APPLICABILITY OF AI-BASED TECHNOLOGIES TO THE INTEREST-FREE FINANCE SECTOR: "THE BENEFIT SHARING MODEL" AS A NEW APPROACH[*]

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Abstract
This article examines the theoretical background of an approach to interest-free financial transactions called The Benefit Sharing Model. This model is examined via an algorithm dataset in the context of interest-free finance. The innovative approach presented here provides advanced computation and analysis opportunities in interest-free financial transactions, designed using a machine learning algorithm. In this respect, the article evaluates structuring the machine learning algorithm with constant and variable data set groups. The study proves that artificial intelligence-based technologies can be used more effectively by the stakeholders in the interest-free finance sector. Ultimately, it demonstrates that strengthening the existing contract models in the interest-free finance sector and increasing the use of financial technologies will contribute to the development of the sector.

The Benefit Sharing Model proposed in this article, uses a machine learning algorithm that is designed to produce decision outputs in interest-free financial transactions. This approach is presented in order to realize financial transactions in accordance with the basic principles of the interest-free finance sector. In fact, in a financial engineering process designed on an interest-free basis, the most basic premise is the obligation to comply with certain principles. For this reason, more detailed transaction analyses are needed for interest-free financial transactions than conventional financial transactions where interest is considered a legitimate instrument.

Keywords: artificial intelligence, artificial learning, cloud computing, interest-free finance sector, financial technologies, benefit sharing, blockchain, smart contracts.

Introduction

Since the 1990s, the widespread prevalence of internet technology on a global scale has also triggered the development and diversification of financial technologies. The fact that artificial intelligence-based information processing technologies are developing more and more day by day leads to major transformations in computer-based computing technologies. Globally, influential companies are becoming information centers with versatile and detailed data pools. Big data comes to the fore in terms of collecting the data of all people who are internet users and reusing them for commercial gains (Sohangir, Wang, Pomeranets, & Khoshgoftaar, 2018). Artificial intelligence-based technologies are of great importance at the point of reuse of the collected data and are needed to process and reuse the collected data. Although today the access time to a wide variety of multi-faceted information is quite easy and short; it has become very difficult to analyse and process the information obtained. This process, on the other hand, transforms the business models of all sectors and will continue to affect them more deeply. All financial market instruments and financial technologies on a global scale are also significantly affected by the digital transformation process (Mondal, 2020).

The most effective computation and analysis methods, especially in financial decision-making processes, have come to offer significant advantages in this transformation process. In addition, the use of financial technologies, the widespread use of automation systems in the field of finance, and dehumanisation processes within the scope of financial analysis methods are increasing rapidly. Artificial intelligence-based technologies have been widely used in the financial sector as in almost all sectors in the last ten years. Artificial intelligence-based

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technologies consist of 6 different sub-fields: cognitive computing, computer vision, machine learning, deep learning, computation via artificial neural networks, and natural language processing. The reason why this system is defined as artificial intelligence is that it is a mechanism that "works by imitating the intelligence of living things" existing in nature. It is called "artificial" because it has the ability to "analyze" the connectivity between existing data through algorithms (Aylak, Okan, & Yazıcı, 2021: 77).

Many financial services such as digital technologies, payment services, online robotic consultancy services, investment and stock market advisory services, ensuring personal financial information security, insurance services developed on the basis of artificial intelligence, and others are used more and more in the financial sector. New financial technologies such as big data analytics, biometric verification, internet of things, cloud computing technologies, robotic consulting, blockchain and smart contracts are also emerging technologies that increase diversity and efficiency in the sector. (Mondal, 2020)

Machine learning refers to the training of the algorithm by introducing the relevant data sets to the algorithm, and the trained algorithm's ability to produce meaningful decision outputs by itself. The machine learning model can be processed through three different processing methods (Alpaydın, 2014: 1). Artificial intelligence-based technologies are used in many financial computing areas, especially financial forecasts, credit risk and return analysis, bankruptcy forecasting, optimal capital structure forecasting, exchange rate forecasting, stock market index forecasting and stock price forecasting. This method, which provides a more efficient technical infrastructure, stands out as a technology that has the potential to further strengthen traditional econometric analysis methods.

The use of systems that provide high-efficiency financial forecasting and foresight in the interest-free finance sector by making advanced use of artificial intelligence-based technologies has become very important in recent years. In this context, the use of models that can "make multiple data analysis" based on machine learning methods (which can produce financial decisions by analysing the interconnections between related data) has become more important (O'Halloran & Nowaczyk, 2019).

According to Islamic jurisprudence, economic transactions that are not considered legal (permissible) are basically types of transactions that have the potential to disrupt individual existence and social order, and they are prohibited. In this sense, Muslims are prohibited from engaging in various economic transactions that disrupt the social order in the relations between the parties, especially in interest-bearing transactions. Today, many financial institutions operating on a global scale with names such as "Islamic bank", "participation bank", "interest-free financial institution" and operating according to the interest-free principle have also aimed to serve with these basic principles. Financial institutions that carry out interest-free financial transactions are classified as follows according to their characteristics: (a) established by obtaining an Islamic bank license, (b) those who perform transactions by “opening a window” within a conventional bank, (c) those who establish a venture capital subsidiary and perform interest-free financial transactions through subsidiaries (Alamad, 2020: 130). Many interest-free finance models that have been produced throughout history can be considered as financial innovations. In fact, each financial application is produced in order to meet the financial needs of the society at the time of its implementation. For this reason, the reinterpretation of prior applications should also be understood as financial innovation (Ahmed, 2011; a.g.e., 2020: 77). In the process of developing interest-free financial products, the "main purpose of the shariah" can be revealed by considering the essence and meaning of the relevant legal system, rather than just the wording in the contract texts that are based on *shar'a law* (El-Gamal, 2006). Due to some features in the interest-free finance sector, progress and innovation in this field lag behind conventional banking. These risks include “long-term fund deficiency” as well as

“maturity mismatches between assets and liabilities” (Alamad, 2020: 82). For this reason, in the management of financial risk factors, it is important to develop methods that can calculate risk and profitability sharing (Al-Bashir, 2008: 1; Alamad, 2020: 82) by carefully evaluating many different impact factors. In this way, the efficiency of financial engineering methods based on the interest-free principle will be increased within the interest-free finance ecosystem, and it will allow the use of new computational methods that are in line with the spirit of the times. In this context, a new calculation and analysis method in accordance with the spirit of the time is proposed in The Benefit Sharing Model.

1. As an Innovative Model for Interest-Free Finance: The Benefit Sharing Model

The Benefit Sharing Model has been proposed as a model that can be used in interest-free financial transactions and was created to provide financial insights to stakeholder parties. The combination of artificial intelligence-based technologies has been proposed as a new interest-free finance approach for the realisation of related financial transactions on the basis of "justice" and “benefit". Many interest-free financial instruments applied today are criticised for their low efficiency and because they are based on "murabaha" instead of the commercial partnership models. This new approach has been developed in order to eliminate these criticisms and increase efficiency in the interest-free finance sector. In this sense, this new model is based on the idea of using artificial intelligence-based technologies and big data resources in the most effective way. This Benefit Sharing Model can also be applied by adapting it to many interest-free financial instruments (such as financial contracts). The data set groups introduced to the algorithm are shown in the table below and their details are explained. The Benefit Sharing Model is based on the concepts of “maqâsıd-ı şeria” (Boynukalın, 2003), “justice” (Karaman, 1988), “benefit” (Hacak, 2004), “interest” (Özsoy, 1995), and its applicability has been demonstrated in terms of theory and technique.

Artificial intelligence-based technologies are used in many areas of life, as well as in the processes of "producing legal interpretations" and “argumentation” (Surden, 2019). The process of *ijtihad* in Islamic law refers to the process of reaching a decision by using various deduction (*istinbat*) methods and evaluating relevant data by a responsible authority. In this sense, *ijtihad* is a concept that expresses the process of producing valid rules about the problem encountered based on certain *fiqh principles* (*Islamic Sharia Law*) (Apaydın, "İctihad", 21/432-445). When evaluated from this aspect, it can be said that *ijtihad* is actually a method of multiple data analysis. However, the nuance here is that although traditional *ijtihads* are based on very narrow influence factors; The mechanism of producing *ijtihad* by using artificial intelligence is based on a very large data set groups. In addition, calculation and analysis processes using artificial intelligence have the potential to offer much more advanced foresight possibilities (Claudé & Combe, 2018: 16).

1.1. Data Set Groups of The Benefit Sharing Model’s Algorithm

Algorithms are scripts created to solve specific problems, or in other words, code sequences used to convert data inputs into data outputs (Alpaydın, 2020: 28). However, there is a difference between programming algorithms and machine learning algorithms. Programming is based on the coding of definite constants as "yes" or “no". In the artificial learning method, the learning algorithm is based on the principle of learning the causality between the given information, which is then used in the process of continuous training of the machine learning algorithm. In this way, machine learning algorithms that can perform advanced computations in "decision-making processes" with many different variables, offering very advantageous usage opportunities in desired areas. This situation undoubtedly has very close similarities with *autopoiesis* (Kılıç, 2020: 36), which is a type of intelligence that emerges in the case of constantly processing certain information for a certain period of time. In other words, every

information-processing system eventually produces its own intelligence, revealing its own information network. Just like the human brain, it can produce its own decision outputs by processing data with very different types of properties at the same time. The main difference between computation based on machine learning methods and computation based on statistical methods is that the statistical computation simulates the datasets given to the model and produces the outputs (Kruse et al., 2013). In the machine learning method, the connectivity between the data sets introduced to the algorithm is discovered through continuous training of the algorithm. In the machine learning process, the machine learning algorithm does not merely imitate existing data; it is possible to make inferences for new situations that have not been seen before (Alpaydın, 2020: 43-44).

The working principle of The Benefit Sharing Model is based on the idea of introducing an analysis and computational approach that can make inferences through machine learning methods. This is because this method is capable of performing operations with high efficiency based on multivariate parameters. In this model, the qualities of the data sets introduced to the algorithm are of great importance (a.g.e., 2020: 33-34). The Benefit Sharing Model algorithm will be trained and empowered by introducing many dataset groups to the algorithm. In this way, this trained and learned algorithm, which learns the connectivity between the data sets, can be used in subsequent computation processes.

1.2. Technical Details of The Benefit Sharing Model

a) Naming of The Model

This new model has set the principle of ensuring “justice” as the main target, since the main motivation in all belief systems where interest-bearing transactions are prohibited is aimed at providing “justice". For this purpose, The Benefit Sharing Model is envisaged for use in the financial interaction process to be established between the parties. It is named as The Benefit Sharing Model because it is based on the principle of fair sharing of the common benefit and the common risk that will arise as a result of such an interest-free financial interaction process.

b) Theoretical Aspects of The Model

The general features of the technical infrastructure elements of the Benefit Sharing Model are as follows:

1. The Benefit Sharing Model is based on the calculation of all functions of the contents of the financial contracts to be established between the "parties" in interest-free financial transactions through machine learning methods. In this model, the related data set groups introduced to the algorithm are used both for training the algorithm and for producing new decision outputs in subsequent computation.

2. In this model, four different recommendation decision outputs are produced by performing multiple analytical financial data analysis with machine learning methods. This algorithm model is aimed at creating mutual offers by proposing 4 different benefit / risk sharing ratios for all phases of the financial relationship between parties. This model is based on an approach that aims to share the common interest and common risk fairly between the relevant parties of the contract.

3. Constant data functions and variable data functions in this model are introduced to the machine learning algorithm and can be used through iteration at the required level. The diversity in the data set groups selected for this purpose can be updated and changed in accordance with the desired financial transaction. In addition, it is foreseen that the general information collected under the name of big data will be used in the machine learning model that can obtain up-to-date data.

4. It is envisaged that The Benefit Sharing Model will operate based using real economic assets on an interest-free basis. In addition, this model aims to produce decision outputs that are compatible with the "principle of justice of Islamic law" between the parties by equalising the interests of the parties at the most optimum level.

5. Preventing the emergence of many injustices such as *interest*, *garar*, *gambling*, *adulteration*, etc., which are considered prohibited according to Islamic law, are also included in the computational criteria of the relevant algorithm. In addition, the prevention of legally inconvenient situations, such as preventing harm to humans, other living things and nature, is one of the other criteria of the algorithm.

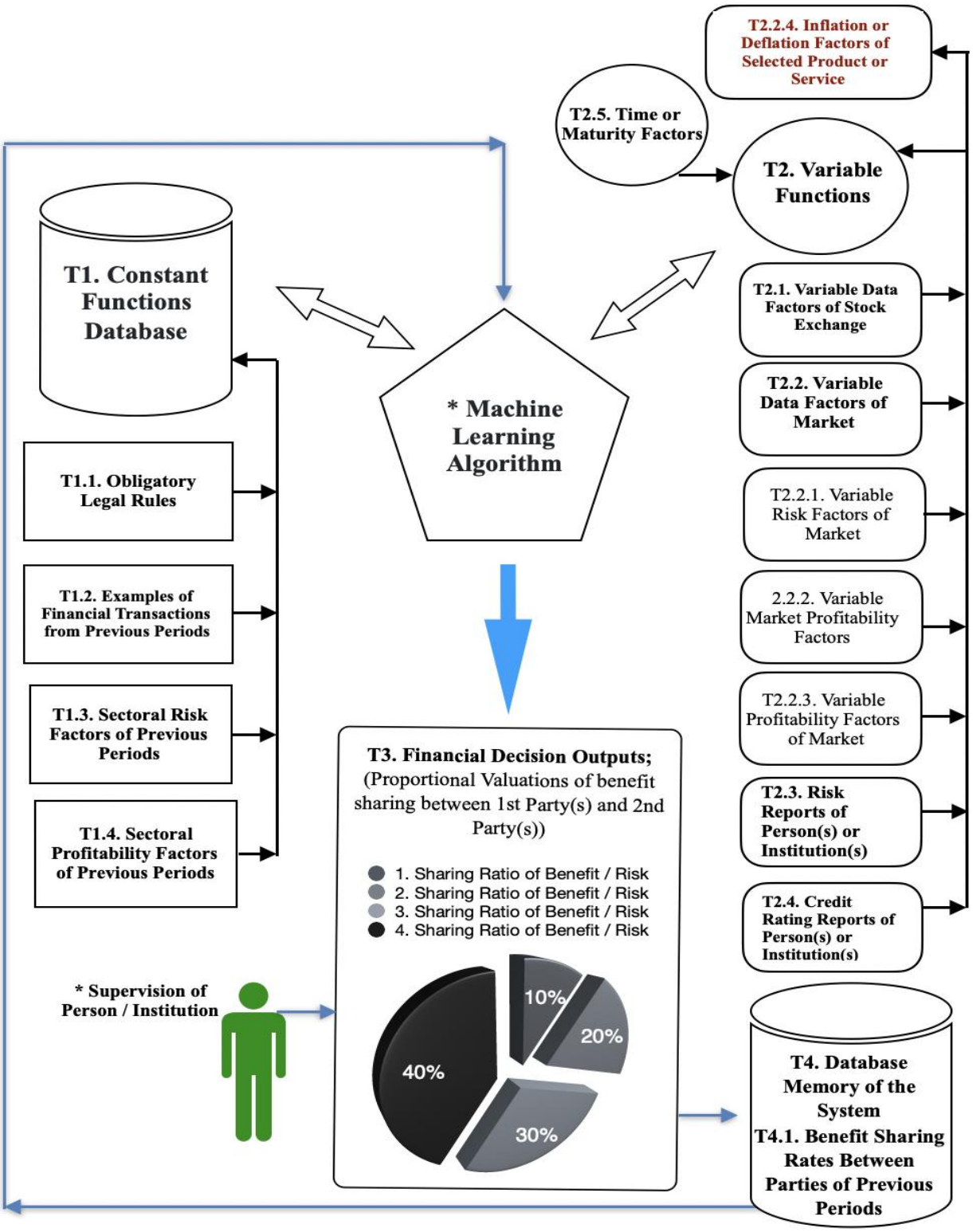
6. The Benefit Sharing Model aims to provide high foresight to the parties in the process of establishing financial relations in the context of determining the "agreed rate" option in contracts according to Islamic law.

7. In some studies, there are also model proposals similar to financial robo-advising (Jung, Glaser, & Köpplin, 2018; Lam, 2016; Noor & Hassan, 2020). However, each machine learning algorithm differs from each other in terms of processing styles and algorithm architecture due to its unique data set groups. The Benefit Sharing Model is also presented as an algorithm approach that provides high foresight to the parties by producing financial decision outputs based on its own related data set groups in the multi-data analysis process.

1.3. Data Set Groups of The Benefit Sharing Model

The sample data set groups of The Benefit Sharing Model Algorithm are as follows; 1. Constant Functions Data Sets, 2. Variable Functions Data Sets, 3. Financial Decision Outputs, 4. System Memory Database. These data set groups are summarised in Figure 1. and Table 1. The contents of these data set groups have been evaluated in such a way that they can be realised by introducing the data set groups for the fields and sectors for which the machine learning algorithm is desired to specialise. In order for the algorithm to be trained in accordance with the desired purpose and to be able to produce decision outputs, all the influence elements included in the model are shown in detail in Table 1. These impact factors are classified by dividing them into other impact factors belonging to subsections and presented in tables under the relevant headings. Each weight effect value shown in Table 1. was determined as sample values. In this context, training the algorithm on the most suitable data sets for the requested purpose is the most decisive factor. The important feature of this model is that it can perform the most suitable multi-data computation for the desired target by using the machine learning algorithm. In this context, it is important to support the algorithm with the most accurate data at all stages of the algorithm training process in order to train and make it competent. It is also important that the datasets can be changed by the algorithm in accordance with the target, that the datasets can be supported with up-to-date and instant information, and that the mistakes made can be learned by the algorithm. Due to these features of the machine learning algorithm processing system, data sets and effect weight values are expressed as changeable.

Figure 1. Dataset Groups of The Benefit Sharing Model (Sample)



Source: Created by the author.

Table 1. Dataset Groups of The Benefit Sharing Model (Sample)

	DATA SET GROUPS (SAMPLE) (To Be Included in the Machine Learning Process)	**Effect of Weight Ratio (%)**
	Data Set Groups	**101,12**
T1.	**Constant Functions Database**	**32,40**
T1.1.	**Obligatory Legal Rules**	**10,00**
T1.2.	**Examples of Financial Transactions from Previous Periods**	**10,00**
T1.3.	**Sectoral Risk Factors of Previous Periods**	**6,20**
T1.4.	**Sectoral Profitability Factors of Previous Periods**	**6,20**
T2.	**Variable Functions**	**63,62**
T2.1.	**Variable Data Factors of Stock Exchange**	**5,60**
T2.2.	**Variable Data Factors of Market**	**29,7**
T2.2.1.	Variable Risk Factors of the Market	5,6
T2.2.2.	Variable Market Profitability Factors	9,00
T2.2.3.	Variable Profitability Factors of Selected Product(s) / Service(s)	6,00
T2.2.4.	Inflation or Deflation Factors of Selected Product(s) / Service(s)	9,10
T2.3.	**Risk Reports of Person(s) or Institution(s)**	**5,5**
T2.4.	**Credit Rating Reports of Person(s) or Institution(s)**	**16,12**
T2.5.	**Time or Maturity Factors**	**6,70**
T3.	**Financial Decision Outputs (Benefit Sharing Ratios Between Parties)**	**2,50**
T4.	**Database Memory of The System**	**2,60**

Source: Created by the author.

Conclusion

This study has investigated how the interest-free finance sector can benefit from new developments in the field of financial technology. In this context, the applicability of artificial intelligence-based technologies to this sector has been demonstrated with the theoretical aspects with the approach called The Benefit Sharing Model. This model can be integrated into many structures such as various financial digital platforms, internet-based cloud computing systems, and smart contracts based on blockchain technologies in the field of interest-free finance. In addition, the proposed Benefit Sharing Model is envisaged as an adaptable model to financial interaction platforms and cloud computing systems based on the blockchain system.

The Benefit Sharing Model can be used by adapting to different contract types in the interest-free finance sector, so that the parties in the financial interaction process do not need any intermediary financial institution. In this respect, the model can be applied to many of the fields of crowdfunding, interpersonal financial interaction (P2P), business interaction between companies (B2B), business interaction between company and consumer (B2C), business interaction between customers (C2C) in the rapidly developing interest-free finance sector.

The Benefit Sharing Model is intended to be a model that aims to provide high social benefit (*maslaha*). In this context, it is aimed to ensure that the parties establish fast and secure financial relations, and to equalise the mutual interests and risks of the stakeholders on both the supply and demand sides in financial relations. In this way, it is aimed that this proposed model will contribute to the development of interest-free financial products. The inclusion of these basic principles in the computation and analysis process with the machine learning method has revealed the main claim of the study in the context of making interest-free transactions and producing accurate financial forecasts. This Model proposed in this study is applicable to all Islamic financial contracts.

In addition, in the study, data set groups were created as the first step of performing an algorithm design, and the data set groups of the Benefit Sharing Model learning and implementation algorithm were outlined. In this context, the general structures of constant data set groups and variable data set groups are shown on the tables by listing them with sample weight ratios. In conclusion, the Benefit Sharing Model Learning and Implementation Algorithm, which is expected to be trained and empowered through these determined sample data set groups, can provide high foresight between the parties by producing financial decision outputs is presented in the study.

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