at that date, he mentioned that value concept is measured by the excess profit after we deduct a capital charge. By the help of this model, we measure the value of the bank on the capability of the bank to accomplish a flow of return higher than the return which will be achieved by the invested capital with the same risk level (i.e. opportunity cost). When this model is examined from an academic perspective, it is noticed that the model's measures abide by Feltham and Ohlson model. The bank's value stringently hinges upon whether the return is more than the capital cost (i.e. excess return). If this stipulation is not accomplished in the forecast term, then bank value is simply net asset value. The model can be calculated as below (Beltrame & Previtali, 2016: 23-25):

$$\text{Residual Income} = (ROE - r_e) * \text{Equity Capital}_{t-1}$$

$$\text{Residual Income} = \text{Net Income} - (r_e * \text{Equity Capital}_{t-1})$$

$$\text{Equity Value} = \text{Equity Book Value} + \sum_{t=1}^{t=n} \frac{RI_t}{(1+r_e)^t} + \frac{TV}{(1+r_e)^n}$$

$$TV = \frac{RI_{t+1}}{(r_e - g)}$$

In other words, in the excess return technique, cash flows are separated into normal return cash flows and excess return cash flows. When the bank earns a risk-adjusted required return, this is recognized as cash flow of normal return but when the bank creates cash flow above or below this figure, and then it is called an excess return. This excess return may be positive or negative. Excess return technique originates from the concept of capital budgeting and NPV (net present value). As long as bank achieves positive NPV, the regarding investment improves the value (the prior estimated profitability of the investment does not matter). This means that if the excess return is achieved then cash flow growth and earnings matter value (equity return > cost of equity). Therefore this technique values the bank as a function of estimated excess returns (Damodaran, 2006: 37).

2.2 DISCOUNTED CASH FLOW MODELS

As it is usually applied, the discounted cash flow (DCF) approaching is built on the theory that we estimate the asset's price by discounting back the expected cash flows in a period. In bank valuations, mainly two discounted cash flow models are utilised: Dividend Discount Model (with excess capital adjustment) and Cash Flow to Equity Model (CFE). When these models are examined, it is seen that they give the same results when banks pay out all distributable earning. This happens when the pay-out ratio is equal to 100% (Beltrame & Previtali, 2016: 19-22).

$$\text{Value} = \sum_{t=0}^{\infty} \frac{\text{Cash Flow}_t}{(1+r_e)^t}$$

Estimation of profit evolution for banks can be accomplished by regression analysis or by analysing the plan in terms of finance from data prepared from profit & loss account and balance sheet. The regression analysis technique is suitable in developed countries where there exists long term stability. Secondly, this technique is more appropriate for banks rather than nonfinancial corporations since banks usually operate under strict regulations and there is not chief unsteadiness. However, if it is available to the bank's financial plan is the best and most accurate way to estimate future performance (dividend etc.). An analyst should be able to examine the critical features of a bank's profits and future projections. It should be usually reasonable if estimations are performed for the next 5 years. Loans and other earning assets which are main profit creators and

income from fees should be very carefully assessed in the analysis (Horvatova, 2010: 57).

Nevertheless, calculating a value from cash flows can be problematic. In terms of cash flow, there is not a well-defined value creation procedure, since, for example, the dividend represents a synthetic amplitude of cash. By some academicians, it is advocated that equity side perspective can be imperfect technique since this technique does not permit to analyse cash formed by the use of asset and liability (Beltrame & Previtali, 2016: 1).

According to Damodaran (2009) two main figures that affect bank value are the 'cost of equity', which is the function related to the risk that originates from the banks' investment, and 'the return on equity', that is settled by banks' business choosings and regulatory stipulations.

For a bank, in comparison with other nonfinancial corporation there exists a substantial difference in terms of the portion of own and foreign fund sources. Due to the characteristics of bank, it usually has a high gearing ratio. Cost of capital stands for the investors' expected rate of return considering the investment risk grade. Expected rate of return should be higher than the bank interest rates (bank deposit) since any kind of business facility represents a higher risk than risk-free investment. Risk-free rate(r_f) may be calculated from government bond interest rates or these government bonds' yield to maturity. Cost of capital is higher than the risk-free rate considering the tax shield. Some techniques for estimating the cost of equity can be listed as below (Horvatova, 2010: 53-54):

- Gordon Growth Model
- Capital Assets Pricing Model (CAPM)
- APT (Arbitrage Pricing Theory) Model
- The foreign funds' cost
- Average profitability

2.2.1. CASH FLOW TO EQUITY MODEL

Aggelopoulos (2017) argues that when a bank's cash flow model is tried to be built outside the bank, Cash Flow to Equity technique rather than the Discounted Cash Flow technique should be utilised. Because the financing and operating judgement can not be segregated in banks (interest expense and income (financing judgements' elements) are crucial factors of operating income) (Aggelopoulos, 2017: 2). In this technique, rather than free cash flows provided to debt and equity holders are used, only cash flows expected to be provided to equity holders are utilised. Since the expected cash flows are only for equity holders, when the present value of these cash flows is calculated, the equity cost of the bank should be used. The sum of discounted values of equity cash flows estimates the value of

a bank's equity. When equity value is divided by the stock number, the price of each bank stock is estimated. Stock price in the market can be compared to the required value of the stock estimated by the model and buy-sell decisions are given by examining the difference (Bozacı, 2012: 34-38).

$$\begin{aligned} \text{Cash Flow} &= \text{EBIT} * (1 - T) \\ &\quad - (\text{Capital Expenditure} - \text{Amortisation Expense}) \\ &\quad - \Delta \text{Net Working Capital} \end{aligned}$$

EBIT = Earnings Before Interest and Tax

2.2.2. DIVIDEND DISCOUNT MODEL

Damodaran(2009) mentions that some analysts believe that the estimation of value by cash flows for banks is not applicable and only depend on the sole discernible cash flows: dividend. This can be thought to be sensible, these analysts inherently assume that the dividend which is paid by banks is reasonable and sustainable. Nevertheless, this assumption is not always correct. It is known that some banks are paying dividend too much and afterwards they issue new shares to recompense and some pay too little and utilise the remaining amount to improve their capital proportion(ratio). When the valuation is performed depending on paid out dividends by considering the scenarios mentioned, in the former case we will overvalue the value of the bank and in the latter case, we will undervalue the value of the bank. The use of present dividends can be problematic; for example, the bank can have high growth potential and pay a very little dividend for a very long time compared to the mature banks. This time we can again undervalue the bank. If the bank pays no dividend, we can even conclude that the value of the bank is zero!

Horvatora (2010) believes that in utilising cash flow to estimate value from the perspective of bank shareholders below issues should be taken into consideration:

- For banks, statement of cash flows is not appropriate for deciding owners' sources because dividend related to the bank shareholders can be reimbursed only from real net income after tax and not from the cash flow activity.
- Banks' and nonfinancial corporations' profits are not evenly come-at-able because there is not a problem in terms of cash available to bank shareholders due to the character of most of the assets&liabilities, whereas in nonfinancial corporations substantial deviations exist between profits and cash flows (some businesses may create profit but not enough cash flow).

- The primary income generators for banks are service fees and the balance between interest income and expense.

i) **Gordon Growth Model**

As mentioned by Damodaran(2002), the Gordon Growth Model is utilised usually to value corporations which have steady growth and which have dividend growth rate preserved in an infinite time. Because of the reason that it is assumed in the model that the corporation's growth rate in dividends is anticipated to continue eternally, in literature the title 'steady growth rate' is extensively argued and queried. One of the viewpoints of the Gordon Growth Model and the model's steady growth is that other functioning rates (for example 'earnings') have the identical yearly growing rate as a dividend. For this reason, in the case that corporation's earning is developing quicker than its 'dividend payout ratio' in the long-term, than the corporation's 'payout ratio' is going to tardily come close to zero and this isn't a characteristic of a corporation which has a stable growing structure. Moreover, a corporation which is in 'steady state' can not possess a growing rate which surpasses the growth rate of the sector & economy where the corporation functions. It is pellucid that 'growing rate' has an important function in this model and if we utilise inappropriate rate, this will result as improper valuations. It can be seen in the regarding the formulation of the model that when the corporation's 'growth rate' approaches the 'cost of equity', the value will become infinite and when the 'growth rate' passes the 'cost of equity' then the value will become negative (Charumathi & Suraj, 2014: 39).

Regarding the payout ratios issue; the 'expected dividend per share' may be calculated by finding the product of EPS (Earning per Share) and 'Expected Payout Ratio'. There are two gains when we derive dividends from 'expected earnings'. Firstly this enables the analyst to concentrate on 'expected growth rate in earnings', that is more credible and obtainable than 'growth in dividends'. Secondly, 'payout ratio may vary in due course and this shows that investment possibilities and growth are changing. We can calculate the bank's 'payout ratio' dividing the dividend by the earning (same calculation with the corporations in other sectors). When the dividend performances of banks are examined it is noticed that banks usually pay more dividends in comparison with the other corporations in the market. The 'dividend yield' and 'dividend payout ratio' for banks are mostly higher than the results of the corporations in different sectors. This happens firstly because banks facilitate in much more ripe field in comparison with the corporations in other fields such as software and telecommunication. Secondly, even the differences in the expected 'growing rate' are controlled, banks usually pay more in dividends compared to non-financial corporations for two causes: banks customarily have fewer investments in the 'capital expenditures' than non-

financial corporations (so more dividend from more net income can be paid and as a dividend) and when the historical performances are analysed it is seen that banks are stable and high performance in dividend payment (so they earned the reputation of being reliable dividend payers) and they appealed investors who prefer dividend and by this way, it has become more arduous to modify their dividend payment scheme (Charumathi & Suraj, 2014: 40).

The formulation is as below:

$$Value = \frac{D_1}{k_e - g}$$

$k_e = \text{Cost of Equity}$

$g = \text{Growth Rate of Dividend}$

ii) Two-Stage Dividend Discount Model

This model allows us to use two different growth rates for two different periods. Firstly, a growth rate is decided for the suitable first period (this rate does not need to be constant). Secondly, a constant growth rate is used for the second period which is assumed to continue eternally. In most cases, it is expected that the growth rate is higher than the constant growth rate. However, this is not a necessity. This model can also be applied to the banks which have low growth rates initially however which are expected to grow fast afterwards. (Bozac1, 2012: 41-42). The formulations are as below:

$$Value = \sum_{t=1}^n \frac{D_t}{(1+k_e)^t} + \frac{V_n}{(1+k_e)^n}$$

$$V_n = \frac{D_{n+1}}{(k_e - g_n)}$$

$D_t = \text{expected dividend in year } t$

$k_e = \text{cost of equity}$

$V_n = \text{value in year } n$

$g = \text{growth rate at the beginning}$

$g_n = \text{unchanging growth rate}$

iii) H Model

H Model is another quantitative method which can be used in the dividend discount model. This technique is quite alike as the two-stage

dividend discount model. The difference is that growth rate is attempted to be smoothed out over time and it does not suddenly change from high to a low value. In this model, it is assumed that the growth rate falls linearly towards the final growth rate. For most of the corporations, dividends fall or rise gradually rather than suddenly changing. This model was created for the corporations whose growth rates change over time (“What is the H-Model?”,t.y.)

The formulations are as below:

$$Value = \frac{D_0(1+g_n)}{k_e - g_n} + \frac{D_0 * H * (g_a - g_n)}{k_e - g_n}$$

D_t = expected dividend in year t

k_e = cost of equity

H = the duration of the decline in company's growth

g_a = growth rate at the beginning

g_n = unchanging growth rate after $2H$ years

iv) Three-Stage Dividend Discount Model

This model is created by combining the two-stage dividend discount model with the H model. This is the most flexible dividend discount model. In this model, it is assumed that the corporation will grow at a constant high rate, afterwards, it will decline gradually and finally, it will remain at a lower constant rate and continue eternally in this constant growth rate (Bozacı, 2012: 44-45).

$$Value = \sum_{t=1}^{n_1} \frac{E_0 * (1+g_a)^t \Pi_a}{(1+k_e)^t} + \sum_{t=n_1+1}^{n_2} \frac{D_t}{(1+k_e)^t} + \frac{E_{n_2} * \Pi_n * (1+g_n)}{(k_e - g_n)(1+k_e)^{n_2}}$$

D_t = expected dividend in year t

E_t = earning in year t

k_e = cost of equity

Π_a = dividend payout ratio in high growth rate period

Π_n = dividend payout ratio in unchanging growth rate period

g_a = growth rate for n_1 period

g_n = unchanging growth rate

$\Pi = 1 - \frac{\text{expected growth rate}}{\text{equity profitability}}$

Below primary propositions can be made when discounted cash flow models are considered as a whole (Beltrame & Previtali, 2016: 22-23):

- Dividend discount model is easier to be performed in practical life since free cash flows to equity can not be calculated for banks unless we make some strong suppositions. Moreover, a bank usually does not pay out all of its yearly earning and it tries to smooth stockholder's cash flow in time. Dividends can be regarded as the best substitute for the free cash flows available to stockholders.
- From the viewpoint of an external analyser, it can be quite tough to estimate the dividends in the long-term since dividends are the outcome of banks' dispersion policies. It can be advocated that historical performance can be a useful benchmark, however, valuation is made for the future. When it is tough to estimate the future (for example in case of crisis) dividend discount model can be untrustworthy. In such occasions, it would be convenient to perform probabilistic sensitivity review or asset-side technique of valuation.

2.3. RELATIVE MARKET VALUATION MODEL

Relative market valuation model takes its roots from the presumption that financial markets are efficient and have liquidity. When the financial markets are efficient, then alike assets that have the same risk and return properties should be traded with close prices to each other. Value and market multiples are usually used to value the firm by assuming the above presumption and the bank's value is estimated in the context of banks' which have close properties. To able to apply the above methods, we have to have similar banks that are close to each other in terms of growth, efficiency, profitability, diversification, size and commercial plan. But it is a quite tough task to find similar banks. For this reason, the criteria are loosened to achieve a tradeoff between the number of the banks in the list and the closeness of the banks in terms of properties and a counterbalance between data quality and precision is tried to be accomplished. Since there is a risk to misprice the bank and a risk to be inaccurate, this technique is advised to be used only as a control method (ie not the chief method) (Beltrame & Previtali, 2016: 31).

Damodaran (2006) mentions that corporate value multiples such as Value to EBIT or Value to EBITDA can not be simply used for the valuation of banks, because we can not simply estimate operating income and value for banks. Therefore it is advised that equity multiplies should be utilised in the valuation process. Mostly, in practice, price to sales ratio, price to book value ratio and price-earnings ratio are used. It is believed

that from these ratios, price-earnings ratio and price to book value ratio should be preferred since sales are not easy to be measured for banks and it is more difficult to use price to sales ratio.

i) Price Earnings Ratio:

Price-earnings ratio is among the most favourite valuation techniques for analysts who are interested in the values of firms. It is quite useful since the price-earnings ratio seizes stock's growth rate and risk. Therefore we can evaluate the bank's value by utilising the price-earnings ratio of corresponding banks that have the same growth and risk. This technique is particularly handy when we can not observe the value of a bank. The functioning of this technique relies on the way we choose comparable banks. Alford (1992) inspects many explications of comparable corporations (for example sector membership, return on equity, size) (Cheng & McNamara, 2000: 349-350).

$$Price\ Earnings\ Ratio = \frac{Price\ per\ share}{Earnings\ per\ share}$$

$$Value = Price\ earning\ ratio * Bank\ 's\ net\ profit$$

ii) Price to Book Value Ratio:

If we keep other factors same, higher price to book ratio will occur when return on equity, earnings growth rate or payout ratio increases or equity cost decreases. Among these four ratios, return on equity has the greatest impact on the price to book value ratio, therefore this ratio can be identified as the associate variable for the price to book value ratio. It can be said that the association of return on equity and price to book value ratio is stronger for the banks in comparison with the firms in other industries & sectors. The reason for this is the fact that equity's book value is closer to the equity's market value. Additionally, accounting facilities affect the return on equity less for banks (Damodaran, 2009: 30).

$$Price\ to\ Book\ Ratio = \frac{Price\ per\ share}{Book\ value\ of\ the\ equity\ per\ share}$$

$$Value = Price\ to\ Book\ Ratio * Bank\ 's\ Equity$$

2.4. ASSET MARK-DOWN MODEL

Beltrame & Previtali (2016) proposed a new model which is based on bank-specific theoretical valuation perspective and a novel asset side model. It is an adjusted PV(Present Value) model and it aims to calculate

chief value creator originators which are identified as mark-down on deposit, tax benefit on bearing liability (deposit and non-deposit debt) and free cash flow from assets (FCFA). Unlike industrial companies, bank deposit creates value. To estimate value created by banks, model formulates an association between WACC and cost of assets and suggests a restatement of the Modigliani Miller proposition utilising bank-specific adjustments.

CONCLUSION

In this book section, an overall picture of the valuation methods which can be utilised for banks is drawn. In the practical world, a diversity of valuing methods are used and it is difficult to mention & find a specific technique which predominates other techniques. There can be benefits to utilise many techniques at the same time since each of the bank valuation techniques possesses unlike advantages&disadvantages (Deev, 2011: 43).

Valuation of banks has often been a tough issue mainly because of two main characters. Firstly, the cash flow of bank can not be handily appraised, because some elements such as debt, working capital and capital expenses can not be readily specified. Secondly, most banks facilitate under a regulation model where the capitalisation, investment and growth rate are governed. The variations of the regulatory framework can cause significant changes in banks' values (Damodaran, 2009: 1).

Bank valuation is very critical since the focus should be more on stability growth, therefore the bank value rather than profit growth. Bank executives and managers should be rewarded on the increase in the value of the bank they manage rather than the increase in profit (Horvatova, 2010: 59).

In future academic studies, different approaches regarding the bank valuation should be tried & attempted to be developed since it is clear that the existing methods are not fully convincing or applicable in the real world.

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CHAPTER V


AN EMPIRICAL STUDY ON THE POTENTIAL IMPLICATIONS OF BLOCKCHAIN INTEGRATION INTO CORPORATE GOVERNANCE MECHANISMS

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1. INTRODUCTION

Large-scale accounting and finance based corporate scandals such as Enron and WorldCom since the early 2000s and the global financial crisis in 2008 have had devastating consequences for financial institutions, companies, independent auditing, and ultimately all stakeholder circles including investors. While the first solution that comes to mind after the scandals and crises around the world is to strengthen the mechanisms and methods currently used by stricter regulations, it is understood that this “solution” is way behind to pave the way for sustaining ideal structure. Corporate governance principles are also an important tool to restore trust between investors, businesses, other stakeholders, and regulatory authorities after corporate scandals and financial crises (Rainey, 2013).

For a much broader purpose than just being a tool used in times of crisis, corporate governance seen as a crucial tool for the solution of information asymmetries and other power-decision balance issues between shareholders and the managers of businesses that are being unsolved since the evolution of modern corporations and by the end of the 90s this practices in the field have started to be called corporate governance. The study of the Securities Exchange Commission (S.E.C) in the U.S. in 1976 can be seen as one of the earliest attempts for designing the framework of corporate governance (Cheffins, 2012). In the United Kingdom, the Committee on the Financial Aspects of Corporate Governance, which was established in 1991, and the Cadbury Report published in 1992 as a result of the work of the committee is a cornerstone in terms of corporate governance principles. The Corporate Governance Principles published by the Organization for Economic Co-operation and Development (OECD) in 1998 provided that corporate governance principles were scrutinized by

companies and regulatory authorities around the world. Later, with the support at the G20 summit held in 2014, an updated version of the OECD's Corporate Governance Principles was published. In the OECD Corporate Governance Principles updated in 2015, the purpose of corporate governance is stated as *“Helping to create an environment of trust, transparency, and accountability necessary to enhance long-term investments, financial stability and integrity of businesses, and thus support stronger growth and more inclusive societies”* (OECD, 2016).

When considering the underlying theories of corporate governance, agency theory focus on manager and shareholder relations from a perspective that the interests of these groups may differentiate (Bonazzi and Islam, 2007; Fama and Jensen, 1983) while stewardship theory considers managers as stewards of shareholders with a focus on shareholder wealth from an organizational psychology and sociology basis (Glinkowska and Kaczmarek, 2015; Pande and Ansari, 2014). From a transaction cost theory perspective, corporations are organizations that operate transactions of products and services while the focus is on operational efficiency and effectiveness rather than shareholder rights (McClelland and O'Brien, 2011; Wieland, 2005). On the other hand the expanding stakeholder environment and new business models of modern companies with the help of digitalization load new roles and responsibilities for managers and creates new expectations from corporate governance (Fenwick et al., 2019; Scherer and Voegtlin, 2020). Fenwick and Vermeulen (2019) identify this new corporate organization as *“a community-driven corporate organization and governance”*.

The corporate governance applications need to be enhanced to increase the value delivered by benefiting from the technological advancements to conform with the shifting paradigm of business and corporate environment. In this context, the use of emerging tools with technological developments is discussed both for accounting practices (Moll and Yigitbasioglu, 2019) and other various corporate governance applications (Brennan et al., 2019a). Blockchain technology has an important share in these discussions. While the potential benefits of the use of blockchain technology to sustain better corporate governance are being discussed both by practitioners and scholars the technology's usage primarily in financial operations of companies (such as Initial Coin Offerings-ICO) has led to the emergence of new stakeholder groups in terms of businesses, and therefore the framework of expectations from corporate governance has also expanded (Blemus and Guegan, 2019; Fenwick et al., 2019).

While blockchain technology is often recalled alongside cryptocurrencies, the technological leap that blockchain offers is in practice in the record-keeping algorithms. Cryptocurrencies generally use

public blockchain systems while the first experimental implementations of blockchain have used private chains. While maintaining the core characteristics of blockchain such as decentralization or immutability, these public chains require immense amounts of computing power, causing a waste in the energy utilization aspect. The Proof of Work concept used in these public currencies is the main cause of this waste and most of the proof of work algorithms used today are quantum-vulnerable. This practically means that when quantum computers get into the system, they will render the whole system inoperable.

Vitalik Buterin, co-founder of Ethereum platform defines blockchain as “*A blockchain is a magic computer that anyone can upload programs to and leave the programs to self-execute, where the current and all previous states of every program are always publicly visible, and which carries a very strong crypto-economic secured guarantee that programs running on the chain will continue to execute in exactly the way that the blockchain protocol specifies.*” (Buterin, 2015).

After its first introduction in 2008, blockchain technology has succeeded in attracting attention with cryptocurrencies and then other fields and sectors where it can be applied as a decentralized database. Although there has not been a rapid transformation in the expected application areas, the interest of individuals and institutions in this technology is expanding and it has the potential to play an important role in eliminating the deficiencies in corporate governance practices, which is one of the most fundamental factors that deepen the crises mentioned above. Akgiray (2019) claims in the working paper he prepared for OECD that the blockchain has four instruments that can achieve the four main objectives of corporate governance. These instruments are listed as shared distributed ledgers, irreversibility of records, peer-to-peer communication, and smart contracts. Especially the permissioned blockchain structures can both sustain the transparency and decrease transaction costs for management, shareholders, and other stakeholder issues.

This study has two main purposes. First, to contribute related literature with empirical research since the previous works are mostly based on theoretical discussions and secondly to evaluate the contribution that blockchain technology can provide to companies by integrating it into corporate governance practices. The study is considered important as it fills an important gap in the literature by testing the assumptions in previous studies in this field.

2. THEORETICAL BACKGROUND

One of the most fundamental studies questioning the applicability of blockchains in terms of corporate governance was conducted by Yermack (2017). Yermack argues that the implementation of blockchains

for corporate governance will have effects on the transparency of ownership, liquidity, institutional investors and activists, managers, market microstructure, voting, and real-time accounting. Based on his work, he argues that transparency can be increased, transaction costs can be reduced, and agency problems can be eliminated by using blockchain. Following the arguments of Yermack researches on the potential benefits of blockchain technology to various corporate governance pillars can be seen in the literature.

The type of implied blockchain that is suggested to be integrated into the corporate governance practices is the permissioned blockchains. Permissioned blockchains, retain the crucial advantages of using a blockchain-based system such as immutability. However, the permissioned blockchains must be centralized. While some analysts argue that this is against the principle of blockchain ideology, this concern only applies when one is trying to use this system as a financial system basis. In a corporate governance infrastructure, the ideal system is centralized and immutable. Centralization allows customized information flows between different members of the system which allows specific information flow designs tailored to the needs of the corporations. The centralization of blockchain in this context also eliminated the energy cost of the system as the proof of work system is altered entirely in this algorithm.

F. Piazza (2017) claims that technology will have a positive impact on transparency and disclosure pillar in terms of corporate governance and that greater transparency and lower information asymmetry can be achieved by shared ledgers. On the other hand, the study claims that the voting rights of the shareholders can be strengthened with the help of technology, and the oversight of the financial operations of the enterprise can be achieved more effectively by reducing the accounting and auditing costs. Another study that supports the arguments of Piazza is made by Lafarre and Van der Elst (2018) which address blockchain applications with a focus on shareholder rights and relations and argues that the technology can improve shareholder voting rights and reduce voting costs.

Kaal (2019) focuses on the possible effects of the integration of blockchain technology in terms of agency theory and claims that decentralized Autonomous Organizations will resolve agency problems after the necessary infrastructure conditions are provided. Singh et al. (2019) examined the effect of blockchain technology on corporate governance practices within the framework of technology acceptance theory and argued that it can improve corporate governance practices in terms of effectiveness, transparency, fraud prevention, and voting. Panisi et al., (2019) also have approached the effects of blockchain technology on corporate governance from the perspective of shareholders and argue that the technology will provide ownership transparency for public companies,

thus enabling shareholders to exercise their rights more effectively through a more effective voting system.

From another perspective, scholars argue that the complete implementation of blockchain technology in accounting operations will enable the transformation of the double-entry accounting system into a triple-entry accounting system which has been discussed for many years even before the blockchain technology (Dai and Vasarhelyi, 2017; Wunsche, 2016). Thanks to the triple-entry accounting system kept in permissioned blockchains, auditors will be able to simultaneously participate in the accounting recording process carried out by smart contracts and the audit function will be transformed into the oversight function. In this way, the rights of the shareholders and other broad stakeholder groups of the company will be protected much more effectively (Faccia and Mosteanu, 2019; Gökten and Özdoğan, 2020). According to the extensive literature review made by Daluwathumullagamage and Sims (2020), the main focus of scientific papers is on regulations and ICO's.

3. DATASET AND METHODOLOGY

The question “How can firms utilize blockchain features for their business processes?” was defined by Risius and Sphorer's (2017) study to develop new research questions from the existing literature. As mentioned in the theoretical background, various studies focus on Risius & Sphorer's research questions from a conceptual perspective. Unlike several studies that follow-up on this article, we try to quantify this conceptual relationship by using representative variables to address the phenomenon in question.

In this study, our research question aims to test whether if a theoretically perfect corporate governance system introduced through the implementation of blockchain into corporate governance procedures, would improve the market value of the firm. To answer this research question, we have established a research model. Improvement of the market value is represented by the volatility of the market value of the company in question. In the research model, we first aimed to confirm the hypothesis that there is a significant performance difference between firms that are listed in the corporate governance index and the firms that are not. With this purpose, we used an independent sample t-test to test for the equality of means.

Table 1: Group Statistics

		Equality of Means t-test		
	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
			Lower	Upper
Equal variances assumed	4,07E+08	1,00E+08	2,10E+08	6,04E+08
Equal variances not assumed	4,07E+08	1,02E+08	2,08E+08	6,06E+08
Variable	N	Mean	Std. Deviation	Std. Error Mean
CG	1614	2,9340E9	3,35772E9	8,35782E7
Non-CG	1740	2,5270E9	2,40537E9	5,76643E7

Table 2 (Continued): Independent Samples Test

	Levene's Test for Equality of Variances		Equality of Means t-test		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	448,653	0	4,058	3352	0
Equal variances not assumed			4,009	2903,826	0

CG series represent market cap movements of 3 firms that were randomly selected from the corporate governance index of BIST, while Non-CG represents 3 firms that were within BIST 100 but not in the Corporate governance index.

Findings of independent sample t-test yield a 4.009 t-statistic with a statistical significance value of 0.000, which indicates that at a 1% level of significance there is a significant difference between the means of two groups. While currently reported results are between ASELS, AYGAZ, and VESTL from the Corporate Governance index and ADANA, AKSEN, and AKGYO from the non-corporate governance index, the results have

been replicated using 62 different combinations of firms with similar results. The dataset covers the period between 05.12.2011 to 01.01.2020 in daily frequency.

Next, we move on to modeling the relationship between corporate governance scores and firm performances to reveal the relationship between corporate governance efficiency and firm performance. Firm performance is represented by market capitalization while corporate governance efficiency is represented by corporate governance grades reported by regulatory institutions regularly each year.

As we are using financial time series, by nature of the dataset we are going to be using non-linear models. In this context, we have decided to model our series using the GARCH model (Bollerslev, 1986) which is derived from the ARCH model developed by Engle (1982) and is widely used in financial econometrics analyses. GARCH models are executed under symmetrical conditional heteroskedasticity assumptions. Where e_t is a real-valued discrete-time stochastic process and ψ_t is the dataset at time t , GARCH(p,q) can be expressed as follows:

$$e_t/\psi_{t-1} \sim N(0, h_t)$$

$$h_t = \alpha_0 + \sum_{i=1}^q \alpha_i e_{t-i}^2 + \sum_{i=1}^p \beta_i h_{t-i} = \alpha_0 + A(L)e_t^2 + B(L)h_t$$

$$p \geq 0, q > 0, \alpha_0 > 0, \alpha_i \geq 0, i = 1, \dots, q, \beta_i \geq 0, i = 1, \dots, p$$

$$V(\varepsilon_t) = E[\varepsilon_t^2] = \frac{\alpha_0}{1 - \alpha(1) - \beta(1)}$$

e_t is the white noise variable. While $p = 0$ (ARCH(q)), the process equates $p = q = 0$.

GARCH(p,q) process is a function of delayed conditional variances and is stationary under the following assumption:

$$\alpha(1) + \beta(1) = \sum_{i=1}^p \alpha_i + \sum_{i=1}^q \beta_i < 1$$

(Kirchgässner & Wolters, 2007, p. 253).

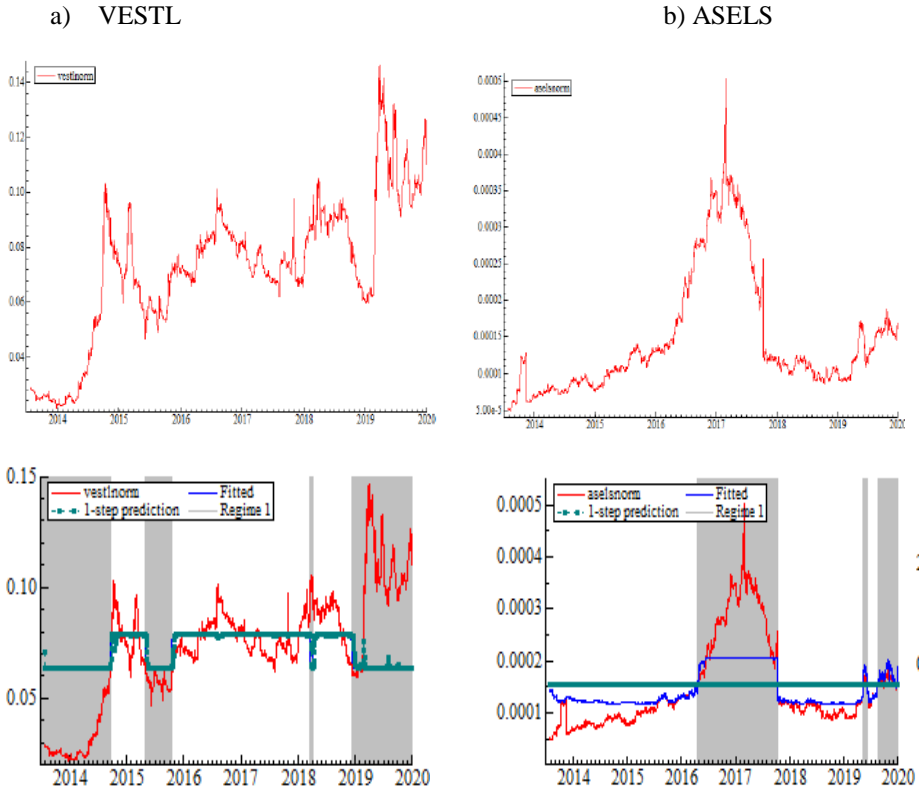
The descriptive statistics of the series used in the GARCH models have represented in Table 3. Additionally, the timeline and smoothed graphs for series are demonstrated in Figure 1.

Table 3: Descriptive Statistics

	VESTL	ASEL S	Δ VESTL	Δ ASELS	CGSVES TL	CGSASE LS
Mean	0.072386	0.000148	5.05E-05	6.85E-08	1.969260	1.958355
Median	0.073925	0.000118	-0.000146	6.49E-08	1.971276	1.961421
Maximum	0.146365	0.000503	0.015273	4.08E-05	1.983716	1.968016
Minimum	0.021758	4.95E-05	-0.013515	-0.000130	1.951580	1.932981
Std. Dev.	0.025383	8.39E-05	0.002250	6.23E-06	0.011551	0.010459
Skewness	-0.226408	1.463662	0.962134	-7.831230	-0.468344	-1.641241
Kurtosis	3.040784	4.180034	12.03691	154.6041	1.612549	4.479270
Jarque-Bera	13.90099***	669.9249	5737.478	1561191.	188.4616	871.7573
Q(50)	57564***	71874**	123.52***	82.055	75.187***	62.332***
Q ² (50)	45660***	56480**	1055.3***	18.835	70.475***	56.871***
ARCH(5)	12413***	14496*	40.9747***	2.2582***	79.737***	23879***
Observations	1614	1614	1613	1613	1614	1614
Zivot Andrews Unit Root Test						
	VESTL	ASELS	Δ VESTL	Δ ASELS	CGSVES TL	CGSASE LS
Intercept	-3.5476 (4)	-4.4058 (3)	- 40.1301(0))***	- 25.8332(2))***	-5.7898(0))***	-6.1485(0))***
Breaking Date	17.07.2014	13.10.2017	14.10.2014	2.02.2017	17.12.2015	8.10.2014
Intercept and Trend	-3.9104 (0)	- 3.8819(3)	- 40.3156(0))***	- 25.8995(2))***	-6.7575(0))***	-8.5035(0))***
Breaking Date	10.03.2015	13.10.2017	14.10.2014	2.02.2017	17.12.2015	8.10.2014

Note: Values in parentheses signify delay lengths. The critical values at 5% level of significance for “fixed-term” and “fixed term and trended” unit root tests are -4.93 and -5.08, respectively. *** shows significance at 1% significance level

Figure 1: The Time-Line and Smoothed Graphs for VESTL and ASELS



As seen in Table 3, neither VESTL nor ASELS market capitalization figures are normally distributed. They also resemble heavy-tail characteristics, which collectively indicate that market values are distributed in leptokurtic formation.

At the same time, when the ARCH effect is examined, it can be stated that the market value of both companies has a non-linear structure. Therefore, conditional variance models should be utilized to analyze the effect of corporate management scores on the market value of companies. Table 4 contains the ARMAX (2,2) -GARCH (1,1) model estimation results for VESTL and ASELS companies.

Table 4: ARMAX(2,2)-GARCH(1,1) Model Estimation Results

	VESTL	ASELS
Mean Equation		
Constant	5.54E-05 (1.3197)	6.81E-08 (0.3498)
AR(1)	0.009662 (0.3767)	0.092203 (9.3298)***
AR(2)	0.003218 (0.1432)	-0.097623 (-6.7536)***
AR(3)	-0.010652 (-0.4757)	-0.041286 (-1.7399)*
AR(4)	0.047596 (2.0128)**	0.007208 (0.2392)
Variance Equation		
C	7.21E-07 (14.2813)***	2.70E-12 (5.8316)***
RESID(-1)^2	0.518293 (13.9118)***	0.337048 (5.6100)***
GARCH(-1)	0.446680 (20.4037)***	0.569358 (14.3877)***
D(LCGSASELS) / D(LCGSVESTL)	-0.000319 (-26.9374)***	-0.000128 (-11.1304)***
T-DIST. DOF	2.61729 (12.1214)***	3.204151 (14.4475)***
Q(50)	37.725	50.931
Q ² (50)	15.606	3.8633

Note: ***, **, * symbols indicate statistical significance at respectively 1%, 5% and 10% significance level. Delay lengths are indicated by values in parentheses.

The results in Table 4 can be summarized as follows: While the effect of a shock on the market value of VESTL company lasts for approximately 87 days, the effect of a shock on the market value of ASELS company is approximately 67 days. When looking at the effect of the Corporate Governance Index on the market value of companies, a 10% increase in the Corporate Governance Index for VESTL causes a 0.05% decrease in the volatility of the market value. Similarly, a 10% increase in the Corporate Governance Index for ASELS company causes a 0.04% decrease in the volatility of the market value.

When the diagnostic test results are examined, it is seen that the ARCH effect disappears in the models while there are no heteroskedasticity or autocorrelation problems. At the same time, the sum of the ARCH and GARCH coefficients is less than 1. This is the stationarity condition of the GARCH model and is met. These results express the validity of the models.

We assume that in a corporate governance procedure where blockchain-based systems are utilized, CSR scores won't go below the

score of 2 standard deviations above their current means and as it moves beyond 100 points at certain periods, we normalize the series' previous observations based on the exceeding value. We also assume this process to result in exponentially reduced volatility values in the series and expect these values to be the square roots of their current rates after adjusted other external systematic factors such as seasonality.

Based on these assumptions and findings from the GARCH model, the volatility of these stocks is expected to be drastically lower with the implementation of a blockchain-based corporate governance system, which may reduce volatility nine-fold for VESTEL while eight-fold for ASELS. Reduction in market volatility is also expected to drastically reduce the cost of capital for these firms, which may further contribute to the performance of the firm.

4. CONCLUSION

The findings of the study indicate that there is a significant relationship between corporate governance compliance and firm performance in the Turkish stock market. Furthermore, there seems to be a clear positive relationship between corporate governance scores and firm performance in Turkey. Along with the findings of simulation, results collectively indicate that implementation of blockchain into the corporate governance mechanisms may yield significant market value increases and potential performance improvements. Modeling a technological leap that will result in drastic managerial performance improvements is rather difficult with linear models. While the effect of blockchain implementation is thought to have exponential results, the empirical study we used had to be a linear model for sake of presenting overestimation.

As of the writing date of this article, we were not able to find any study in the literature that attempts to empirically measure the potential market value effects of the integration of blockchain systems into corporate governance procedures. As such, we have compared our results against the literature under 3 categories in Table 5. In-Line studies represent studies that have in some way found that blockchain has the potential to increase the efficiency of corporate governance and may result in higher profitability or a significant jump in the firm value. Complementary studies represent the articles that focus on not just the efficiency aspect of blockchain and focuses on complementary implications or features of blockchain integration into corporate governance systems. Lastly, the Theory-based studies are as the name suggests, theoretical, and discuss the framework or underlying mechanisms of blockchain or corporate governance processes.

Table 5: Related Studies

Author, date	Focus	In-Line	Complementary	Theory-Based
Risius & Spohrer, 2017	Blockchain Framework			+
Hussein et al., 2018)	BPM And IoT		+	
F. S. Piazza, 2017	C.G. Tool Development			+
Böhme et al., 2015	Cryptocurrency			+
Kaal, 2019	Agency Problem	+		
Pan et al., 2020	Operational Capabilities	+		
Yu et al., 2018	Blockchain Application			+
Mending et al., 2018	Process Management		+	
Murray et al., 2019	Autonomous Organization		+	
Yermack, 2017	Core Study			+
Brennan et al., 2019b	Disruptive Potential	+		
Kostyuk et al., 2018	Literature Review	+		
Sheel & Nath, 2019	Operational Effectiveness		+	
Zachariadis et al., 2019	Challenges Facing Blockchain-Based Applications		+	
Hald & Kinra, 2019	Operational Process		+	
Fenwick & Vermeulen, 2019	Technological Analysis			+
Fenwick, McCahery, et al., 2019	Corp. Governance Revolution		+	
Ivaninskiy, 2019	Literature Review	+		
Hsieh et al., 2017	Blockchain-Based Organization Structure		+	

Results are almost unanimously following the findings of this study. While every study appreciates the potential of blockchain in corporate governance as a given, there are several different views on how the transformation to blockchain-based systems would take place. With this study, while a non-substantial and empirical contribution from the Turkish stock market is presented to the literature. As literature already emphasizes the potential of the blockchain, this study would be most beneficial to corporate managers considering the monetary aspect of the transformation process.

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