Kırşehir Ahi Evran Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi (AEUİİBFD)
Cilt 3, Sayı 2, Aralık 2019, Sayfa: 7-24.
Politics, Economics and Administrative Sciences Journal of Kirsehir Ahi Evran University
Volume 3, Issue 2, December 2019, Page: 7-24.

Makale Geliş Tarihi / Aplication Date: 20 Ağustos 2019 / August 20, 2019
Makale Kabul Tarihi / Acceptance Date: 12 Kasım 2019 / November 12, 2019

ARTICLE / MAKALE:

ISLAMİC ALGORİTHMİC EQUİTY PORTFOLİO

İSLAMİ ALGORİTMİK HİSSE POFTFÖYÜ

Ahmet GÖKBEL[*], Halil ARSLAN[**]

ÖZET

Yüzyılın ortasında Markowitz ve Fama salt matematik akla göre modern portföy stratejilerini geliştirirken modern teorinin olandan ziyade ideale göre kurgulanması eleştiri konusu olmuştur. Getirisi düşük olmasına rağmen riske olan bağımlılıklarından dolayı daha yüksek riskli araçlara yatırım yapan yatırımcılar bulunmaktadır. Davranışsal finans bu dönemde modern portföy teorisine bir tepki olarak doğsa da yatırımcıları tamamen irrasyoneliteye meyilli olarak tanımlaması bir eleştiri konusudur. Teknolojinin gelişimi, yatırım seçeneklerinin hiç olmadığı kadar artması, zamanın önemli bir kaynak olması ve yapay zeka teknolojileri dijital bankacılığı ve algoritmik portföy modellerini öne çıkarmaktadır. Kriterlerini belirlediğimiz İslami algoritmik model portföy, bir teori olmaktan ziyade 2014 Temmuz ayında Borsa İstanbul tarafından KATMP kodu ile endekslenerek yayınlanmaya başlamıştır. İslami algoritmik model portföyün oluşturulan kriterlere göre hem BIST100 endeksini hem de diğer katılım endekslerini son 4 yıl ortalamasında getiri performansı olarak geçtiği görülmektedir. Model portföy sharpe rasyosunda da endekslerden daha iyi bir performans sergilemiştir. Algoritmik model portföy, portföy yöneticileri için pasif olarak yönetilen genel endekslerden daha iyi bir getiri ve risk dengesi sağlayan yapısı ile Borsa Yatırım Fonu kurulması için ciddi bir adaydır. Ayrıca KATMP'de yer alan şirketlerin muhafazakar yönetim stratejileri, karmaşık ve kaldıraçlı ürünlerden kaçınmaları ve yatırım

[*] Prof, Dr. Kırşehir Ahi Evran Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Kırşehir, Türkiye, email: agokbel@gmail.com, ORCID Number: 0000-0001-8259-8808
[**] Dr. Öğr. Üyesi, Aksaray Üniversitesi, Ortaköy Meslek Yüksek Okulu, Finans - Bankacılık ve Sigortacılık Bölümü, Aksaray, Türkiye, email: halilarslan4444@gmail.com

fizibilitelerinde daha doğru bir yaklaşım sergilemeleri gibi faktörlerin gösterdikleri başarıda dikkate alınması gerekmektedir.

Anahtar Kelimeler: Algoritmik Trading, Portföy Stratejileri, İslami Portföyler, Katılım Endeksleri

ABSTRACT

In the middle of century, while Markowitz and Fama developed modern portfolio strategies based solely on mathematical concept; it was criticized that modern theory was focused on ideal case rather than real case. Despite the low return, there are investors who invest in higher risk instruments due to their dependence on risk. Though behavioral finance emerged as a reaction to modern portfolio theory in this period, it is a matter of criticism that it defines investors as fully prone to irrationality. The development of technology, the increase in investment options, the fact that time is a vital resource and artificial intelligence technologies emphasize digital banking and algorithmic portfolio strategies. The Islamic algorithmic model portfolio, of which we have defined criteria, was published and indexed as KATMP code by Borsa İstanbul in July 2014 rather than being a theory. It is seen that the Islamic algorithmic model portfolio has overperformed both BIST100 index and other participation indices as yield performance in the last 4 years average. The model also has outperformed the so-called indexes in the Sharpe ratio. The Islamic algorithmic model portfolio is a serious candidate for the establishment of the Exchange Traded Fund with a structure that provides a better return and risk balance for passively managed general indices for portfolio managers. In addition, factors such as conservative management strategies, avoidance of complex and leveraged products and a more accurate approach in investment feasibility of KATMP companies should be taken into consideration in the success by the other companies.

Keywords: Algorithmic Trading, Portfolio Strategies, Islamic Portfolios, Participation Indexes

1. INTRODUCTION

With the development of finance and capital markets and the accumulation of capital, consumers began to have savings. This has led to the development of portfolio management modeling and investment strategies. Many investors have made significant efforts to develop the right investment strategy among the rising investment options. Only an investment strategy was not enough; the general principles of the portfolio to be created had to be determined.

Return and risk were considered to be the two most vital variables in the formation of portfolios. (Karan, 2001, p. 131). The creation of an optimal portfolio has always been considered a controversial issue because it contains inherently risk and uncertainty, and there

is no mathematical general rule. The lack of a general portfolio model in this area embodies a paradox in itself. Because a non-dynamic model can easily be copied by other investors. In addition, the fact that there is a human factor in the construction of prices eliminates the mathematical infrastructure of the model.

Though human factor and uncertainty variables result in the absence of a general mathematical model for the optimal portfolio, some basic factors are always valid. It is seen that investment instruments with a certain risk level generally yield higher returns. In the last 10 years, the return of Borsa İstanbul is above the deposit interest rate. Only intuitive approaches are not sufficient for model selection. There is also a need for some basic and mathematical approaches. This situation has led to the development of algorithmic and robotic portfolio management techniques for financial markets which have gained weight in economies in the recent period. Algorithmic models do not make mistakes that may arise from people's emotional prejudices.

Traditional models first came to the fore in the construction of the optimum portfolio; in the middle of the 20th century, normative models based on rational mind were developed with Markowitz and Fama. Afterwards, a new era has started for model portfolios with the advances in software and computer technology and artificial intelligence Genetic Algorithms. However, both models have been criticized because of the fact that they have only taken into account the rational mind that people have defined and have no place in the natural flow of life in every case. This has brought behavioral finance to the forefront for the optimal portfolios. Though behavioral finance has reached the right points on certain issues, it has failed to claim that the investor is acting in a completely irrational manner. Some algorithmic and robotic portfolios, while considering the behavioral approaches of investors, can partially eliminate the mistakes that may arise from the emotional biases. Because of the fact that some algorithmic models consider investors' emotions or behavior in a rational way, they should be seen as a combination of rationality and behavioral approach.

The Islamic algorithmic portfolio, which we have established within a private sector company (BMD) according to some criteria we set, was indexed by Borsa İstanbul in July 2014 under the code of KATMP and became tradable on the stock exchange. Thus, the trial period for the Islamic algorithmic model portfolio has been completed. The model portfolio is updated every 15 days in accordance with its criteria. The Islamic model portfolio creates a robotic portfolio to investors by providing time advantage without human touch. Moreover, the 4-

year performance of this portfolio can be easily observed with the indexation of Borsa İstanbul. There is no significant accumulation in the literature regarding the algorithmic model portfolio studies. When we evaluate this situation in terms of the Islamic algorithmic portfolios, the literature is quite infertile. The study supplies a theoretical contribution to the Islamic algorithmic model portfolio literature. Furthermore, the system we have developed provides a practical product to the literature by creating an index that has been traded for 4 years at the stock market. According to the success of the model, portfolio managers can build and market an Exchange Traded Fund (ETF) based on the Islamic Algorithmic Model Portfolio. Our passively managed model portfolio has a higher performance compared to the other passive indices like BIST100. The fact that the companies selected according to the algorithmic criteria perform better than the index performance may be a point of interest by the management of other companies. In addition to these, investors can achieve higher returns by using such a model eliminating human bias.

The study compares the return of the portfolio formed by algorithmic criteria considering the rational viewpoints of investors with to the Participation Index and BIST100 index. The success of the algorithmic model portfolio, which we have established in accordance with Islamic principles, will be tested in terms of both return modeling and risk. In the first part of the study, we briefly touch on traditional and modern portfolio theories. While the studies in the literature are examined in the second part, in the third part, the methodology will be defined. In the fourth part of the article, the success of the portfolio created in the last 4 years is examined comparatively.

2. LITERATURE REWIEW

According to the Ceylan and Korkmaz (1998), the main objective of the traditional approach is to reduce the risk by enhancing the number of assets in the portfolio. In this approach, the relationship between the assets included in the portfolio is not examined. Modern portfolio theory was put forward by Markowitz in the mid-20th century. In this model, the market was seen as an investment instrument collectively and a systematic approach was proposed to minimize risk while maximizing return. (Genel, 2004, p. 5)

Markowitz (1952) rejected risk reduction of the traditional approach by rising assets in the portfolio and argued that the important thing is that whether or not the assets within the portfolio are correlated with each other. If the level of correlations between assets is high, the

rise in the amount of assets in the portfolio will not be a crucial risk mitigation mechanism. According to him, the risk arising from the internal mechanisms of the portfolio or firm-specific risk, excluding the risk arising from the general risk of the country or systematic risk, could be completely eliminated by the correct correlation.

The Markowitz model uses some assumptions to maximize return and minimize risk. For example, all investors are rational and prone to diversification. Capital markets are active and asset prices are at fair level. Another assumption is that investors expect higher returns when risk enhances. In most stock balloons, these assumptions do not run. Some investors invest in more risky assets due to their dependence on risk even though their returns are low. Although they are at the same risk level, they may choose a lower return instrument. The factors that are effective in this case may be the mood of the investor or the bias that the investor establishes with the instrument. According to the evaluations of Fabozzi et. al (2002), Markowitz's model does not explain what it is; it explains what should be or ideal.

After Markowitz's model, studies on the optimum number of assets to be included in the portfolio began to come to the fore. Elvans and Archer (1968) and Latane and Young (1969) claimed that a portfolio containing 8-15 or 8-16 stocks might have productive diversification. Wagner and LAU (1971) said that this number may be 10. While Gökçe et. al (2003) determined that the optimum number of investment instruments would be between 6-14, İskenderoğlu and Karadeniz (2011) claimed that the risk of a portfolio consisting of 6-8 stocks might be lower than BİST30.

Fama E. (1970), defined the investor as a rationally acting entity and concluded that financial assets contain all the information correctly as the inevitable output of this assumption through the Efficient Markets Hypothesis. With the theory put forward right after Markowitz, Fama gained an important position in the classification of rational modeling.

Due to the development of technology, revolution in artificial intelligence programs and time constraints despite rising investment options, algorithmic model portfolios come to the forefront. These portfolios are also programs that can create a portfolio eliminating prejudicial and emotional approaches of human beings. Holland (1992) is characterized as a pioneer with his works in this field. Genetic algorithms are used in many areas of financial markets.

According to Er, Çetin, and İpekçi Çetin (2005) genetic algorithm is defined as a random search using biological evolutionary process rules in computer simulations.

Genetic algorithms can be applied in different financial areas such as portfolio selection, risk scale determination, time series and credit rating. (Feldman and Treleaven, 1994), (Kingdon and Feldman, 1995).

The coding method, crossover, mutation probabilities and conformity function determination processes do not provide easy flexibility for different cases. There are no general rules for the solution and optimization of the problem for these variables. For someone who believes that the investment process takes place through simpler mechanisms, genetic algorithms may be too complex to produce accurate results.

Traditional, modern and genetic algorithms have a vital credibility in the literature. However, investors often do not act according to these models. In addition to financial models, investors can act with psychological tendencies, experience and intuition. According to Kant, who is accepted as an authority in moral philosophy, events can be understood and decided by purely intuitive approaches, not by experience. The corresponding model to Kant's approach in finance is behavioral finance. Expectation Theory laid the foundation for behavioral finance. According to this theory, investors may move away from rationality due to psychological tendencies, prejudices, beliefs, intuition and emotional factors. (Aydın and Ağan, 2016, p. 95) In fact, unknown and unmeasured some variables that cannot be defined even by human can be included among these variables. In addition, how and by whom rationality is defined becomes important.

The most crucial feature that distinguishes behavioral finance from other classical models is that it does not dictate any attitude about how investors should act. Instead, it examines how they actually act. (Bostancı, 2003, p. 10)

According to Sefil and Cilingiroğlu (2011), investors are managed in their investment strategies by their instinct to avoid regret. Investors' over self-confidence on their own abilities can lead to wrong decisions by passing the information through a wrong process. (Nofsinger, 2005, p. 11) Kahneman and Tversky argued that investors act according to their reference points. (Tversky and Kahneman, 1974, p. 1128) Accordingly, after showing the goods with a high price to the investor, lower priced products may be more rational to the investor. Therefore, it is recommended that the price should be opened irrationally from the upper level in the merger and acquisition. The price opened at a low level may bring unwillingness to the buyer and the questioning of the quality of the goods. Investors tend to

spread a bad start through the entire duration of the investment. For example, unhealthy pricing at the initial public offering of a company may cause a negative view of some investors throughout the company's entire life on the stock exchange. However, the company may reach a very successful point in its activities. Investors see the wrong investment as being cheated. They cannot accept to be cheated and cannot sell their assets when necessary because they do not want to experience the loss of reputations and the pain of regret caused by deceit. (Daniel and Titman, 1999, p. 29)

The absolute value of the loss on investments is greater than the absolute value of the gain. This may make many investors conservative. According to Lehrer, in the financial decision-making process, mind and intuition need to act arm-by-arm, but emotions often predominate. (Lehrer, 2011, p. 218)

According to Altay (2007), herd behavior, which is the main thesis of behavioral finance, is experienced in Borsa Istanbul both on the rise and fall. According to Branch (1977), the stock markets provide the highest return on average in January, which cannot be matched to a mathematical rationality. Gumuş et. al (2013) concluded that marital status, age, gender, income and education levels are effective in investment strategies of investors in Turkey sample. Kuden (2014) has reached similar conclusions and argues that investors make faulty investments with behavioral approaches contrary to traditional and modern theories.

According to the Aydın and Ağan (2016)'s survey study on Turkey sample, interest rates, exchange rates, tips, political stability, technical analysis, fundamental analysis and advisory recommendation are effective of 71.3%, 43.9%, 37.2%, 36.6%, 29,4%, 26.7% and 16.2% respectively at the decision making process of investments.

In general, traditional and modern approaches dictate investors such that they should act according to their own rationality. The rational mind can vary from person to person and from time to time. In addition, many analysts determining this approach do not act according to a rational model in their own life decisions. Familiarity, sensuality and simplicity are often vital factors for their decision-making process. In this sense, modern approaches are open to criticism from many ways. This critical view has given rise to behavioral finance. However, as seen in the literature, behaviorists tend to present investors in a irrational way. The excessive demand in stock exchanges on January cannot be explained only by irrational feelings. It is a very rational strategy to see the purchases starting in the new year in January

after the sales observed in the stock markets stemming from Christmas and holidays in December. Many investors invest in assets according to the interest rate and exchange rate movements rather than brokerage house reports that include basic analysis. However, when the brokerage reports are examined, it can be observed that they change target prices within the range of 50-100% after 20-30% change in interest rates and exchange rates. From this point of view, reports of financial institutions based on fundamental analysis are far from rationality.

Many investors do not prefer complex and lengthy review mechanisms in their investment decisions. Simple and understandable structures are preferable choice for investors. This causes investors to tend to make investments that they already know or can learn immediately with a simple set of information. In many case studies it has been concluded that investors act on simple, understandable and predictable variables. (Ertan, 2007, p. 44) This situation does not make investors irrational; on the contrary, they act according to rational ethics. BİM is the most demanded stock in the stock market with its simple and understandable structure for many years. BİM has also reached a very profitable model with its understandable structure. An understandable structure can be regarded as a rational approach rather than an emotional approach.

3. METHODOLOGY

3.1. Participation Indexes

In order to make transactions from Istanbul Stock Exchange according to the Islamic principles, it must first be checked whether the assets are sharia compliant. Those rules are determined by Turkey Participation Banks Association with the aid of Sharia Board of Participation Banks. Albaraka, Kuveytturk, Turkiye Finans and Vakıf Katılım are the sponsor of the Participation Index. According to the explanations on Participation Index Website, the following criteria determines whether a stock is sharia compliant. (Katılım Endeksi Temel Kuralları, 2014)

a) The companies shall not operate in areas contrary to Islamic principles. For example, alcoholic beverages, cigarettes, pork trade and so on.

b) The ratio of total loans bearing interest to market value should be less than or equal to 30%.

c) The ratio of cash and cash equivalents generating interest income to the market value of the company should be below 30%.

d) The share of incomes from other unsuitable activities in total income should be or less than 5%

It is stated that if an equity complies with the rules mentioned above, there will be no drawback in terms of sharia principles in the purchase and sale of such share. However, it should not be understood that the purchase and sale of stocks that do not comply with these rules are contrary to the sharia rules.

The purpose of building participation indices is to measure the risk and return performance of the sharia compliant equities. Consultants of the index are Turkey Participation Banks Association and Bizim Securities Inc. (BMD). Whilst indices are calculated by Borsa İstanbul A.Ş., index sponsors are Albaraka Turk Participation Bank, Kuveyttürk Participation Bank, Turkey Finans Participation Bank and Vakıf Katılım.

The main space that will be used to select the sharia compliant companies consists of the companies listed at Borsa İstanbul Yıldız Pazar and National Pazar, Real Estate Investment Trusts, Venture Capital Investment Trusts and A and B group companies.

There are 4 index periods for the Participation-50 and Participation-30 indices: January-March, April-June, July-September and October-December. With the disclosure of financial statements, the companies complying with the index are recalculated in each period according to the criteria mentioned above. Those who comply with the principles of participation are added to the list and those who do not comply are removed. Subsequently, all listed companies are ranked from larger to smaller according to the average market value within the year. While the first 30 companies constitute the Participation-30 index, the first 50 companies represents the Participation-50 index. However, the number of shares that comply with the principles of participation may be more than 50. Companies that are included in the Participation-50 and Participation-30 index are published on www.katilimendeksi.org.

The Participation-30 index has been started to be calculated on the Stock Exchange as of 06.01.2011. Participation Index, which was the previous name of the Index, has been changed to Participation-30 Index since 09.07.2014. The Participation Model Portfolio Index (Islamic

Algorithmic Model) and the Participation-50 Index have been calculated as price and return indices since 09.07.2014.

3.2. Islamic Algorithmic Portfolio (KATMP)

The "Participation Model Portfolio" or Islamic Algorithmic Portfolio is calculated as KATMP code on the stock exchange by Bizim Securities Inc. It consists of 13 companies from the Participation-50 index, which is recalculated and updated every two weeks according to various criteria.

Islamic Algorithmic Portfolio has outperformed both the BIST100 index and the participation indices in terms of performance since July 2014. All criteria were determined by us and Bizim Securities updates the model according to those criteria in every 2 weeks. We have briefly summarized these criteria below.

All equities to be selected into the Islamic Algorithmic Model (KATMP) may consist of assets in the Participation 50 space. So, the main equity universe is the Participation-50 stock index.

a) According to the Credit Rating Methodology, companies in the last 5 of the Participation-50 index are eliminated.

b) The stocks with an average transaction volume of 181 days which fall behind TL 300.000 are removed from the main space on the day the model is valued.

c) P/E, EV/EBITDA and P/B ratios are determined for the companies remaining after the first 2 criteria from Participation 50 stocks and BIST Industrial Index. All ratios are calculated based on the data of trailing year and current market values.

d) 15% discount is applied for BIST Industrial Index ratios. The average ratios of the industrial index are then compared with the remaining Participation 50 stocks after the first 3 criteria.

i) In all three ratios, if the number of companies with a multiple lower than the discounted average of the industrial index is 13, those companies construct Islamic Algorithmic Portfolio (KATMP)

ii) In all three ratios, if the number of companies with a multiple lower than the discounted average of the industrial index exceeds 13, the companies

which have higher EV/EBITDA compared to sample, removes from the sample so that the model can contain 13 stocks

iii) In all three ratios, if the number of companies with a multiple lower than the discounted average of the industrial index below 13, %15 discount applied BIST Sinai Index Average replaces with %10, %5 and %0 until the model can contain 13 stocks

iv) In cases where it cannot reach 13, the remaining stocks are ranked according to EV/EBITDA ratios and companies that cannot meet the model portfolio criteria even though EV/EBITDA ratio is the lowest are added to the model portfolio and reached 13 companies.

e) Another criterion is that at most 2 participation banks can be included to the model. If more than 2 participation banks incorporate to the model, the bank with higher P/E ratio will be subtracted from the model. In this case, in order to ensure the 13-number rule of the model, the companies with the lowest P/E ratio that cannot enter the model in the previous ranking are selected and the number 13 is reached again.

f) Substitute stocks are not determined for the Islamic Algorithmic Model portfolio. If some stocks are separated from the general index due to delisting or bankruptcy within the period, the Islamic Algorithmic Model Portfolio continues until the next accounting period with available stocks.

g) In the Islamic Algorithmic Model Portfolio, KATMP index is calculated by equal weight to all stocks. Equal weighting method continues during the whole calculation period. This calculation is made by Borsa İstanbul.

h) In order to be able to add the companies making IPO to the Islamic Algorithmic Model Portfolio, new companies must disclose their subsequent financial statements after the initial public offering.

4. DATA

Islamic Algorithmic Model was started to be published by Borsa Istanbul on 9 July 2014 as KATMP code according to our criteria. After this date, the Islamic Algorithmic Model Portfolio (KATMP) started to be published as an index through all data providers of Borsa

İstanbul (Forex, Matrix, Bloomberg). Abovementioned date will be starting point to test the performance of the model. Algorithmic model performance will be compared to Participation Index, Participation 50 Index and BİST100 index during July 2014-June 2019. All data have been taken from Borsa Istanbul. Thus, 1,254 days are determined to monitor the performance of the Islamic Algorithmic Model Portfolio. During this period, if the performance of the model portfolio is above other comparable passive portfolios, the Exchange Traded Fund (ETF) can be issued for the model portfolio. Since ETF will be created by tracking the model portfolio, portfolio managers can issue ETF on the model portfolio and sell it to their investors.

After determination of daily returns, variance is calculated from daily returns and Sharp Ratio is determined for all indices. Even if the return of the model portfolio is better than comparable indices, the risk exposed should also be considered. Portfolio managers who want to issue ETF should compare the Sharp ratio of the model portfolio with other indices.

5. THE PERFORMANCE OF THE MODEL PORTFOLIO

Periodical Return Table							
	2014/07-2014	2015	2016	2017	2018	2019-2019/06	All Times
KATMP	**6,7%**	**-3,8%**	**23,8%**	**20,3%**	**-16,9%**	**15,7%**	**44,9%**
KATLM	10,3%	-8,5%	10,9%	37,7%	-21,7%	10,9%	30,5%
KAT50	11,1%	-8,8%	10,9%	38,2%	-22,0%	11,0%	31,1%
XU100	7,9%	-16,1%	10,8%	48,3%	-22,3%	8,3%	21,1%

Daily Return Standard Deviations							
	2014/07-2014	2015	2016	2017	2018	2019-2019/06	All Times
KATMP	**0,8%**	**1,1%**	**1,2%**	**0,9%**	**1,3%**	**1,4%**	**1,1%**
KATLM	0,9%	1,2%	1,1%	0,8%	1,2%	1,2%	1,1%
KAT50	0,9%	1,2%	1,1%	0,8%	1,2%	1,2%	1,1%
XU100	1,2%	1,4%	1,3%	1,0%	1,4%	1,4%	1,3%

Sharpe Ratio							
	2014/07-2014	2015	2016	2017	2018	2019-2019/06	All Times
KATMP	**8,0**	**-3,3**	**19,8**	**23,1**	**-12,7**	**11,4**	**39,3**
KATLM	11,1	-7,3	9,7	48,2	-17,5	9,4	28,1
KAT50	12,2	-7,6	9,7	48,8	-17,9	9,4	28,8
XU100	6,5	-11,5	8,3	48,7	-16,1	6,0	16,4

The yield performance of the Islamic Algorithmic Portfolio is compared with the performance of the other passive indices like the Participation Index, the Participation 50 index and the BIST100 index. Although it is possible to compare the model with Industrial Index, this comparison will not be fair. Because 2 participation banks can be included in the model

portfolio and there is no financial institution in the industrial index. Therefore, industrial index performance is not included in the study.

From July 2014 to the end of 2014, KATMP performed below all other passive indices. In this period, whilst BİST100 was able to generate return of 7.9%, KATMP was able to provide return of 6.7%. The return for the 5-month period was still at a good level on nominal basis; it was well above the interest rates for that period.

2015 was a very negative year for equity market. In this period, BIST100 declined by 16.1% yoy while the Participation Index and Participation 50 index decreased by 8.5% and 8.8%, respectively. In a negative year, KATMP declined by 3.8%, outperforming all indices. This may indicate that KATMP has a more resistant structure than other indices during the crisis years. Companies formed according to Islamic and algorithmic criteria are generally more conservative in their structure and work with low leverage principles and are more resilient than other companies during crisis years. KATMP is also more resistant than the average of the participation index.

In 2016, the BIST100 index experienced a positive year after the negative 2015 year. Even though a coup attempt took place in July 2016, the indices closed the year with positive returns. While the BIST100 index closed the year with a return of 10.8%, the Participation Index and Participation 50 index yielded 10.9% and 10.9% returns, respectively. KATMP, on the other hand, outperformed interest rates and the general stock index by return of 23.8%.

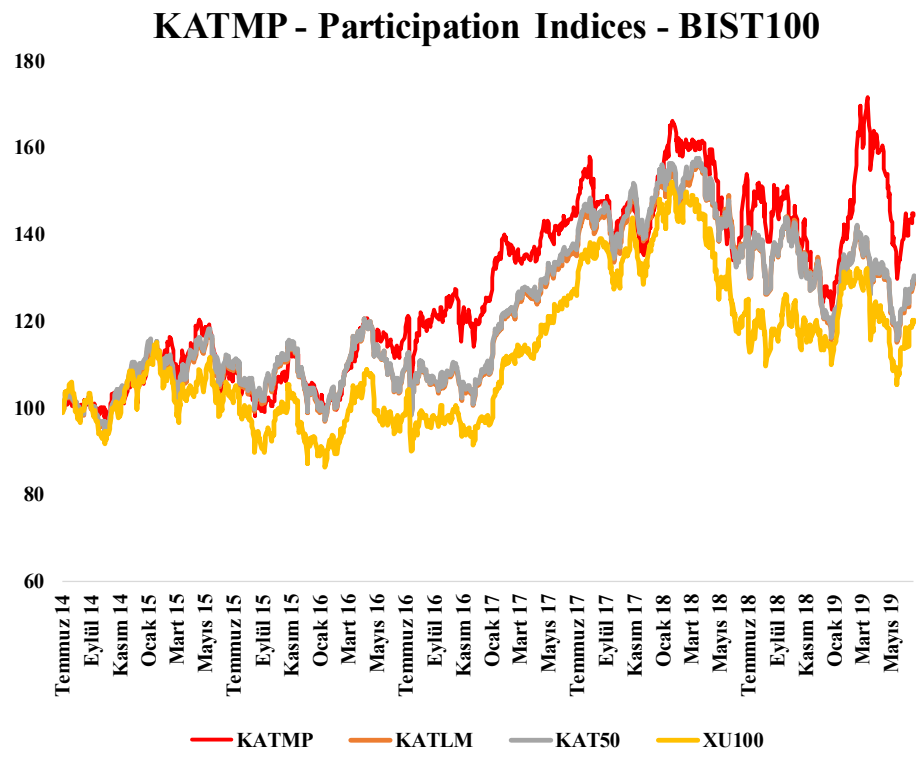
In 2017, with the support of the credit guarantee fund, significant profit increases were experienced both on the basis of companies and banks and this enhanced the risk appetite in the stock market. With the effect of flexible money market policies, the BIST100 index provided 48.3% annual return, while KATMP remained below both the BIST100 and other participation indices with 20.3%. KATMP, which exhibited a more resilient stance in the year when the market contracted by shock, achieved a more conservative return in 2017, when the indices rose rapidly with expansionary policies. However, the yield is still above the interest rates annually. This may indicate once again the resistant structure of KATMP. While keeping the return at a rational level, the risk did not exceed a certain level.

In 2018, with the August exchange rate shock, the economy went into a recession and this was reflected in the stock indices. While the BIST100 index decreased by 22.3% on an annual basis, the Participation Index and Participation 50 index declined by 21.7% and 22%,

respectively. In such a negative year, KATMP had a more conservative stance than the indices with a decline of 16.9%.

In 2019, the indices entered a positive period in the January-June period. If stock indices generally reduces in the previous year, they follow a positive trend in the following year. However, the positive trend in 2019 is more moderate compared to the unbalanced growth in 2017. In the modest return period, KATMP surpassed all indices in terms of performance with a periodic return of 15.7%. While KATMP performs better than indices in negative years, it surpasses the indices in the modest return period in terms of performance. In the period when risk appetite is opened unevenly, the return of the Islamic algorithmic model portfolio is below the other indices and above the interest rate. Even if the return pattern is considered, it can be said that KATMP is composed of low risk companies with modest returns potential.

Looking at the yields of all periods, BİST100, Participation Index and Participation 50 index generated the return of 21.1%, 30.5% and 31.1%, respectively, while the total return of KATMP was 44.9% in the same period. This means that since the date of its publication, the KATMP has significantly outperformed the BIST100 and participation indices.



Although return alone is a measure, risk should be compared with return. Looking at the Sharp ratio of all indices covering all periods, it is seen that the Islamic Algorithmic Model Portfolio performs quite well. The Sharpe ratio of the general index remains at 16.4x, while the ratio of KATMP is 39.3x. This can be interpreted as not only the return but also the risk is taken into consideration when creating the model and criteria that can provide the highest return at the same risk level.

6. CONCLUSIONS

With the development of the capital concept and the savings of consumers, investment strategies have started to gain importance. The rise in investment options has led investors to develop the right investment strategies and rules.

At the first stage traditional portfolio models were developed and it was stated that as much as possible stocks should be in the model portfolios for higher return. Afterwards, modern portfolio strategies started to develop, and it was stated that it was not enough to increase the number of shares for the optimum portfolio; the correlation between assets is also vital. The most crucial criticism of modern portfolio management strategies is that it tries to what should be rather than what it is. Behavioral finance has emerged as a reaction to modern portfolio management strategies which have the main assumption that human being should make the investments according to mathematical models and consider rationality as the most important criterion.

Some investors may establish an irrational bond with their assets. Though their return level is lower, they can invest in more risky assets due to their dependence on risk. While risk appetite is relatively higher in the spring season, stock markets may follow a negative trend on average on Mondays. A person's mental state can affect risk appetite and pricing considerably. Behavioral finance tried to model the investment strategy with all the features of human being rather than a dictating more reasonable approach. The most critical part of behavioral approach is that it tries to put investors into an irrational pattern. However, investors may actually behave rationally in many areas where they behave intuitively.

Technological revolution, rising investment options more than ever, and time restriction for investors have caused algorithmic models to come to the fore in investment strategies. With the development of artificial intelligence technology, algorithmic models will become more prominent in investment strategies. Algorithmic models do not consist solely of mathematical

variables. Investors' behavioral characteristics can also be partially integrated into the models. After the articulation of these variables, the mathematical approach and the behavioral approach can be presented as a combined investment strategy. There will be no human biases in the algorithmic model.

While there is no important study in the literature on algorithmic models, the studies in the Islamic literature are much more limited. In 2014, we created a model in which we set basic criteria for stocks chosen according to Islamic principles. Borsa İstanbul indexed the model and started to publish the performance of the model instantly. With nearly 4 years of data, the performance of the Islamic Algorithmic Model has been visible to all researchers and investors. Looking at the performance of the model indexed by the KATMP code, it is seen that the performance over the last 4 years has been better than both the participation indices and BİST100. Better return performance than other indices means that KATMP is an important candidate for ETF on behalf of portfolio managers and investors. When portfolio managers establish a fund that tracks KATMP, this passive portfolio can beat the other passive portfolio like BİST100 in terms of performance.

Another important result when we look at the dynamic of the return is that when the general market generates negative return, KATMP shows a more conservative and resistant stance. The same situation is observed in periods when risk appetite rises above the usual level and KATMP produces a much more balanced return. This can be explained by the fact that companies in the model portfolio have a more conservative structure, avoid high leverage and complex products, and make more rational investments. thanks to the Islamic principles, In this sense, the criteria determined by KATMP and the examination of the financial, human resource, investment management, communication and management capabilities of the companies determined according to these criteria may have crucial results for the other companies. The fact that the sharp ratio of KATMP is better than the other indices in the average during all periods indicates that the companies in the model have a low standard deviation and establish a more sustainable structure.

The biggest limitation of the study is to test the performance of the Islamic Algorithmic Model Portfolio with 4-year data. With the rise in the number of data in the coming years, it will be possible to get most accurate results.

REFERENCES

Altay, E. (2007). İMKB' de Piyasa Yonunde Suru Psikolojisinin İncelenmesi. 11. Ulusal Finans Sempozyumu. Zonguldak.

Aydın, Ü., & Ağan, B. (2016). (Üzeyir Aydın, Büşra Ağan, Rasyonel Olmayan Kararların Finansal Yatırım Tercihleri Üzerindeki Etkisi: Davranışsal Finans Çerçevesinde Bir Uygulama. Ekonomik ve Sosyal Araştırmalar Dergisi, 95-112.

Bostancı, F. (2003). Davranışçı Finans. Sermaye Piyasası Kurulu Denetleme Dairesi Yeterlilik Etudu, Yayım No:57,, 1- 19.

Branch, B. (1977). A Tax Loss Trading Rule. Journal of Business, 1198-1207.

Ceylan, A., & Korkmaz, T. (1998). Borsada Uygulamalı Portföy Yönetimi. Bursa: Ekin Yayınevi.

Daniel, K., & Titman, S. (1999). Market Efficiency in an Irrational World. Financial Analysts Journal, 28-40.

Elvans, J., & Archer, S. (1968). Diversification And The Reduction Of Dispersion: An Empirical Analysis. Journal of Finance, 761-767.

Er, H., Çetin, M., & İpekçi Çetin, E. (2005). Finansta Evrimsel Algoritmik Yaklaşımlar: Genetik Algoritma Uygulamaları. Akdeniz İ.İ.B.F. Dergisi, 73-94.

Ertan, Y. (2007). Davranışsal Finans ve Pişmanlık Teorisi'nin Döviz Kuru Riskinden Korunma Kararına Etkisi. Bursa: Yayımlanmış Yuksek Lisans Tezi.

Fabozzi, F., Gupta, F., & Markowitz, H. (2002). The Legacy of Modern Portfolio Theory. The Journal of Investing, 7-22.

Fama, E. (1970). Efficient Capital Markets: A Rewiew of Theory and Emprical Work. Journal of Finance, Vol. 25, No:2.

Feldman, K., & Treleaven, P. (1994). Intelligent Systems in Finance. Applied Mathematical Finance, 195-207.

Genel, H. (2004). Genetik Algoritmalarla Portföy Optimizasyonu, Yüksek Lisans Tezi. Ankara: T.C. ANKARA ÜNİVERSİTESİ SOSYAL BİLİMLER ENSTİTÜSÜ İŞLETME ANABİLİM DALI.

Gökçe, G., & Cura, T. (2003). İMKB Hisse Senedi Piyasalarında İyi Çeşitlendirilmiş Portföy Büyüklüğünün Araştırılması. Yönetim Dergisi, 63-81.

Gumuş, F., Koc, M., & Agalarova, M. (2013). Bireysel Yatırımcıların Yatırım Kararları Uzerinde Etkili Olan Demografik ve Psikolojik Faktorlerin Tespiti Uzerine Bir Calışma: Turkiye ve Azerbaycan Uygulaması. Kafkas Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 71-93.

Holland, J. (1992). Genetic Algorithms. Scientific American, 44-54.

İskenderoğlu, Ö., & Karadeniz, E. (2011). Optimum Portföyün Seçimi; İMKB 30 Üzerine Bir Uygulama. C.Ü. İktisadi ve İdari Bilimler Dergisi, Cilt 12, Sayı 2, .

Karan, M. (2001). Yatırım Analizi ve Portföy Yönetimi. Ankara: Gazi Kitabevi.

Kingdon, J., & Feldman, K. (1995). Genetic Algorithms and Aplications to Finance. Applied Mathematical Finance, 89-116.

Kuden, M. (2014). Davranışsal Finans Açısından Bireysel Yatırım Tercihlerinin Değerlendirilmesi. . İzmir: Gediz Universitesi Sosyal Bilimler Enstitusu Yayımlanmış Yuksek Lisans Tezi.

Latane, H., & Young, W. (1969). Test of Portfolio Building Rules. The Journal of Finance, 595-612.

Lehrer, J. (2011). Karar anı: Beynimiz karar vermemizi nasıl sağlıyor. Boğazici Universitesi Yayınevi, Populer Bilim Dizisi.

Markowitz, H. (1952). Portfolio Selection. Journal of Finance, 77-91.

Nofsinger, J. (2005). The Psychology of Investing,. Second Edition. Pearson Education, Inc.

Sefil, S., & Cilingiroğlu, H. (2011). Davranışsal Finansın Temelleri: Karar Vermenin Bilişsel ve Duygusal Eğilimleri. İstanbul Ticaret Üniversitesi Sosyal Bilimler Dergisi, 252-262.

Tversky, A., & Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases. Science, New Series, 1124-1131.

Wagner, W., & LAU, S. (1971). The Effect Of Diversification On Risk. Financial Analysts Journal, 48–53.

Webkaynak. (2014). Katılım Endeksi Temel Kuralları. katılımendeksi.org: http://www.katilimendeksi.org/content/userfiles/files/kural_kitapcik_50_1.pdf