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The Size Anomaly in Islamic Stock Indices: A Stochastic Dominance Approach

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Abstract: This paper examines whether small Islamic firms' returns stochastically dominate (outperform) the returns of large Islamic firms using Ascending and Descending Stochastic Dominance (ASD and DSD) approaches. In other words, we investigate the size anomaly in Islamic equity indices. We use global, European, Asian/Pacific, and US Islamic equity indices from 1996 to 2019. For risk-averse investors, we find that small-size portfolios of Islamic indices ASD outperform large-sized portfolios in Asia/Pacific and Europe, while the opposite is true in the Dow Jones and the US. For risk-seeking investors, we find that small-sized portfolios of Islamic indices DSD outperform large-sized portfolios in the Dow Jones and the US, while the opposite is true in Asia/Pacific and Europe. We conclude that a size anomaly is present, and Islamic stock indices are inefficient in the semi-strong form. The results of this study should assist those who are interested in investing in Islamic equity markets in building their investment portfolios.

Keywords: Islamic equity indices; size anomaly; stochastic dominance analysis

JEL Classification: G11; G15

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1. Introduction

During the last three decades, the Islamic finance market has experienced exceptional growth worldwide. In 2018, the value of the total assets of the global Islamic finance markets amounted to about 2.52 trillion US dollars. The projected total asset value for the global Islamic finance markets will amount to $3.47 trillion by 2024.[1] As a result, practitioners and academicians became interested in Islamic investing more than before, mainly during and after the world financial crisis of 2008.

Prior research has empirically studied the performance and behavior of Islamic stock indices to achieve a deeper understanding of Islamic equity markets. For instance, researchers examine the performance and efficiency of Islamic stocks relative to conventional stocks (Alkhazali et al. 2014, 2016; Hassan and Girard 2011; Hayat and Kraeussl 2011; Merdad et al. 2010; Albaity and Mudor 2012; Azmat et al. 2014; Charles et al. 2015; Alkhazali and Mirzaei 2017). Several studies examine the dynamic relationship between Islamic and conventional stocks (El Mehdi and Mghaieth 2017; Umar 2017; Hammoudeh et al. 2014; Majdoub and Mansour 2014), while others test the advantage of the inclusion of Islamic stocks as part of the investment portfolio to diversify risk (Maghyereh et al. 2019; Alkhazali and Zoubi 2020). Despite the progress of Islamic finance, the literature on the topic has not provided insight into the performance of Islamic stocks within each index. Most of the academic literature on Islamic finance focuses on the performance comparison between Islamic and non-Islamic stocks or Islamic versus non-Islamic banks. However, none of the previous studies attempted to investigate the performance of Islamic stocks within Islamic

indices. This paper fills this gap by studying the performance of Islamic indices based on firm size, portfolio size, and index size, which remains an unresearched topic.

Previous studies document a significant firm-size anomaly, which contradicts rational expectations in an Efficient Market Hypothesis (EMH) (See Banz 1981). According to the firm-size anomaly, smaller firms (i.e., companies with a small market capitalization) outperform larger firms. Researchers indicate that this pattern appears to be an anomaly since it cannot be explained by standard asset pricing models such as the Capital Assets Pricing Model (CAPM).

Although voluminous, previous research that examined a firm-size anomaly has focused mainly on conventional (non-Islamic) stocks. Instead, our paper examines the firm-size anomaly in Islamic stock indices.[2] More specifically, we attempt to find whether small firms outperform both medium and large firms. Therefore, we evaluate the Efficient Market Hypothesis (EMH) in Islamic stock indices by testing the size anomaly.

To understand the return predictability and market efficiency of Islamic stocks, we ask three research questions here. *First*, do small Islamic firms stochastically dominate (outperform) large Islamic firms? *Second*, does the firm-size anomaly exist in Islamic stocks? *Third*, are Islamic stocks efficient in their semi-strong form?

The above question is essential given the specifics of Islamic stock indices. For example, these indices screen many companies to meet Shariah compliance. Under Sharia (Islamic law) rules, companies can be screened for lack of track record, high debt, and low working capital. As a result, Islamic stocks differ from traditional stocks in that they are less diversified, smaller-cap-oriented, sector-focused, and less leveraged. These small-capitalized Shariah-compliant equities typically suffer from illiquidity compared to traditional equities (Sensoy et al. 2015). In addition, "true" asset-based transactions, financial derivatives such as futures and options, fixed rate government bonds, futures trading hedges, interest rate swaps, and transactions involving items not physically owned by the seller (e.g., short sales), are not allowed in this context (Alvarez-Diaz et al. 2014). These differences are expected to be reflected in the predictability of stock returns, as explained by Lo and Mackinlay (1988).

We carry out our research investigation using daily prices of the small, medium, and large Islamic stock indices from four Dow Jones Islamic indices (DJII), namely: Asia/Pacific, European, Global, and the US. We utilize the Stochastic Dominance (SD) nonparametric approach to overcome the weaknesses of parametric methods such as CAPM, MV, and GARCH, which were used in previous studies. Specifically, we investigate whether the returns of small Islamic firms stochastically dominate those of medium and large Islamic firms. We also test if medium-sized Islamic firms' returns stochastically dominate large Islamic firms' returns.

Most previous studies examining anomalies have used parametric tests (mean-variance MV, CAPM, and GARCH). These methods are based on normality assumptions, which in practice are not. In addition, MV and CAPM depend only on the first two moments of the asset return (i.e., mean and variance). However, both positive and negative skewness are present in return on investment, so MV can miss important information. The MV criterion also requires a quadratic utility function and is not suitable when the investor's utility function is non-square. Moreover, previous studies have shown that when violations of assumptions affect the results of parametric methods, the results of nonparametric methods are: B. Stochastic dominance may be more appropriate. To address the shortcomings of parametric approaches, several authors applied a nonparametric stochastic dominance (SD) approach to study calendar anomalies. The SD approach considers information about the entire distribution of stock returns, not just the first two moments (i.e., mean and variance). Moreover, the SD approach avoids many of the assumptions required by other ranking methods. The SD method should outperform other methods such as CAPM and MV by avoiding these restrictive assumptions.

We contribute to the literature in many ways. First, this is the first paper to link size anomalies to the efficient market hypothesis of Islamic stock indices. Second, the paper

examines size anomalies and EMH performance under different market conditions. Our research uses a sub-sample (two sub-periods) to determine whether the size anomaly (market efficiency) of the Dow Jones Islamic Index is influenced by global, regional, or regional economic events. It assesses and captures the impact of political, environmental, and economic influences. A social event to share prices across global markets. Third, we use a non-parametric approach that allows us to look at size anomalies in Islamic stocks from the perspective of a risk-averse or risk-seeking investor.

For risk-averse investors, we find that small-sized portfolios of Islamic indices stochastically dominate (outperform) large-sized portfolios in Asia/Pacific and Europe. In contrast, the opposite is true for Dow Jones and the US. For risk-seeking investors, we find that small-sized portfolios of Islamic indices stochastically dominate (outperform) large-sized portfolios in the Dow Jones and the US, while the opposite is true in Asia/Pacific and Europe. We conclude that size anomalies exist in Islamic stocks, and they are inefficient in the semi-strong form.

The results of this study have valuable implications for different stakeholders. Islamic equity indices have become more prevalent than ever in recent years. Our analysis contributes to the desired understanding of this niche market to enable investors to accurately and efficiently assess its behavior. This study assists those interested in investing in Islamic equity markets to build their investment portfolios. Our findings enhance investors' and regulators' understanding of the behavior of Islamic equity markets (See Wahyudi and Sani 2014). In addition, the results of this paper may have implications for the individuals, domestic institutions, international investors, and policymakers.

If the size effect is present in Islamic stock markets, investors seeking profits can form portfolios that consist of small stocks instead of large stocks. The size effect defies the theory of market efficiency. Since the efficiency of the stock markets is vital to capital allocation and economic development, the findings of this study have useful implications for all market participants in Islamic stock markets. Furthermore, anomalies are essential to both practitioners and academicians. Anomalies offer exploitable profits to practitioners and weaken one of their basic tenets, the efficient market hypothesis, to academicians. The existence of size anomalies in Islamic stock returns implies that Islamic indices are inefficient in the semi-strong form.[3] Furthermore, this research can motivate other researchers to pursue further investigations into the behavior and specificities of Islamic equity markets.

The rest of this paper is organized as follows: Section 2 provides a brief literature review. Data and hypotheses are presented in Section 3. Methodology and results are presented in Section 4, and the final section concludes.

2. Literature Review

Academics and professionals alike are now paying more attention to this area of the global economy as a result of the rapid rise of Islamic finance. To better understand Islamic equities markets, earlier research empirically examined the performance and behavior of Islamic stock indices. Early research compared Islamic equity markets to traditional stock indices in order to evaluate the relationship between risk and return. For instance, Hakim and Rashidian (2004) indicate that Islamic indices have distinct risk and return characteristics than conventional indices. Hussein (2005) demonstrates that during the bull market sub-period, Islamic indices outperform non-Islamic indices, but not during the bear market sub-period. Elfakhani et al. (2005) concludes that both Islamic and conventional mutual funds have similarities in their performance.

Hussein and Omran (2005), on the other hand, discover that Islamic indices outperform conventional ones. Due to the use of the profit-and-loss sharing principle in Islamic investing, Al-Zoubi and Maghyereh (2007) conclude that the risk of the Islamic stock indices is much lower than that of the conventional stock indices. Hoepner et al. (2009) analyze the behavior of Islamic mutual funds and discover that because Islamic equity funds can only invest in stocks with low debt/equity ratios, they are especially well-suited to perform a hedging function. Alam and Rajjaque (2010) discover that portfolios of Shari'ah-compliant

stocks are more resilient during times of general downturn, less volatile, and less risky. Islamic stock portfolios provide sharper ratios that are noticeably higher than conventional stock portfolios, according to Milly and Sultan (2012), who draws the conclusion that in times of economic and financial turmoil, Islamic stocks are more secure than conventional ones. According to Ashraf and Mohammad (2014), benchmark indexes for Islamic equity show, on average, less volatility than their conventional counterparts. According to Jawadi et al. (2015), Islamic assets perform better than conventional investments during economic downturns. In contrast, when things are quiet, conventional assets do better than Islamic ones.

Researchers claim that Islamic stocks have a significant potential for portfolio diversification because of their low-risk characteristics (Saiti et al. 2014; Shamsuddin 2014). Additionally, Saiti et al. (2014) contend that because of the distinctive features of Islamic stock markets, such as ethical investment, ratio screening, a low debt-to-equity ratio, and the absence of derivative securities, Islamic stock indices are thought to be more resistant to financial crises. Thus, during financial crises, Islamic stocks might act as a haven asset. According to Abbes and Trichilli (2015), diversification benefits from Islamic stock indexes may be advantageous during short-term crisis situations. Recent research looked at the diversification advantages of investing in Islamic firms in the Islamic developing, Islamic emerging, Islamic Asian, Saudi, and GCC stock markets (Rizvi et al. 2014; El Alaoui et al. 2015; Saiti et al. 2014). They claim that Islamic stocks offer greater benefits for diversification than their traditional counterparts. The document further claims that Islamic financial systems can offer protection against unforeseen dangers and economic catastrophes according to Islamic law.

Additionally, across various investment horizons, Maghyereh et al. (2019) study the dynamic interconnectedness between gold, sukuk, and Islamic stocks. They conclude that gold plays an average but stable role in hedging and diversifying Islamic stocks across all investment horizons and that gold hedges the risk of sukuk in the short and medium terms. The role of gold in the diversification of eight Dow Jones Islamic stock index portfolios from 1996 to 2017 has recently been examined by Alkhazali and Zoubi (2020). The authors demonstrate that in all Islamic stock indices, a gold-Islamic stock portfolio stochastically outperforms one without gold at the FSD, SSD, and TSD stages. Furthermore, as they increase their gold holdings, the level of SD orders rises. Additionally, they discovered that all gold percentage holdings experienced the SD order throughout the financial crisis (2007–2009). This suggests that to optimize their expected utilities, risk-averse investors in Islamic stock indexes should incorporate gold in their portfolios.

Alkhazali et al. (2014) demonstrate that across the time periods 1996–2012 and 2001–2006, most traditional indices stochastically outperformed Islamic indices in all markets, with the exception of the European market. However, their findings suggest that during times of crisis, Islamic indexes outperform conventional indices. The findings of Ho et al. (2014) are comparable to those of Alkhazali et al. (2014). They did not come to any firm conclusions regarding the non-crisis times, though. Additionally, Mohammad and Ashraf (2015) draw the conclusion that choosing equities using Islamic principles as opposed to traditional approaches increases returns for investors. They further state that the Islamic equity index performance in emerging countries differs dramatically from those in developed economies. The performance of the Islamic stock portfolio (ISP) and conventional stock portfolio (CSP) for Malaysia's five industrial sectors and marketplaces is examined by Hoque et al. (2020). They discover that the risk-sharing ISP offers better profits at both the sectoral and market levels than the risk-bearing CSP.

Promoting efficiency and integrity in the securities markets is one of the key objectives of regulators and policymakers. Guyot (2011) demonstrates that applying Shari'ah laws to stock selection has no negative impact on the performance of the Dow Jones Islamic index. El Khamlichi et al. (2014) demonstrate using variance ratio tests that the effectiveness of Islamic indices is comparable to that of conventional indices. For three important Dow Jones Islamic stock markets, Jawadi et al. (2015) study the weak-form Informational Efficient

Hypothesis (World, Emerging, and Developed). They discover that developing Islamic stock markets appear to be less efficient than established ones, pointing to interesting investment opportunities and the benefits of diversification in this region.

With a few exceptions, the majority of earlier studies did not evaluate the weak form of market efficiency using time-varying metrics of return predictability (Sensoy et al. 2015; Charles et al. 2015; Alkhazali et al. 2016). Sensoy et al. (2015), for instance, examine the weak-form efficiency of conventional and Islamic equity markets using daily stock prices for 12 Dow Jones Indices and find that all indices have various levels of time-varying predictability. Additionally, their findings demonstrate that Islamic marketplaces operate more efficiently than conventional ones. Additionally, Charles et al. (2015) indicate that Islamic and traditional stock portfolio returns exhibit comparable predictability using the automated portmanteau and variance ratio tests. However, the Islamic portfolio's level of efficiency is far higher than its conventional counterparts, particularly during times of crisis. Alkhazali et al. (2016) evaluated the Martingale Difference Hypothesis (MDH) and the Random Walk Hypothesis using a sample of nine conventional and nine Islamic stock indices for the years 1997 to 2012. (RWH). Their findings show that during non-crisis periods, traditional European, Japanese, and UK stock indexes perform relatively better than their Islamic Indices counterparts. While the crisis is present, the efficiency gap vanishes simultaneously.

The scholarly literature on the topic has grown despite the expansion of Islamic financing, but it still lacks data on how Islamic stocks have performed inside each index. To put it another way, no study has looked at the performance of Islamic indexes according to firm, portfolio, or index size. We thus investigate firm-size abnormalities in Islamic stock indices in this paper.[4] We want to see if Islamic small enterprises do better than Islamic medium and large firms.

3. Data and Hypotheses

For four Dow Jones Islamic indices, this study uses daily stock prices from Datastream for small, medium, and large firms.[5] We use the Asian/Pacific, European, Global, and US Islamic stock indices. Our data sample includes the Global Dow Jones Islamic index, two continents (Asia/Pacific and Europe), the United States, and two economic sectors (emerging and developed). Three more Islamic equity index providers exist in addition to Dow Jones: Financial Times Stock Exchange (FTSE), Standard and Poor's (S&P), and Morgan Stanley Capital International (MSCI).

Islamic jurisprudence (Shari'ah) principles' screening standards for stock selection apply to Islamic stocks. For stocks to be included in an Islamic fund, they must clear three requirements: a revenue source, business activity, and financial factors. The inclusion criteria used by each index provider, however, vary slightly depending on how the Shari'ah board's decision is interpreted (Ashraf 2014). This leads to a variety of portfolio compositions as well as rebalancing and monitoring fees. According to different Shari'ah screening requirements, different portfolio compositions and return performances result (Derigs and Marzban 2008; Rahman et al. 2010; Adamsson et al. 2014).

In order to obtain reliable results, this study solely focuses on the examination of Islamic indexes created by Dow Jones. Additionally, since 1999, Dow Jones has been the first supplier to create Islamic stocks and to offer statistics since 1996. Additionally, compared to other suppliers, it offers Islamic stock indices that practically cover all of the world's regions for longer periods of time and with higher sample sizes. We chose the four Islamic indices mentioned above for four different reasons. The initial construction of Islamic stock portfolios is performed by Dow Jones Islamic Equity Provider using market capitalization. Second, the extensive geographic coverage enables us to examine more nations and regions than those in other research on Islamic investing, resulting in a more accurate and thorough analysis.[6] Third, we can account for the diversity in political and economic events in various regions and nations thanks to the availability of data across longer time periods. Fourth, the Dow Jones Islamic Indices give us the ability to examine

indices that use comparable Shari'ah screening techniques. Due to the fact that many of the stocks in Islamic nations do not adhere to Shari'ah, we solely evaluate Islamic stock indexes in this article and ignore markets in Islamic nations. Additionally, anomalies and EMH have already been thoroughly studied by researchers in Islamic nations.[7]

We look at the sample period from 2 January 1996 to 15 October 2019, as well as two sub-periods, each of which was characterized by a different trend in the market index. We study two sub-periods with regionally specific events in the manner described as follows to investigate how the size effect may alter in response to significant crises, political events, and economic conditions. Periods 1 and 2 are from 2 January 1996 to 31 December 2006, and 2 January 2010 to 15 October 2019, respectively. The financial crisis had a significant negative effect on the global economy. The financial crisis occurrence times (2007 to 2009) were removed to prevent their effects from being shown in the results.

The two sub-periods correspond, respectively, to the Asian Financial Crisis, the period from 2007 to 2008 before the global financial crisis, and the post-global financial crisis. The Dotcom and European Sovereign Debt crises are also covered.

We chose these two sub-periods to investigate the sensitivity of the Dow Jones Islamic indexes' size effect to global, regional, and local economic events as well as to capture the influence of societal, political, and environmental developments on stock prices across the board. The Asian financial crisis (1997–1998), the dot-com crash (11 March 2000), the terrorist attack on the World Trade Center in New York (11 September 2001), the Iraq War (2003), numerous bankruptcies (Enron, WorldCom, and Lehman Brothers), the OPEC oil production cut, the Arab uprising (2011), the European debt crisis (20), and the financial crisis in the United States (1996–2019) are just a few of the significant events that affected the global markets during the entire period (2012 to present). As a result, we split the data into two sub-periods and analyzed how structural breaks and changes in market conditions affected the market value of each Islamic index component during these periods.[8]

The closing values of the Islamic stock index on days t and t_1 are used to calculate the daily log return, or R_{it}. In this study, all portfolios are compared pairwise using the SD approach. We intend to test the following three hypotheses with SD:

Hypothesis 1. *Small Islamic stock returns do not stochastically dominate medium Islamic stock returns.*

Hypothesis 2. *Small Islamic stock returns do not stochastically dominate large Islamic stock returns.*

Hypothesis 3. *Medium Islamic stock returns do not stochastically dominate large Islamic stock returns.*

The findings from the descriptive analysis (Table 1) of the Islamic equity indices have profound implications for traders and investors. The results refute the validity of the positive returns attributable to the size anomaly observed on the DJII. The positive returns are, in fact, statistically erroneous because all three series showed high skewness and kurtosis in their return distributions, and all three return series failed the tests of significance for the normality of their return distributions. Parametric tests cannot statistically validate the significance of the size anomaly shown in Table 1. Therefore, there is a need for an alternative statistical tool in the form of nonparametric tests that do not rely on the assumption that the underlying return distributions are normal. SD analysis is such a nonparametric test, and its analytical advantages over parametric tests are discussed below.

Table 1. Descriptive statistics for return of Islamic index per size (1996–2019).

Index		Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	*p*	N
Asia	Large	0.00016	0.012185	−0.1967	8.441356	7696.248	0.00	6206
	Medium	0.000177	0.010755	−0.4376	8.441023	7853.356	0.00	6206
	Small	0.000221	0.010573	−0.81504	10.0823	13,657.38	0.00	6206
DJI	Large	0.000228	0.009735	−0.3434	10.66245	15,304.2	0.00	6206
	Medium	0.000313	0.010686	−0.44498	8.574341	8239.837	0.00	6206
	Small	0.000352	0.011255	−0.43444	7.354663	5098.755	0.00	6206
Europe	Large	0.000202	0.01483	0.037681	9.569214	11,160.52	0.00	6206
	Medium	0.000243	0.013605	−0.25627	8.376725	7543.362	0.00	6206
	Small	0.000372	0.013605	−0.34932	7.877995	6279.162	0.00	6206
US	Large	0.000274	0.011755	−0.09547	10.44547	14,344.02	0.00	6206
	Medium	0.000389	0.013761	−0.32397	8.473588	7855.761	0.00	6206
	Small	0.000411	0.014642	−0.27193	6.816068	3842.07	0.00	6206

4. Methodology and Results

Descriptive statistics (mean, standard deviation, skewness, kurtosis, and Jarque-Bera) for each Islamic index per size are reported in Table 1.

It shows that the mean returns increase as the size of the Islamic stocks' indices decreases. Moreover, the standard deviation of returns tends to increase as the size of the index decreases in all Islamic indices except in Asia. These findings suggest that small Islamic stocks provide, on average, higher returns and risk than medium and large Islamic stocks. Table 1 also shows that the returns have positive skewness for every Islamic stock index. In addition, returns from Islamic indices show a positive kurtosis and none of the returns are normally distributed, suggesting that returns are highly leptokurtic.

Normality test results suggest that nonparametric methods, such as stochastic dominance (SD) analysis, may lead to different conclusions if violations of parametric assumptions drive the previous results. Furthermore, if normality does not hold, then the MV rule may lead to paradoxical effects. Based on the findings of the prior research using the MV approach, we cannot conclude whether the investor's preference among portfolios will lead to an increase in wealth or an increase in utility without an increase in wealth, in the case of risk-averse individuals. Therefore, the SD approach can be used for this purpose.[9]

The most generally used SD rules conforming to three mostly defined utility functions are first-, second-, and third-order Ascending SD (ASD)[10] for risk averters, denoted FASD, SASD, and TASD, respectively. All investors are assumed to have non-satiation (more is preferred to less) under FASD, non-satiation and risk aversion under SASD, non-satiation, risk aversion, and decreasing absolute risk aversion (DARA) under TASD.

SD for risk seekers works with the DCDF, which counts from the best return descending to the worst return (Wong and Li 1999; Levy and Levy 2004; Post and Levy 2005). Hence, SD for risk seekers is called Descending SD (DSD). All investors are assumed to have non-satiation under FDSD, non-satiation and risk seeking under SDSD, and non-satiation, risk seeking, and increasing absolute risk seeking under TDSD.

Typically, risk averters prefer assets that have a lower probability of loss, especially in downside risk. In comparison, risk seekers prefer assets with a higher likelihood of gaining, especially in upside profit.

For risk averters, the results of ASD are reported in Tables 2–4. There is no FASD for all sizes in all regions for the whole sample period and both sub-periods. Supporting our second hypothesis, we find that in the Dow Jones and US Islamic indices, larger-sized portfolios of ASD dominate the smaller-sized portfolios at the second- and third-order stochastic dominance (SSD and TSD) for the whole sample period and both sub-periods.

Table 2. Ascending Stochastic dominance (ASD) results of Davidson and Duclos test (1996–2019).

Islamic Index	FSD	SSD	TSD
AS_L vs. AS_M	ND	G > F	G > F
AS_L vs. AS_S	ND	G > F	G > F
AS_M vs. AS_S	ND	ND	ND
EU_L vs. EU_M	ND	G > F	G > F
EU_L vs. EU_S	ND	G > F	G > F
EU_M vs. EU_S	ND	ND	ND
DJ_L vs. DJ_M	ND	F > G	F > G
DJ_L vs. DJ_S	ND	F > G	F > G
DJ_M vs. DJ_S	ND	F > G	F > G
US_L vs. US_M	ND	F > G	F > G
US_L vs. US_S	ND	F > G	F > G
US_M vs. US_S	ND	F > G	F > G

Table 3. Ascending Stochastic dominance (ASD) results of Davidson and Duclos test: sub-period 1 (1996–2006).

Islamic Index	FSD	SSD	TSD
AS_L vs. AS_M	ND	G > F	G > F
AS_L vs. AS_S	ND	G > F	G > F
AS_M vs. AS_S	ND	G > F	G > F
EU_L vs. EU_M	ND	G > F	G > F
EU_L vs. EU_S	ND	G > F	G > F
EU_M vs. EU_S	ND	ND	ND
DJ_L vs. DJ_M	ND	F > G	F > G
DJ_L vs. DJ_S	ND	F > G	F > G
DJ_M vs. DJ_S	ND	F > G	F > G
US_L vs. US_M	ND	F > G	F > G
US_L vs. US S	ND	F > G	F > G
US_M vs. US_S	ND	F > G	F > G

Table 4. Ascending Stochastic dominance (ASD) results of Davidson and Duclos test: sub-period 2 (2010–2019).

Islamic Index	FSD	SSD	TSD
AS_L vs. AS_M	ND	ND	ND
AS_L vs. AS_S	ND	F > G	F > G
AS_M vs. AS_S	ND	ND	ND
EU_L vs. EU_M	ND	ND	ND
EU_L vs. EU_S	ND	ND	ND
EU_M vs. EU S	ND	ND	ND
DJ_L vs. DJ_M	ND	F > G	F > G
DJ_L vs. DJ_S	ND	F > G	F > G
DJ_M vs. DJ_S	ND	F > G	F > G
US L vs. US_M	ND	F > G	F > G
US_L vs. US_S	ND	F > G	F > G
US_M vs. US_S	ND	F > G	F > G

Note: FSD, SSD, and TSD denote first-, second-, and third-order stochastic dominance, respectively. L is the large-sized portfolio, M is the medium-sized portfolio and S is the small-sized portfolio. F > G: the first portfolio dominates the second portfolio. G > F: the second portfolio dominates the first portfolio. ND means no stochastic dominance.

The reported results indicate that while medium Islamic stock indices dominate small Islamic stocks indices by SSD and TSD, they are dominated by large Islamic stock indices. In other words, the returns of small Islamic stock indices are stochastically dominated by returns of large and medium Islamic stock indices by SASD and TASD in Dow Jones and the US Islamic indices. The results indicate that risk averters can maximize their

utility and wealth by investing in large Islamic stock indices rather than medium or small Islamic stock indices in the Dow Jones and US Islamic indices. These results contradict the findings of previous studies in conventional stock markets, such as those in the US and other international stock markets.[11]

On the other hand, the Asia and EU regions have a different dominance pattern than the US market. Our results indicate that the large-sized portfolio is ascending stochastic dominated by the medium- and small-sized portfolios at the SSD and TSD orders for the whole sample period. Nevertheless, we could not find dominance between the medium- and small-size portfolios. In the first sub-period, the dominance pattern is about the same except that the small-sized portfolio dominates the medium-sized portfolio in Asia. In the second sub-period, the pattern changes where no dominance is found in both regions except the large-size portfolio ASD and the small-size portfolio at the SSD and TSD orders in Asia. The results show that risk-averse investors should invest in small rather than large Islamic stock indices in Asia and Europe over the entire period or the first sub-period to maximize their utility and wealth. These results are consistent with those studies in conventional stock markets.[12]

For risk seekers, the results of DSD are reported in Tables 5–7. In terms of DSD, as expected, there is no dominance at the first order for all sizes in all regions for the whole sample period and both sub-periods. However, the Dow Jones and US Islamic indices have reversed their results. The smaller portfolios dominate the larger portfolios at the SSD and TSD over the entire period and the two sub-periods. The results indicate that risk-seeking investors should invest in small stock indices in Dow Jones and US Islamic indices to maximize their utility and wealth.

Table 5. Descending Stochastic dominance results (DSD) of Davidson and Duclos test (1996–2019).

Islamic Index	FSD	SSD	TSD
AS_L vs. AS_M	ND	F > G	F > G
AS_L vs. AS_S	ND	F > G	F > G
AS_M vs. AS_S	ND	F > G	F > G
EU_L vs. EU_M	ND	F > G	F > G
EU_L vs. EU_S	ND	F > G	F > G
EU_M vs. EU_S	ND	ND	ND
DJ_L vs. DJ_M	ND	G > F	G > F
DJ_L vs. DJ_S	ND	G > F	G > F
DJ_M vs. DJ_S	ND	G > F	G > F
US_L vs. US_M	ND	G > F	G > F
US_L vs. US_S	ND	G > F	G > F
US_M vs. US_S	ND	G > F	G > F

Table 6. Descending Stochastic dominance (DSD) results of Davidson and Duclos test: sub-period 1 (1996–2006).

Islamic Index	FSD	SSD	TSD
AS_L vs. AS_M	ND	F > G	F > G
AS_L vs. AS_S	ND	F > G	F > G
AS_M vs. AS S	ND	F > G	F > G
EU_L vs. EU_M	ND	F > G	F > G
EU_L vs. EU_S	ND	F > G	F > G
EU_M vs. EU_S	ND	ND	ND
DJ_L vs. DJ_M	ND	G > F	G > F
DJ_L vs. DJ_S	ND	G > F	G > F
DJ_M vs. DJ_S	ND	G > F	G > F
US_L vs. US_M	ND	G > F	G > F
US_L vs. US_S	ND	G > F	G > F
US_M vs. US_S	ND	G > F	G > F

Table 7. Descending Stochastic dominance (DSD) results of Davidson and Duclos test: sub-period 2 (2010–2019).

Islamic Index	FSD	SSD	TSD
AS_L vs. AS_M	ND	F > G	F > G
AS_L vs. AS_S	ND	F > G	F > G
AS_M vs. AS_S	ND	ND	ND
EU_L vs. EU_M	ND	ND	ND
EU_L vs. EU_S	ND	ND	ND
EU_M vs. EU_S	ND	F > G	F > G
DJ_L vs. DJ_M	ND	G > F	G > F
DJ_L vs. DJ_S	ND	G > F	G > F
DJ_M vs. DJ_S	ND	G > F	G > F
US_L vs. US_M	ND	G > F	G > F
US_L vs. US_S	ND	G > F	G > F
US_M vs. US S	ND	G > F	G > F

Note: FSD, SSD, and TSD denote first-, second-, and third-order stochastic dominance, respectively. L is the large-sized portfolio, M is the medium-sized portfolio, and S is the small-sized portfolio. F > G: the first portfolio dominates the second portfolio. G > F: the second portfolio dominates the first portfolio. ND means no stochastic dominance.

On the other hand, we report that smaller-sized portfolios are dominated by larger-sized portfolios in Asia and EU markets. The results are consistent across the time, except for a few cases of no dominance in the second sub-period. The results indicate that risk-seeking investors in Asia and Europe should invest in large Islamic stock indices to maximize their utility and wealth.

In summary, the results indicate that risk-averse investors should invest in small Islamic stock indices in Asia and Europe and large Islamic stock indices in Dow Jones and the US. However, risk-seeking investors should invest in small Islamic stock indices in Dow Jones and the US and large Islamic stock indices in Asia and Europe. We conclude that there is a size anomaly in Islamic equity markets. Thus, the size anomaly in Islamic equity markets does not support the semi-strong form of market efficiency in the four Islamic indices under study.

While our results provide some evidence of a size effect in the Islamic stock indices used in this study, we cannot state that investors would benefit from a wealth perspective by investing in small Islamic stock indices relative to other Islamic stock indices, whether over the entire sample period or during any sub-period examined. This conclusion is supported by the fact that no FSD was found in this study. The results indicate that risk-averse investors will increase utility by switching from large Islamic stock indices to small Islamic stock indices in Asia and Europe and vice versa; however, the existence of SSD does not imply any arbitrage opportunity, and neither does it imply the failure of market efficiency nor market rationality. Thus, we conclude that although small Islamic stock indices do not outperform large Islamic stock indices from a wealth perspective, risk-averse investors would prefer to invest in small Islamic stock indices relative to the other Islamic stock indices.

Since the efficiency of the stock market is vital to capital allocation and economic development, the findings of this study have useful implications for all market participants in Islamic stock indices. Furthermore, anomalies are essential to both practitioners and academicians. To practitioners, the anomalies show ways to exploit profits, and to academicians, the anomalies deteriorate the efficient market hypothesis.

5. Summary and Conclusions

Prior research has not examined the firm-size anomaly in Islamic stock indices. This paper is the first to investigate the firm-size anomaly for Islamic indices using the stochastic dominance approach. We carry out our empirical examination using daily prices of small, medium, and large Islamic stocks for four Islamic indices.

The results of descriptive statistics show an inverse relationship between returns and the size of Islamic stock indices. In addition, the standard deviation of returns increases as the size of the Islamic index decreases. These results suggest that Islamic small stock indices on average provide higher returns and risk than medium and large Islamic stocks. The results also indicate that small-sized portfolios stochastically dominate large-sized portfolios in Asia/Pacific and European Islamic indices, while the opposite is true in Dow Jones and US Islamic indices for risk-averse investors, implying that the size anomaly did indeed exist for Islamic stock indices. These results suggest that risk-averse investors should invest in small Islamic stocks in Asia/Pacific and Europe and large Islamic stocks in Dow Jones and the US. In contrast, risk-seeking investors should invest in small Islamic stocks in Dow Jones and large Islamic stocks in Asia/Pacific and Europe.

This study has several implications for individuals, domestic institutions, international investors, and policymakers. Given the size effect in Islamic stock markets, investors interested in wealth maximization can form portfolios that consist of small stocks instead of large stocks. Since the efficiency of the stock market is vital to capital allocation and economic development, the findings of this study have useful implications for all market participants in Islamic stock markets. Furthermore, anomalies are essential to both practitioners and academicians. To practitioners, the anomalies show ways to exploit profits, and to academicians, the anomalies deteriorate the efficient market hypothesis. Furthermore, this research can motivate other researchers to pursue further investigations into the behavior and specificities of Islamic equity markets.

We contribute to the literature in several ways. First, this is the first paper that links the behavior of the size anomaly with the efficient market hypothesis for Islamic equity indices. Second, it examines the performance of size anomaly and EMH under different market conditions. It uses subsamples (two sub-periods) to determine whether the size anomaly (market efficiency) in the Islamic indices is sensitive and affected by world, regional, and local economic events.

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Notes

1 Please see: https://www.statista.com/statistics/1090815/worldwide-value-of-islamic-finance-assets/#statisticContainer (accessed on 30 October 2019).

2 In data section, we discuss Islamic stock indices based on size.

3 We have semi-strong form market hypothesis when current stock prices adjust rapidly to the release of all new public information.

4 In data section, we discuss Islamic stock indices based on size.

5 The Dow Jones Islamic indices are constructed based on regional location: Global (developed, emerging, and frontier), Americas (pan regional, USA, Canada, Latin America), Europe (pan regional), Middle East and Africa (pan regional, Arab and GCC, Israel, Africa, south Africa), Asia/Pacific (pan regional, Australia and New Zealand, China, Japan, Korea).

6 Sensoy et al. (2015) use the following six Islamic indices: Asia/Pacific, Canadian, European, Japan, UK, USA; and Charles et al. (2015) use only Global Islamic indices.

7 Weber and Nickol (2016) use data for 13 Islamic countries namely: the Amman Stock Exchange, the Bahrain Bourse, the Borsa Istanbul, the Bursa Malaysia, the Casablanca Stock Exchange, the Dubai Financial market, the Egyptian Exchange, the Indonesia Stock Exchange, the Karachi Stock Exchange, the Kuwait Stock Exchange, the Muscat Securities Market, the Qatar Exchange, and the Tadawul. For more discussion, see Alkhazali et al. (2007, 2017); Alkhazali (2014); Rizvi et al. (2014).

8 Nieto et al. (2014) compare the performance of nine time-varying beta estimates taken from three different methodologies namely the least-square estimators including nonparametric weights, the GARCH-based estimators and the Kalman filter estimators.

[9] For SD analysis, please see Alkhazali et al. (2017).

[10] We call it Ascending SD as its integrals count from the worst return ascending to the best return.

[11] The firm-size anomaly, documented initially by Banz (1981) in the US market, states that small NYSE firms have significantly higher average returns than NYSE firms, even after adjusting for returns on betas. Furthermore, Brown et al. (1983) and Fama and French (1992) report that the smallest size decile outperforms the largest in NYSE, Amext, and Nasdaq stocks. Furthermore, the firm size anomaly is investigated in the international markets. For instance, De Moor and Sercu (2013) examine the size effect in 39 countries over the period of 1980 to 2009 and discover that the size effect is still exists, while Van Dijk (2011) indicates that the size effect in the international evidence is inconclusive.

[12] For more detailed discussion see Banz (1981) and De Moor and Sercu (2013).

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