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İSLAMİ HİSSE SENEDİ PİYASALARINDA TAKVİM ANOMALİLERİNİN İNCELENMESİ: HAFTANIN GÜNÜ ETKİSİ[1]

AN INVESTIGATION OF CALENDAR ANOMALIES IN ISLAMIC STOCK MARKETS: THE DAY-OF-THE-WEEK EFFECT[2]

Hilmi Tunahan AKKUŞ*

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Öz

Bu çalışmanın amacı, Morgan Stanley Capital International (MSCI) İslami endekslerinden küresel sermaye endeksini temsil eden All Country World Index (ACWI)'te takvim anomalilerinden haftanın günü etkisinin araştırılmasıdır. Bu amaçla MSCI İslami ACWI endeksi, koşullu değişen varyans modellerinden Nelson (1991) tarafından geliştirilen EGARCH yöntemi ile analiz edilmiştir. Araştırma sonucunda MSCI İslami ACWI endeksinde haftanın günleri etkisinden sadece Pazartesi günü etkisinin varlığına ilişkin kanıtlara ulaşılmıştır. Bu sonuç aynı zamanda söz konusu İslami endekste Müslümanlar için diğer günlere göre İslami açıdan daha önemli sayılan Cuma günü etkisinin bulunmadığını da göstermektedir. Böylece bu piyasanın Etkin Piyasalar Hipotezi (EPH) kuramından saptığı, uygun yatırım zamanlamasıyla bu piyasada normal üstü bir getiri elde etmenin mümkün olduğu düşünülebilir.
Anahtar Kelimeler: Etkin Piyasa Hipotezi, Davranışsal Finans, Haftanın Günü Etkisi, EGARCH Modeli.
Jel Kodları: G12, G14, G15.

Abstract

The aim of this study is to investigate the day-of-the-week effect of calendar anomalies on the All Country World Index (ACWI), which represents the global capital index from Morgan Stanley Capital International (MSCI) Islamic indices. For this purpose, MSCI Islamic ACWI index was analyzed by EGARCH method developed by Nelson (1991), one of the conditional heteroscedasticity models. As a result of the study, the day-of-the-week effect in the MSCI Islamic ACWI index was found only on Monday. This result also shows that there is no effect of Friday, which is considered to be more important for Muslims. Thus, it can be considered that this market deviates from the theory of Efficient Markets Hypothesis (EMH), and it is possible to obtain an extraordinary return in this market with appropriate investment timing.

Keywords: Efficient Market Hypothesis, Behavioral Finance, Day-of-the-Week Effect, EGARCH Model.
Jel Codes: G12, G14, G15.

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* Assoc. Prof., Balıkesir University, Savaştepe Vocational School, Department of Wholesale and Retail, *Balıkesir-Turkey*. tunaakkus@balikesir.edu.tr, ORCID: 0000-0002-8407-1580.

1. Introduction

It is important for investors to be able to predict asset prices in financial markets. In this context, the first study to estimate the future prices of an asset by using past prices was carried out by Bachelier (1900), but the term "random walk" was not included in this study (Karan, 2013: 280). However, Efficient Markets Hypothesis (EMH), argued by Fama (1965), is accepted as the most basic theory regarding the pricing process of securities traded in financial markets (Çil Yavuz, 2015: 467). Fama (1965) stated that prices follow a random walk process in an efficient market, thus no predictions can be made about the future of securities prices based on past prices and no one can obtain an extraordinary return (Fama, 1965: 55). EPH states that an uninformed investor and a very informed investor are the same in relation to a stock (Bildik, 2000: 1). In this case, only surprise news has an impact on asset prices (Weber and Nickol, 2016: 66). However, many studies conducted in the context of behavioral finance in recent years provide evidence of deviations from EPH.

Deviations from the EPH theory, which is referred to as market anomalies, are the recurrence of certain events without a rational reason (Gürsoy, 2014: 866). Anomalies that may occur in different ways are classified as periodic (time-dependent) and non-periodic anomalies in the studies of Bildik (2000) and Arı and Yüksel (2017), while Karan (2013) classifies them as market efficiency anomalies in weak form, market efficiency anomalies in semi-strong form and market efficiency anomalies in strong form (Karan, 2013: 288-308). In addition, it is stated in the financial literature on capital markets that anomalies can be classified as calendar, technical and basic (Akhter, Sandhu and Butt, 2015: 1).

Calendar anomalies constitute an important part of the anomalies in financial markets. Calendar anomalies are basically seasonal or repetitive patterns in stock returns that can be used to generate abnormal profits through market timing and investment strategies (Avcı, 2016: 7). Calendar anomalies mean abnormal behavior of stock exchanges for a certain period of time (Akhter et al. 2015: 1). By examining calendar anomalies, it is aimed to detect abnormally high or low returns at certain times of the year (Kafou and Chakir, 2015: 28). The most important calendar anomalies; the day-of-the-week effect with usually higher returns on Friday and lower returns on Monday, "the month or January effect" when January returns are relatively higher than the other months, and "the holiday effect" when returns are higher on days before festivals or holidays (Abdullah et al. 2011: 29). In addition, these calendar anomalies can occur not only according to the Gregorian calendar, but also according to calendars such as the Hijri calendar and the Hebrew calendar used by different societies (Akhter et al. 2015: 1; Shah, Qureshi and Aslam, 2017: 57).

Anomalies have attracted attention since the day they were introduced because of the significant effects of investors and portfolio managers on their investment decisions and the development of strategies accordingly (Arı and Yüksel, 2017: 78). The investigation of the day-of-the-week effect anomaly is of interest to market investors and traders. The increase and decreases in returns and the successful estimation of implicit risks throughout the days of the week can lead to the formation of profitable trading strategies (Abdullah et al. 2011: 29-30). The presence of calendar anomalies such as the day-of-the-week effect and the month effect may provide an optimal timing opportunity for traders based on daily and monthly price fluctuations (Ariss, Rezvanian and Mehdian, 2011: 293).

A universal explanation of all "inefficiencies" in stock exchanges could be that they have considerable costs of learning, and that individuals need time to fully acquire all relevant information. This may explain why some reporting effects have disappeared after being publicly reported. Another explanation is the presence of noise traders who react to noise rather than information (Weber and Nickol, 2016: 74).

Many hypotheses have tried to explain day-of-the-week anomalies in returns, particularly the effect of Monday. A significant explanation of this impact is that information published during the weekend tends to be negative. When bad news is announced, companies fearing panic sales can be postponed until the weekends, allowing more time for information to be digested. Another explanation about the effect of Monday is the payment effect (Kafou and Chakir, 2015: 30). In addition to these reasons, the effects of Monday may be the result of the bad situation of investors referred to as Blue Monday Hypothesis (Weber and Nickol, 2016: 68). Karcıoğlu and Özer (2017) stated that due to the settlement time of t + 2 days in BIST, those who buy stocks on Thursday and Friday may make their payments for these purchases at the beginning of the following week, they may have short-term returns during the weekend and therefore stock prices may be positively affected on Thursday and Friday (Karcıoğlu and Özer, 2017: 478).

Calendar anomalies are one of the characteristics against EPH in financial markets (Iqbal, Kouser and Azeem, 2013: 999). It can be said that the market is ineffective in the presence of any anomaly that is utilized by investors and will provide abnormal profit (Lean and Tan, 2010: 3). The existence of anomalies in the stock market contradicts the predictions of EPH in at least weak form, as predictable movements in asset prices offer investors opportunities to generate abnormal returns (Aly, Mehdian and Perry, 2004: 302). Since investors can predict the

direction of change in share prices in case of calendar anomalies, calendar anomalies are against EPH (Ali, Akhter and Ashraf, 2017: 2).

The aim of this study is to investigate the day-of-the-week effect, one of the calendar anomalies, in Islamic stock indices. In this context, the Islamic ACWI index published by MSCI will be analyzed by EGARCH method. The study will also investigate the effect of Friday, which is considered to be an important day for Muslims. As can be seen in the literature review section of the study, there is no calendar anomaly study on the MSCI Islamic ACWI index. This index is a comprehensive global index consisting of 23 developed and 24 developing countries. Additionally, since the study on Islamic indices on this subject is very limited, this study will contribute to the literature. The EGARCH method used in the study is an asymmetric heteroscedasticity model that takes into account the asymmetric effects of positive and negative returns on conditional volatility. The presence of the day-of-the-week means that this market deviates from the EMH, therefore it is possible to obtain an abnormal return in this market with appropriate investment timing strategy. Accordingly, investors will be able to organize their portfolios.

After the introduction, literature review will be presented in the second part of the study. In the third part, explanations about the method of the study and in the fourth part, the study data will be explained. The empirical findings will be given in the fifth part of the study. Finally, the general conclusions of the study will be included in the sixth part and the study will be completed.

2. Literature Review

There are many studies on anomalies in securities prices. However, since this study was carried out on calendar anomalies, other price anomalies except from calendar anomalies were not included. The studies of Cross (1973) and French (1980) were the leading studies on calendar anomalies. In the study conducted by Cross (1973), non-random movements in stock prices, particularly the distribution of price changes between Friday and Monday and the relationship between price changes in these two days were examined. The study found that the S&P Composite index yielded higher returns on Friday compared to other days. French (1980) examined the process of generating stock returns with two alternative models, calendar day and trading day. The results showed that the average return for Monday was significantly negative in each of the five-year sub-periods and in the whole period.

There are also significant studies on the calendar anomaly related to Islamic markets. Furthermore, apart from the calendar anomalies such as the day-of-the-week effect, January effect, and holiday effect mentioned in the first section, different calendarical anomalies such as the effect of Ramadan, the effect of Zilhicce (the month of pilgrimage), the effect of Muharram, and ashura day effect also exist in Islamic markets (Ali et al. 2017). Since the day-of-the-week effect is investigated in this study, other calendar anomalies are relatively ignored. The mentioned studies in the literature are as follows.

Abidin and Mahmood (2007) investigated the presence of the day-of-the-week anomalies in the Kuala Lumpur Composite Index, representing the Malaysia Stock Exchange, by the Ordinary Least Squares (OLS) method. As a result of the research, significantly negative Monday effect and significantly positive Tuesday effect were determined for both sample and sub-periods.

Al-Barrak (2009) examined the existence of the day-of-the-week effect in the markets of Saudi Arabia, Kuwait and Dubai, which are some of the Gulf Cooperation Counsil (GCC) markets, and concluded that the day-of-the-week effect existed only in Kuwait stock returns. Accordingly, the highest returns in Kuwait stock were recorded on Saturday and the lowest on Sunday.

In their study, Wenhui, Yusof and Sieng (2009) investigated the day-of-the-week and the months-of-the-year effects for FTSE Bursa Malaysia Hijrah Shariah Index. The study showed that positive Friday and January effects were determined for the index according to EGARCH(1,1) method. It was stated in the study that he Friday effect was due to the fact that Muslims were in a cheerful mood on Friday.

Lean and Tan (2010) conducted a study on the day-of-the-week effect on ten indices including Bursa Malaysia Emas Shariah and Bursa Malaysia Hijrah Shariah indices. As a result of the OLS and GARCH type methods used in the study, it was observed that day-of-the-week effect was only available for FTSE Bursa Malaysia MESDAQ Index, therefore no day-of-the-week effect was observed for other Islamic indices.

In their study, Abdullah et al. (2011) investigated the day-of-the-week effect on three Islamic indices (Kuala Lumpur Shariah Index (KLSI), FBM Emas Shariah and FBM Hijrah Emas Shariah) in Malaysia. As a result of the study, evidence regarding the day-of-the-week effect was only found for Monday as negative and Friday as positive for KLSI, but no day-of-the-week effect was reached for other indices. According to this result, it was seen that the market was not fully efficient.

Ariss et al. (2011) examined calendar anomalies in seven stock indexes (Abu Dhabi, Bahrain, Kuwait, Muscat, Qatar, Saudi Arabia, Dubai) belonging to six GCC countries. As the result of the study, since the last trading day of the week is Wednesday, the "Wednesday effect" which is similar to the Friday effect was determined. However, this effect was more commonly observed in months other than Ramadan. Moreover, contrary to the reported January effect in western countries, a statistically significant and positive December effect was also detected. According to the results, it was determined that calendar anomalies prevailed in GCC stock exchanges similar to international markets.

Gharaibeh and Azmi (2015) investigated the day-of-the-week effect in the Kuwait Stock Exchange (KSE) index both as sub-sample periods and as the whole sample period. As a result of the research, the existence of the day of the week effect was determined for different days in the KSE index in 2003, 2005, 2008 and 2011. However, statistically significant evidence for the day of the week effect could not be obtained for the whole sample period.

Kafou and Chakir (2015) investigated the day-of-the-week effect in the Dow Jones Islamic Market (DJIM) index for the period 25.05.1999-28.11.2013. The study period was divided into four sub-groups, two of which were crisis periods (Dot.com and subprime crises). As a result of the study, no effect of day of week on DJIM index was found according to mean comparison tests. On the other hand, while no evidence for the day-of-the-week effect was found according to the results of GARCH(1,1) model conducted with raw data, the Wednesday effect during the Dot.com crisis, and the Thursday effect for the general period were determined according to the results of GARCH(1,1) model performed with market-adjusted data.

In his study, Avcı (2016) investigated Islamic and conventional indices of five countries. The study was divided into a general period of 2003-2014 and three sub-periods (2003-2007; 2008-2009; 2010-2014) to reveal the effects of the crisis periods. As a result of the study, the day-of-the-week effect was not observed except for the Canadian conventional index for the 2008-2009 crisis period, but no generalizable result was obtained for the whole sampling period (2003-2014).

Weber and Nickol (2016) conducted a comprehensive study examining the calendar effects on 24 countries, more than 50% of the population of which were Muslim or officially accepted Islam. In this study, the day-of-the-week effect and the effect of Gregorian and Hijri months for the 24 countries were investigated. According to the results of the study, it was shown that there was some evidence for calendar effects in almost every market and the results could change when different estimation techniques were used.

Ali et al. (2017) investigated the effect of the Islamic holy days on the stock returns in Asian financial markets including Pakistan, Bahrain, Saudi Arabia and Turkey. They also included Gregorian calendar anomalies as a control variable. As a result of the study, it was found out that only Eid-ul-Fitr (sacrifice feast) had an important positive effect on the stock returns of Asian markets. It was also determined that Friday was the only Gregorian calendar anomaly that existed in Asian markets.

In their study, Majid et al. (2018) investigated return differences between Jakarta Islamic Index and LQ-45 conventional index in Indonesia as well as calendar anomalies such as the weekend effect, January effect and Ramadan effect. As a result of the study, no weekend or Ramadan effect was found but there was the month effect in both indices for 01.12.2009-30.01.2016 period. Accordingly, it was observed that abnormal returns could be obtained in March, April, October in the Islamic index and in March, April, October and December in the conventional index.

Öztürk et al. (2018) examined the day-of-the-week effect, the January effect, and the Ramadan effect in terms of the existence of anomalies for BIST-100 and Participation-30 Islamic index in Turkey. No such calendar anomalies were found in the mentioned indices. Therefore, the Turkish Islamic stock market was found to be efficient.

Yardımcı and Erdem (2020) investigated the day-of-the-week effect for 19 stock markets with predominantly Muslim population. They provide evidence of the day-of-the-week effect in most of the stock markets analyzed as a result of the research.

Güneş (2021) examined the day-of-the-week and the January effects for BIST-100 and Participation-30 (Kat-30) Islamic index in Turkey. Results regarding the return index: There is no day-of-the-week effect on the BIST-100 index return, but Monday and Wednesday have a negative effect on the Kat-30 index. It has been determined that January has a negative effect on both index returns. Results on volatility: It has been determined that Monday and Wednesday have a negative effect in the BIST-100 index, and that Monday has a negative effect on the Kat-30 index. It has been determined that January has no effect on both indices volatility.

Aslam et al. (2022) investigated the existence of calendar anomalies (day-of-the-week, Gregorian and Islamic month-of-the-year effects) for eight Islamic frontier markets. According to the findings of the study, little evidence of the existence of calendar anomalies was obtained. According to these findings, the authors concluded that the relevant markets are weak-form efficient.

The summary of the literature review section within the scope of the day-of-the-week effect is shown in Table 1 below.

Table 1: Summary of the Literature Review

Reference	Sample (Variable)	Period	Econometric Method	Findings
Cross (1973)	S&P Composite Index	02.01.1953-21.12.1970	1. Mann-Whitney U test	A positive Friday effect
French (1980)	S&P Composite Portfolio	1953-1977	1. OLS method	A negative Monday effect
Abidin and Mahmood (2007)	Bursa Malaysia Kuala Lumpur Composite Index	04.01.1999-29.12.2006	1. DF unit root test 2. OLS method	Negative Monday and positive Tuesday effects
Al-Barrak (2009)	3 GCC countries (Saudi Arabia, Kuwait and Dubai)	01.2002-12.2005	1. One-way ANOVA test	The day-of-the-week effect for Kuwait
Wenhui et al. (2009)	FTSE Bursa Malaysia Hijrah Shariah Index	01.07.1999-14.08.2007	1. ADF and PP unit root tests 2. OLS method 3. EGARCH model	Positive Friday and January effects
Lean and Tan (2010)	10 FTSE Bursa Malaysia indices	2006-2008	1. ADF and PP unit root tests 2. OLS method 3. GARCH, EGARCH and TARCH modals	No the day-of-the-week effect in Islamic indices
Abdullah et al. (2011)	Malaysia Islamic indices (KLSI, Emas Shariah, Hijrah Shariah)	21.05.2007-19.09.2008	1. DF unit root test 2. OLS methods	Negative Monday and Positive Friday effects for KLSI. No day effects for the other two Islamic indices.
Ariss et al. (2011)	6 GCC countries stock indices	1994-06.2008	1. ADF unit root test 2. OLS method	Apart from Ramadan month effect, Wednesday effect and significantly positive December effect.
Gharaibeh and Azmi (2015)	KSE index	01.01.2002-30.09.2011	1. OLS method	The day-of-week effect for different days of the week in sub-sample periods
Kafou and Chakir (2015)	DJIM index	25.05.1999-28.11.2013	1. Comparison of mean tests (T-test and Wilcoxon signed-rank test) 2. The generalized method of moments (GMM) 3. GARCH variance specification 4. ADF and PP unit root tests	The day-of-the-week effect

Avcı (2016)	Conventional and Islamic indices for USA, UK, Canada, Japan and Indonesia	2003-2014	1. OLS method	No the day-of-the-week effect on Islamic indices for the crisis period. The day-of-the-week effect on different days for each country index in other periods.
Weber and Nickol (2016)	24 Muslim countries	It differs according to markets	1. OLS method 2. GARCH, EGARCH, NGARCH, APARCH and TGARCH modals	Evidence regarding calendar anomalies in almost every market.
Ali et al. (2017)	Pakistan, Turkey, Saudi Arabia and Bahrain stock indices	01.01.2001-31.12.2014	1. Panel regression method	A positive Eid-ul-Fitr (sacrifice feast) effect and the day-of-the-week effect on Friday
Majid et al. (2018)	Indonesia (Jakarta Islamic index and LQ-45 conventional index)	01.12.2009-30.01.2016	1. T test and Levene test 2. Multiple regression model	The month effects for both indices, no Ramadan and the weekend effects.
Öztürk et al. (2018)	Turkey (BIST-100 and Participation-30 indices)	07.01.2011-08.08.2017	1. ADF unit root test 2. OLS method 3. GARCH model	No the day-of-the-week, January, and Ramadan effects for both indices
Yardımcı and Erdem (2020)	19 countries with a predominantly Muslim population	01.01.2005-01.01.2015	1. GARCH model	The day-of-the-week effects in the majority
Güneş (2021)	Turkey (BIST-100 and Kat-30 indices)	07.01.2011-24.07.2020	1. ADF, PP, KPSS unit root tests 2. EGARCH model	The day-of-the-week and January effects
Aslam et al. (2022)	8 Islamic frontier markets (Bangladesh, Bosnia, Jordan, Kuwait, Morocco, Oman, Pakistan and Palestine)	01.2006-09.2019	1. ADF, PP and KPSS unit root tests	Little evidence of the existence of calendar anomalies

As seen in the literature, calendar anomalies are observed in all studies except Lean and Tan (2010) and Öztürk et al. (2018). In addition, as seen in the study of Ariss et al. (2011), the first and last days of the week may vary in some countries and therefore the weekend holiday may change accordingly. It is important to consider the impact of this situation in analyzes and comparisons.

3. Method

The volatility clustering property in financial time series adversely affects the power of predictions made with linear time series models, which take into account the assumption that errors have constant variance. However, ARCH/GARCH type conditional variance models, which take into account the volatility clustering features in financial time series, provide robust estimations. As it is seen in the literature review section, the day-of-the-week effect is analyzed with the help of OLS and GARCH type models. However, the heteroscedasticity, which is expressed as the variance of the error term in financial time series such as stock price and interest rates, is observed and in this case, parameter estimations may become ineffective in estimating with OLS and the parameter estimations may become statistically insignificant (Çil Yavuz, 2015: 433-434). Therefore, the exponential GARCH (EGARCH) method, which is one of the conditional heteroscedasticity models, is used instead of the OLS method.

The EGARCH model developed by Nelson (1991) is a model that considers the asymmetric effects of positive and negative returns on conditional volatility (Nelson, 1991: 353). One important limitation of the GARCH models is that they force a symmetric response of volatility to positive and negative shocks. However, it is claimed that a negative (bad news) shock in financial time series increases volatility more than a positive (good news) shock of the same magnitude. This is also referred to as the "leverage effect" (Brooks, 2014: 440). The conditional variance equation in the EGARCH method, which can be formulated in various ways, can be shown as follows (Brooks, 2014: 441):

$$ln(\sigma_t^2) = \omega + \beta\, ln(\sigma_{t-1}^2) + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \alpha \left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right] \quad (1)$$

The coefficient γ in Equation 1 shows the effect of asymmetry and if this sign is negative and statistically significant, it is stated that there is leverage effect (Çil Yavuz, 2015: 463). To reveal the day-of-the-week effect, dummy variables are added to the variance equation of the variance model representing each trading day of the week. In this case, the new variance equation for the EGARCH model can be adapted as follows:

$$ln(\sigma_t^2) = \omega + \beta\, ln(\sigma_{t-1}^2) + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \alpha \left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right] + V_i D_{i,t} \quad (2)$$

The D_i variable in Equation 2 above is the dummy variable for the day i of the week; the V_i coefficient indicates the volatility change on the i day of the week. For instance, when creating a dummy variable, if D_i is Monday, 1 is given for Monday and 0 for other days. Similar dummy variables are also created for other days. The statistical significance of the V_i coefficient indicates the predictability of volatility, which shows the existence of the day-of-the-week effect on volatility. In this study, whether there is the day-of-the-week effect on the Islamic stock indices is investigated, the hypotheses of the study can be expressed as follows:

H_0: There is no difference in volatility compared to the mean on certain days of the week.

H_1: There is a difference in volatility compared to the mean on certain days of the week.

The effects of calendar anomalies may be subject to change when different models or distributions are used (Weber and Nickol, 2016: 65). The most commonly used method for selecting the appropriate model is the model with the lowest Theil coefficient. In addition, it is preferable that Akaike, Schwarz information criteria and Mean Absolute Percentage Error-MAPE value are low, and the log-likelihood value is desired to be large (Karcıoğlu and Özer, 2017: 469). Which distribution is used in the estimation is also very important. Although the most commonly used default value is Gaussian distribution, it may be advantageous to use other distributions as a normal distribution may not be able to capture the statistical characteristics of stock returns (negative skewness and fat-tailed, etc.) (Weber and Nickol, 2016: 89). Nelson (1991) suggests the generalized error distribution (GED) for the EGARCH model (Nelson, 1991: 352).

4. Data And Descriptive Statistics

As seen in the literature, Islamic indices published by S&P and Dow Jones have been analyzed in various studies. In this study, MSCI Islamic ACWI index, which is one of the Islamic indices published by MSCI and is not included in the literature, is used. This index is a global capital index which consists of 23 developed and 24 emerging markets (www.msci.com). Therefore, it can be said that the index is quite comprehensive. Daily data obtained from the MSCI website regarding the index covers the period 26.05.2014-17.05.2019. In addition, since the data used in the study were not related to any special Islamic holidays and calculated according to the Gregorian calendar, it did not require any conversion in the data according to the hijri calendar.

In this study, index values were first converted to logarithmic return series with the formula $R_t = \ln(P_t/P_{t-1})x100$. Table 2 below provides both general and daily-based descriptive statistics for the MSCI Islamic ACWI index logarithmic return series.

Table 2: Descriptive Statistics for MSCI Islamic ACWI Index Return Series

	All days	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	0.005868	-0.030040	-0.000113	0.071032	-0.004552	-0.006984
Median	0.022744	0.020116	0.021797	0.018752	0.012191	0.068815
Maximum	2.643120	1.934332	1.666047	2.358848	2.347310	2.643130
Minimum	-4.512857	-3.807787	-2.622700	-2.048298	-2.333315	-4.512857
St. Deviation	0.693026	0.708951	0.659465	0.649477	0.661389	0.778598
Skewness	-0.562683	-1.011975	-0.408231	0.127448	-0.146882	-0.930505
Kurtosis	6.180561	7.004046	3.994888	4.498774	4.523471	7.830570
Jargue-Bera	616.5478	218.0616	17.94447	25.03902	26.07866	290.3091
Probability	0.000000	0.000000	0.000127	0.000004	0.000002	0.000000
Observation	1300	260	260	260	260	260

According to Table 2, while the mean return of MSCI Islamic ACWI index is positive for all days, the mean return of other days except Wednesday is negative when evaluated on a daily basis. However, the day with the lowest standard deviation is also Wednesday. On the other hand, Friday is the day with the highest standard deviation. The skewness value of all days except Wednesday and the whole index is negative. Negative skewness values indicate that the series is left skewed. Again, the mean return of all days except Wednesday is smaller than the median, which is an indication that the series is left-skewed. The kurtosis values for all series are greater than three, which means that the distribution of the series exhibits vertical and fat-tailed characteristics. Since the probability values of the Jarque-Bera statistics are less than 0.05 for all series, the distributions of the series are not normal.

The price and logarithmic return time series graphs for the MSCI Islamic ACWI index to be used in the study are shown in Figure 1 and Figure 2, respectively.

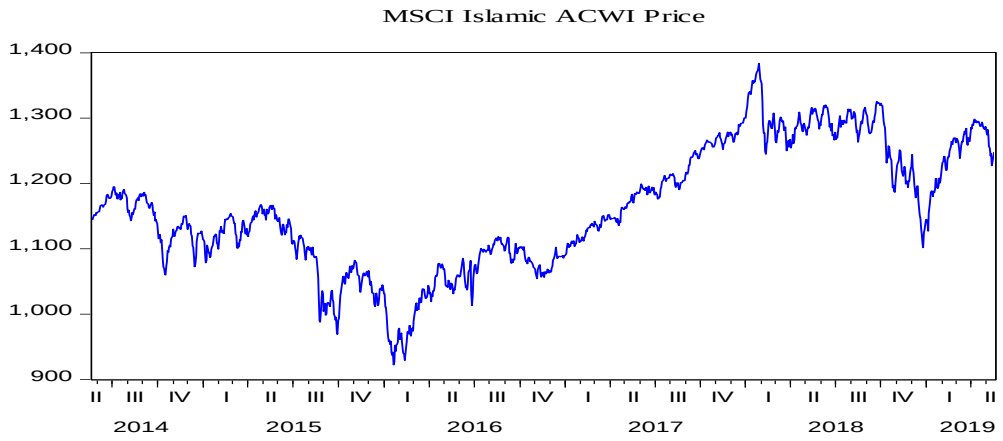

Figure 1: MSCI Islamic ACWI Index Price Graph

According to the Figure 1, the lowest prices in MSCI Islamic ACWI were realized on 20.01.2018 (approximately USD 923) and on 11.02.2016 (approximately USD 929). Furthermore, the highest price in the relevant index was realized on 26.01.2018 (approximately USD 1.384).

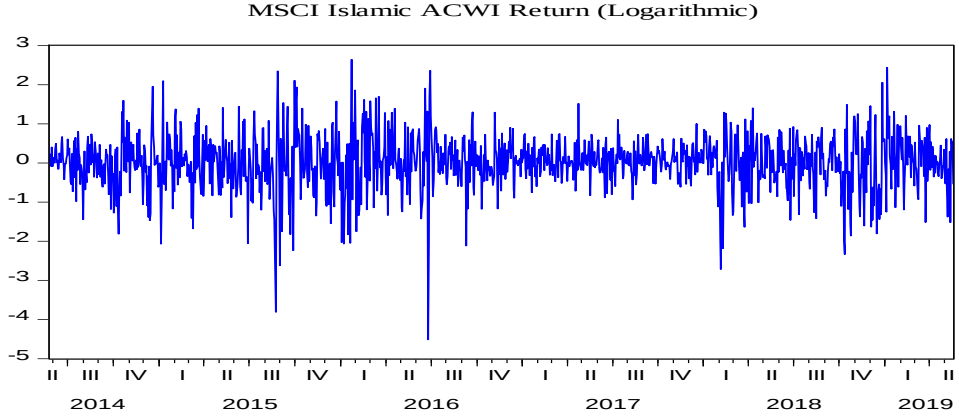

Figure 2: MSCI Islamic ACWI Index Return Graph

When the Figure 1 and Figure 2 are examined together, it is observed that there is an increase in the volatility of returns in case of a decrease in prices, or vice versa. In addition, the volatility cluster is seen in Figure 2. That is, high volatility periods are followed by high volatility periods and low volatility periods are followed by low volatility periods.

5. Empirical Findings

Before investigating the day-of-the-week effect for the MSCI Islamic ACWI index, whether the index series are stationary or not should be investigated. For this purpose, Augmented Dickey-Fuller (ADF) (1981), Phillips-Perron (PP) (1988) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) (1992) unit root tests are performed. The results of these unit root tests are reported in Table 3 below.

Table 3: ADF, PP and KPSS Unit Root Test Results

	ADF		**PP**		**KPSS**	
Variables	**Intercept**	**Trend and Intercept**	**Intercept**	**Trend and Intercept**	**Intercept**	**Trend and Intercept**
Islamic ACWI	-18.21 [3]***	-18.21 [3]***	-29.30 [11]***	-29.29 [11]***	0.08 [8]***	0.06[8]***

Note: *** indicates significance level of 1%, values in square brackets indicate delay lengths determined by Akaike information criterion for ADF test and Newey-West bandwidth for PP and KPSS tests.

After it is found that the MSCI Islamic ACWI index is stationary according to all the unit root test results applied in the study or does not contain any unit roots, it should be determined whether there is ARCH effect in MSCI Islamic ACWI index. The mean equation required to determine the ARCH effect is estimated as ARMA(2,3), in which the Akaike information criterion is the smallest. The hypotheses of the ARCH test are shown below.

H_0: There is no ARCH effect in the model.

H_1: There is an ARCH effect in the model.

ARCH-LM test results are given in Table 4.

Table 4: ARCH Effect Test Results of the Variable

	F Statistics	**Probability F**	**Observation*R-Square**	**Probability Chi-Square**
Islamic ACWI	20.59279	0.0000	20.29998	0.0000

Since the probability values in Table 4 are less than 0.05, the hypothesis asserting that there is no ARCH effect in the Islamic ACWI index series is rejected, and the alternative hypothesis indicating that the ARCH effect exists is accepted. Therefore, EGARCH(1,1) method which is one of the methods considering ARCH effect is applied in

the study and results of variance equation are shown in Table 5. Furthermore, since the Islamic ACWI series does not show a normal distribution characteristic, the estimates are made by considering the GED distribution proposed by Nelson (1991) instead of the normal (Gaussian) distribution.

Table 5: EGARCH(1,1) Model Results

Variables	Coefficient	Standard Error	t-value	t-probability
V_{monday} (D_{monday})	**-0.278533**	0.145627	-1.912649	**0.0558***
$V_{tuesday}$($D_{tuesday}$)	-0.054961	0.166694	-0.329710	0.7416
$V_{wednesday}$ ($D_{wednesday}$)	-0.132918	0.177886	-0.747211	0.4549
$V_{thursday}$ ($D_{thursday}$)	0.249857	0.170070	1.469140	0.1418
V_{friday} (D_{friday})	0.222391	0.155310	1.431914	0.1522

Note: *, %10 indicates significance level.

According to the results of Table 5, it is seen that only V_{monday} coefficient of the D_{friday} dummy variable is significant. Accordingly, the volatility of Monday in the MSCI Islamic ACWI index may be predicted. In other words, there is a Monday effect on volatility. In addition, the negative coefficient indicates that volatility decreases on Mondays. As a result of the analysis, there was no Friday effect, which is considered as a more important day for Muslims compared to other days.

The results of this study, including the presence of calendar anomalies, are consistent with all other studies except Lean and Tan (2010); Öztürk et al. (2018). Evidences for the negative Monday effect, French (1980), Abidin and Mahmood (2007), Abdullah et al. (2011), Gharaibeh and Azmi (2015), Avcı (2016), Weber and Nickol (2016), Yardımcı and Erdem (2020), Güneş (2021), Aslam et al. (2022) were also found in their studies.

Finally, as a result of the diagnostic tests performed on the EGARCH(1,1) model, no autocorrelation and heteroscedasticity problems were found. This shows the suitability of the relevant model design.

6. Conclusion

According to Efficient Market Hypothesis, which is proposed by Fama (1965) and accepted as the most basic theory about the pricing of assets in financial markets, asset prices follow a random walk process in an effective market. In such a case, it is impossible for anyone to derive an abnormal return since there can be no prediction about the future of asset prices based on historical prices. However, many studies on behavioral finance in recent years have proved the existence of various events that are expressed as anomalies that contradict these explanations about effective markets. In this study, the day-of-the-week effect in MSCI Islamic ACWI index, which is one of the global index, and consists of 23 developed and 24 developing country markets, was investigated. For this purpose, MSCI Islamic ACWI index was analyzed by EGARCH method developed by Nelson (1991), one of the conditional heteroscedasticity models.

As a result of the study, it was found that the volatility of Monday can be predicted in the ACWI index which represents the global capital index of MSCI Islamic indices. In other words, Monday effect was found in volatility. In addition, the fact that there is no effect of Friday, which is considered more important for Muslims than other days, is another important result of the study. In particular, the presence of anomalies in the MSCI Islamic ACWI index indicates that there has been no market efficiency in the index yet. Thus, those who invest in this index will be able to obtain an above-average return with appropriate investment strategies. Accordingly, investors will be able to organize their portfolios.

In the future studies, the day-of-the-week effect can be investigated for other Islamic markets such as Islamic bonds (sukuk) and Islamic investment funds as well as stock markets. In addition, other calendar anomalies may be included and the scope of future studies may be expanded.

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