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Understanding Volatility dependence between MENA Sukuk, GCC Sukuk and Nifty Shariah Index during Covid-19: A C-vine Copula Approach

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Abstract— **The study aims to identify the dependence between MENA Sukuk, GCC Sukuk, and Nifty 50 Shariah indices. Further, it finds out volatility patterns among the same indices before and during the COVID-19 pandemic. Daily data (April 2017 to November 2020) of the indices are analyzed using the GARCH model and C-Vine Copula approach. It is done by modelling the returns of the indices. The outcomes may provide a prodigious advantage for portfolio makers and stockholders towards investment policies throughout financial catastrophes like the COVID19 pandemic. In the pre-Covid period- C Vine copula shows that the Sukuk have strong dependence while the Shariah index has rather weak dependence, for MENA Sukuk and Nifty Shariah 50 it increased by a great margin in during-COVID 19 periods. GCC Sukuk and Nifty Shariah indices are positively correlated to each other in comparison to the returns of Mena Sukuk. The results of the GARCH model show asymmetrical co movements for losses and gains. Moreover, conditioned on MENA Sukuk, the GCC Sukuk and Nifty Shariah 50 had a higher negative degree of dependence within and throughout the COVID-19 period. The findings show substantial high and low tail dependency among the Sukuk and Shariah markets before Covid19. GCC Sukuk and Nifty Shariah 50 indices are highly positively correlated to each other in returns of MENA Sukuk. We also find negative dependency among the GCC Sukuk and Nifty Shariah 50 during Covid19 with MENA Sukuk. The outcomes are varied due to the time variation copulas that shows dependency diverges over time for all variables. Furthermore, this study would be helpful to find out the significance of ethical finance functions safe havens for world investors by using the copula model.**

Keywords: Covid-19, Dependency, Volatility, Sukuk, Index, Copula, GARCH

I. INTRODUCTION

The outbreak of the pandemic of coronavirus (COVID-19) is a widespread economic challenge and a major influencing factor in the current time. The novel disease has unfolded quickly athwart boundaries with quite 5,049, 497 individuals confirmed the infection and therefore the deaths of 367,230 people in more than 195 countries around the world, carrying an average death rate of 6.07% below 1% mortality from flu (Gormsen & Koijen, 2020; Sherif, 2020), which has affected the Islamic finance market too.

The major contributor to the recent growth of the Islamic finance market is Sukuk, the Islamic bond. These are structured to generate returns for investors without violating Shariah. The Sukuk market has shown remarkable growth in the first half of 2017. It has developed from just $ 200bn in 2003 to projected $ 4 trillion by the year 2030 (Alam & Seifzadeh, 2020). Such exceptional development has been grown up in non-Muslim nations in Asia and Europe (Alam, 2019). This is because of the cultural diversity with enormous numbers of Muslim immigrants (Alam & Seifzadeh, 2020).

Empowered by the above contentions and the possible effect of the current flare-up of the COVID-19 pandemic, this study looks at and gives new proof on the impact of COVID-19 on the S&P Dow Jones MENA Sukuk and GCC Sukuk disparity with the Nifty Shariah 50 record and examines the volatility pattern of the S&P Middle East and North Africa (MENA) Sukuk, Gulf Cooperation Council (GCC) and Nifty Shariah 50 indices.

The key motivation for this research study is to analyze the volatility and dependency structure for Shariah and Sukuk index before and during the Covid-19 pandemic. Shariah market, including Sukuk, is inclined by the situation of financial market circumstances specifically the volatility and returns. The statistic recounts the unrivalled volatility in Sukuk and Shariah indices throughout Covid-19.

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This paper also focuses on the factors of coupling and decoupling of Sukuk and Shariah index before and during the pandemic in association with globally perilous issues given joint dependency of return disseminations together in tails (extremes) and the focus.

Additionally, we enhance contribution and originality via associating the volatility of two Sukuk and a Shariah market, which gives a good insight of their comparative upended before and during the pandemic period. These findings provide better perceptions in understanding the volatilities. The outcomes may provide a prodigious advantage for portfolio makers and stockholders towards investment policies throughout financial catastrophes like to COVID19 pandemic. Apart from this, there is a dearth of studies on the S&P Middle East and North Africa (MENA) Sukuk, GCC Sukuk and Nifty Shariah 50 indices together.

This study adopts a copula approach that offers great flexibility in separating the marginal distributions from the dependence structure and in modeling these distributions independently to provide information on average dependence as well as on the probability that two variables jointly experience extreme upwards or downwards movements.

This paper is organized as follows. Section 2 reviews the documents available in the same way and/or related to Islamic funds. Section 3 describes the data source and method used for the current study. Section 4 shows the strong results of the analysis and finally, section 5 concludes the paper by giving the real and strategy suggestions and delineation for future study.

II. LITERATURE REVIEW

The studies that have examined Sukuk indices are few. The empirical studies based on Islamic indices, conducted around the world, collected from various sources, are presented in Appendix 1. From the review of literature, it can be interpreted that the co-integration model is the widely used tool for analyzing Shariah indices, followed by Multivariate GARCH, CAPM and T-test. There are a few articles that have used other tests like Copula, wavelet analysis and GMM. There are a few articles that have used other tests like wavelet analysis and GMM.

This paper subsides the existing literature by investigating the dependency structure among Sukuk and Nifty Shariah. So, we used various copulas which help to find out any variations in dependency structure over time variations. It is notified that most of the outcomes imply that the relationship between Sukuk and Shariah index counterpart by pretentious a continuous and symmetrical collaboration among them, most of the studies reflect the strong dependency between Sukuk and Shariah stocks. In our best information and considering the research gap, there is no research on GCC, MENA Sukuk and Nifty Shariah 50 index based on copula approach. The study intends to find out the modelled return in indexed based investments, primarily in Sukuk before and during COVID-19.

III. METHODOLOGY

3.1 Data and Hypotheses

As stated earlier, the data consists of daily returns of three indices, namely, Dow Jones MENA Sukuk (MS), S&P GCC Sukuk (GS) and Nifty Shariah 50 index (NF). The empirical analysis is conducted on daily data obtained for the period 1st April 2017 to 30th November 2020 for benchmark indices. To examine the link between Sukuk and Nifty Shariah, we consider the daily closing prices of the nearest contract to maturity on the Sukuk and Shariah. We choose data from 2017 to 2020 to analyze the pre and during COVID-19 pandemic situation as it was earlier observed that there was the highest issuance of Sukuk after financial crises.

The Dow Jones MENA Sukuk consists of US dollar-denominated investment-grade Sukuk (Islamic bonds) issued in the MENA region, which are Shariah-compliant. The S&P GCC Sukuk consists of US dollar-denominated investment-grade Sukuk from GCC countries of risk. The Nifty Shariah 50 consists of investors with Shariah-compliant investment solutions. The data is taken from the official websites of S&P Dow Jones Indicesand Nifty indices (www.spindices.com and www.niftyindices.com). (See Appendix 1)

Null Hypotheses

For this purpose, two null hypotheses are put as follows:

H01: There is no significant difference in dependency structure among GCC, MENA Sukuk and Nifty Shariah 50 before and during the COVID-19 pandemic is not the same.

H02: There is no significant difference in the volatility in Sukuk and Nifty Shariah 50 before and during COVID-19 pandemic.

This includes various copulas with different tail dependency structures like Student-t (symmetric dependency), Rotated Gumbel 180(Lower and Upper tail dependency), Gaussian (Upper tail dependency) and Frank (symmetric tail dependency). Intended for a better understanding, we analyze two global Sukuk indexes namely, MENA and GCC Sukuk and Nifty Shariah 50 index by considering the data from 1st April'17 to 30th November'20. Outcomes represent that both Sukuk and Nifty Shariah50 indices are highly affected by the pandemic. Additionally, results proposed that Sukuk and Shariah index are sturdily related and inclined to co-move during the Covid19 crisis, which proves the coupling hypothesis of Sukuk from Shariah.

Our outcomes have several significant consequences and proposed some prominent contributions to the existing literature by examining the co-movements of the dependency structure of Shariah and Sukuk market through the Copula approach before and during the COVID-19 pandemic. For explaining the associations among Sukuk and Shariah Index we build a dynamic and static dependency structure through Copula. To our best knowledge, this research is the original one that examines the volatility and dependency among Sukuk (MENA and GCC Sukuk) and Shariah (Nifty 50) index before and throughout the COVID-19 crisis.

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TABLE I. DATA SUMMARY

Index	Launch date	First date	Countries considered	Symbols used at levels	Symbols used at first difference
S&P MENA Sukuk Index	September 20, 2013	July 31, 2013	The Middle East and North Africa	MS	RMS
GCC Sukuk	March 22, 2018	December 31, 2012	Bahrain, Kuwait, Oman, Katar, Saudi Arabia, and UAE	GS	RGS
Nifty Shariah 50	February 19, 2008	December 26, 2008	India	NS	RNF

Source: Authors' elaboration

All the data series are considered after computing their log returns using the formula for calculating return:

rt= ln (Pt / P(t-1)).

Here, rt and Pt addresses the everyday return at the business day t individually.

All data series are retrieved from Bloomberg, S&P Dow Jones and Nifty Shariah. The explanation behind using the Dow Jones list is for normalization in the total of indices value. Next, the S&P MENA is used for global Islamic fixed income. The S&P index measures the performance of MENA Sukuk around the world which is involved in the Middle East and African market. Then, the Bloomberg index is used to reflect the GCC Sukuk. GCC Sukuktracks the performance of 6 countries Sovereign Sukuk that are globally traded.

Lastly, Nifty Shariah 50 indices are used for reflecting the uncertainty in Sukuk. This study has divided the observation into the Before-COVID 19 and the During-COVID 19 period to examine the difference between Pre and During COVID-19. World Health Organization (WHO) issued the first Disease Outbreak News Reporting 2019 globally.

Hence, we took the beginning of the COVID-19 from November 2019 as global and defined the 1st November 2019-30th November 2020 as during the COVID-19 period. The period from 1st April 2017 to 31st October 2019 is defined as the before COVID-19 period.

In the methodology part, first, we provided a brief introduction of the models used for the distribution of the margins. Then, a brief description of the approach used for dependence.

Figure 1a-c presents pre COVID-19 and 2a-c during COVID-19-time plots of the price series and Figure 3a-c presents pre COVID-19 and 4a-c during COVID-19 presents the time plot of return series for the three sample indices.

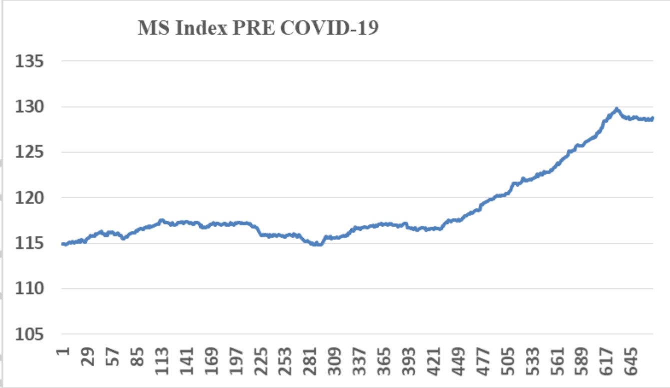

Figure 1a: Price series from 1st April 2017 to 31st October 2019. Source: Authors' elaboration

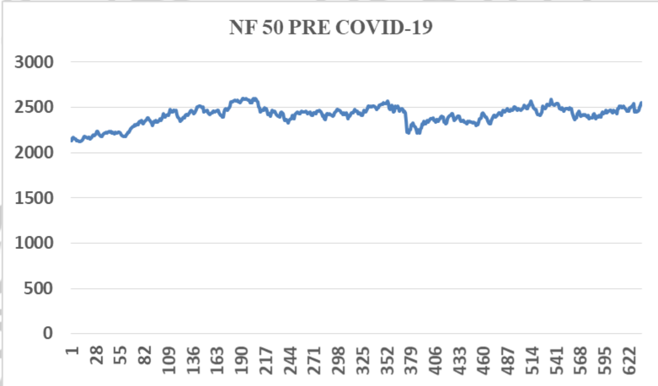

Figure 1b: Price series from 1st April 2017 to 31st October 2019. Source: Authors' elaboration

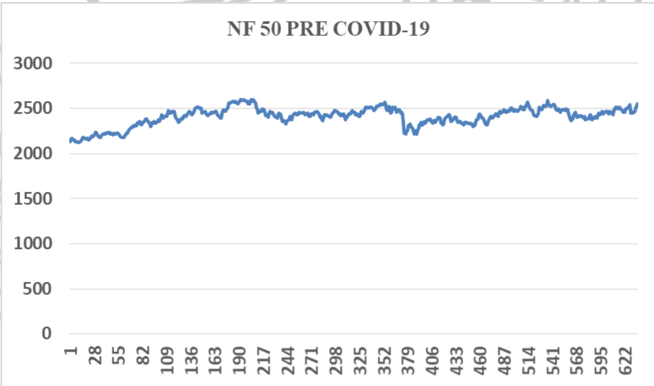

Figure 1c: Price series from 1st April 2017 to 31st October 2019. Source: Authors' elaboration

Figures 1a, 1b and 1c (Pre Covid-19 Period) show that NF was at the level of 2150 as of April 1st, 2017, as it was initiated way before the other two indices. It rose and fell due to America's trade war with China and again rose and finished at the rose level from starting (at increasing rate up to 50 per cent)

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after 2.5 years. While, the other two were initiated on April 1st, 2017, at the level of 117.5 and 115. Both GS and MS show a rising trend.

PRICE SERIES DURING COVID-19

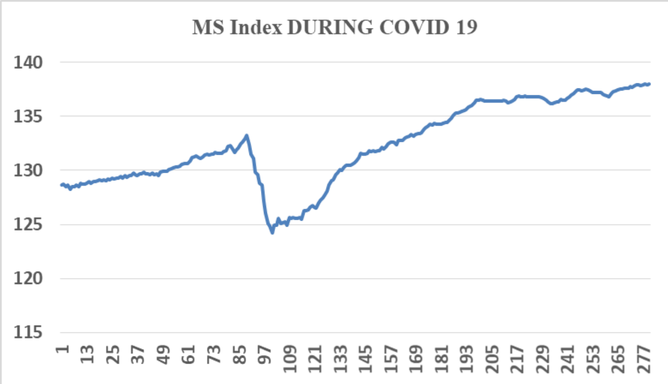

Figure 2a: Price series from 1st November 2019 to 30th. Source: Authors' elaboration

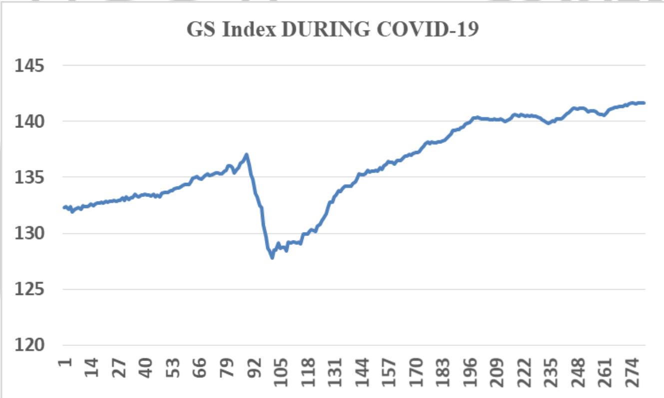

Figure 2b: Price series from 1st November 2019 to 30th November 2020. Source: Authors' elaboration

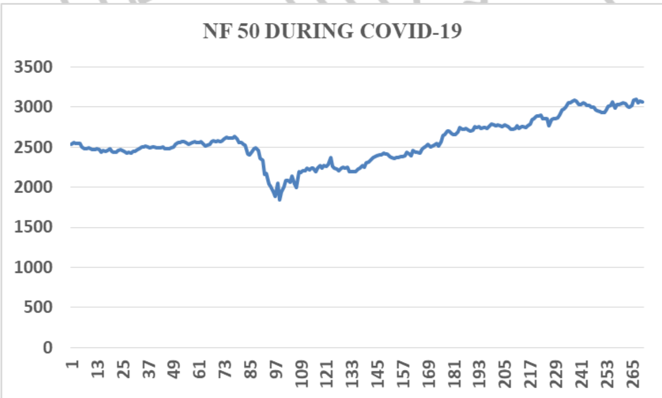

Figure 2c: Price series from 1st November 2019 to 30th November 2020. Source: Authors' elaboration

Figures 2a, 2b and 2c show that NF was at the level of 2500 as of November 1st, 2019, as it was initiated way before the other two indices. It rose and fell due to the Covid-19 pandemic and lockdown situation in the world. Investors do not have the funds to invest in the stock market which affect the global economy but once the lockdown was lifted from the economy and things normalize then again investors invest into the stock market so the price rose and finished more it's starting (increased 20 per cent) level. The other two were initiated i.e., MS and GS on November 1st, 2019, at the level of 128 and 133. Both MS and GS show a rising trend (increase 7.81 and 6.76 per cent).

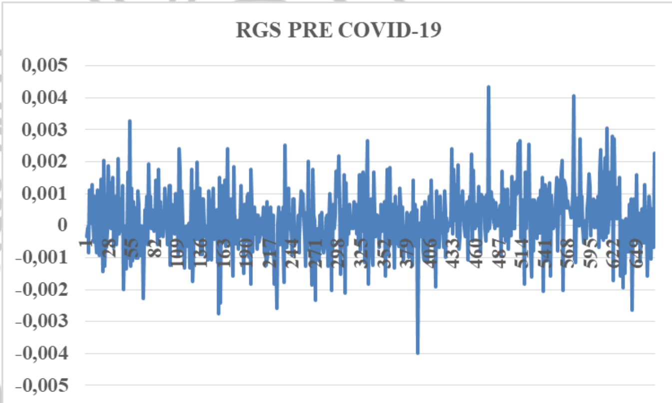

Figure 3: Return series from 1st April 2017 to 31st October 2019. Source: Authors' elaboration

RETURN SERIES DURING COVID-19

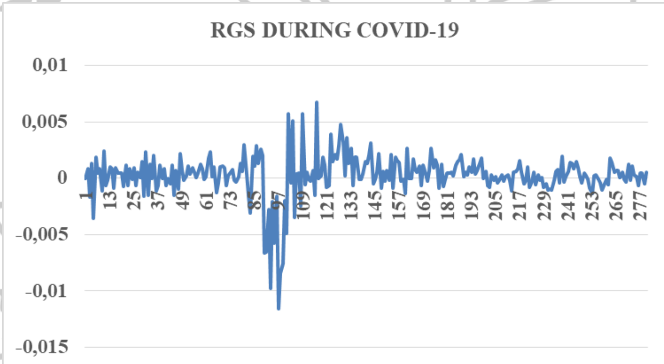

Figure 4a: Return series from 1st November 2019 to 30th November 2020. Source: Authors' elaboration

Figure 3 & 4 shows the return series for the three indices and it can be observed that the return of during Covid-19 of MS (RMS), GS (RGS) and NS (RNF) having higher fluctuations as compared to returns of Pre Covid-19 period of MS (RMS), GS (RGS) and NS (RNF) while, RMS and RGS are leaping around the same path. This was due to the spread of the corona virus pandemic from China into the rest of the world, and the economic shutdown and investors were worried about the impact of the COVID-19. Hence, it can be observed from the graph that NS is the most volatile out of the three indices. Outliers are also visible.

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Tables 3 & 4 reports summary statistics for the daily returns of the indices considered as well as statistics testing for normality and independence.

3.2 Preliminary results

Preliminary analysis and results are presented as follows:

Descriptive Statistics before Covid-19

Descriptive statistics of Before Covid-19 period are presented in table 2.

TABLE II. DESCRIPTIVE STATISTICS BEFORE COVID PERIOD (3RD APRIL 2017 – 31ST OCTOBER 2019)

	MS	GS	NF
Mean	0.000173	0.000177	0.000215
Median	0.000171	0.000166	0.000146
Minimum	-0.00403	-0.004	-0.05156
Maximum	0.004697	0.004318	0.027081
Std.Deviation	0.001011	0.000998	0.008275
Skewness	0.153036	0.149481	-0.63146
Kurtosis	4.247265	4.153168	6.588454
Jarque-Bera	46.0444	39.61861	404.0084
Probability	0.000000	0.000000	0.000000
Observation	670	670	670

Source: Authors' elaboration

Table 2 premises the descriptive properties before the Covid-19 period. The sample means are positive for MS, GS, and NF in the Pre Covid-19 period, whereas the standard deviation is lowest for GS (00.09 per cent) and highest for MS (00.10 per cent). Thus, MS is found to be the most volatile index followed by GS and NS.

Skewness and kurtosis indicate that all series are completely skewed except Nifty Shariah 50 it skewed negatively and extremely leptokurtic. The values of skewness and kurtosis reveal that all indices follow the traditional distribution that is other verified by the value of Jarque-Bera datum and prospect value. As higher kurtosis relates to the extremity of outliers, which is highest for NF distribution followed by MS and GS, respectively.

Descriptive Statistics for During Covid-19

Descriptive statistics of During Covid-19 period are presented in table 3.

TABLE III. DESCRIPTIVE STATISTICS DURING COVID PERIOD (1ST NOVEMBER 2019 – 30TH NOVEMBER 2020)

	MS	GS	NF
Mean	0.000251	0.000244	0.000683
Median	0.000375	0.000372	0.001353
Minimum	-0.01172	-0.011702	-0.10902
Maximum	0.006651	0.006697	0.089551
Std.Deviation	0.001935	0.001937	0.018286
Skewness	-1.99655	-1.98831	-0.8989
Kurtosis	13.6984	13.67204	13.90106
Jarque-Bera	1515.907	1507.83	1195.223
Probability	0.000000	0.000000	0.000000
Observation	279	279	235

Source: Authors' elaboration

Table 3 summarizes the descriptive properties of the variables during the Covid-19 period. The sample means are positive for MS, GS, and NF during the Covid-19 period, whereas the standard deviation is lowest for MS (00.19 per cent) and highest for NS (01.82 per cent). Thus, NF is found to be the most volatile index followed by GS and MS.

The values of skewness and kurtosis reveal that all indices don't follow the normal distribution. The same is given by Jarque-Bera test. As higher kurtosis relates to the extremity of outliers, which is highest for NS distribution followed by MS and GS, respectively.

After the comparison of Before COVID-19 and During the COVID-19 period, all variables, except MS have a positive return. The volatility of each variable has increased in both periods under study. NS has shown a higher mean return in the COVID-19 period. The maximum and minimum returns during and after the COVID period show the highest peak. Standard deviation is highly volatile during the COVID-19 period in comparison to pre-COVID-19 period. All variables are somewhat asymmetric as shown by their non-zero skewness coefficients.

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IV. RESULTS

4.1 GARCH modelling

To comprehend the impulsiveness of the securities market, we will in general allow Exponential GARCH models that area unit broadly utilized in learning the variability of the financial market in money writing have depended on uneven GARCH model developed by Admiral Nelson (1991) recommending the following work of ARMA GARCH model for volatilities (D'Ecclesia & Clementi, 2019). The ARMA approach created by Box and Jenkins (1976) may be a class of random models needed to investigate measurement information considering the ensuing autoregressive moving normal model meant as ARMA (p,q).

$$y_t = \delta + \sum_{i-1}^{p} \phi_i\, y_{t-i} + \sum_{j=1}^{q} \theta_j\, \varepsilon_{t-j} + \varepsilon_t$$

(1)

Where δ may be a constant term, ϕi the ith autoregressive constant, θj the jth moving average constant, and εt error term at time t. p and q are known as the sets of autoregressive and moving normal terms, severally. when the backshift administrator B is applied, Eq. (1) are regularly composed as:

$$(1- \sum_{i=1}^{p} \phi_j\, B^i)\ (y_{t-\mu})\ =\ (1 + \sum_{j=1}^{q} \theta_j\ B^j)\ \varepsilon_t$$

(2)

where B(yt−μ) =yt−1−μ and Bεt=εt −1.

It is used to explore what proportion of Sukuk influenced the market volatility Pre and during the COVID-19 crisis.

In this study, the ARMA-GARCH method is used to assess the parameters of the marginal. The best-fitting model was selected among completely different lag orders (ARMA (0, 0), ARMA (0,1), ARMA (1,0), ARMA (1,1)) with the error term following the traditional, student's t or Generalized Error Distribution (GED).

The estimated parameters for the select models are reported in Tables 4 & 5.

TABLE IV. ESTIMATES OF MARGINAL DISTRIBUTIONS – BEFORE COVID-19

	MS	GS	NF
	GED	GED	GED
μ	0.00014***	0.00178***	0.000237
	(0.000046)	(0.0000)	(0.32956)
λ	-0.146645 ***	-0.149879 ***	0.053997
	(0.000054)	(0.000136)	(0.21395)
δ	-	-	-
	-	-	-
ω	0.000000	0.000000	0.000004 ***
	(0.958645)	(0.845614)	(0.00000)
α	0.025792 ***	0.033352 ***	0.048261 ***
	(0.002054)	(0.001945)	(0.00000)
β	0.961937 ***	0.950449 ***	0.896015 ***
	(0.00000)	(0.00000)	(0.00000)
Shape	1.378927 ***	1.387345	1.238533 ***
	(0.00000)	(0.518705)	(0.00000)

Source: Authors' elaboration

* The table gives the constraint estimations of marginal distribution function along with standard error and p-value of GARCH test for the suitability of distribution function. The constraints of peripheral distribution function are given in eq. (1&2). For GARCH testing, p-values which are lesser than 0.05 shows that null hypothesis is rejected. *, **, *** shows statistical consequence at 10%, 5% and 1% level correspondingly.

TABLE V. ESTIMATES OF MARGINAL DISTRIBUTIONS – DURING COVID-19

	MS	GS	NF
	STD	STD	STD
M	0.000329 ***	0.000313 ***	0.001102 ***
	(0.002897)	(0.004982)	(0.0000)
Λ	0.856217 ***	0.856441 ***	0.397966 ***
	(0.00000)	(0.00000)	(0.00000)
Δ	0.730880 ***	-0.730492 ***	-0.343426 ***
	(0.00000)	(0.0000)	(0.0000)
Ω	0.000000	0.000000	0.000007
	(0.955101)	(0.958515)	(0.513746)
α	0.140091 **	0.138502 **	0.147472 *
	(0.015616)	(0.018440)	(0.077205)
β	0.829632 ***	0.833673 ***	0.818538 ***
	0.00000)	(0.00000)	(0.00000)

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	MS	GS	NF
Shape	8.602566 **	8.456019 **	0.988159 ***
	0.023592)	(0.021254)	(0.00000)

Source: Authors' elaboration

* The table gives the constraint estimations of marginal distribution function along with standard error and p-value of GARCH test for the suitability of distribution function. The Constraints of peripheral distribution function are given in eq. (1&2). For GARCH testing, p-values which are lesser than 0.05 shows that null hypothesis is rejected. *, **, *** shows statistical consequence at 10%, 5% and 1% level correspondingly.

As shown in the above Tables, all the return series are best captured either by the GED or student t distribution based on AIC. The Autoregressive and Moving Average (ARMA) terms are statistically significant for the selected variables. The ARCH coefficients represented by α, exhibits the influence of past squared residuals. On the other hand, the GARCH coefficient represented by β shows the impact of lagged forecasted variance. All coefficients are statistically significant at 1% for all series.

Further, the sum of ARCH and GARCH coefficients is closer to unity which showing that the shocks are persistent. Shape parameters are statistically significant indicating that the return series was asymmetric.

Lastly, the diagnostic tests could not reject the null hypothesis of no ARCH effect and no serial correlation.

4.2 C-vine Copula Approach

A Copula is a variable accumulative distribution operate of which marginal distribution is uniform on the interval [0,1] and it captures the dependence structure of a variable distribution. (Rüschendorf, 2009). Multi-data distribution methods have high flexibility as a result of it permits scholars to shape the marginal CDFs aboard a dependable structure expressed in Copula's work. In alternative words, through Copula, we will split the combined allocation operation Fxy into a phase that explains the reciprocity among the random variables X and Y and also the classes solely describe a marginal behaviour.

According to Sklar's Theorem, there exists a copula perform C (.) such for all x,y$\in$ $[-a, a]$:

$$F_{XY}(x,y) = C\,(F_X(x), F_Y(y)) \tag{3}$$

Where Fx (x) and Fy(y) denote the marginal distribution functions

The theory additionally states that joint distribution is given Fxy performance; copula is exclusive for Fx × range Fy range, which may be a set of the ranges of the marginal CDFs. This suggests that the verb is going to be distinctive on the off chance that the marginal Fx and Fy are persistent. Depending on the formulation, copula could be used to connect marginal to a multivariate of distribution functions, which could also deteriorate into its univariate minimal appropriation and copula catches the reliance structure.

On account of bivariate appropriation incorporates a thickness Fxy (x,y), and this is accessible, further:

$$F_{XY}(x,y) = C\,(F_X(x), F_Y(y)).\, f_X(x).\, f_Y(y) \tag{4}$$

Where c(.) is the depth of the copula.

A necessary property of the copula is that it provides important details associated with the mean dependence referenced and tail dependence (excessive dependence), that tests the chance of the two markets can collectively together expertise extreme top or drawback worth movements. Unsurprisingly, the higher tail dependence suggests the relative quantity of size inside the higher (lower) portion of the quartile distribution.

Attained from copula, higher and smaller tail Dependency processes area unit given as:

$$\lambda_U = Pr\,[X \geq F_X^{-1}(u) \mid Y \geq F_Y^{-1}(u)] = \lim_{u \to 1} \frac{(1-2u+C(u,u))}{1-u} \tag{5}$$

$$\lambda_L = Pr\,[X \leq F_X^{-1}(u) \mid Y \leq F_Y^{-1}(u)] = \lim_{u \to 0} \frac{C(u,u))}{u} \tag{6}$$

where $0 \leq u \leq 1$, $0 \leq \lambda_u, \lambda_u \leq 1$. If $\lambda_L > 0$ ($\lambda_L > 0$), then variables X and Y will in general be lower (upper) tail subordinate. This suggests a non-zero likelihood of noticing a tiny (huge) esteem for one arrangement with a minuscule (enormous) esteem for another arrangement (Mensi, Hammoudeh, Shahzad, & Shahbaz, 2017).

Further, different copula families are used to study the dependence between the variables. Therefore, standard residuals from the GARCH models are transformed into uniform distribution using ECDF.

4.2.1 Copula Functions

This paper uses a varied family of copula functions that have exceptional dependency structures. It includes Student-t (symmetric dependency), Rotated Gumbel 180(Lower and Upper tail dependency), Gaussian (Upper tail dependency) and Frank (symmetric tail dependency). The characteristics of these Copulas are specified below:

The rotated Gumbel copula has an only a lower tail dependency.

CRG(u1, u2; δ) = u1+ u2 − 1 + CG(1 – u1, 1 – u2; δ). (7)

Student t-Copula shows only symmetric tail dependency.

$$\text{Cn.p }(u,v) = \int_{-\infty}^{t^{-1}(u)} .\, n \int_{-\infty}^{t_n^{-1}(v)} . \frac{1}{2\pi\,(1-p2)1/2}\, exp \left\{1 + \frac{s^2 - 2pst + t^2}{n(1-p^2)}\right\}^{\frac{-n+2}{2}} \text{dsdt} \tag{8}$$

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$\lambda L = \lambda U = 2 + [1 - tn{-}1\sqrt{(n+1)}\,(1+p,(1-P))]$
(9)

Gaussian Copula has only Upper tail dependency.

$$C_R^{Gauss}(u) = \phi_R\ \left(\phi^{-1}(u_1)\ldots\phi^{-1}(u_d)\right)$$
(10)

Frank copula has only symmetric tail dependency.

$$-\frac{1}{\theta}\log\left[1+\frac{(\exp^{(-\theta)-1}(\exp(-\theta u)-1)}{\exp(-\theta)-1}\right]$$
(11)

Another phase is to identify a sequence of the variables in the C-Vine Copula structure. Here, MS is placed in the first place in the order of the variables. For the rest of the variables, this study has used the method proposed by (Panagiotelis, Czado, & Joe, 2012)for identifying the maximal tree spanning by arranging the variables following their sum of absolute pairwise estimated Kendall's tau $\hat{S}_i = \sum_{j=1}^{d} \left|\hat{T}_{i,j}\right|$ The variable with the highest dependency is placed at the next sequence and so on.

By this method, the order of the variable is decided as MS, GS, and NF. This sequence applies to the Pre and during COVID 19 periods datasets both.

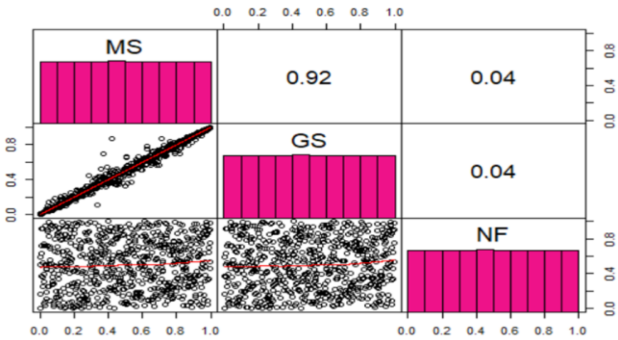

Figure 5: Pairwise Scatter Plot (Before Covid 19). Source: Authors' elaboration

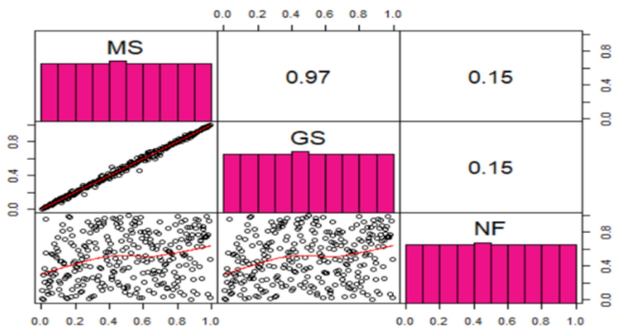

Figure 6: Pairwise Scatter Plot (During Covid 19). Source: Authors' elaboration

Figures 5 and 6 show Kendall's τ (above the diagonal) and pairwise scatter plot (below the diagonal) of the copula data. From the graph, it is evident that MS has strong dependence while NF has rather weak dependence on other indices. From the estimated Kendall's τ, MS is the highest dependent variable with the rest of the variables as it has the greatest sum of Kendall's tau, which labels it as the second variable.

The next step involves choosing a suitable copula family for each pair and estimating their parameters accordingly. Tables 7 and 8 summarize the results of parameters estimated for the GED copula structure. The first tree reflects the degree and structure of dependence between MS and two other indices- GS and NF. The estimated Kendall's tau evidenced that the degree of dependence has increased between MS and the other two indices the COVID-19 period. This implies that GS and NS are more positively correlated with the movements in the returns of MS.

The dependence structure between GS and NF is shifted from rotated Gumbel 180 degrees to Frank copula. Though, both the copulas measure the lower tail dependence suggesting the downward movements in the index's returns are more correlated than upward movements.

In the view of symmetric tail dependency Student-t, Gaussian, rotated Gumbel and Frank copulas shows the dependency among Sukuk and Nifty Shariah index is optimistic and substantial, opposing the view towards the Sukuk as to be used as hedger and instrument of risk diversification in the risky market situation also. Additionally, the proof of optimistic symmetric upper and lower tail dependency given by Student- t copula suggests that Sukuk and Nifty Shariah index markets change collectively but at different periods before and during Covid19. For GCC and MENA Sukuk, there is a sign of optimistic dependency, even the tail dependency is lower, which shows the optimistic collective response towards the before Covid19 situation. For GS and NF, the symmetric copulas offer the sign of optimistic dependency by supportive sign of upper and lower tail dependency. Though, for GS and NF, we discover a sign of negative lower tail dependency with MS. So, with the features of oblique copulas, it gives the benefit for the diversified portfolio and managing the risk before the crisis.

Next, in the second tree, we tend to explore the dependence between GS and NF conditional on MS. Given the returns of MS, the worth of Kendall's tau between MS and NS increased by a positive margin duringCOVID-19 period. Also, the dependence degree of MS and NF is highest among all the pairs. It is to be noticed that there are asymmetrical co-movements as extreme losses are more correlated than extreme gains depicted through lower tail dependence. Furthermore, conditioned on MS,GS and NF had a higher negative degree of dependence during the COVID-19 period. The increased negative dependence could be due to high volatility in the index (during the COVID period).

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Table 8. During Covid-19 period (1st Nov 2019 -30th Nov 2020)							
	Pairs	**Copula**	**Par1**	**Par2**	λ_L	λ_u	**Kendall's tau**
Tree 1	MS-GS	Student t	0.9979992	2.83224	0.9536992	0.9536992	0.9597219
	MS-NF	Rotated Gumbel 180	1.161558	-	0.1838131	0	0.1390873
Tree 2	GS-NF│ MS	Frank	-0.101906	-	0	0	-0.0113283
Source: Authors' elaboration							

For GS and MS, there is a sign of optimistic dependency, with symmetric upper and lower tail dependency, that shows the optimistic collective response towards the during Covid19 situation. For MS and NF, the symmetric copulas offer the sign of optimistic dependency by supportive sign of high lower tail dependency. Though, for GS and NF, the symmetric copula gives the sign of negative dependence with a higher and lower tail dependency with MS. It illustrates that dependency with globally risky issues changed but asymmetrical due to Covid19.

V. Conclusions

The prodigious possible development and low apparently susceptibility of Nifty Shariah index as compared to Sukuk throughout the strained financial situation. It attracts the curiosity of Muslims, Conventional stockholders as well as portfolio managers globally. Due to the Covid19 pandemic, the relationship between Sukuk and Shariah index is analysed and concurrence rises on the basis of literature related to the dependency among Islamic finance and another index market, specifically in the risky market situation.

We examine the volatility and dependency among the GCC and MENA Sukuk, and Nifty Shariah 50 index market by using the varied family of copula methods having different dependency structures with different periods i.e., 1st April'17 to 31st Oct'19 as before Covid19 and 1st Nov'19 to 30th Nov'20, the practical outcomes show substantial high and low tail dependency among the Sukuk and Shariah market before Covid19.

GS and NF indices are highly positively correlated to each other in returns of MS. We also find negative dependency among the GS and NS during Covid19 with MS. The outcomes are varied due to the time variation copulas that shows dependency diverges over time for all variables.

We find that Sukuk has consistent tail reliance as Bahrain, Oman, and Abu Dhabi; these discoveries counsel that these Gulf markets area unit getting constant direction and the same magnitude throughout the Covid-19 era additionally as these three also. There are asymmetrical co movements for losses and gains. Moreover, conditioned on MS, the GS and NF had a higher negative degree of dependence within and throughout the COVID-19 period. The enhanced negative dependence may be because of high volatility in the index (throughout the COVID period).

Hereafter, H01 was rejected because there is higher and lower tail dependency shown in Sukuk and Nifty Shariah 50 before Covid-19 and during COVID-19 but GS and NF indices are highly positively correlated and dependent to each other in returns of MS during COVID-19.

H02 was rejected because before COVID-19 Sukuk and Nifty Shariah 50 indices are less volatile due to the news effect but highly volatile during COVID-19. Sukuk and Nifty Shariah 50 stock market are Conditioned on MS, the GS and NF show high volatility in index.

Lastly, the outcome indicates some consequences and implications for portfolio managers and global stakeholders seeking interest to invest in the ethical stock market. Meanwhile, the ethical stock market is pessimistically impacted by discriminating dread, tension and concern in the conventional stock market, the hedging assets and hedging strategies seem to be safe in the ethical stock market. Furthermore, this study would be helpful to find out the significance of ethical finance functions safe havens for world investors by using the copula model.

Table 7 Pre Covid-19 period (3rd April 2017-31st Oct 2019)							
	Pairs	**Copula**	**Par1**	**Par2**	λ_L	λ_u	**Kendall's tau**
Tree 1	MS-GS	Student t	0.992768	2.0001	0.923475	0.923475	0.9233846
	MS-NF	Rotated Gumbel 180	1.045677	-	0.0596446	0	0.043679
Tree 2	GS-NF│ MS	Gaussian	-0.03402	-	0	0	-0.021667
Source: Authors' elaboration							

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Followed Appendix A.

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APPENDIX A. REVIEW OF THE LITERATURE

S. No	Authors (year)	Conceptual/ Data (Index and time period)	Methodology	Findings
1	Irfan (2020)	SENSEX, NIFTY (2010-2012)	Beta (CAPM), CAGR, Correlation, T-test	There is no difference between Shariah index and benchmark indices Return and conjointly in Shariah index and customary index. It found that equity primarily based Shariah index is social accountable to invest in investors especially small and private investors.
2	Sherif (2020)	UK Dow Jones index, FTSE100 index. Time period is from January'20 to May 20.	Regression	A well-structured and important statistical correlation among the COVID-19 epidemic and the performance of a general stock market indices. It has shown a negative impact compared to the market indicator of complaints. It has co-examined the effect of COVID-19 on the performing of UK 10 sector clusters. The IT revenues of the IT sector have done much better than the market. return of shares in the field of consumer understanding,
3	Grassa & Miniaoui (2018)	88 Sukuk and 287 conventional bonds of GCC countries were taken. The time period is from 2000 to 2015 (15 years)	Correlation, GMM	Prefer Sukuk in the issuance of large debt and long tenor, because it gives negative correlation in terms of credit rating.
4	Aloui, Hammoudeh, & Hamida, (2015)	GCC Shariah stocks and Sukuk. The time period is from 2008-2013 (6 years)	Markov, univariate and multivariate EGARCH	It propounds changes in sukuk price index having a considerable impact on chance of transmission across regime. It has many economic and managerial implications for Islamic portfolio managers, Islamic hedge funds, stock market regulators, and policy makers
5	Bhuiyan, Rahman, Saiti, & Ghani (2019)	Bond index (US, UK, Australia, Canada, Germany and Japan) and Malaysia sukuk index. The time period is from 2010 to 2015 (5 years)	Wavelet coherence, multivariate GARCH	Developed market shown lower co movement of returns between bond and Malaysian sukuk. Malaysian Sukuk shown negative correlation with bond market, good sign of diversification. It divulges alluring opportunity with credit quality to invest in fixed securities.
6	Dharani, Narayanamoorthy, & Natarajan(2011)	Nifty Shariah Index, Nifty Index 2007 to 2010 (4 years)	Sharpe, Treynor, Jensen and T- test	It was found that Nifty Shariah underperformed throughout sample period. Each were underperforming and consistent with respect to risk free return. Nifty shariah is less volatile as compared to Nifty index.

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7	Aloui, Hammoudeh, & Hamida, (2015a)	GCC Sukuk indices and Shariah stocks. Daily data of 240 days.	Wavelet, VaR	It was found that there is strong dependency between shariah stocks and sukuk index. Portfolio diversifications also vary with frequencies and time.
8	Bhuiyan, Puspa, Saiti, & Ghani, (2020)	Sukuk and Bond indices. The time period is from 2010-2015 (6years)	VaR	It analyses that VaR amount of sukuk indices is way under VaR of bond indices. Sukuk index with bond indices can cut back the VaR portfolio by 30-50%
9	Abadi & Silva, (2020)	MENA Region 2007-2015 (8 years)	Sharpe ratio, Multifactor Model	Performance measure and period of analysis affects the performance of Islamic and non-Islamic portfolios. Each portfolio found to be underperforming against the benchmark. Islamic portfolios underperformed in global financial crisis. non-Islamic counterparts throughout the Arab Spring their performance was at par
10	Jawad & Faris, (2019)	Mena region, S &P Sukuk and Bond index	GARCH, EGARCH, ARCH-LM	It founds that Sukuk reacts lesser to shocks in comparison to bond. Sukuk are more stable and have less risk.
11	Ali, (2020)	Mena Sukuk, Mena Bond	ADRL, DCC GARCH, Copula	It founds that Mena Sukuk is correlated with Mena equity and Mena bond in short run and in long run it is correlated only with Mena.
12	Boujlil, Hassan, & Grassa, (2020)	143 Sukuk and 602 conventional sovereign bonds of 16 OIC countries were taken. The time period is from 2000 to the year 2015 (15 years)	Correlation and Logit model	National, financial, and macroeconomic indicators decide about the governments' choice of sovereign debt. Countries with developed financial markets, could issue sovereign Sukuk than sovereign bonds, to diversify their monetary markets with new debt products.
13	Kumar & Sahu, (2017)	India region Shariah indices and stock market. The time period is from 2006 to 2015. (9.5 years)	VECM, Granger, VAR, Johansen's	Long run equilibrium relation between Dow Jones index and macroeconomic indicators. In short run, unidirectional causality between Dow Jones index and money supply. Indian Islamic capital market is inefficient due to Co-integration between stock return and macroeconomic indicators.
14	El-Khatib & Samet, (2020)	45 emerging countries stock market index	GARCH	It shows harshly struck and sharp decrease in stock market indices. It causes a growth in volatility levels on sovereign credit default.
15	Ashraf & Marashdeh, (2018)	Shariah Indices from Kuwait, Oman, Qatar, Bahrain, Saudi Arabia and the United Arab Emirates, 5 years 6 months	Breusch Godfrey LM test, KPSS test and GPH (Geweke Porter Hudak) test	It was noticed in this study that during the study period, the returns of all GCC Equity Shariah were not informationally economical however fractionally integrated.
16	Siddiqui &	Nifty 50 Shariah,	Correlation test,	It was seen from the analysis that the returns of

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	Sheikh, (2016)	Nifty 500 Shariah, Nifty 50 and Nifty 500, 9 years	Cointegration test, Granger Causality test, GMM and 3SLS	Shariah Indices are better, and it is less risky as compared to underlying indices.
19	Reddy & Fu (2014)	Shariah and conventional stocks for companies listed on the Australian Stock Exchange (ASX), 13 years	Risk adjusted. return, Sharpe rating, Treynor rating, Jensen alpha rating, and Multiple Reduction Test	The study shows that Shariah based indices are better investment options while both indexes have a tendency towards act in the same way.
20	El Khamlichi, Sarkar, Arouri, & Teulon, (2014)	Islamic Indices and conventional benchmarks of Dow Jones (12 years 2 months), Financial Times (3 years 4 months), Standard & Poor's (4 years 2 months) and Morgan Stanley (3 years 2 months)	Cointegration test and Variance ratio test	The study concluded that Shariah guidelines work other than in the case of MSCI and FTSE. Whereas the Islamic Indices and conventional indices of Dow Jones and S&P are found to be integrated and hence, provide opportunity of investment diversification.
21	Akguc & Al Rahahleh, (2018)	Standard and Poor Compustat global database of GCC region. The time period is from 2000 to 2014	Multi variate regression analysis	Shariah firms are more profitable than Non Shariah firms
24	Al-Khazali, Lean, & Samet, (2014)	Nine Dow Jones indices, 17 years	Correlation, Capital Asset Pricing Model (CAPM) statistic and Davidson–Duclos (DD) tests	The results indicate that traditional indexes overshadow Shariah index all markets with the exception of European market. Whereas Islamic indices for world, European and US markets overlook their traditional equivalents.
26	Tyagi & Rizwan, (2012)	BSE Tasis Shariah and Sensex, 1 year 6 months	Graphical method	The study revealed that Sensex and Tasis Shariah behaved similarly for the period under study.
27	Natarajan & Dharani, (2012)	Nifty Shariah index, Nifty index and BSE Sensex index, 5 years	t-test, CAPM to estimate beta, and correlation Matrix	It was determined that the median yields of the sharia Compliant Stocks and benchmark index were comparable. The returns from the sharia index were just like the returns attained from the common index. Thus, sharia Compliant investment is taken into account a viable and ethical investment opportunity.
28	Munusamy & Natarajan, (2011)	Nifty Shariah index and Nifty index, 4 years	T-test	No difference was found between average day-wise returns of the Nifty Shariah index and Nifty Index during the period of study. The effect of Ramazan was also observed in the Indian stock market. Also, seasonal variation exists in the Shariah Index.

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29	Mansor & Bhatti, (2011)	Malayasian Shariah Mutual Fund and traditional portfolios, 13 years 4 months	T-test and Correlation analysis	The results revealed that Shariah portfolio earns less returns in regard of traditional equivalents and riskier than conventional one.
30	Hassan & Girard, (2011)	Dow Jones Islamic Market Index (DJIM) and their non-Islamic counterparts, 10 years	Sharpe, Treynor, Jensen and Fama's selectivity, four-factor pricing models and cointegration test	No distinction was found among Islamic and non-Islamic files. The Dow Jones Islamic lists surpass their ordinary partners from 1996 to 2000 and fail to meet expectations them from 2001 to 2005. Generally, comparable award to hazard and enhancement edges exists for each the Islamic and regular lists.
31	Sadeghi, (2008)	Daily stock prices, bid ask to spread and volume of trade for 188 publicly traded companies on Shariah Index of Bursa Malaysia, 7 years	Event Study Methodology	The results showed that the introduction of Shariah index had a positive impact on the performance of financial performances of stock included in the study.

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The Sharia Compliance Level of Islamic Banks in Asia and Its Implications on Financial Performance and Market Share

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Abstract— **This study aims at showing the influence of the Sharia compliance level of Islamic banks in Asia and how it affects their financial performance and market share. It analyzing whether the average level of the Sharia compliance of Islamic banks in Asia is adequate. It incorporates a descriptive quantitative research design. The sample comprises 62 Islamic banks located in Asia with the observation period ranging from 2016 to 2018. However, following the analysis, the results of the study could not show whether the Sharia compliance level of Islamic banks in Asia has an influence on the financial performance and market share. The limiting factors behind this could be attributed to the limited sample and the short observation period of this study. However, the results of this study can be considered by stakeholders when investing their funds. In this regard, the regulators in Indonesia are expected to make deeper regulations for Islamic banks. This study contributes to the Islamic economic literature because the number of studies that look at the level of Sharia compliance with one measurement in the Asian region and see the implications of the level of this compliance on financial performance and market share is still limited.**

Keywords- Sharia; compliance; financial; performance; Islamic; bank

I. INTRODUCTION

Islamic banking operates side by side with conventional banks. It makes the competition between them very challenging [1]. The competition drives Islamic banks (IBs) to work harder and be more creative and innovative in order to gain adequate market shares [2]. The main challenge of Islamic banking and finance is to provide products and services that are diverse, innovative, and competitive with the conventional financial instruments while still being in accordance with Sharia [3]. In carrying out its operations, IBs base their rules on the Qur'an and Hadith. All Islamic banking activities must comply with the Islamic Sharia principles and regulations made by the Sharia supervisors [4]. In this regard, shareholders and Islamic scholars are entitled to the services provided by Islamic banks in accordance with Sharia law [5].

There are several studies which show that Sharia compliance is the most important factor for prospective customers in choosing an IB [6] [7] [8]. Sharia compliance also guarantees an IB's credibility and inspires trust in their shareholders and stakeholders. To achieve uniformity of Sharia compliance among financial institutions, the Islamic Financial Services Board (IFSB) and the Accounting and Auditing Organization of Islamic Financial Institution (AAOIFI) were formed. Their responsibilities include forming the accounting, auditing, and government standards while also implementing the ethics that are in accordance with the Islamic law for financial institutions. An IB is determined by its commitment in following Sharia in all aspects [9]. The compliance of IBs and financial institutions to AAOIFI and IFSB standards is very important to manage the Sharia compliance risk, mitigate operational risks, and ensure transparency in financial statements [10].

Islamic financial institutions are exposed to Islamic disobedience risk which is a unique risk for these institutions [8]. Several cases of IBs and financial institutions violating Sharia principles raise serious doubts about Sharia compliance [7]. Examples include the Dubai Islamic Bank (DIB) scandal, Sunrise Equities Inc. case, and Dana Gas sukuk scandal. IBs and conventional banks are very similar in how they operate, due to which the former often ends up violating the Sharia principles and hindering the achievement of a Sharia principle's goals [11] [12]. Many of the financing offered by IBs have similarities with debt instruments rather than profit and loss sharing (PLS) practices. These practices negatively affect public perception [7]. They make customers skeptical of an IB with regards to its Sharia compliance [13].

In this regard, a Sharia compliance analysis would be beneficial for prospective customers and bank customers [8]. Most shareholders and investors are very concerned about the funds they invest and whether it is in alignment with Sharia principles or not [14] [7]. Therefore, there is an obligation on

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banks to reflect Islamic values in all their activities [9]. Sharia compliance is also important to promote trust, as it will increase customer protection. Customers trust an IB with their investment because they believe that it truly adheres to Sharia principles that prohibit usury, speculation, and undue risk [7]. In this regard, IBs have claimed that they are complying with the Sharia principles [15] [10] [16].

However, the fact remains that the level of Sharia compliance cannot be qualified as compliant or non-compliant; there must be a ranking system that regulates compliance with the law, including levels/categories such as high, satisfying, weak, and non-compliant. The different levels of Sharia compliance between banks in different countries cannot be compared because they use different measurements. There is no certain model that can describe the Sharia compliance of each IB [13]. Therefore, it is important to use a uniform measurement model so that the Sharia compliance levels of IBs in Asia can be compared fairly. The Sharia compliance ranking system is very helpful in measuring the progress toward achieving the goals of the Islamic Financial System and in gaining the stakeholders' trust. In addition, high compliance can help and support AAOIFI and IFSB in improving improve their standards so that they can be applied by Islamic financial institutions globally [15] [8].

Market forces should obey Sharia principles to increase the efficiency and competitiveness of the Islamic banking industry [17]. A majority (75%) of respondents agree that high Sharia compliance guarantees more financial benefits in Bangladesh [10]. A study using five categories of financial performance, namely profitability, efficiency, risk, asset quality, and liquidity, to examine the financial performance of IBs and conventional banks in Pakistan was conducted. The result shows that IBs are relatively better in terms of profitability, efficiency, risk, and liquidity management, while conventional banks are superior in asset quality [18]. On the other hand, Sharia compliant companies underperform compared to non-Sharia compliant companies. The Sharia compliance also has an impact on a bank's market share. The higher the level of a customer's or prospective customer's trust in IBs, the more people will invest their funds in these banks [19].

The aim of the study is to also expand the scope of or improve upon the previous research. The relationship between Sharia compliance and an IB's performance in Asia is an interesting issue. No previous paper discussed this topic and case before. The structure of the paper starts from the introduction and then proceeds to the literature review and hypothesis development. This is then followed by the research method and the analysis, the last of which is the conclusion.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

A. *Corporate governance theory*

Corporate governance is a set of internal corporate arrangements that defines the relationship between managers and shareholders and is aimed at supporting financial stability, sustainable growth, and economic efficiency. The OECD principles can be adapted by Islamic financial institutions so that they can conduct business according to Sharia principles which are fair and honest with others. The scope of governance in Islamic principles is broader, as it not only prioritizes the interests of stakeholders but also the socio-economic interests. Based on the OECD principles, the only party entitled to decision making and internal business transaction participation is the Board of Directors (BOD) and senior management. However, in the case of in Islamic principles, anyone related to the organizational stakeholders is given the full right and responsibility to participate and convey their thoughts and ideas in reforming corporate governance [20].

The distribution of profit sharing is carried out fairly in accordance with the agreement of the two parties (bank and customer), which is determined at the time of the contract. Disclosure and transparency are emphasized in governance according to the Islamic principles. According to these principles, banks or financial institutions are not only responsible to the BOD, but also to Allah SWT. Therefore, it is important for IBs to pay attention to the Sharia compliance, as it is one of the good governance principles. By complying with Sharia principles, an IB has achieved certain key goals, namely carrying out activities that are free of usury and oriented to profit and social welfare.

B. *Financial performance*

Financial performance is a company's ability to manage and control its resources [21]. The measurement of financial performance is carried out by looking at the profitability level of the company, such as Return on Assets (ROA) [22] [23]. This ratio measures the company's ability to use its assets to make a profit. Financial ratios are taken from financial statements and made available to the public [24] [25]. A financial ratio analysis is useful for the management and interested parties to evaluate financial conditions expeditiously.

C. *Market share*

Market share is a proxy to see market power [26]. Companies that have a high market share tend to have more innovation. Companies with high market shares that continue to innovate also get higher valuations in the stock market than companies that do not [27].

D. *Sharia compliance*

In carrying out its operations, IBs are required to comply with laws, regulations, and Islamic principles because they are fundamental factors that distinguish IBs from conventional banks. Despite close supervision being carried out by various parties in this regard, various Sharia principles have been violated in the banking industry. Islamic scientists says that in conducting Sharia banking transactions, an IB does things that are contrary to Islamic regulations [28]. This is caused by ineffective governance, human resources, the role of the Sharia supervisory board, and unscrupulous people [29]. The implementation of Sharia compliance in Islamic banks must be reported and requires standards in order to produce a systematic financial report that can be understood by all parties who need information. AAOIFI has developed standards on

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auditing, governance, and accounting for Islamic financial institutions. In this regard, the Sharia compliance can be influenced by various factors, namely bank size [10], a Sharia internal audit and audit committee, profitability, board independence, and liquidity [30].

E. Hyphothesis development

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Most IBs adhere to Islamic principles, such as those in Bahrain and Malaysia [16]. However, it is worth noting that not all banks with Islamic labels follow Sharia principles [7]. One reason or this is that the modern Islamic banking financial system is similar to conventional banking [11] [12]. Only a small portion of financing that is actually based on PLS and Islamic deposits is not interest free so it is as same as conventional deposits too. This certainly violates Sharia and hinders the achievement of Islamic principles. In addition, there are several cases of Sharia violations committed by IBs that occurred during the mid-1980s. One example of this is how Islamic banks in Turkey have deviated from the practice of Islamic banks [31]. In this context, the question on whether IBs in Asia comply well with Sharia remains to be answered. This has led to the formulation of the first hypothesis:

H1: The average level of the Sharia compliance of Islamic banks in Asia is compliant.

Increasing the competitiveness and efficiency of the Sharia banking industry can be done if the market force complies with the Sharia principles [17]. The greater the compliance level of IBs with Islamic law, the greater the customer's intention to get funds from these banks so that the latter can sustain their customer base [32]. The majority (75%) of respondents agree that better Sharia compliance guarantees more financial benefits in Bangladesh [10]. Islamic banks are relatively better at profitability, efficiency, risk, and liquidity management than conventional banks [18]. On the other hand, companies that are Sharia compliant perform lower than companies that are non-Sharia compliant [19]. It is on this basis the second hypothesis has been formed:

H2: The more compliant the Islamic bank is with Sharia principles, the better the Islamic bank's financial performance.

The more compliant the IBs are with Islamic principles and regulations, the greater the customer's intention to continue to obtain funds from them [32]. Customers will check for the Islamic compliance of an IB before deciding to choose it [7]. This will certainly increase the number of customers and the market share of the bank. In this regard, the third hypothesis has been formed:

H3: The more compliant the Islamic banks are with the Sharia principles; the market share of the Islamic banks will increase.

III. RESEARCH METHOD

This study follows a descriptive quantitative research design that uses secondary data, namely the annual financial statements published by Islamic bank. The sample for this study comprises all the IBs of Asia that are registered in ORBIS from 2016 to 2018. The annual reports for each IB are obtained through its official website. Out of the 113 IBs in the Asian region, only 62 fulfilled the sample selection criteria. Following this, the researchers tested the Sharia compliance with financial performance using a simple linear regression analysis with the following model.

$ROAit = \beta0 + \beta1\ Complianceit + Sizeit + Branchit + Ageit + \varepsilon$

$ROEit = \beta0 + \beta1\ Complianceit + Sizeit + Branchit + Ageit + \varepsilon$

$OERit = \beta0 + \beta1\ Complianceit + Sizeit + Branchit + Ageit + \varepsilon$

$NPFit = \beta0 + \beta1\ Complianceit + Sizeit + Branchit + Ageit + \varepsilon$

$CTDit = \beta0 + \beta1\ Complianceit + Sizeit + Branchit + Ageit + \varepsilon$

$CARit = \beta0 + \beta1\ Complianceit + Sizeit + Branchit + Ageit + \varepsilon$

$FDRit = \beta0 + \beta1\ Complianceit + Sizeit + Branchit + Ageit + \varepsilon$

$MSit = \beta0 + \beta1\ Complianceit + Sizeit + Branchit + Ageit + \varepsilon$

Descriptions:

ROAit: Return on Assets of Islamic bank i in t

ROEit: Return on Equity of Islamic bank i in t

OERit: Operating Expense to Revenue of Islamic bank i in t

NPFit: Non-Performing Financing of Islamic bank i in t

CTDit: Cash to Deposit of Islamic bank i in t

CARit: Capital Adequacy Ratio of Islamic bank i in t

FDRit: Financing to Deposit ratio of Islamic bank i in t

MSit : Market Share of Islamic bank i in t

Complianceit: Sharia compliance of Islamic bank i in t

Sizeit : The assets value owned by Islamic bank i in t

Branchit : Number of branches owned by Islamic bank i in t

Ageit : Period years of bank operates

The level of Sharia compliance from IBs is measured by using the Sharia compliance index developed by Ashraf and Lahsasna [13]. There are 14 indicators that look at this. They are grouped under five categories: support from regulators, quality of Sharia supervision, business structure, composition of assets and deposit base, and capital adequacy standards. Each indicator is assessed according to a predetermined score. A bank can get a maximum risk-weighted score of 150 and a minimum risk-weighted score of -138. The formula used to get the percentage of each IB is

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% Sharia compliance= (Achieved score)/(Maximum achievable score)

After the IB compliance percentage value is obtained, the IB is classified as shown in Table 1.

Table 1. Sharia compliance levels

Achieved degree of compliance	Rating	Interpretation
≥80%	SSS	High Sharia compliance
50%–80%	S+	Satisfactory Sharia compliance
0–50%	S-	Weak Sharia compliance
Nilai negatif	SN	Sharia non-compliant

Source: [13]

The dependent variables in this study are financial performance and market share. Financial performance is measured using several financial statement ratios, namely ROA, ROE, OER, NPF, CTD, FDR, and CAR. The market share variable is measured using the formula from Berger [26]:

Market share= (total assets of Islamic banks/ total assets of national Islamic banks) x 100%

The total IB national asset is obtained from the stability report issued annually by the IFSB. In the stability report, the total IB assets in the world per region and their presentations for each country are given. Based on this percentage, the total assets of the national Islamic banking in each country are calculated, while the total IB assets are obtained from each IB's annual financial statements.

IV. RESULTS

Table 2. Descriptive statistics

Variables	Average	SD	Max	Min
ROA	0,0101	0,0294	0,1842	-0,1077
ROE	0,0802	0,1347	0,3685	-0,9401
OER	0,7223	0,5764	6,2130	-0,2039
NPF	0,0579	0,1079	0,8910	0
CTD	0,4709	3,9200	53,529	0,0015
CAR	0,1847	0,2579	1,6307	-1,2508
FDR	0,8410	0,5613	4,7373	0,0190
MS	0,2228	0,2739	1,0000	0.0156
SC	0,6982	0,0736	0,84	0,44
Descriptions: ROA *(Return On Asset)*; ROE (*Return On Equity*); OER (*Operating Expense to Revenue*); NPF (*Non Performing Finance*); CAR (*Capital to Adequacy Ratio*); CTD (*Cash to Deposit*); FDR (*Financing to Deposit Ratio*); MS (*Market Share*); SC (The value of Sharia compliance level)				

Source: Authors' elaboration

The value of each variable in Table 2 shows the effectiveness of the investment management (ROA) and capital (ROE) conducted by an IB, the amount of profitability of IBs (OER), the quality of financing provided by IBs (NPF), the amount of IB funds used for financing (CTD), IB capital adequacy (CAR), and the amount of financing provided for deposits received by the banks (FDR). The highest ROA value of 0.1842 is owned by the Bank of Punjab Taqwa Islamic Banking (Pakistan, 2018) while the lowest ROA value of 0.1077 is owned by Bank Mega Syariah (Indonesia, 2017). The highest ROE value of 0.3685 is owned by Al-Hilal Bank (Kazakhstan, 2018) while the lowest ROE value of -0.9401 is owned by Bank Panin Syariah (Indonesia, 2017). Meanwhile, the highest OER value of 6.2130 is owned by ICB Bank (Bangladesh, 2017) while the lowest OER value of -0.2039 is owned by ICB Bank (Bangladesh, 2018). The highest NPF value of 0.8910 is owned by the Muamalat Malaysia Berhad Bank (Malaysia, 2017) while the lowest NPF value of 0 is owned by the ABC Islamic Bank (Bahrain, 2016). The highest CTD value of 53,529 is owned by Maybank Syariah (Indonesia, 2018) while the lowest CTD value of -0.0015 is owned by the Alliance Bank (Malaysia, 2016).

The highest CAR value of 1.6307 is owned by Maybank Syariah (Indonesia, 2018) while the lowest CAR value of -1.2508 is owned by the ICB Islamic Bank (Bangladesh, 2018). The highest FDR value of 4.7373 is owned by the Khaleeji Bank (Bahrain, 2017) while the lowest FDR value of 0.0190 is owned by Bank Muamalat Malaysia Berhad (Malaysia, 2018). The highest MS value of 1,0000 is owned by Al-Hilal Islamic Bank (Kazakhstan), Islamic Bank of Thailand (Thailand), and the Maldives Islamic Bank (Maldives) while the lowest MS value of 0.0156 is owned by Maybank Syariah (Indonesia, 2018). The Islamic bank that got the highest value of Sharia compliance (0.84) is the Meezan Bank (Pakistan) while the one who got the lowest Sharia compliance value (0.44) is the Gulf International Bank (Bahrain). The average value obtained was 0.6982.

In determining the level of Sharia compliance, a scoring is conducted on the annual financial statements of IBs in Asia. Based on the scoring result, there are three IBs in the satisfactorily compliant category, 61 IBs in the high-compliant category, and one IB in the less-compliant category with none in the non-compliant category. The scoring results show the average Sharia compliance level of Islamic banks in Asia is compliant. This proves H1 that IBs in Asia comply with Sharia principles. There are only three IBs in the high-compliant category, namely the Aljazeera Bank, Jordan Islamic Bank for Finance and Investment, and Meezan Bank. These banks have very high Islamic compliance because their amount of distribution of financing in the form of mudarabah and musyarakah is very high compared to other Islamic banks. However, what should be underlined here is that this assessment is based on the annual financial statements of the IBs. The less compliant Islamic Bank is the Gulf International Bank (GIB) because the Sharia supervisory board reports the shariha compliance opinion to the CEO so its independence is less than the Islamic Bank reporting to the BOD or directors. Moreover, GIB also does not have its own Sharia supervisory board report although it has its own risk management report. In this regard, it is more focused on risk management compared to Sharia compliance. Moreover, it does not make a breakdown of the income earned (murabahah, musharaka, mudarabah or

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ijarah). Instead, it has a pool of funds mixed with conventional banks because it is a business unit of conventional banks.

Some other interesting things were also discovered by researchers in scoring the IBs' annual financial statements. First, the separation of the Islamic banking law from conventional banking law is carried out by three countries, namely Bahrain, Iraq, and Kuwait. In contrast, other countries have one single banking law that regulates Islamic Bank with conventional banks. However, Indonesia and Malaysia—despite having a single law governing Islamic banks with conventional banks—have separate guidelines and regulations for IBs. Second, there are some Sharia supervisory boards that are in charge of conducting Sharia audits, while there are those who only serve as advisors of Sharia banks. Based on the scoring, most countries require Islamic audits. Countries that assigned Sharia supervisory boards as advisors to Islamic banks include Indonesia, Sri Lanka, Iraq, and Brunei Darussalam. Third, a majority of the sample reports the opinion results to the BOD, compared to the CEO and directors. The IBs, in general, also report the results of the assessment (opinion) of the Sharia compliance in the financial statements very well, namely by notifying what is done. Following this, further advice or recommendations are given on the basis of these findings, in addition to explaining that the IB is compliant with Sharia. Fourth, a majority of the sample have separate legal entities within conventional banks. In addition, certain IBs have very little Profit Equalization Reserve, namely those in Bahrain (3 Islamic banks), Kuwait (1), Oman (2), and Pakistan (1). Fifth, the majority of IBs in the sample have separate but not independent charity funds (charity funds are obtained from non-halal income or obtained from zakat). Only a few IBs have foundations or special programs for their charity funds such as Al-Bilad Bank (Saudi Arabia). Sixth, the sample mostly has 6 to 10 types of financing products. The majority of third-party fund structures owned by IBs are obtained from mudarabah and musyarakah rather than murabahah. Finally, the sample in this study has a very good capital adequacy in accordance with IFSB rules which is above 12%. Some even have CARs above 20%.

Based on the scoring results, it can be concluded that IBs in Asia have a level of Sharia compliance at 50–80% which is 69.82%. This is in line with Vinnicombe which states that political, economic, social, and geographical factors have an impact on the level of compliance with AAOIFI standards [9]. In most countries, IBs are placed under the supervision of a central bank and treated the same as conventional banks.

Table 3. Results of H2

Variable	Model 1		Model 2	
	Coef.	Prob.	Coef.	Prob.
Constants	-0,0157	0,3005	-0,2303	0,0410
SC	0,0168	0,4470	0,1052	0,2265
Size	0,0008	0,7420	0,0115	0,0190
Branch	-0,0036	0,7440	0,0007	0,1020
Age	-0,0005	0,5440	0,0009	0,2310
R2 Overall	0,0127		0,1930	
F-statistics	0,8664		0,0007	
	Model 3		**Model 4**	
Constants	24,535	0,0000	0,0966	0,308
SC	-10,301	0,0435**	0,0356	0,381
Size	-0,0487	0,0200**	-0,0036	0,380
Branch	0,0001	0,6230	0,0001	0,655
Age	-0,0073	0,0320**	0,0001	0,988
R2 Overall	0,1796		0,0093	
F-statistics	0,0013		0,9209	

Descriptions:
SC: Sharia compliance level of Islamic bank; Size: Logarithm of total assets; Branch: Total branches of Islamic banks; Age: The period of bank operate
Coef: Variable coefficient
***: significant level 1%; **: significant level 5%; *: significant level 10%.

Source: Authors' elaboration

The result of testing model 1 shows that the independent and control variables have no significant effect on the dependent variable. The R2 overall value in model 1 is 0.0127. This shows that high or low ROA value does not have a relationship with Sharia compliance. IBs, especially in Indonesia, have a small ROA compared to conventional banks because the former bear a greater cost than the income earned. The model 2 test results show that the independent variable and control variables do not have a significant effect on the dependent variable. The R2 overall value in model 2 is 0.1930, i.e., the level of ROE does not affect the level of Sharia compliance. The ROE shows how the more efficient Islamic bank managers manage their capital to conduct financing. The results from testing model 3 show that the independent variable has a significant influence on SC at a significance level of 5%. The control variables, namely size and age, significantly influence the dependent variable at a significance level of 5%. The overall R2 value in model 4 is 0.1796. That is, the more compliant the IB, the lower the OER ratio. This is contradictory to Lassoed's findings that IBs have to bear higher costs when providing quality services [33]. This is because quality services are supported by diverse facilities and friendly services, which, in turn, require huge expenses to sustain it. Qualified human resources are needed due to which, it is necessary to recruit and provide adequate training to the employees.

Table 4. Results of H2 and H3

Variable	Model 5		Model 6	
	Coef.	Prob.	Coef.	Prob.
Constants	0,7534	0,8250	-0,1129	0,6080
SC	-62,865	0,0685	0,5109	0,0031**
Size	0,2426	0,1010	0,0011	0,9070
Branch	-0,0003	0,8310	-0,0006	0,4840
Age	-0,0158	0,5070	-0,0038	0,0120**

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R2 Overall	0,0452		0,1181	
F-statistics	0,3405		0,0188	
	Model 7		**Model 8**	
Constants	0,5008	0,2950	-0,2036	0,3810
SC	0,9303	0,0585*	-2,942	0,1540
Size	-0,0190	0,3580	0,0346	0,0010***
Branch	-0,0006	0,0010**	0,0001	0,2810
Age	-0,0064	0,0520*	-0,0008	0,6140
R2 Overall	0,1285		0,1452	
F-statistics	0,0120		0,0058	
Descriptions: SC: Sharia compliance level of Islamic bank; Size: Logarithm of total assets; Branch: Total branches of Islamic banks; Age: The period of bank operate Coef: Variable coefficient ***: significant level 1%; **: significant level 5%; *: significant level 10%.				

Source: Authors' elaboration

The model 5 test result shows that the independent variable does not have a significant effect on the dependent variable. The R2 overall value in model 5 has a value of 0.0452. In other words, Sharia compliance does not affect CTD. A large amount of cash violates the Maqasid Syariah principles because the cash is idle money that should be used to distribute financing to customers. The more cash in the bank, the more it implies that the money is buried in the bank. Fewer IBs give financing to customers. The model 6 test result shows that the independent and control variables significantly influence the SC variable at a significance level of 5%. The overall R2 value in model 6 is 0.1181. This shows that Sharia compliance has a relationship with the CAR. The more compliant the IBs, the higher the CAR value. This ratio shows the adequacy of the capital owned by IBs in bearing the risk of losses that may occur due to mudarabah, musharakah or other transactions.

The result from testing model 7 shows that the FDR variable significantly influences the dependent variable at a significance level of 10%. There are two control variables that have a significant influence on Sharia compliance, namely the number of branches and age of IBs at the significance level of 5% and 10%, respectively. On the other hand, the overall R2 value in model 7 is 0.1285. From this, it is quite evident that the Sharia compliance affects the FDR. The more compliant the IBs, the higher the FDR. IBs which have a lot of financing are getting better because they achieves their goal of providing financing to their customers. Significant control variables operate behind an IB's size and number of branches in affecting the level of Sharia compliance [10]. The model 8 test result shows that the MS variables and the majority of control variables do not significantly influence the dependent variable. There is one control variable that influences Sharia compliance, namely an IB's size with a significance level of 1%. The R2 overall value on model 8 is 0.1452 which implies that the Sharia compliance does not affect market share. All in all, from the market share, one can see the development of IBs.

Based on the regression results above, it can be concluded that H2 was rejected. This finding is in accordance with the fact that Sharia compliant companies have lower performance compared to non-Sharia compliant companies [19]. Although Sharia compliance is a governance principle, financial performance depends on not only Sharia but also the internal control systems, risk management systems, and services provided by employees. Considering all this, the results of the regression test failed to prove that better Sharia compliance guarantees more financial benefits [10]. However, the study supports Bizri (2014) in the fact that prospective customers prefer IBs based on security, trustworthiness, quality of service rendering, and price of financing compared to Sharia compliance [7].

V. CONCLUSION

The study aimed to determine the Sharia compliance level of IBs in Asia and its influence on their financial performance and market share. The level of Sharia compliance of IBs in Asia on average can be classified under the high-compliant category. This is due to the people in the sample countries upholding Islamic principles in various aspects of life including banking. This opinion is consistent with previous studies that investors in the sample countries prioritize Sharia bank compliance before investing their funds [34] [35]. Based on the regression results, Sharia compliance affects the OER, CAR, and FDR of IBs. However, the ROA, ROE, NPF, and CTD are proven not to be affected by Sharia compliance. The establishment of IBs in countries that do not have a majority Muslim population is hindered by regulations. Moreover, they also do not have the support of the central bank due to which, the level of compliance remains low. In this regard, the IBs in Indonesia must emulate the IBs in Asia so that the level of Sharia compliance is maintained and further enhanced. This is because an adequate level of Sharia compliance is the goal of IBs. The results of this study can be considered by stakeholders before investing their funds. They can find out whether IBs actually comply with Islamic regulations because they are the basis that distinguishes IBs from conventional banks. The regulators in Indonesia are expected to be able to make deeper regulations for IBs, as has been done in several countries, such as Bahrain, Iraq, and Kuwait. These three countries have Islamic banking laws that are separate from conventional banks.

However, there are certain limitations to the study due to which, its scope can be extended further in future studies. For instance, the sample is limited and the observation period is quite short. Moreover, the measurement of Sharia compliance is not the best one. Future research could keep these limiting factors in mind while deciding on research designs and components that would be more efficient. It is also worth noting that the results of the study are subjective as well, as the assessment is based on the annual Islamic financial statements. In future, it is recommended that case studies be conducted for

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each IB to better ensure a sufficient level of Sharia compliance on the part of IBs.

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Mapping Islamic finance and new technologies: research and managerial perspectives

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Abstract— **New technologies promote radical changes in how banking services are delivered. The field of Islamic finance is not exempt from radical changes and is gaining increasing attention from academics and practitioners. Although several scientific studies have been conducted on the impact of technologies on specific Islamic finance instruments, no research has examined bibliometric variables in this area. This study aims to cover this gap by conducting a bibliometric and open coding analysis on 170 sources of published studies on Islamic finance and technology. Our study detects the most influential authors, journals and countries of publication that currently prioritise research in this field. In addition, the thematic analysis reveals that among the niche themes are applications of technology to Takaful. Among the motor themes is the opportunity for technology to facilitate decision-making in Islamic banks. Finally, in terms of originality, this study highlights the field's current state by combining methodological approaches and providing valuable insights for future research. Moreover, it is also a starting point for practitioners to fully understand the characteristics and potential of technology in Islamic finance. Finally, the article provides researchers with a research agenda to guide future research ideas.**

Keywords: Islamic finance; Blockhain; Cloud; Artificial intelligence; FinTech; business implications; Future research agenda

I. INTRODUCTION

New technologies are gradually changing various businesses and activities. [1], [2]. Islamic finance is also looking with interest at critical global trends. In fact, among the most-watched developments today are cloud, blockchain and artificial intelligence [3]–[5]. According to several international authors, these technologies could change the business models of Islamic banks and promote new virtuous economies to make them more attractive from the economic point of view than traditional finance banks. [6]–[8]. Therefore, this literature sees a decisive advantage for Islamic finance from applying new technologies.

Alongside the technologies applied to the business of Islamic financial institutions, numerous publications are dealing with Islamic Fintech and its compatibility with Sharia'h [9].

Today, the main areas of study in the business sector are undoubtedly Sukuk with process robotisation applications [10], Takaful with automatic management applications and fraud reduction thanks to the blockchain [11] and FinTech [12].

Despite the widespread interest shown by the growth in publications, as defined by Delle Foglie et al. (2021) and Uluyol (2021) [13], [14], more research will be needed in this initial area to systematise publications and identify any increased scope for global competition. This can only be the case if the level of knowledge on the subject is precise. Therefore, precisely on this point, as suggested by Zupic and Cater (2015) and Secinaro et al. (2021) [5], [14], timely analyses of knowledge flows with bibliometric and open code analyses could provide researchers and practitioners with a state-of-the-art on what has been published so far.

All these premises give us the idea of an embryonic stream of knowledge with few authors and citations looking for its own space within the more significant strand of research on Islamic finance.

Therefore, this paper proposes a broad investigation, including studying primary bibliometric data on peer-reviewed sources in the international Scopus database [16], [17].

The main findings denote a multidisciplinary view of the research field studied. The literature includes an interesting discussion on possible new technological tools for Islamic

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finance, the development of new technical processes to increase the operational efficiency of the Islamic financial system, and the presence of alternative payment and investment methods based on Fintech. Furthermore, we note that the strand of research looking at technological solutions consistently looks at cost reduction as a sign of operational efficiency vis-à-vis traditional type banks. Our analysis is innovative for the topic of interest. It applies a hybrid methodology that includes, without distinction, new technologies and not only a specific tool such as Sukuk or Takaful or FinTech as a financial innovation [12], [18].

Therefore, our article aims to map, discuss, and critique the research debate on these issues by answering the following questions: (1) What are the main characteristics of these research streams considering authors, citations, and geographical interest? (2) What are the most frequent topics in this literature? (3) What are the possible implications for future research in this field?

The rest of the article is structured as follows. Section 2 sets out the methodological flow. Section 4 shows the results of our research. Section 5 provides an in-depth interpretation of the data, commenting on and critiquing the main results. Section 6 concludes this article by considering the current implications and limitations and building on these by suggesting future research paths.

II. Methodology

This paper uses a hybrid method joining the bibliometric analysis and the available coding analysis [5]. As the first research step, we create the review protocol. According to Massaro et al. (2016) [17], authors should include clear and direct data replication processes. Additionally, as Tranfield et al. (2003) [19], in wide-ranging literature reviews, research teams should put transparency measures to allow for high reliability and replicability of the research, even at different times. We implement a six-step research protocol from other published papers with known elements, motivation in conducting this research paper, the topic under discussion, the research limitations, tools used, and the research framework followed. The following Table I shows the research protocol followed by the researchers. Finally, the next sub-paragraphs describe the dataset creation phase, all the tools used to implement the analysis, and the open coding analysis protocol.

TABLE I. Research protocol

Review protocol elements	Author's considerations
What is already known? (Step 1)	Technologies promote a change in Islamic financial institutions' working and business models [20]. More and more researchers are fostering research in this area because of the opportunity for cost reductions and operational modifications [5], [21].
Motivation (Step 2)	A rising research stream analyses how new technologies will impact Islamic finance. There is currently no unified mapping in the literature despite numerous research studies. This creates fragmentation and difficulty in interpretation for researchers who must verify multiple sources of knowledge.
Research topic (Step 3)	Fragmentation promotes possible bibliometric analyses in this emerging research area [15].
Research limitations (Step 4)	Following Massaro et al. (2016) and Secinaro et al. (2021) [5], [16], we decided not to limit the search to a single scientific journal. Moreover, as Dumay and Cai (2014) [20], we included peer-reviewed journal articles, book chapters, and conference proceedings in the analysis. Finally, book chapters and white papers were excluded as nonpeer-reviewed sources.
Research tools (Step 5)	Scopus database, Bibliometrix R package and Atlas. Ti Cloud.
Research framework (Step 6)	Years, documents' information, sources, authors, keywords, citations, countries, theories analysed, methodologies used and technologies under discussion.

Source: Author's elaboration

A. Dataset creation

The critical sources under analysis were collected, starting with studying the keywords. According to Chen and Xiao (2016) [23], keywords selection can be made using different methods. The first is to use wide-ranging words that encompass a large, high-level search domain. The second is to analyze smaller and perhaps rising search domains. Therefore, this study utilizes the second mode of research by analysing the micro-domain of new technologies and their use in Islamic finance.

Additionally, starting from the analysis conducted by Massaro et al. (2020), de Mem Machado (2021) [24] and Rosa et al. (2020) [25], we have selected which keywords: "Islamic finance" AND "Tech*" OR "Blockchain" OR "Artificial intelligence" OR "Cloud" OR "Smart".

As shown in Table 1, we used the multidisciplinary and international Scopus database for data collection [26]. Indeed, several studies published in leading international journals use this database as it also includes data from other registries such as Web of Science [5], [27]–[29]. Despite the certainty of the previous studies, we decided, in any case, to compare the results of the two databases to avoid the loss of relevant data. In the outcome, we can confirm that the coverage of articles was more excellent on Scopus.

The dataset's creation includes only documents published until 2021 [30]. The application of the search requirements returned 179 documents. However, the research team could not access PDFs of 9 documents, so the final sample analysed was 170 documents. Figure 1 below, using the methodological paper by Liberati et al. (2009) [31], shows the research steps used by the authors.

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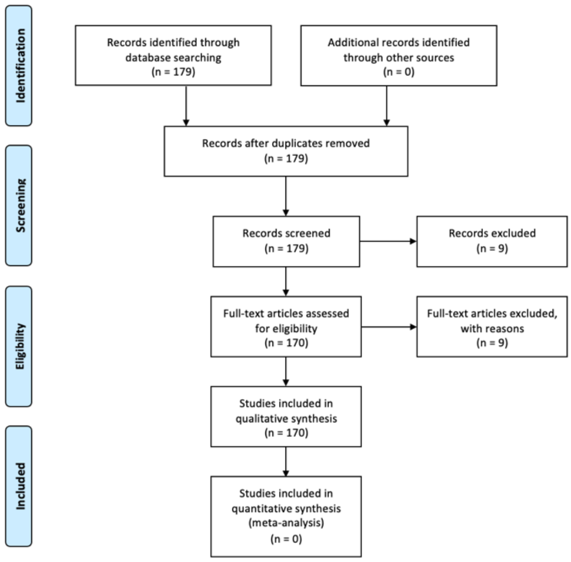

Figure 1. Prisma Workflow. Source: Author's elaboration using Liberati et al. (2009) [31]

B. Tools of analysis

The research used several analysis tools. First, the quantitative and qualitative data analysis was done using the Bibliometrix and Biblioshiny package through the R Studio application [32]. Similarly, as evident from the research gap, few studies deal with providing a map of the theories and, at the same time, systematising the technologies that to date are applied to Islamic finance. Therefore, our research uses Atlas. Ti Cloud software will provide valuable insights regarding technologies applied by researchers in this research area [33].

III. RESULTS

This section aims to illustrate the bibliometric and open code analysis results. In the following sub-sections, the reader will see the research variables such as types of documents, years of publication and scientific production, scientific reference sources, growth of sources, number of articles per author, author productivity and the area related to keyword analysis. Finally, the section will end with a specific analysis of the theories used by researchers and the study of methods and technologies.

A. Main information

Table II shows the information of the 170 papers selected between 1997 and 2021. The research topic appeared in 112 scientific sources with an average annual publication rate of 3.7 articles. However, as shown in Figure 2, the figure could be misleading as most published papers are after 2013.

Further on, the most published type of document is the scientific article in a peer-reviewed journal (119), followed by books (15) and peer-reviewed book chapters (14). Finally, the analysis of authors and collaborations is also interesting. What emerges from these first data is a research field with a still low level of collaboration and single authors or an average number of authors equal to 2.28, a symbol of a growing area that is still little explored by researchers worldwide.

TABLE II. MAIN INFORMATION

Data	Results
Timespan	1997-2021 (September)
Documents	170
Sources	112
Average years from publication	3.7
Average citations per document	7.3
Average citations per year per document	1.224
Number of references	10.367
Document types	
Articles	119
Books	15
Book chapters	14
Conference papers	13
Conference review	1
Editorial	1
Review	7
Document contents	
Keywords Plus	183
Author's keywords	515
Authors	
Authors	387
Author appearances	435
Authors of single-authored documents	38
Authors of multi-authored documents	349
Authors collaboration	
Single-authored documents	44
Documents per Author	0.439
Authors per document	2.28
Co-Authors per documents	2.56
Collaboration Index	2.77

Source: Author's elaboration

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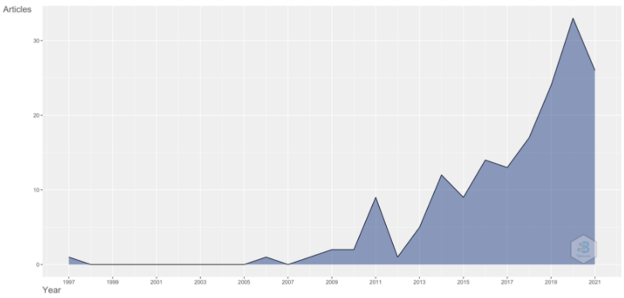

Figure 2. Annual scientific production. Source: Author's elaboration using Biblioshiny

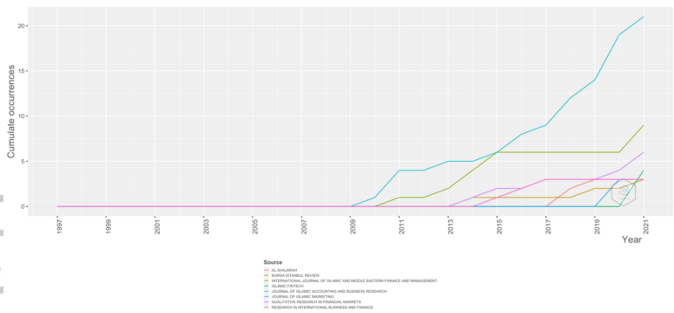

Figure 3. Source Growth. Source: Author's elaboration using Biblioshiny

B. *Sources' analysis*

Table III identifies the top 10 sources of publication. Interestingly, the unitary distribution of the sources published both in reference and monothematic journals on Islamic finance and journals with a wide range of topics. For example, the Journal of Islamic Accounting and Business Research is one of the most critical publications (21), followed by the International Journal of Islamic and Middle Eastern Finance and Management (9). On the other hand, among the journals with a broader subject matter is Qualitative Research in Financial Markets (6), aiming to publish contemporary research on corporate and international finance issues.

TABLE III. RELEVANT SOURCES

Sources	Number of publications
Journal of Islamic Accounting and Business Research	21
International Journal of Islamic and Middle Eastern Finance and Management	9
Qualitative Research in Financial Markets	6
Islamic Fintech	4
Al-Shajarah	3
Borsa Istanbul Review	3
Journal of Islamic Marketing	3
Research in International Business and Finance	3
Arab Law Quarterly	2
Contemporary Studies In Economic And Financial Analysis	2

Source: Author's elaboration using Biblioshiny

Figure 3 identifies the cumulative frequency distribution of articles published by Journals. Therefore, the names of the journals that have published research contributions on this topic to date are shown. Interestingly, the publication flow in the most relevant scientific journals began in 2009, a year that is also relevant for technologies such as blockchain [5]. These results align with the growth shown in Figure 1 and the interest in economic research approaches.

C. *Authors' analysis*

Table IV shows the top 10 most relevant authors. The authors with the most publications are Rabbani MR. from the University of Bahrain, a very active centre for publications on technology, and Professor Hassan M.K. from the University of New Orleans and Editor-in-Chief and editorial member of several journals on Islamic finance. His research has helped broaden the research horizons of Islamic finance by providing interesting and up-to-date ideas and research objectives for other fields. Finally, Khan S. and Saiti Buerhan follow with 6 and 5 publications.

Finally, what emerges from the analysis is a research topic trying to find its place within the macro-discussion on Islamic finance. The first authors per publication indicated here are experts in the field who, with their pilot research projects, are promoting an open and unconditional discussion on the topic.

TABLE IV. MOST RELEVANT AUTHORS

Sources	Number of publications
Rabbani M.R.	8
Hassan M.K.	8
Khan S.	6
Saiti B.	5
Rudnyckyj D.	4
Alam N.	3
Calder R.	3
Morea D.	3
Ahmad K.	2
Ahmed A.	2

Source: Author's elaboration using Biblioshiny

Table V shows the analysis of the most promoting research on Islamic finance and new technologies. The International Islamic University Malaysia is the leading institution in the number of articles published (17). Next, we discover how the significant universities in the world dealing with research in this field reside in the Middle East. A clear vision can explain these results that states like Bahrain promote funding for new technologies [34].

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TABLE V. MOST RELEVANT AFFILIATION

Sources	Articles
International Islamic University Malaysia	17
Kingdom University	8
University College Of Bahrain	6
University of Bahrain	6
University of Malaya	6
Universitas Islam Indonesia	5
Universitas Indonesia	4
University of New Orleans	4
University of Victoria	4
Al-Farabi Kazakh National University	3

Source: Author's elaboration using Biblioshiny

D. *Citations' analysis*

The analysis of citations can yield interesting drivers of observation (Table VI). We will first use concerns by studying the most cited sources at the local level, i.e., within the research area under study. This approach is beneficial in omitting references with greater scientific relevance [28], [35]. In particular, one of the most cited sources is a literature review by Rabbani, Khan and Thalassinos [32], which aims to identify the level of knowledge of Islamic finance within Fintech, cryptocurrency, and blockchain. Furthermore, the study classifies Islamic financial instruments that are Shari'ah compliant. Another interesting study is Khan et al. (2020) [10], which introduces the concept of Sukuk tokens by showing that blockchain can decrease managing costs'.

TABLE VI. MOST RELEVANT LOCAL CITATIONS

Author	Total citations
Gheeraert L. (2015), Econ Model [36]	54
Rudnyckyj D. (2014), Am Ethnol [37]	31
Syed MH. (2020), Int J Econ Bus Adm [38]	17
Rabbani MR. (2020), Int J Econ Bus Adm [18]	16
Diaw A. (2015), J Islamic Account Bus Res [39]	14
Hassan MK. (2020), J Econ Coop Dev	9
Rabbani MR. (2020), Int J Sci Technol	4
Khan N. (2020), Global Financ J [10]	4
Salim BF. (2016), Int J Econ Financ Issues	2
Khediri KB. (2015), Res Int Bus Financ [8]	2

Source: Author's elaboration using Biblioshiny

E. *Keywords' analysis*

Analyzing keywords allows us to study the concepts most frequently addressed by researchers [23]. As shown in figure 4, we do not find uniform examples of technologies except for blockchain and Fintech. We also see that Sukuk is one of the most used tools applied. Finally, a geographic fact that will be confirmed later in the analysis is that Malaysia has the highest level of research in this area.

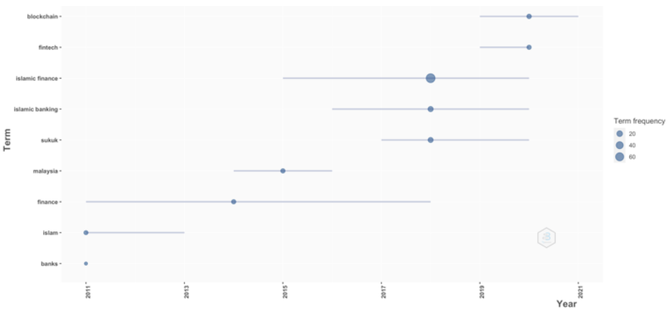

Figure 4. Trend topic. Source: Author's elaboration using Biblioshiny

Figure 5 below illustrates the thematic map of trending topics based on keywords plus analysed. These are words or phrases that often appear in the titles of article references but not in the primary title of the article itself. Such extractions are possible thanks to an algorithm developed by Clarivate Analytics that allows extending the scope of information by looking at the article's content and not only at the title, abstract and external keywords [40]–[42]. Applying the data reading to the Bibliometrix package makes it possible to obtain a graph by relevance and development. Inside it is possible to notice a distinction by topics:

- Niche themes;
- Motor themes;
- Emerging/declining themes
- Basic themes.

Starting with the first one above, we find that the topic of blockchain is applied to the takaful insurance industry among the niche themes. We see interest from researchers in this topic, especially for data management between different insurance locations and fraud prevention by policyholders [11]. Despite the interest and potential, this topic is not yet widely developed.

The second quadrant of the graph shows the motor themes. They represent the topics on which the scientific discussion is based today. We discover how technology can support the decision-making processes of Islamic financial institutions. Among the most curious applications is pioneering research that identifies technology as an opportunity to increase the economic sustainability of Islamic banks in case of banking disputes and controversies [43].

The third quadrant of the graph identifies emerging issues in which researchers may have future interests. These include climate change. Although widely developed in several businesses and traditional finance [44]–[46], its treatment is still far from widespread in Islamic finance.

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Finally, the last part of the graph shows the basic themes, including Islamic Fintech, which has had its scientific history with numerous contributions investigating its compatibility with Sharia'h [7], [9], [47], [48].

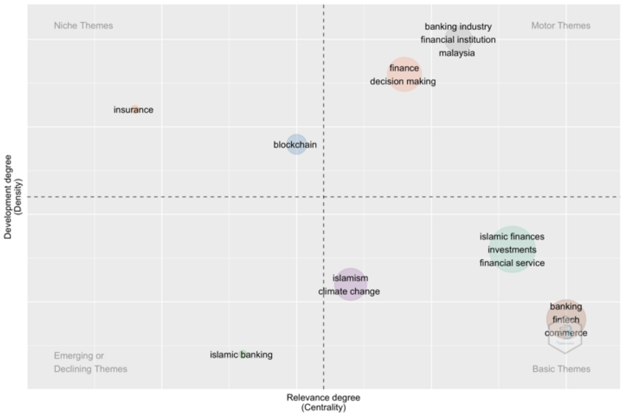

Figure 5. Thematic map. Source: Author's elaboration using Biblioshiny

F. *Open coding analysis*

The objective of this brief section will be to show the results of the open code analysis conducted by the researchers on the selected documents. The research uncovers several interesting points.

First, the most addressed technologies that meet the definition of Adomavicius (2006) [1] are only blockchain and artificial intelligence.

Second, documents that deal with Fintech do not focus on technology but rather on the applications it allows concerning means of payment.

Third, although reported in the sample, we find data noisiness as many papers use the word technology without going into detail but only into hypothetical applications.

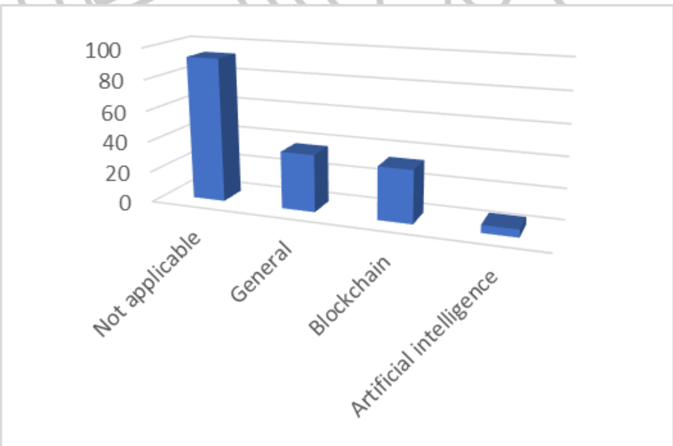

Figure 6. Coded technologies. Source: Author's elaboration using ATLAS.Ti Cloud

G. *Geographical and collaboration analysis*

Table VII identifies the frequency of publication and the countries with the most significant interest in technology in Islamic finance. Malaysia (79) is the country with the highest scientific output on the topic, followed by Bahrain (26), Indonesia (26) and the UK (21). The analysis shows that Muslim countries primarily analyse the research topic. However, the topic is also of interest in countries whose financial sector is traditional, such as Italy, the USA, and the UK.

Finally, interesting research insights can be derived from the analysis of Figure 5, which identifies collaborations between academics worldwide.

As can be seen, there is a strong cluster of collaboration between Indonesia and Australia with the USA and between, Turkey and Brazil. These results also represent active research collaborations and discoveries in other research topics such as halal food or Waqaf [27], [29] and reflect faculty teams currently working to increase knowledge in this interesting area.

TABLE VII. COUNTRY SCIENTIFIC PRODUCTION

Country	Frequency
Malaysia	79
Bahrain	26
Indonesia	26
UK	21
USA	21
Italy	19
Pakistan	10
Turkey	9
Nigeria	8
Saudi Arabia	8

Source: Author's elaboration using Biblioshiny

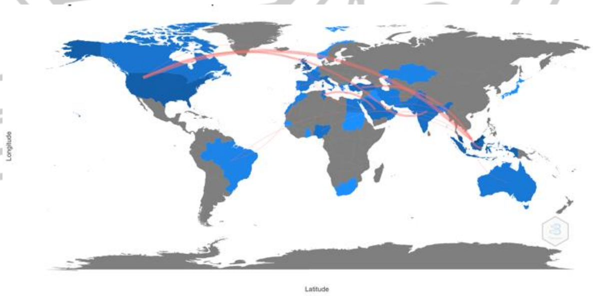

Figure 7. Thematic map. Source: Author's elaboration using Biblioshiny

IV. DISCUSSION AND CONCLUSION

Our study used bibliometric analysis to investigate the broad literature about technologies and Islamic finance. We conducted a bibliometric analysis using Bibliometrix R-

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package and an open coding analysis using ATLAS to answer the three research questions Ti Cloud accurately.

Starting from the gap in the literature with numerous studies in this direction but without a systematisation [7], [49], this article provides an in-depth qualitative and quantitative analysis of bibliometric variables. Some valuable theoretical insights can be made.

Firstly, although sustained in the last three years, the scientific production in this field has not had constant levels so far. Moreover, the increase in interest by researchers is primarily sanctioned to seek solutions and answers to the compatibility of Fintech with Shari'ah [9], [48] and to understand the relationships between blockchain and artificial intelligence in the business of Islamic banks [8], [21], [50]. This evidence is demonstrated, for example, in Figure 5, which shows the primary topics of discussion.

Secondly, from a theoretical point of view, the analysis aims to criticise what is reported in the literature constructively. The research shows noisiness in the data collected, which is to be outlined in the Scopus analysis conducted. However, what is noticeable in the study is a homologation of possible technologies for Islamic finance. For example, according to Adomavicius (2006) [1], Understanding the dynamics of technological evolution is the first point of reference for verifying the state of cyclicality and application of many technologies. In the context of Islamic finance, we have observed a stage of embryonic development on a purely scientific level. Moreover, it is unclear what evolutionary state we are in many works, and applications such as Fintech are likened to technologies like blockchain and artificial intelligence. Therefore, this evidence confirms the novelty of scientific literature and the great space it may have for future researchers.

Moreover, our analysis also contains some practical insights. First, Islamic managers and banks should increasingly open up to the technological wave by aspiring, as demonstrated in the literature, synergies to improve and evolve their business models [47], [50]. Second, despite the expansion of technology, as admitted by Adomavicius, the wave of new technologies needs to be managed and controlled in its life cycle. Therefore, financial managers should understand to what extent a technology in use is in its initial or final life cycle. This is instrumental in activating, if necessary, further developments to remain competitive.

Like all research, this one has some limitations. First, the current work does not consider the technical issues of the technologies analysed. Future research could combine a more careful analysis of recent technological problems and variables. Second, the study might be biased using a single research database. Therefore, future research stimuli could conduct integrated, multi-database analyses.

The following table VIII aims to provide researchers with new avenues of research for the future.

TABLE VIII. FUTURE RESEARCH PERSPECTIVES

Macro-themes	Future research perspectives
Blockchain	(1) How can blockchain be used to limit the economic impact of costs in Islamic banking and insurance? (2) How can blockchain features enable the development of the Islamic financial system?
Artificial intelligence	(1) How will artificial intelligence stimulate Islamic banking processes? (2) To which administrative processes can artificial intelligence be applied? (3) How will artificial intelligence support Sukuk, Takaful and Waqf?
FinTech	(1) How will FinTech improve Islamic banking processes? (2) Is there compatibility between FinTech and Islamic law? (3) How can Fintech relate to other technologies such as blockchain and artificial intelligence?

Source: Author's elaboration using Biblioshiny

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Trust Enhancement in Zakat Institutions using Blockchain Technology: A Qualitative Approach

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Abstract— **There is an indication that zakat institutions are inefficient and lack transparency in terms of distributing and managing their funds. This leads to a lack of trust between Muzakee and zakat institutions; hence, they prefer to pay zakat to Mustahiq directly. This means that zakat institutions may be collecting far less in zakat funds than the maximum amount that is potentially available. Meanwhile, the invention of blockchain technology has disrupted the financial sector as it offers transparency in transactions, meaning intermediaries are no longer needed. The use of blockchain in zakat management is important for improving transparency in the distribution of zakat. The objective of this paper is to explore the determinant factors that influence trust in zakat institutions using blockchain technology as a mediating effect. The results of the literature review revealed that these factors are reputation, satisfaction with zakat distribution, service quality and disclosure practice. This study expects that trust in zakat institutions can be enhanced through the use of blockchain technology.**

Keywords: Blockchain, Zakat, Trust, Zakat institution

I. INTRODUCTION

Zakat is one of the financial tools and resources used in Islamic economic development. Zakat funds are designed to help people or communities in need and every Muslim's responsibility to pay zakat forms part of their worship and duties. The goal of the Zakat Fund is to minimize economic gaps among communities, which is only achieved if zakat institutions succeed in collecting large amounts of Zakat. According to Act No. 23, 2011, Zakat management in Indonesia is carried out by two institutions, namely The National Amil Zakat Agency (Badan Amil Zakat Nasional – BAZNAS) and The National Amil Zakat Institution (Lembaga Amil Zakat – LAZ). BAZNAS manages zakat at the national level and is formed by the government, while LAZ is formed at the community level and is responsible for the collection, distribution and utilization of zakat. To assist in the collection of zakat, BAZNAS formed a separate organization, the Zakat Collection Unit (UPZ) as noted by Andayani, Hanum, Zaenal, Asmita, Damayanti, Fahrudin & Kardiman [1]

Poverty is one of the many problems facing Indonesia. Zakat has been proven to be effective in reducing or eradicating poverty, with prominent examples from the era of the Second Caliph of Islam, Hazrat Umar bin Khattab (R.A) and of Umar bin Abdul Aziz, who was the First Caliph of Islam for just over one year (99-101H) as noted by Hudayati & Tohirin [2]. As such, Zakat, along with Infaq, Waqf and Sadaqah, is an example of Islamic philanthropy that has a significant impact on alleviating poverty. As set out in Law No. 23 of 2011, BAZNAS is the agency or institution responsible for the overall management of zakat in Indonesia.

As the most prominent Muslim country globally, Indonesia has the potential to collect a large amount of zakat funds. According to the BAZNAS report of 2017, Indonesia boasted a potential zakat fund of Rp 286 trillion. BAZNAS collects many types of zakat, including from households, private companies and state enterprises, in the form of deposits and savings. However, the entire zakat operation collected only Rp 3.7 trillion in 2015, thus indicating a significant difference between the actual and potential amounts collected as noted by Firdaus, Beik, Irawan & Juanda [3], meanwhile, found that the total size of the zakat fund could potentially reach Rp 217 trillion (combined amount from households, industries and deposits). This figure equates to 11.45% of Indonesia's national income from 2018. However, data from BAZNAS in 2017 show that the total zakat collection in 2016 amounted to only Rp 5 trillion.

Currently, the amount of zakat funds collected lags far behind its potential, which in turn means that the amount of

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funds distributed automatically to eight Asnaf (*Mustahiq*) is not optimized. Many factors explain why BAZNAS has not received the maximum amount of funds available. One issue is a distrust of zakat institutions among the *Muzakee* as reported by BAZNAS [4]. This distrust stems partly from skepticism among the *Muzakee* concerning the ability of zakat institutions to distribute and manage their funds efficiently, due to a lack of transparency as reported by BAZNAS [4]. Thus, many *Muzakee* continue to pay zakat directly to the *Mustahiq*. These issues must be urgently addressed to further optimize the zakat collection.

Several previous studies have examined the use of blockchain in zakat management as a way of improving trust in zakat institutions. These studies include Beik, Nurzaman & Sari [5]; Rejeb [6]; Nienhaus [7]; Nor, Abdul-Majid & Esrati [8]; Zulfikri, Kassim, & Hawariyuni [9]. These studies focused predominantly on the creation of a model and mechanism for implementing blockchain in zakat management, but none measured the effect of blockchain technology on influencing trust in zakat institutions. Hence, this study attempts to fill this gap by measuring the effect of blockchain technology in improving trust in zakat institutions using a qualitative approach and by developing a conceptual model.

II. LITERATURE REVIEW

A. *Blockchain technology*

Bitcoin is a type of digital currency based on cryptography that was developed by Satoshi Nakamoto in 2008 as noted by Abubakar, Ogunbado, & Saidi [10]. However, Kamaruzaman, Yassin, Zabidi, Zaman, Rizman, Baharom & Wahab [11] argued that Satoshi Nakamoto is a fictitious name. Nakamoto published a paper entitled 'Bitcoin: A Peer-To-Peer Electronic Cash System' describing a peer-to-peer version of electronic cash that would enable online payments to be sent directly from one party to another, with no need to pass through a financial institution or intermediary as concluded in Crosby, Nachiappan, Pattanayak, Verma, & Kalyanaraman [12]

While the bitcoin innovation was thrilling and ground-breaking, it was the mechanism behind its flawless operation that was the real story. Soon after Nakamoto's paper was released, it became clear that the core mechanical invention was not the digital currency but the technology operating it. As part of the bitcoin operation, Nakamoto also developed a ledger called 'A chain of Blocks', which later became the more familiar 'blockchain' as noted by Morkunas, Paschen, & Boon [13]. Blockchain and bitcoin are therefore linked as blockchain is the public ledger used for bitcoin currency as note by Zubaidi & Abdullah [14]

Blockchain is essentially a decentralized transaction ledger that can be used to create, authorize and send transactions to other nodes within the same network as noted by Tama, Kweka, Park, & Rhee [15]. It combines the basics of cryptography, peer-to-peer networking and game theory. While blockchain was created to track the database underlying the cryptocurrency, which is bitcoin, it is now commonly regarded as a distributed ledger with a software algorithm to record transactions as a chain of blocks safely and anonymously as noted by Laroiya, Saxena, & Komalavalli [16]

Although blockchain is often linked solely to bitcoin, many other blockchain applications have been developed since Nakamoto first introduced it. Despite being a ledger for digital currencies, the use of blockchain as an application has extended further to impact the economy, financial sector and beyond as noted by Crosby, Nachiappan, Pattanayak, Verma, & Kalyanaraman [12]; Zubaidi & Abdullah [14]. According to Lakhani & Iansiti [17] blockchain has gained significant recognition to potentially become the new Internet and is proving transformative in terms of enabling organizations to modify how they both generate and take value.

Since its initial development, blockchain has grown in popularity as a tool with a decentralized transaction ledger that can be used to register, confirm and send payments or contracts. The use of blockchain technology has also extended far beyond financial transactions to include a much broader range of transactions and applications such as healthcare, utilities, real estate and government as noted by Christidis & Devetsikiotis [18]. Wang, Zheng, Xie, Dai, and Chen [19] acknowledged that while blockchain is famous for bitcoin, it can also be applied to diverse applications beyond cryptocurrencies as it enables payments to be made with no involvement from banks or any intermediary. With this in mind, Morkunas, Paschen & Boon [13] stated that blockchain is expected to disrupt existing business models and propose new value creation.

B. *Trust in Zakat Institutions*

Trust plays a crucial role in society as noted by Abdul-Rahman & Hailes [20]. Previous researchers have described trust as 'general trust for others'. Sahidi [21], meanwhile, stated that the role of zakat institutions in providing a quality service to the community is an essential factor in attracting and encouraging entrepreneurs to pay zakat.

As a non-profit organization, trust is an essential foundation for BAZNAS to achieve its objectives. Handriana [22] reported that the intention of *Muzakee* to maintain LAZ is influenced by their trust in the institution. Yang, Brennan, and Wilkinson [23], meanwhile, asserted that a trustworthy charity meets the public's expectations. Hence, both LAZ and BAZNAS must work tirelessly to both examine and meet the demands of the public in order to gain their trust. In this way, the presence of trust will strengthen the commitment of *Muzakee* to pay zakat to zakat management institutions and thus maintain the sustainability and life of the programme. If they have trust in LAZ, people become more confident that their zakat funds will be paid to zakat institutions.

An examination of the relevant past studies reveals that trust is influenced by reputation, satisfaction with zakat distribution and the quality of the service provided. Zainal, Abu Bakar & Saad [24] showed that the greater the reputation, satisfaction with zakat distribution and service quality factors, the higher the trust of stakeholders in zakat institutions, and vice versa.

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C. Reputation and Trust in Zakat Institutions

Reputation has a significant effect on trust in zakat institutions as noted by Mukhibad, Fachrurrozie, & Nurkhin [25]. The concept of reputation in a non-profit organization has been widely explored in the economic and sociological literature and given numerous definitions. Reputation can be defined as the accumulated stakeholder assessment of an organization that develops over time and is a result of consistent performance and communication as noted by Gray & Balmer [26]. Richard and Zhang [27], in their study, defined reputation as the overall perception of stakeholders of the company's performance over time. This is in line with the definition from the Concise Oxford Dictionary, as cited by Zainal, Abu Bakar & Saad [24], that reputation constitutes what is generally said or believed about the character or standing of a person or thing.

Meanwhile, Abratt and Kleyn [28] identified that citizens trust a company based on past product experience and the company's reputation. As such, the company's reputation is the final determinant in meeting consumer expectations and demands as noted by Abratt & Kleyn [28]. Extending this, reputation has a significant influence on trust in zakat institutions.

D. Satisfaction with Zakat Distribution

Customer satisfaction is the key to an organization's success, which is especially relevant in the case of service-based organizations. According to Oliver [29], satisfaction can usually be viewed as an evaluation of the market in terms of the extent to which the preferences of the customer match the actual service rendered by an organization. Satisfaction with the distribution of zakat should be improved to maintain the performance of zakat and thus encourage Muslims to pay it through the relevant zakat institutions as noted by Ellany & Lateff [30]. According to Idris & Ayob [31] distrust of zakat institutions leads to non-compliance, especially when that distrust relates to transparency and inefficiencies in the management of zakat distribution. The greater the satisfaction with zakat institutions, the higher the adherence to paying zakat. In accordance with the above claims, a stakeholder who is highly satisfied with the distribution of zakat would be expected to have greater trust in zakat institutions, and vice versa. Therefore, satisfaction with zakat distribution has a significant influence on trust in zakat institutions.

E. Service Quality and Trust in Zakat Institutions

Service quality is closely related to customer satisfaction. According to Gronroos [32], service quality can be defined as how well a service meets the expectation of the customer. Zeithaml [33], meanwhile, stated that service quality refers to a customer's overall assessment of the advantages and value of the product or service. Service quality is measured using a small number of evaluative dimensions that have met previous research expectations. Parasuraman, Zeithaml, & Berry [34] point to the use of SERVQUAL as a measurement of service quality. In the SERVQUAL model, service quality is made up of the five dimensions of reliability, responsiveness, assurance, empathy and tangibles.

To maintain the efficiency of zakat, zakat institutions must increase the amount of zakat payments as noted by Zainal, Abu Bakar, & Saad [24]. Previous studies reported various findings regarding satisfaction with zakat distribution. Among these, Md. Idris & Ayob [31] found that widespread non-compliance was caused by the poor administration of zakat-by-zakat institutions in terms of their transparency and efficiency. As such, greater levels of satisfaction with zakat institutions were more strongly correlated with higher zakat compliance. In line with the above arguments, it is expected that a high level of satisfaction among stakeholders will lead to greater trust in zakat institutions. Therefore, service quality has a significant influence on trust in zakat institutions.

F. Disclosure Practice and Trust in Zakat Institutions

Financial statements serve as a reliable means of assessing the success of the management and financial condition of an organisation as noted by Samargandi, Tajularifin, Ghani, Aziz & Gunardi [35]. These financial statements contain information that is valuable for various people and it is therefore the responsibility of the zakat board of management to ensure their credibility as documents as noted by Karim [36]. As the primary shareholders in non-profit organizations, donors and investors turn to published financial statements as their main source of information. Zakat institutions must disclose a wide range of financial and other related details related to their expenditure. This information is necessary to demonstrate the credibility of the organization as noted by Zabri & Mohammed [37].

A significant difference often exists, however, between the size of the potential zakat fund and the amount of zakat actually received by zakat institutions in Indonesia. Problems with zakat funds resulted from mistrust in zakat institutions due to the quality of the financial information that they provide. This information is needed when making decisions on whether zakat institutions should be trusted to obtain, use and distribute zakat funds that have been entrusted to them by zakat payers as noted by Mediawati [38].

Meanwhile, Jayanto, Jayanto, & Munawaroh [39] stated that the disclosure of financial statements is expected to enhance the public's reasoning agility and increase their interest in paying the zakat profession. The transparency of zakat institutions has a significant effect on *Muzakee* due to the close relationship between transparency and the receipt of zakat funds as noted by Jayanto, Jayanto, & Munawaroh [39]. Transparency entails the disclosure of information to stakeholders concerning the use of funds. Schnackenberg & Tomlinson [40] identified three main elements of transparency: information disclosure, clarity and accuracy. Based on this, it can be concluded that disclosure practice has a significant influence on trust in zakat institutions.

G. Mediating Effect of Blockchain Technology

Blockchain is a technology that offers the potential to significantly improve the traceability of food-related products not only for companies but also consumers and policymakers. Blockchain facilitates the establishment of a distributed network that holds records of digital assets in a decentralized

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manner. Abojeib & Habib [41] highlighted the continuous efforts being made to apply blockchain technology in the social and financial system based on the system's good governance, low transaction costs and high transparency.

Given their role in building a strong zakat environment, the amil zakat (zakat officer) is critical to the collection of zakat funds. Hamdani [42] asserted that at least four factors contribute to a plentiful zakat collection that can alleviate poverty and bring prosperity to the people. These factors include the Amil, who must be trustworthy, professional, fair and responsible. Blockchain, for its part, makes processes traceable, auditable and irreversible, which is the most important aspect of successful philanthropy. Based on this, it is expected that blockchain technology has a significant influence on trust in zakat institutions.

III. RESEARCH METHODOLOGY

This study is qualitative in nature. It utilized an extensive review of the literature to identify and analyze the relevant studies to propose the conceptual model. The systematic review of the literature promotes new ideas, the discovery of new alternatives, and the development of new hypotheses and research proposals, as noted by Fiegen [43].

According to Khan [44], the process of conducting a systematic literature review includes framing questions for review; identifying relevant literature; assessing quality; summarizing evidence; and interpreting findings.

To perform systematic literature review, this study used Google Scholar and Emerald Insight database. The papers retrieved from reputed journal databases range from 2015 to the present, focusing on the use of blockchain in zakat management. Books and book chapters also were included in the analysis. The analytic results of this literature review produce a conceptual framework.

IV. RESULTS AND DISCUSSION

This study develops an initial conceptual framework of factors influencing trust in zakat institutions with blockchain as mediating variable. We examine the literature in the context of trust and blockchain technology.

Reputation

Reputation has significant effect on trust in zakat institutions. A non-profit organization like BAZNAS needs such a reputation to stimulate the trust of zakat payer. Furthermore, studies have found a positive relationship between reputation and consumer trust as noted by Oladimeji, Har Sani & Akhyar [45]. Therefore, it is hypothesized that Reputation significantly influences trust in zakat institutions.

Satisfaction with Zakat Distribution

Trust in zakat institutions is strongly influenced by the satisfaction of distribution zakat. Mohammed Dahan in Saad, Farouk & Abdul Kadir [46] argued that poor zakat distribution management leads to a bad image of zakat institutions, which in turn affects zakat collection. Meanwhile, Zainal, Abu Bakar & Saad [24] stated that low confidence in Zakat institutions can be attributed to a lack of transparency and inefficiency in zakat distribution. Thus, Satisfaction with Zakat Distribution significantly influences trust in zakat institutions.

Service Quality

As an institution that manages public funds, zakat institutions' credibility is also affected by how their customers perceive their services. In general, service quality can be described as the difference between what customers expect and what they get as noted by Ghani, Said & Syed Yusuf [47]. According to Parasuraman, Zeithaml, & Berry [34], If service expectations are higher than the service performance, then the perceived quality of the service is less than satisfactory, resulting in customers' dissatisfaction. This finding shows the importance of having a good service delivery (service quality). Therefore, Service Quality significantly influences trust in zakat institutions.

Disclosure Practice

As non-profit organization, BAZNAS need to provide information that is useful to a variety of users including *Muzakee* such as financial statements. The concept of disclosure refers to the perceptions of transparency exhibited by an entity. Information and data produced by companies fall under this category, including financial and non-financial data, quantitative and qualitative data, required or voluntary information, and information produced through formal and informal means. Information may be disclosed through different mechanisms, such as annual reports, press releases, investor relations, periodic reports, brochures, and websites as noted by Hassan & Marston [48].

With regard to zakat institutions, the early practices of Prophet Muhammad (SAW) and his pious successors exhibited transparency with regard to zakat proceeds, particularly regarding their storage and distribution. According to Al-Njrani in Sawmar & Muhammad [49], Zakat payers and authorities should embrace transparency hence, Zakat payers are expected to disclose their wealth subject to zakat to zakat collectors.

It is important that information about the activities of zakat institutions be disclosed through annual reports and verified by trustworthy auditors. By viewing the information disclosed, zakat payers may be more inclined to pay zakat in the future since they will have a sense of mutual trust. Therefore, Disclosure Practice significantly influences trust in zakat institutions.

Blockchain Technology

Blockchain technology can optimize trust in zakat institutions by offering transparency. There will only be two parties involved in a blockchain-based transaction. The transaction itself and its decentralized validation. The originality of the blockchain technology is at the level of validation, as there is no third party involved as noted by Chong [50].

Technically, blockchain is distributed, transparent, immutable, validated, secured and pseudo-anonymous. Blockchain data enables one to create an incorruptible and resistant to censorship secure legal identity, referred to as a "trust stamp". Using this technology, smart contracts cannot be

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altered or removed after they are written as noted by Chong [50]

Given the advantage of blockchain technology in term of transparency, thus, we proposed the blockchain technology as the mediating effect that could enhance trust in zakat institutions.

Based on the discussion above, this study proposed research model shown in Figure 1. The model postulates that trust in zakat institutions is influenced by Reputation, Satisfaction with zakat distribution, Service quality and Disclosure practice. The framework also postulates that the independent variables are expected to have a direct positive influence on the dependent variable. Meanwhile, blockchain technology strengthens the direct relationship between the independent variables and dependent variable.

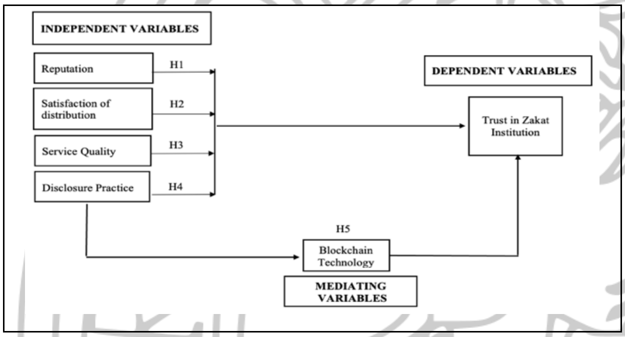

Figure 1. Conceptual Model. Source: Authors' elaboration

V. CONCLUSION, IMPLICATION AND FUTURE RESEARCH

This paper aimed to explore the determinant factors that influence trust in zakat institutions, where the use of blockchain was expected to enhance this trust. From the literature review, reputation, satisfaction with zakat distribution, service quality and disclosure practice are the determinant factors influencing trust in zakat institutions. In addition, this study suggests that blockchain technology has a mediating effect and is expected to enhance trust in zakat institutions. The proposed research model can be used to conduct further research on trust in zakat institutions' issues, while policymakers in zakat institutions can use the findings and analysis of this study to enhance Muzakees' level of trust through the implementation of blockchain technology. This, in turn, would help to maximize the level of zakat funds collected in the near future. This paper is conceptual in nature; therefore, no empirical evidence is provided. Further research could use the survey method to validate and examine the predictive power of the proposed model.

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Islamic Banks and the European Banking Union: An Overview of Critical Issues and Perspectives

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Abstract— **The aim of this paper is to provide a general, but in-depth overview of aspects of incompatibility and actual interest profiles of Islamic finance in relation to the legal system of the European Banking Union, identifying some prospects for positive future developments. It examines the relevant Islamic principles for banking and the differences from conventional European banks for regulation and supervision, a number of experiences and possible relationships. The modern communication between the Islamic banking scheme and the European (and international) one is certainly allowed by the activity of the IFSB regulator, especially as regards the adaptation to the Basel Committee standards and the related capital requirements, transparency criteria and common references, considering the global application to operate in the international markets. The examination of the relationship with the European Banking Union allows the identification of future profiles for debate and research in economics law, considering the suitability for regulatory adjustments and the interaction between EU and national law and the interesting ethical aims of the socially responsible Islamic finance.**

Keywords: Islamic finance, Islamic banking, European Banking Union, Regulation, Supervision, Transparency, Certainty of rules, Comparison, Perspectives

I. INTRODUCTION

In Europe, for several years now, there has been a significant growth of interest in Islamic finance and banking for investment companies, Islamic bond products and other credit collection instruments. Very significant was the position of the Financial Service Authority which, in 2004, issued an authorisation to operate to the Islamic Bank of Britain [1] and to the first European Islamic Investment Bank. Other European countries have experimented with Islamic financial products, albeit in a limited way [2]. In this context, it is interesting to look further at the possible relations between the conventional bank model that operates in the EU market and the Islamic bank that follows criteria, including ethical-religious ones (e.g., the prohibitions of riba and gharar), but with issue regarding risk control and data transparency, regulation and prudential supervision [3], especially in relation to the current European system, capital requirements and the Basel III Agreement.

The age-old question of the prohibition of interest is also known in conventional banking, in the sense of considering the difficulties of the weak contractor for elementary forms of lending; moreover, the reference to the prohibition of usury and to the forms of protection provided by the national systems that extend to the various forms of traditional operations is inevitable, while for the issue of supervision and risks, the evolution has been very different until the appearance of European banking supervision. From the Islamic perspective, instead, the mechanism of pecuniary interests has been replaced by the "sharing" of the creditor in the profits and risks of the banking activity. In essence, the result of profit can be achieved through sophisticated legal constructions (shareholdings, investment funds, linked contracts) also to encourage credit, given that banks use credit in commercial operations, or with the affirmation of ethical justifying principles linked to necessity or the common good.

In addition, the prohibition of gain (gharar), based on uncertainty for reasons inherent in the value of the asset for speculative purposes or when the asset is not determined for the contracting parties and, therefore, the contract is qualified aleatory, involves an element of risk and uncertainty that is, instead, central to contracts in European (and international) financial markets [4]. A derivative financial product is, of course, an instrument that "derives" its value (price) from that of an underlying financial asset. Derivatives are intended to

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hedge business risks (e.g., foreign exchange options to hedge foreign exchange transactions between importers and exporters), but are currently mainly used for speculation on future price movements, as the value of derivative contracts consists of multiples of the actual economic transaction. These financial instruments certainly do not meet the requirements of linkage to an asset and the character of "non-speculation"; conservative Shariah scholars argue that the prohibition of gharar eliminates speculation on interest, options and some conventional insurance contracts because they conflict with the prohibition of uncertainty and wagering (maysir), even if there is a hedging of an underlying economic transaction [5].

The main ways of collecting credit consist of current accounts for the management of payments, for which interest payable and receivable are foreseen and repayment is only guaranteed, and in savings deposits for which there is no form of guarantee regarding the return or the repayment of capital, but a share of profit paid periodically [6]; the other collection instruments, traceable to forms of co-participation or partnership - mudàraba and mushàraka [7], muràbaha [8] - are clearly different from bank deposits.

For the well-known principle of the prohibition of interest, there are further particular rules in the Islamic banking model [9]; it is based on precepts of the Shariah: the prohibition of investing in activities forbidden by Koranic law and in speculative activities, the sacredness of the contract and the obligation to pay the zakat, which is a religious tax; moreover, these principles also apply in the securities market [10]. Therefore, the model of the Islamic bank, precisely because of its necessary conformity to ethical-religious values, is conditioned in several respects: in investments, the bank must ascertain the credibility of the projects, the entrepreneurial skills of the client and the ethical character of the financed operation with regard to the aims; thus the collection of savings must be ethically consistent and the objective is obviously to attract the interest of savers, even if no interest is paid, through investment funds with participation in the profits according to pre-established conditions.

As we known, the Islamic banking has adopted the Basel III standards, a solution that revealed a significant regulatory challenge, given that the agreement does not consider the specificities of Islamic banks and Islamic products present various profiles of incompatibility with the European (and international) markets [11]. The context is complex and Islamic banks are required to be adequately capitalised to inspire trust and maintain sufficient liquidity under Basel III, like European banks, in order to protect depositors and avoid expensive governments "bail-outs" in the case of defaults. Besides an increasing number of Islamic funds screen equity investments to ensure they are permitted and there are even indices tracking Shariah compliant stock, most notably the S&P Dow Jones Islamic Indices.

This framework suggests a reflection on the sector in relation to the European Banking Union, in order to identify conflicting legal profiles, and to highlight the need for specific European and national rules and compatibility aspects especially considering sustainable finance. The aim of the research is to outline legal considerations regarding the prospects for the establishment of Islamic banks and the use of financial products; the results that emerge may provide a reference for future research.

II. Literature review

The article adopts an interdisciplinary analysis between law and economics, in the sense that the legal reflection cannot disregard decisive economics studies. The literature cited in the "References" section shows jurists have not confirmed a particular interest, beyond the episodic in the context of conferences, especially in the Italian legal system or the initiatives of financial institutions (ECB, Bank of Italy). The results of economic studies make it possible to acquire an adequate awareness of the affirmation of Islamic finance in the international markets and of the reasons for its necessary consideration in relation to the European legal systems.

It should also be pointed out that the role of lawyers depends on the existence and interpretation of disciplines or at least the adoption of bills; as is well known, there are not European rules for Islamic banking, but individual experiences of some European countries. From the bibliographical references emerge a clear minority of law studies and an extensive panorama of in-depth studies by Italian and foreign economists who analyse the relevant presence in international market of Islamic finance from several points of view.

Predieri was the first Italian jurist to deal with Islamic banks in essays in 1996 and 2006 with the broader aim of fostering knowledge of Islamic law and contributing to cultural enrichment; Piccinelli also follows this line, focusing on legal instruments. Since 2006, some authors (Donato, Donini, Freni, Gimigliano, Miraglia, Piccinelli, Porzio, Rotondo, Russo, Santoro, Scolart, Casoria) have explored the topic from an interdisciplinary perspective, above all, in several collective volumes, often containing conference proceedings that highlight the intention to solicit further studies. However, the debate has not had much follow-up among Italian jurists, while there has been more interest in other legal systems. There are also some contributions from foreign lawyers (Aldohni, Al-Rimawi, Ariff, Arnaud, Decock, Engels, Farook, Housby, Lewis, Sagaert, Wilson, Knan, *et al.*) dealing with the differences between conventional and Islamic banking systems, also with reference to the European Union and the experience of the United Kingdom.

Undoubtedly, the most numerous and specific studies consist of economics studies by many foreign (Abbas, Abiad, Ahmed, Aracil, Ariff, Asad, Ashraf, Asutay, Chazi, Ginena, Gintzburger, Hassan, Khallaf, Khavarinezhad, Jafari-Sadeghi, Khan, Zamir *et al.*) and Italian authors (Biancone, Calandra, Colecchia, Floreani, Miglietta, Paltrinieri, Prandi, Lanzara *et al.*) who addressed various aspects of Islamic finance: the response to the crisis, capital requirements and the application of Basel III, risk exposure of GCC banks and activities in the European context as well as sustainable finance profiles.

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In this survey, the law and economics studies, reports and publications of the Islamic Financial Services Board (IFSB) [12] represent crucial references for an overall knowledge of the sector and regulation aimed not only at Shariah compliance, but also at aligning Islamic banks with international standards acquired by the European Banking Union and the Single Supervisory Mechanism.

This article could help fill a gap in law studies on possible relationships between the European system and Islamic banking industry.

III. METHODOLOGY

The method of investigation adopted consists in comparing the typical legal principles and the economic aspects of Islamic finance and the European Banking Union and national law, in order to verify whether the establishment of Islamic banks and investment companies is conceivable or whether, for reasons of structural incompatibility, the current European regulations and organisation can only admit the offer of Islamic finance products by conventional European banks.

More precisely, the method of comparative law [13] allows a comparison of the relevant aspects of the two sectors of banking activity that belong to different law systems, examining the European discipline and the principles of Islamic finance in order to identify possible areas of "coexistence" in the same system. The survey draws on the contribution of the extensive economics literature cited in the "References" section which has supported the study of legal profiles, in the light of the modern interdisciplinary research that is indispensable in such complex areas. In fact, for the field of Islamic finance, economic studies are prevalent compared to the limited interest of European jurists.

The difficulty of finding legal scholarship conditions the debate, which focuses mainly on the economic consequences and less on the construction of legal instruments for operational adaptation in the European banking system. In fact, lawyers tend to examine disciplines that already exist in the system of reference, the possible changes or bills; in this case there are no specific rules of European law, but there are general principles and individual experiences of some European countries that have allowed the use, within certain limits, of Islamic financial products.

Economic studies, on the other hand, can evolve by examining global economic phenomena using case study criteria and empirical analysis of the activities of operators according to international standards. The approach is more open, and the object of the research concerns the economic consequences of existing legal schemes, which can provide an interesting basis for legal reflection, especially when a sector, such as Islamic finance, is so widespread that it cannot be ignored by European legal systems.

IV. FINDINGS AND DISCUSSION

A. *The comparison with the European conventional banking system and differences*

Relations with conventional banks are difficult because of the characteristics of Islamic finance and banking activities exercised in the EU context according to different rules for the financial intermediary, above all, considering the management of the risk, to the rules of vigilance and to the regulation of competition. For the intermediary from the Islamic discipline, the implementation of transparency depends essentially on the respect of conduct provided by the supervisory authorities and by the Shariah guarantee committee for an ethical control, while the informative obligations depend on the discretion of the bank with inevitable problems of transparency and certainty of the rules. However, the IFSB has contributed significantly to improving relations with the conventional banking system. A central aspect that must be examined is the compatibility of the Islamic banking activity with the European supervision discipline, on the requirements of liquidity of the capital and on the financial system in order to envisage a framework of admissible relations.

In general, as we have seen, the principle of participation which is linked to the sharing of the risk characterises Islamic banking activity and because of its structure it is not linked to an obligation of guarantee for the capital deposited and funds reimbursement, a substantial aspect which is not compatible with European banking discipline and the requirements of capital liquidity, especially after the innovations of the Banking Union. However, it is necessary to distinguish between the regime of free and participating deposits and, in fact, only the latter can be affected by losses, if the bank is not able to meet them with its capital reserves. Moreover, it is necessary to point out that the location of the bank, be it Islamic or conventional, conditions the applicable discipline in the relative order; the purposes of the bank deposit are different: in the Islamic system, the capitalsation of savings and the guarantee of preservation, while in conventional banks the deposit has represented, at least until the financial crisis and the drastic reduction of interest rates, also a solution of investment and short-term savings [14].

An immediate comparison [15] between the two systems shows the different nature of the discipline: since for conventional banks the functions and operating procedures are provided for by European and national laws and standard rules, while for Islamic banks the reference is the Shariah to which the production of profits must conform, an objective common to the conventional bank, while the main function is different, which in the first case consists in participation in partnership activities and in the second in the intermediation of funds. The relationship with clients is a three-way one, i.e., between investors, partners and intermediaries, which is different from the "traditional" one based on the creditor/debtor dynamic; as for interest, this is not applicable as it is contrary to the rule of risk sharing between depositors and custodians of funds, unlike our system which provides for active and passive interest rates as a return and costs to be

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incurred for the deposit. The approach is also different for the phase of verification of admission to projects financing, since the Islamic bank gives importance to the feasibility, while the conventional one gives priority to the reliability of the applicants and financing based on the provision of guarantees. In the event of defaults or delays, the Islamic bank cannot set interest or other charges, a rule that is, instead, general in the conventional scheme, and neither would there be an obligation to fully guarantee deposits, an issue that has been the focus of attention in the EU and in the choices of the ECB until the introduction of a single mechanism for the resolution of banking crises (Reg. (UE) 15 July 2014, n. 806; Directive (UE) 15 May 2014, n. 59).

In any case, the obstacle of the prohibition of interest has prevented easy access to the interbank market and investment in "conventional" securities precisely because of their intrinsic nature of referring to interest-based return mechanisms. However, specific forms of investment and credit collection have been developed for issuance, consisting of transactions, especially in mutual funds, in participatory corporate contracts and in the issuance of bonds and Sukuk, which are bonds deriving from the securitisation of portfolios of contracts, and in participatory current accounts. Islamic bonds are issued by the state or other public entities according to the scheme of securitisation of public assets through sale and lease Ijarah. In the mutual fund, the holders of the shares entrust the management of a capital to a specialised operator who is entitled to a fixed amount of the profits deriving from the management and the investor is entitled to a share in profits and losses proportional to the amount conferred, based on the trust agreement between bank and depositor. The management of the fund can also take place through a company, which is responsible for the correct administration of the investments in compliance with the Islamic discipline and the directives of the body (committee or council) in charge of monitoring compliance with the ethical rules and for any financial losses from which an obligation of compensation generally derives [16].

B. Islamic Banking and European Banking Union

The Islamic bond market has gained significant consideration even among conventional investors as well in the last decade precisely because these instruments are linked to material assets and, therefore, with a high degree of security [17]. Not only Muslim investors are involved, as they formally conform to Islamic principles, but also European ones, given the financial crisis caused mainly by the circulation of instruments that have unsafe mechanisms, based as they are on interest and debt. Indeed, these securities are currently traded in the largest secondary markets mainly because of their security qualities.

The growth of Islamic banking can certainly be traced back to the spread of investment funds and Islamic bonds; the establishment of the Islamic Bank of Britain [18], which is an expression of this evolution also by means of innovative management methods in order to acquire credibility in the markets, notwithstanding its very particular and distinct framework compared to conventional banks. Regarding taxes, the legislation in the UK facilitated the practical implementation of traditional models of acquisition avoiding interest, which are compatible with Islamic law. New rules have been implemented to levy the stamp duty only once in cases of Islamic mortgages and at first HSBC Amanah first offered such Islamic mortgages, with other banks following suit.

However, it is necessary to highlight the problematic issues of compatibility with the conventional market, regulation in the classical sense and the necessary transparency of requirements, when Islamic banks operate in European countries. It is necessary to consider the supervision exercised by the ECB and national central banks, according to the approach of European banking supervision (Reg. (UE) 15 October 2013, n. 1024 and Reg. (UE) 16 April 2014, n. 468 and related disciplines) and many rules (Basel III, EBA) that impose obligations of capital requirements and procedures of necessary transparency (e.g., the "stress test" for banks) about aspects of accounting and internal decisions that can only be based on the adoption of technological innovations for communications between the operators involved. Islamic finance schemes present interesting aspects from the perspective of a sustainable and socially oriented finance, but the critical issue is the certainty of the rules and their effective knowability through widely available technological tools.

It is, therefore, necessary to have a high level of transparency in internal controls by the Council of Shariah, which plays a role analogous to the ethics committees, but according to Islamic ethical-legal rules from which derives a certain unpredictability in the application of rules of conduct by way of interpretation. Moreover, a certain uniformity of rules would be necessary, given the obvious differentiation according to the countries of origin, an objective in theory constantly affirmed by the GCC, but difficult to implement even for the discipline of competition [19].

The Islamic bank is, however, for certain activities, certainly comparable to a conventional credit institution, but for further services of a financial nature, problems of vigilance arise and for the collection of credit "at risk", there is a need for greater transparency also for the savers, especially for European investors. From the mudàraba and mushàraka schemes derives a significant involvement in the business risk of the bank and, therefore, adequate supervisory measures are necessary. In the case of mushàraka, the partnership contract between bank and client foresees that the capital in goods or liquidity derives from both and allows the control to actively participate in the project [20]. Moreover, the need for an organisational separation of the activities of the bank is also envisaged for the Islamic bank, in order to avoid possible conflicts of interest between the parties involved in the business, like the universal bank scheme [21].

C. Tasks of Islamic financial and banking authorities

The Islamic financial activity has, therefore, objectives of an economic nature (preservation of the capital, profits,

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equilibrium between liquidity and profitability) and ethical-religious rules (respect for the precepts and standards of behaviour of the Koran and of the Shariah, considering the legitimate goods - halal - and excluding the forbidden haram activities). Moreover, the concept of cooperation replaces the traditional concept of competition in the market mechanism, which is instead central in the EU.

The difficulty of "translating" ethical-religious or, at least, moral principles into rules of prudential supervision, which in the international market must be compatible with the requirements of Basel III, is evident, in addition to the uniform European framework for Member States. Furthermore, there is the necessary availability of information that can be acquired by financial intermediaries and investors, a condition favoured by technological innovation and tools in the most advanced countries along with the establishment of competent authorities.

The schemes of Islamic finance present characteristics that seem, in effect, to favour economic and social sustainability; however, the risk of unpredictable interpretations adopted by the Shariah supervisory committees is still an element of significant perplexity, especially if we consider the essentiality of legal certainty and reliability of the financial products, after various crises for different reasons. The current solution represents a delicate compromise between the acceptance of international standards and the objective of Shariah-compliance activities.

The national Islamic banking supervisory authorities must guarantee the stability of the financial system according to two objectives: the control of capital requirements with international indications and the modalities of activity that must be Shariah-compliant. This stability depends on ensuring that Islamic banks have systems in place to control requirements and internal Shariah governance policies and processes to identify, monitor and control or mitigate Shariah risk as a result of interpretations that may be inconsistent. As regards the relationship between liquidity and credit risk, some studies have compared Islamic banks and conventional ones and revealed that the former are better than the latter in managing risks [22]. In addition, a further objective of financial regulation is the protection of consumer rights that may be affected by the proposed instruments, and it is essential that Islamic banks ensure fairness and diligence in their operations and compliance with Shariah precepts, as depositors are attracted to these institutions primarily for their ethical and religious principles.

Thus, the IFSB advises supervisors to provide banks with a framework of uniform internal rules to enable Shariah compliance, although supervisors will inevitably have differing views on Shariah governance given the different legal systems in which the banks operate. In addition, the IFSB ascertains the different needs of individual banks, which vary depending on different factors such as size and capital requirements; regulators should ascertain whether banks have control systems in place to ensure Shariah compliance. To this end, the IFSB has developed some guiding principles on requirements for the distribution of Islamic products in the capital market, for Sukuk and collective investment schemes.

The focus issue is the implementation of good practice in financial reporting and the establishment of an independent auditing systems and the task for any supervisory body can be made more manageable by learning from the experience of others and by applying available standards and guidelines. In this sense, the Basel III rules have contributed significantly. At the same time, it is possible to say that Islamic finance schemes may contribute generally to spreading an economic approach of solidarity.

D. *The relationship of the GCC countries with the ECB and some limited experiences of Islamic finance in EU Member States*

From 2005 onwards, it is possible to identify frequent contacts between the EU and the GCC, managed by the General Secretariat [23], and requests for specific advice to the ECB on the single currency project, which was planned for 2010, highlighting the European experience as a model to be followed for the establishment of a centralised banking entity, price stability, and fiscal and monetary convergence parameters [24]. However, links and political relations between the GCC and the EU date back to 1988 and a cooperation agreement, which provided for advice, mutual dispatch of delegations and annual meetings of ministers in sectors such as energy, transport, research and innovation, and the EU-GCC Clean Energy Network and the EU-GCC Trade and Business Cooperation Facility. At present, the objective of the single currency is postponed or at least suspended, given that there are no recent definitive decisions in this direction, to which have to be added the problems of agreement between the various countries, especially for the international policy guidelines that have created diplomatic difficulties.

Decisive decisions are still being awaited on monetary union, while for the financial markets the European discipline has already influenced regulation well beyond its natural boundaries of application due to the need for necessary harmonisation in order to encourage investment, despite the critical aspects. In fact, in the adopting standards, the IFSB, which includes GCC banks, has inevitably further rooted the European schemes as an experience of best practice in conventional markets, initially considering the Directive 2003/71/EC (on trading in financial instruments), the Transparency of Issuers' Information Directive (2004/109/EC), the UCITS Directive 2009/65/EC (regulation of undertakings for collective investment in transferable securities) and, subsequently, the most recent regulations in force, as well as the criteria adopted by the Basel Committee for European and international standards.

The cooperation of the ECB with non-EU countries has therefore also involved GCC countries, as it has strengthened relations with the General Secretariat, central banks and monetary bodies of the Member States since 2005, particularly with a view to introducing a single currency. Instruments have also been developed to enhance cooperation with the major

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central banks of many non-European states, including those of the GCC and their monetary authorities, through specific seminars [25], technical assistance and guidance, including through the contribution of expertise in the conduct of monetary policy, payment systems and banking supervision, as a “source of inspiration” for various systems. This advisory activity is part of the institutional tasks as provided for by Article 5 of the Statute of the ESCB-ECB (Protocol no. 4); for the collection of statistical information, the ECB “shall cooperate with the institutions, bodies, offices or agencies of the Union and with the competent authorities of the Member States or third countries and with international organisations” (Article 5.1.) while Article 6 refers to international cooperation and participation in international monetary institutions.

The ECB cultivates international relations [26] for cooperation with countries outside the EU; in particular, the Article 8 of Reg. (EU), 15 October 2013, no. 1024, on banking supervision, provides for the possibility for the ECB “to establish contacts and enter into administrative arrangements with supervisory authorities, international organisations and administrations of third countries, subject to appropriate coordination with the EBA. These agreements do not create legal obligations for the Union and the Member States”. This provision, which also allows for forms of cooperation in prudential supervision, may help to expand relations with other systems, especially in the exchange of information and the adaptation to common international standards.

In addition, a regulatory convergence between the EU, the GCC and other Islamic countries is necessary for the establishment of Islamic banks in Europe regarding the prerequisites for banking authorisation (Articles 4.1 (a) and 14, Reg. (UE), no. 1024/2013), capital requirements, safety nets, independence and powers of supervisors. In fact, EU law and national legislation provide for rules on administrative and decision-making bodies in a way that is far removed from the presence of the Shariah board.

Islamic financial instruments have been offered on the market for some time; in 2004, in the United Kingdom the Islamic Bank of England obtained its authorisation, in 2006 Sukuk was listed on the stock exchange and in 2014 saw the widespread issuance of Islamic bonds with a specific discipline, as in Luxembourg; while in 2004, Germany, the Land of Saxony-Anhalt decided on the issuance of Sukuk as in France [27].

In Europe, the financial sector considers the needs of Muslims with some solutions, apart from the older case of the United Kingdom, now no longer part of the European legal framework, due to the significant presence of a very traditionally oriented Muslim population. In Germany, there is a significant experience: the Kuveyt Türk Beteiligungsbank (Frankfurt) which obtained a licence as a deposit and investment bank in 2015 after an experience that began in 2004 [28], through a German bank that allowed the knowledge of Islamic finance, along with some national regulatory innovations. Other jurisdictions have introduced a special tax regime for Islamic investors for specific products.

Stock exchange values are currently listed in the Dow Jones Islamic Market and FTSE Global Islamic Indexes. European banks already distribute shares in Islamic equity funds for financial investments that exclude companies involved in gambling, alcohol, tobacco or interest-bearing loans.

The development of Islamic finance has depended on its significant reliability and resistance to financial crises (2007/2008 financial crisis period) due to its low indebtedness and use of operational instruments that are based on real assets. Certainly, financial products are more expensive as sharing entails control costs, problems of information asymmetry and property management. For an effective contribution to sustainable finance, a common regulatory and supervisory system is needed to ensure transparency and certainty, as well as contracts with clear content, especially considering the link between law and moral principles in order to limit legal risk as much as possible.

However, there are critical views regarding the tendency of Islamic financial institutions to offer products and services that are in essence similar those offered by conventional institutions and to try to come up with new ideas to remain competitive as a viable alternative to conventional finance; at the same time Islamic financial experts must ensure their Islamic character [29].

Financial transactions are guaranteed by assets and risk-sharing and transactions have real purposes (concrete and productive activities, real estate), limiting financial speculation; moreover, some recent reports [30] on Islamic finance reveal prospects for growth, despite the difficulties caused by the pandemic [31]. These aspects are of considerable interest to European legal systems as an opportunity and alternative source of financing. In Europe, there is a significant presence of “Islamic counters” that have opened in conventional banks for depositors wishing to implement religious principles, but regulatory innovations must be introduced for supervision and regulation, in the sense that the EU member states where these banks are located should adopt their legislation considering all the potential risks in relation to this new financial activity.

These perspectives also appeal to the Italian system, on the assumption of appropriate regulatory changes necessary to overcome tax issues and incompatibilities with internal rules, in order to encourage the establishment of Islamic banks, especially in the form of investment banks, while European advisory companies are already widespread. In 2010, a seminar, organised at the Bank of Italy, brought together GCC central banks and monetary authorities to examine financial and economic developments in these countries and in the euro area and the consequences of the global financial crisis for stability and monetary policy. A relatively favourable economic experience emerged, especially in comparison with advanced economies and emerging markets. The GCC Region was seen as a major player in international financial markets, engaged in the efforts of the international community to reform the global framework for financial stability and banking supervision [32].

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Later, in 2013 at the IFSB Forum in Rome at the Bank of Italy, the Governor Ignazio Visco focused attention on the interest for Islamic finance and the opportunity to attract foreign capital to underpin economic progress and the intensity of the commercial and financial links with the southern shores of the Mediterranean and make it increasingly important for Italy and its financial system to be equipped with the knowledge and the operational instruments needed to interact with financial systems complying with shariah principles: the principle that profits should be generated from fully sharing in the business risk of an investment, the so-called "profit and loss sharing principle". The asset-banking requirement complements these prescriptions, providing for the link between each financial transaction and an identifiable underlying asset, but it has to be clearly ethical and certainly transparent.

The offer of Islamic financial products is characterised by high growth rates and the most relevant component is banking, but in non-Islamic systems an adaptation of traditional and fiscal schemes is required. The Italian legal system shows a limited and slow interest in these alternative financial instruments, compared to other European countries. Bill no. 4453 of 2 May 2017, presents provisions concerning the fiscal treatment of the operations of Islamic finance, given that a decisive obstacle to the expansion of Islamic finance in Italy consists in the "duplication" of taxation because of the complex structure of the operations to ensure compliance with the Shariah, with an aggravation of fiscal costs in comparison with the instruments of conventional finance [33].

The objective is to "assure a taxation equal to that of the conventional financial operations" (Article 1), in order to attract foreign investments and depositors from the Muslim community in Italy who already hold a high amount of savings. The "constant monitoring" will certainly have to be extended and supplemented by specific rules of regulation and supervision to be included in the current system.

At present, the project is still assigned to the VI Finance Commission, but there have been no further developments. The slowness of the Italian legislator has led some banking operators to consider the possibility of offering Shariah-compliant products through "Islamic windows", i.e., special branches created in conventional banks. Regulation appears to be a very important issue, in order not to exclude from access to credit a sector of the population corresponding to at least one million residents, both for social reasons and for evaluations of credit support and incentives for investment funds.

E. The role of the IFSB

The context of reform of the international rules and global difficulties have undoubtedly aggravated the relevant complexity of the multiple tasks carried out by the IFSB as regulator and supervisor of the Islamic banks in the system of natural belonging and as an authority that adopts the choices of necessary alignment to the conventional system for obvious interests in international markets. This organisation promotes and enhances the soundness and stability of the Islamic financial services industry by issuing global prudential standards and guiding principles, broadly defined to include banking, capital markets and insurance sectors.

The respect of punctual constraints of capital is a further controversial aspect, given that for the Islamic banks the prevailing limits consist in ethical rules of the Shariah, in addition to the evaluations of control of merit which depend on the interpretation of the Shariah, exercised by a council (or committee) of the Shariah, and limits for the liabilities in the balance sheet. However, in addition to these forms of ethical-religious control, there is also the regulation of Islamic banks for the aspects that are linked to risk and capital requirements. In this context, the IFSB has taken on a decisive role, established in 2002 and operational since 2003, precisely because of the particularity of the requirements of financial institutions, which involves several banks in the Arab countries of the GCC and which provides international standards and obligations comparable to those provided by Basel III and the discipline on banking supervision. Indeed, the IFSB has published standards, guiding principles and technical notes covering various regulatory aspects for Islamic banking markets, insurance markets and financial markets.

The IFSB is an international organisation aimed at introducing standards, promoting and enhancing the soundness and stability of the Islamic financial services industry by issuing prudential rules and guiding principles for the financial services industry (banking, capital markets and insurance sectors). The standards developed derive from a complex process specified in guidelines and standard-setting procedures, which are characterised by the issuance of exposure drafts, the conduct of workshops and public hearings. In addition, the IFSB prepares very concise annual reports, conducts research and coordinates initiatives, roundtables, seminars and conferences for regulators and industry participants and for these purposes it cooperates with international, regional and national organisations, research institutes and market participants, as a "dialogue" entity with the conventional banking system.

The IFSB standards follow a comprehensive due process as outlined in its *Guidelines and Procedures for the Preparation of Standards/Guidelines*; it involves the issuance of exposure drafts and carries out workshops and public hearings, research, conferences for regulators and stakeholders [34]. These activities are carried out in cooperation with relevant international and national organisations, research entities and market players.

The *Islamic Financial Services Industry Stability Report 2021* [35] offers a selection of results from the IFSB international research and surveys to achieve a broader and common understanding of critical issues in Islamic finance. In line with governments and regulators in other countries engaged in economic recovery and the adoption of fiscal and monetary measures, the IFSB has been engaged in analysing the most effective interventions to support the banking sector and sustained its growth momentum in 2020 recording a growth rate of 10.7% year-on-year based on significant

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improvement, especially in the Islamic banking and capital markets segments. The financial stability indicators remained satisfactory, especially when compared with previous years' performance, conventional peers, and assessment criteria used by international standard-setting bodies.

The IFSB closely monitors developments in the global financial system generally and specifically in the jurisdictions of its members; it has published a compendium of policy responses and a paper on the impact of the pandemic on the Islamic Financial Services Industry (IFSI) and several standards, guides and technical notes to complement the work of other international standards but also to cater for the specific tasks of the IFSB. The analysis conducted on the Islamic banking segment is based on the Prudential and Structural Islamic Financial Indicators (PSIFI) database of the IFSB, which has extended coverage of the database to both the Islamic capital market and takaful segments from 2020 onwards. The report examines the implications for the soundness and resilience of the global IFSI and recent economic developments and changes in the global financial system, with a particular focus on the pandemic.

The 2021 Report presents an overview of the vulnerability aspects and the outlook of the global Islamic financial services industries and IFSB members regarding the three key sectors: Islamic banking, the Islamic capital market and Islamic insurance that are objects of an in-depth analysis based on data from the Prudential and Structural Islamic Financial Indicators database of the IFSB. This document provides an indicative outlook for the IFSI, which makes it a prime reference for information on the stability of Islamic finance globally and across national systems.

The developments and significant economic impacts depend on the widespread public health measures for the global pandemic, an external shock that did not affect the banking sector. However, the economic and social impacts have affected the stability of financial systems. The Islamic social finance sector can promote stability by diversifying the financial system and indirectly by financial and social inclusion through providing inclusive financial services for poorer people. This financial sector could complement the commercial financial sector through the zakah and waqf that can provide stable funds to tackle the adverse impact of negative shocks such as the pandemic. The zakah is a percentage of wealth a waqf represents in social capital that is relatively stable during negative shocks, and they provide support to people in need [36].

Covid-19 has impeded the achievement of many goals, but it has also highlighted the need to make significant changes. According to the report, in this regard, Islamic social finance needs to transform to become more effective and resilient in order to help promote the development of sustainable and stable economic, social, environmental and financial systems. As in the European system, economic support measures and macroprudential policy measures [37] helped to improve financial conditions and to mitigate any potential financial stability risks that remained relatively resilient with significant differences in several countries.

Reading the report reveals the Islamic banking and Islamic capital markets sectors contributed to the increase in total worth of the global IFSI, while takaful sector experienced a slight contraction; otherwise, the IFSI demonstrated overall growth in 2020 despite many systems experiencing economic recessions as a result of lockdowns and heightened uncertainty due to the pandemic [38]. For example, the GCC countries maintained their position as the most important market for Islamic finance activities in 2020 and the Middle East and South Asia region is the second largest share remaining consistent with the previous year.

The data emerging from the report do not seem negative, if compared to the European experience and if we consider the level of transparency adequate; however, adjustments are also needed to participate in the European market. The countries examined, although they share an Islamic approach to the economy, also have very different situations in the financial sectors, due in part to differences in internal regulations, profitability levels and the market for available energy resources, as the Report clearly shows.

For a useful comparison of compatibility with the European system, it is therefore necessary to examine the commitment to the Basel III standards. The Report considers the Basel Committee programme and strategic priorities for 2021-2022 that focused on implementation and evaluation; it will complete existing work on the prudential treatment of crypto-currency exposures about which a consultation document was published in June 2021 and on disclosure requirements related to market risk and sovereign exposures. In particular, the Report specifies that disclosure requirements may have some impact on future IFSB standards, confirming the direct influence on Islamic banking system.

In 2020-2021, international entities in the banking, securities and insurance sectors issued several documents (reports, consultations, standards, survey reports) that are relevant to the tasks of the IFSB, and show global developments and the impacts of new choices also as a result of the pandemic. The IFSB, "being the complementary global standard setter" for the Islamic banking, capital markets and takaful sectors, monitors standards and guidelines of these global authorities (Basel Committee on Banking Supervision, International Organisation of Securities Commissions, Financial Stability Board, International Association of Insurance Supervisors). Their activities and standards have been seriously affected by the pandemic; in fact, some entities have done significant short-term work in response to it, for example, by providing members with access to information on measures taken in other jurisdictions.

Some postponements of the implementation dates were decided for agreed reforms in order to allow institutions to focus more fully on their responses to the pandemic crisis, for example, the consultation on new Principles for Operational Resilience and revised Principles for the Sound Management of Operational Risk of the BCBS. The IFSB also adopted a consultation on Effective Practices for Cyber incident Response and Recovery, and IOSCO consulted on revisions to its Principles for Outsourcing with operational resilience as a

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driver of several changes. In these documents, there are no references to the specifically Islamic financial and banking regulations, but their influence on the work of the ISFB will emerge in future standards on broader aspects such as risk management or the supervisory review process.

Other topics for specific definitive standards relate to the impact of financial technologies, particularly crypto-assets and "stable coins", but also include the use of artificial intelligence and machine learning by asset managers and other capital markets intermediaries and the use of big data analytics in insurance [39].

The Islamic financial system has shown resilience, and unprecedented interventions by governments and regulators have allowed markets to continue in their tasks [40]. The IFSB has identified a programme focusing particularly on fund liquidity and non-bank financial institutions based on analytical study and a number of changes in standards. In fact, Islamic capital markets have some very positive profiles such as the very limited use of derivatives and the adoption of social projects of financing, while in the Sukuk market a shortage of liquidity has become apparent.

F. The regulatory criteria, standards and supervision of Islamic banks: the needs for transparency and knowability through technological innovation

The implementation of IFSB standards represents a challenge in some jurisdictions that have a limited experience, because they should have adequate infrastructure to support Islamic finance and a skilled policy team. The guidelines represent an opportunity to improve implementation rates by leveraging on the experience of other members and sharing the basic steps of regulatory and supervisory authorities that have successfully implemented IFSB standards [41].

Most of the regulatory and operational aspects of Islamic banking depend on the respective central banks which develop the legislative framework for competition within the Islamic financial sector; the legislations also contain provisions on governance and provide for Shariah compliance committees or boards for financial institutions, present e.g., in all GCC countries [42]. The main role of the Shariah supervisory boards is to ensure that the instruments offered by financial institutions are coherent with the fiqh (jurisprudence) on ethical-religious rules as a form of supervision and governance with additional tasks, e.g., advising the board of directors, providing guidance to Islamic financial institutions on the limits of activity, without executive functions that fall exclusively to the management of the bank or a strategic role for the board of directors. The Shariah board has no competence regarding the management of the risks, apart from those deriving from its own decisions or from the fatwa [43] which is a legal opinion on any Shariah question, according to a predetermined methodology. In fact, the board establishes rules and principles relative to Shariah, ensures that the policies and procedures of the Islamic financial institutions are compliant and can take decisions to create certainty of compliance. Together with the board of directors and other operational committees, the Shariah committee can prevent aggressive lending and higher-risk activities, counter unethical practices, and ensure compliance and principles for social justice purposes, although there may be changes of direction in decisions [44]. In this context, Shariah-compliant financing is a contributing factor to the efficiency of the GCC national banks and the functioning of the overall financial sector.

While several banking laws regarding Islamic finance require banks to have a Shariah board in-house, most regulators are reluctant to engage in Shariah matters and this trend is controversial. Malaysia's regulation [45] is an exception, as the central bank has its own Shariah board, whose fatwa may be of a higher level than the Shariah boards of individual Islamic banks for internal control [46]. This ensures consistency and probably a reduction in risk, but it could potentially limit debate in the future by centralising the decision on compliance. Within the corporate governance system, therefore, adequacy to Shariah is essential, not least to help mitigate the effects of potential risks through due diligence respecting the ethical underpinnings of Islamic economics. However, from recent empirical evidence it emerges that the best practices of Shariah governance have not achieved the efficiency envisaged by the banks, which pursue objectives of governance of the activities according to the ethical Islamic economy [47] and the prevention of financial crises.

Compliant financing has demonstrated positive effects, but improving the quality of institutions, the rule of law, and the effectiveness of government action have emerged as equally important aspects as part of strengthening lending by banks in GCC countries. The main policy implication is that governments and policymakers will have to adapt legislation more vigorously and adopt reforms of laws and regulations governing the banking and financial sector and a more open economy. GCC countries have, in fact, long been in the process of continuously reforming their business sectors to make them more competitive internationally, but attention to strengthening the institutional framework in which finance operates is essential [48].

However, the issue of securities regulation cannot be addressed independently of an examination of the legal context, especially since there are no abstract schemes developed in advanced regulatory regimes that can be adequately introduced into systems with different assumptions and ethical-religious limitations that are a source of legal risks inherent in the application of Shariah and constitutive effects for commercial legislation, such as the prohibitions of riba and gharar that limit the modus operandi of stock markets and the choice of securities [49].

The Shariah produces legal and economic risks that are not quantifiable a priori and that can directly influence modern Arab commercial legislation and, in the worst-case scenario, could render the new discipline inapplicable, given the exercise of supervision according to ethical-religious criteria. In essence, the influence of Shariah cannot be fully foreseen in the examination of commercial legislation, as assessments are based on criteria that are subject to interpretation that is often

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not unambiguous and not even accessible through instruments of certain knowability. The need for transparency is particularly evident in order to reduce risks as they can be known and foreseen in advance [50].

G. The rules on capital requirements

The IFSB institutional website has been enriched with content, and transparency has undoubtedly increased in recent years; however, the difficulty of framing ethical-religious principles in uniformly applicable rules and standards of banking regulation is evident.

The objectives of the guidelines are very similar to those pursued by the EBA and ESMA and, therefore, to the indication of technical standards as a basis for national regulatory and supervisory authorities to define, in turn, specific rules and guidelines on adequacy requirements for the marketing of financial products and investment funds [51], the dissemination of information in the sector and, in particular, greater harmonisation of regulation and practices, in order to encourage investments from third countries. In addition, they include the competence to prepare stress tests [52], similar to the EBA. Among the guiding principles in the offer of Sukuk securities and investment funds, inspired by good practices in conventional and Islamic markets, are the rules of clear, accurate and not misleading information to investors as well as timely disclosure for a reasonable investment decision; in particular, for Sukuk securities, the structure and related contracts must be described with sufficient clarity to allow the investor to understand and assess any risks attached to it [53] and there are similar rules for investment funds adopted by national regulators [54].

The regulatory standards and guidelines for Islamic banks can be divided into two basic categories: the first set of standards relate to Islamic counterparties and consist of guidelines and conventional international standards that include the prudential standards necessary to ensure a stable financial system; in this development the IFSB uses existing international standards issued by relevant bodies, such as the Basel Committee, as the basis for its own standards with adaptations to suit Islamic banking practices. For example, the Capital Adequacy Standard for Institutions (other than Insurance Institutions) Offering Only Islamic Financial Services (2005) is based primarily on the principles of Pillar 1 of the Basel II standards. In particular, the IFSB amended and adapted two Basel Committee documents to develop appropriate capital requirements for Islamic banking practices. Following the financial crisis, IFSB considered the new guidance of Basel III by adopting Revised Capital Adequacy Standard for Institutions Offering Islamic Financial Services (IFSB-15) incorporating the changes in capital adequacy requirements of the new international standards [55]. Thus, the Basel Committee rules are acquired indirectly through the intervention of the IFSB which adapts them to the reality of Islamic banking. The second type of IFSB standard rules is unique to Islamic financial activity and consists of guidelines for an adequate supervisory framework in the application of Shariah for Islamic financial institutions also through digital solutions [56].

The IFSB, in its publication Guiding Principles of Risk Management for Institutions (other than Insurance Institutions), has defined the various categories of risk (e.g., credit, investment, market, liquidity and operational risk) and clarified that Islamic financial institutions should be characterised by a comprehensive risk management process and transparency and reporting requirements. The process should consider adequate measures to comply with the rules and principles of the Shariah and ensure adequate risk reporting to the supervisory authority; among the forms of risk, credit risk: the Islamic Financial Institutions (IFIs) should have a specific strategy of financing and the instruments used must be in conformity with the Shariah, which recognises the potential credit exposures that can arise in different phases of the various financing agreements [57].

As regards investment risk, IFIs should have appropriate risk management strategies and reporting processes in place in relation to risk characteristics for equity investments, including mudarabah and musharaka investments. With respect to market risk, for all assets, IFIs should have a system of appropriate technology tools with respect to risk management and reporting, to be considered separately, including for those that are not intended immediately for the market and/or exposed to high volatility pricing. In terms of liquidity risk, IFIs should have a liquidity management framework (including reports) in place, considering separately and in total liquidity exposures related to each category of current accounts, and restricted and unrestricted investment accounts. Finally, for operational risk, IFIs should have adequate systems and controls in place, including oversight to ensure compliance with ethical and religious norms and principles, including the risk of non-compliance with Shariah [58].

Thus, Islamic banks face the same risks (dependent on insolvency, commodity price fluctuations, liquidity management, regulatory and market risks) as conventional institutions, but the typical risk is that of not properly fulfilling the principle of risk sharing in financial transactions or religious precepts related to economic activities.

The principles prepared by the IFSB also concern the transparency and necessary detailed information on the financial instruments and the investment funds for conformity to the Shariah, in order to allow informed decisions according to ethical-juridical rules; furthermore, specific regulations are provided for the composition of the board, their roles and responsibilities, the circumstances in which the non-compliance can occur and the procedures to detect and control the risks, the processes of internal and external audit as well as the possible pecuniary sanctions as a measure of "purification" for the non-compliant incomes. There are requirements for transparency and constant updating of data by appropriate electronic reporting systems.

The Shariah-compliant contracts used by Islamic banks modify the risk-return characteristics of the products and have relevant regulatory implications [59]. However, despite the

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particularities, some regulatory standards of the Basel Committee can be applied to Islamic banks, while the specific characteristics in relation to ethical rules are certainly not considered by international regulatory standards. For example, the use of profit-sharing investment accounts (PSIA) raises several issues, e.g., whether to consider them as deposits or treat them as capital, as there is a risk-sharing element to the assets. Moreover, since the returns of PSIAs are based on the principle of profit-loss ratio, the rights of investor-depositors need to be protected and the fiduciary nature of the contract also requires greater transparency in the related banking operations [60].

This is a concrete problem common to other international bodies adopting rules with standard provisions and, in fact, even the IFSB does not have "enforcement powers" [61] to ensure the effective application of its prudential standards in the various countries involved, and it is inevitable that enforcement depends on national regulators; in essence, few supervisors have incorporated these standards into national regulation and it is possible to state that the regulatory regimes of Islamic banks can be traced to three solutions: the first concerns a few countries (e.g., Bahrain, Oman [62]) that have adopted specific regulatory guidelines; the second solution concerns countries that require banks to follow the regulations foreseen for conventional banks, even if adaptations are necessary to respect the Shariah.

The third solution adopted by countries such as Saudi Arabia and the United Kingdom [63] is to subject Islamic banks to the same regulation as conventional counterparties and Islamic banks adjust their operations to the existing regulation. While in the jurisdictions where there is no regulation of Islamic finance, the banks, also Islamic, adapt to the national regulatory provisions based on the standards of the Basel Committee and in these countries the Islamic banks must use products and instruments that conform to these rules and to the ethical-legal rules of the Shariah even if a frequent contrast emerges between products that conform both to those standards and to the ethical rules. Thus, e.g., under the Basel III rules on capital requirements, Islamic banks should ascertain acceptable capitalisation (Tier-1 and Tier-2) and the value of risk-weighted assets in their portfolios with the new risk benchmarks. Since PSIA cannot be accepted as capital under the strict Basel III definitions, one solution may be to issue long-term equity-based Sukuk that meet the definition of capital under the new regulatory requirements. In addition, as Basel III pays more attention to market and other special risks, the risk references for partnership contracts such as mudarabah and musharaka and sales-based instruments such as salaam and istisna'a (a medium-term funding technique) are likely to increase.

The Basel Committee had already published guidelines in relation to liquidity for risk management prior to the crisis (Basel II), but with the crisis, the central role of capital further emerged, and this led to the definition of specific requirements with Basel III. The aim of introducing the appropriate capital liquidity requirements is to promote a more flexible banking sector, improving its ability to withstand shocks from different sources. Basel III introduced the Liquidity Coverage Ratio (LCR) to meet short-term liquidity needs and risks and the Net Stable Funding Ratio (NSFR) to ensure adequate medium and long-term liquid funds. In particular, Saudi Arabia has implemented the requirements set out in Basel III, through the Saudi Arabian Monetary Authority, which has undertaken a number of initiatives to strengthen the prudential framework for bank capital and issued the Basel III risk-based capital framework in December 2012 to implement the first phase, which came into force in January 2013. A number of new rules and policies were also introduced in October and December 2012, in particular on capital requirements for bank exposure to central counterparties, the 3 Pillar and the Liquidity Coverage Ratio. The United Arab Emirates also recently adopted the capital requirements of Basel III through its own regulations [64].

The risk of liquidity arises when banks face problems in acquiring sums of cash at reasonable cost from loans or from the sale of assets. In conventional banks, the needs of financial liquidity can be satisfied by private sources, by other financial institutions and by inter-bank money markets. The Islamic banks, instead, must consider the constraints of the Shariah in accessing liquidity from these sources. Since interest-bearing loans are prohibited, under Shariah it is not possible to borrow funds to meet liquidity requirements in case of need and, therefore, there are limits to borrowing; moreover, debt sales are prohibited by Islamic law in most cases and banks could not sell their debt-based assets to ensure market liquidity.

In this context, the identification of quantitative limits to borrowing is a central issue, as banks cannot receive large sums as interest payments and loans must not consist of more assets than the assets held, and loans involving large debts cannot be used to ensure liquidity; over the years, the general rules have been expressed more clearly as a certain reference for the banks and, in particular, the Shariah-compliant financial parameters [65] of the *Dow Jones Islamic Market Indexes* [66] are relevant as criteria of reference for the Shariah boards of the financial institutions [67]. For example, it is prohibited to hold shares in corporations which are in debt to the amount of more 33% of their own capital resources, which draw more than 5% of their profits from non-operating interest revenue or whose receivables amount to more than 45% of their own capital resources. Besides, there were several attempts to establish generally binding standards in order to guarantee sufficient legal security such as the Shariah standard of the Accounting Organisation for Islamic Financial Institutions (AAOIFI) based in Bahrain [68].

Without an adequate supply of Shariah-compliant liquidity instruments and active markets in which to trade, it will be difficult for Islamic banks to meet the requirements of Basel III, since they would have to shorten the maturity of their assets and increase the duration of their liabilities and capital, in order to meet the liquidity requirements. This may put Islamic banks at a disadvantage compared to their conventional counterparts and create obstacles to long-term growth; therefore, additional measures and initiatives with innovative interpretations for Shariah compliance need to be

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introduced to address liquidity requirements.

In many contexts, there are no inter-Islamic banks or organised money markets with reference funds in the event of a crisis. Furthermore, due to the lack of liquidity for Sukuk instruments and active Sukuk markets, the Islamic banks present significant risks of liquidity, given that these certificates represent a positive alternative to the traditional bonds (the issuer must return to the buyer the initial counter-value and the agreed rate of interest), but are structured in such a way that the profits are linked to a concrete asset or to an underlying property with a relative right of ownership.

While central banks in some countries play an important role in providing tradable instruments to meet short-term liquidity needs, liquidity quotas are still a major problem, forcing many banks to raise more funds. The prohibition of the interest rate entails difficulties in the management of the liquidity in the absence of a Shariah-compliant inter-banking market and because of the impossibility of investing in government securities at short expiry and at low risk; a solution is represented by the issuance of Sukuk to be understood as share certificates of Islamic investment, even if related, by affinity, to bonds. Therefore, liquidity management is one of the most challenging and relevant objectives, but with a particular difficulty if liquidity instruments and infrastructure do not evolve. A robust liquidity framework for the Islamic financial sector will be needed, not only to meet liquidity requirements under Basel III, but also for the development of private sources of liquidity and public support services.

V. Conclusions

A. Prospects for Islamic finance in the EU and future economics law research

In the European system of conventional banks, the need to adapt to the requirements of the Basel standards, transparency rules and digital transformation and innovation, raise issues that may inhibit the development of Islamic finance. In fact, the Euro-system provides for interest-based instruments, and, for prudential regulation and supervision, all European banks are required to adhere to deposit insurance and financial services clearing systems, especially after the Banking Union. In contrast, Islamic jurisprudence, which has long prevailed in several Islamic countries, has held that the investment deposits of Islamic banks, which follow the "profit and loss sharing principle", cannot be covered by deposit guarantee schemes. However, recently, this aspect has evolved due to the significant role played by the IFSB. Moreover, there is a significant further obstacle to the creation of Islamic banks, as the corporate governance and management board of European banks, which take full responsibility for management decisions based on EU and national laws, can certainly not be shared with the Shariah board [69].

In general, therefore, there are several legal difficulties and complex profiles for the spread of Islamic banks in Europe, precisely because of the prevailing legal schemes. The establishment of banks would require a specific legal rule, not so much because of the European regulation that, in any case, is in line with the well-known international standards, but because of the issue of banking authorisation which still involves the supranational and national regulatory level and above all because of the internal national rules that need to be integrated.

In fact, Article 14.1, Reg. (EU) n. 1024/2013 provides that any application for an authorisation to take up the business of a credit institution to be established in a participating Member State shall be submitted to the national competent authorities of this legal system in accordance with the requirements set out in relevant national law.

Thus, for example, in the case of an Islamic credit institution to be established in Italy, the related application must be consistent with the objective requirements determined by Article 14 of the Italian Banking law (Testo Unico Bancario), in line with the approach introduced by Directive 1977/780/EU now merged into Directive 2013/36/EU [70].

The authorisation is an administrative measure, which is issued when the conditions laid down in Article 14.1 are met. It is issued by the ECB, on the proposal of the Bank of Italy, and is denied by the ECB or the Bank of Italy, when the verification of the conditions, provided for in paragraph 1, does not guarantee sound and prudent management. For the establishment of non-conventional banks, it would be necessary to introduce specific rules on the admissibility of issuing authorisation with additional conditions for carrying out the activity, given the profound differences, just as specific rules are needed for the offering of Islamic financial products by domestic banks.

The study of the German experience could be a useful investigation for new rules and future economic law research, in order to identify a solution compatible with Italian (or other European) banking laws and tax disciplines, on the assumption of a clear desire on the part of the legislator, obviously fallowing a political decision.

On the other hand, it would be easier to foresee European banks offering Islamic financial products or branches, although the problem of taxation or other legal compatibility questions would arise. This solution should be encouraged and studied, in view of the tangible advantages associated with it and for the presence of Islamic savers and investors, but with adequate controls on the purpose of the investments. However, EU and national legislation need a solution for reasons of legal certainty.

Apart from these central aspects, it is necessary to consider the process of profound change, already underway and accelerated by external events, affecting the activities of banks, the acceleration to new technologies and the related and new risks associated with them, issues that require rapid innovations in terms of the tasks of regulators and legal disciplines.

From the European perspective, the pandemic has confirmed the importance of a solid system of rules capable of directing banks towards virtuous and prudent behaviour and strengthening the ability of the system to cope with the crisis. Reforms and the establishment of the European single

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supervisory mechanism go back some ten years to address the financial crisis, but the framework made it possible to respond to the problems of the health crisis with more adequate capital strength and liquidity. Banks during the most acute phase of the pandemic supported the economy and regulators and supervisors strengthened the resilience of the financial system.

Currently, the Basel Committee intends to improve prudential rules based on studies to verify their actual adequacy and effectiveness; the implementation of the "Final Basel III" standards has been postponed to January 2023 due to the pandemic and to increase banking capacity to face the new challenges.

These considerations can only be extended to Islamic banks: their challenge will be the "Final Basel III" implementation for their attractiveness in the international markets, and future success will depend on the imminent further adjustment in the direction of homogeneous standards. Certainly, this evolution will be examined by future legal and economics research.

Thus, several regulatory measures were adopted at international and EU level, allowing banks to absorb losses and lend during a very challenging period. The choices of postponing the implementation of the recommendations to 2023 and not adopting any further reforms (the so-called "Basel Hard Stop"), in order to ensure the medium-term stability of the prudential regulatory framework, are consistent and appropriate, while not undermining the commitment of banks to transpose the new rules. The European Commission has formulated a proposal for a legislative act from which a wide-ranging debate has ensued to ensure the competitiveness of European banks, compliance with the Basel recommendations and the application of the proportionality of the rules, without any substantial weaknesses [71].

This context undoubtedly has international consequences and can only affect Islamic banks and their relations with EU banks. For future research it will be interesting to examine how the forms of risks (credit, market and operational) are dealt with in the European Banking Union, according to the Basel indications, and how the same risks are assessed by the IFSB which, moreover, has adopted the same rules, precisely in order to cultivate profitable relations with conventional banks.

The reform of the Basel III rules has pursued three objectives to improve credibility, simplicity and comparability and has affected all risks of the so-called first pillar (credit, operational, market). In the case of market risk, it has not been easy to reconcile credibility, which is linked to the ability of quantitative measures to correctly reflect risks, with that of simplicity, which entails the rapid and immediate application and interpretation of calculation methods. Consequently, the search for a compromise has prevailed.

The previous reform of the Basel standards took place more than a decade ago, in connection with the 2007/2008 crisis, involving a comprehensive review of prudential standards and confirming the appropriateness of risk-sensitive rules. Indeed, from the outset, the Basel II rules had significant limitations and an inadequate incentive scheme, and so needed to be corrected. The new formulation has improved the credibility of risk measures, including through the reporting system, and has limited non-responsible behaviour in risk management. The pandemic has certainly confirmed the desirability of ensuring the existence of adequate capital for banks that can help to cope with external difficulties as financial support for companies and other private clients.

Regarding credit risk, as the EBA pointed out in the "Call for advice" of the European Commission, numerous revisions to be considered as widespread practices in the EU. Other revisions allow the European legislator discretionary choices that may contribute to the adoption of a discipline adapted to the specific aspects of the European systems. For operational risk, Final Basel III significantly amends the current framework by providing a single standardised approach for calculating the capital charge that replaces the previous approaches, of which three were standardised and one was based on internal models, which showed complexity, inadequacy in identifying the risk profiles of the banks, and significant problems of comparability across banks and systems.

Regarding market risks, the path has been very complex. The new standards, which were approved in an initial version in 2016 and in 2019, change the treatment of risks according to a more appropriate approach to identify all the risks related to the trading activities of banks. The increased focus on risk has resulted from the increased complexity of the rules, as the new standard has been defined based on the operations of major international banks.

The transposition of the rules in Europe entails the application of the principle of regulatory proportionality, adequately balancing the simplicity and specificity of the measures, the provision of strict conditions for the use of internal models, but which must not constitute regulatory barriers accessible only to the major international banking groups, and simplified solutions for those banks that carry out insignificant trading activities, even though less sensitive to risk.

This complex evolution inevitably affects the adaptation of Islamic banking and financial products for access to the European market. There are several practical implications that cannot be solved by interpretation, but require a specific European legal framework on which to base national implementing rules, a model that is already applied to conventional banks for harmonisation requirements.

Therefore, a special regulation is needed for the coexistence in the Banking Union of European banks and Islamic banks and financial products, at least to obtain banking authorisation for legal certainty and uniformity of solutions. In addition, national supervisors could assess the admissibility of Shariah-compliant banking contracts offered by conventional banks through the combination of several schemes that allow for effects that comply with domestic banking laws. The adoption of legal rules will, of course, depend on political choices, both at supranational and internal level.

Economic studies examine the relevance of Islamic banking activities also for some interesting sustainability aspects and this is a concrete basis for legal considerations to request regulatory interventions at European and national level.

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Adaptation, not immediate and simple, to international standards cannot be considered the only solution because of the implications, also theoretical, of the relationship between two sectors that are based on some very different principles.

Finally, we must mention the various similarities between the principles of Islamic finance (e.g., in the case of sukuk) and the principles of public-private partnership for infrastructures [72], regarding risk sharing, the lender as partner, the exclusion of speculative intentions and certainty in the definition of contractual performance. The comparison could be the topic for interesting studies in the future.

Moreover, the United Nations published a study in 2016 highlighting the possible contribution of Islamic finance to promoting the sustainable development goals of the 2030 Agenda to finance infrastructure. However, sustainable finance requires rules and techniques to manage risk and technology to enable knowledge of standards and accounting rules for the maximum transparency in transactions, and control of compliance with Islamic law as well as compatibility with the conventional system: objectives that are very complex to achieve [73].

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Recent trend of deposits in Islamic banks

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Abstract— **Bank deposits increased sharply in 2020, continuing in 2021, in countries with advanced economies and emerging countries alike. The pandemic caused savings to increase for precautionary reasons. At the same time, the lockdown compressed spending, but deposits are now a financial resource that could be used to boost the recovery of consumption and investments. There was an increase in deposits in Islamic countries, but this was less marked. The fall in GDP in 2020 in all of the Islamic countries considered, with the sole exception of Bangladesh (+5%), was met with an increase in deposits, but not such as to be thought of exceptional magnitude. An acceleration was recorded in Indonesia, Bangladesh and Saudi Arabia, with increases only moderately higher than in the previous year. Several drivers can explain this trend, some of which are attributable to Islamic principles. In assessing the role of Islamic finance and bank deposits, financial inclusion is also critical. Despite gradually increasing, the level of financial inclusion, which is high in countries with the highest income (the Gulf countries), shows a large margin for potential growth. Especially in the less rich Islamic countries, there exists a problem of mobilising resources and providing a custody function for the financial resources of households and businesses. The proliferation of fintech channels, primarily through mobile phones, can contribute significantly to financial inclusion, particularly among young people. Prospects are positive thanks to the confluence of some factors (such as the strong demand for both Sharia-compliant and ESG products).**

Keywords: bank deposit, Islamic finance, Islamic banks.

I. Sharp increase in savings in advanced and emerging economies in 2020

During 2020, there was a sharp increase in savings in countries with advanced economies and emerging countries alike, as deeply analysed by the IMF (2021) [1]. A large part of savings was banked, this being the most immediate way that businesses and households allocate excess liquid funds, while waiting to define their use more clearly. The main drivers supporting deposits were primarily the impossibility of making purchases due to the lockdown, as well as uncertainty about the evolution of the pandemic and therefore the effects of the pandemic on the economy, labour, wages and salaries.

These liquid funds are expected to be used for the consumption of goods and services and investments, which are expected to gradually recover in 2021, as well as for financial products (government bonds, funds, etc.) or for house purchases, including, to some extent, in emerging countries.

The deposits in Islamic finance have some distinctive features that substantially differentiate them from the deposits collected by conventional banks. After considering the continued presence and weight of Islamic finance in the world, this paper outlines the technical peculiarities of the deposits and their objectives. An analysis of the financial statement data of a significant sample of Islamic banks in countries where Islamic finance is applied to a considerable extent, shows their recent dynamics and allows for assessment of the effects of COVID-19 in the sector. Lastly, the examination of the level of financial inclusion makes it possible to assess the spread of bank accounts and the ability of these systems to attract deposits and capture the development opportunities and the main evolutionary trends.

II. The Muslim presence in the world and Islamic finance

Various factors have contributed to the strengthening of the Muslim presence in many countries in recent decades. The first and foremost among these are globalisation and immigration, which has led many Muslims to settle in various western countries. According to the indications on the CIA website [2], Islam is the second most practiced religion globally (by approximately 24% of the population), after Christianity which, in its main denominations (Roman Catholic Church, Protestant Church and Orthodox Church), covers more than 30% of the population.

In the Emerging Europe, there is significant Muslim presence in Albania and Bosnia Herzegovina (over 50% of the population). In the countries of the former Yugoslavia, North

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Macedonia and Kosovo are also predominantly Muslim. A minority is present in Bulgaria.

A significant minority is present in Russia, estimated to be between 10 and 15%. Again, according to CIA's figures, is growing due to the greater birth rate of the Muslim minorities (such as the Chechens) compared to the Orthodox population.

In the world, the main countries with the largest Muslim populations are the Gulf countries, with Iran and Iraq, as well as in Asia, Pakistan, Bangladesh, Indonesia and Malaysia.

The spread of Islamic finance - defined as the activity of financial institutions that base their objectives and operations on the principles of the Koran - reflects the spread of the religion, but with significant particularities. 235 banks that cover this area are operating worldwide (according to the BankFocus Moody's BvD database), 9 of which are in the European Union (27 countries).

The Gulf countries account for the highest share of the total assets of the world's Islamic banks (45.4% at the end of 2019) according to the Islamic Financial Services Industry Stability Report (2020) published by the Islamic Financial Services Board [3]. The Middle East and South Asia (MESA) area covered a share close to 26% on the same date, while the South East Asia region accounted for 23.5%. Even when adding North Africa and Sub-Saharan countries, the African region's share of the world total is marginal (1.6%). Breaking down the individual countries further, Iran's share is the highest (about 29% of the total), followed by Saudi Arabia, which has a slightly lower share (25%).

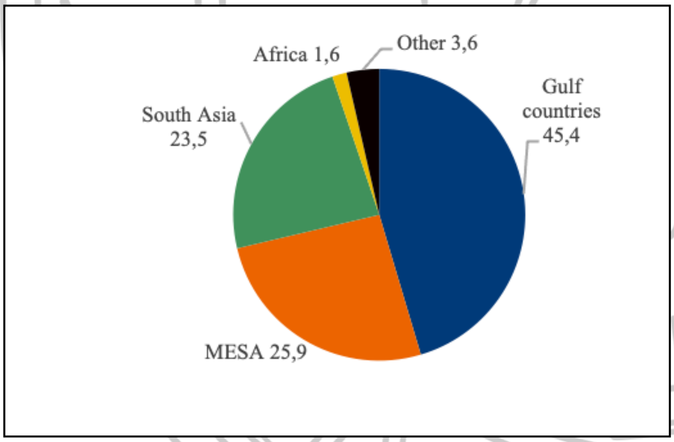

Figure 1. Islamic Finance (breakdown of TA between geographical areas, 2019). Note: MESA includes Afghanistan, Bangladesh, Iran, Iraq, Jordan, Lebanon, the Maldives, Palestine, Pakistan and Sri Lanka. Source: our calculations based on IFSB figures.

It is important to consider the regional distinction. This is because Islam differs among geographical areas and countries (first of foremost with the distinction between Shiites and Sunnis), with a different interpretation of the provisions of the Sharia, the Islamic Law [4].

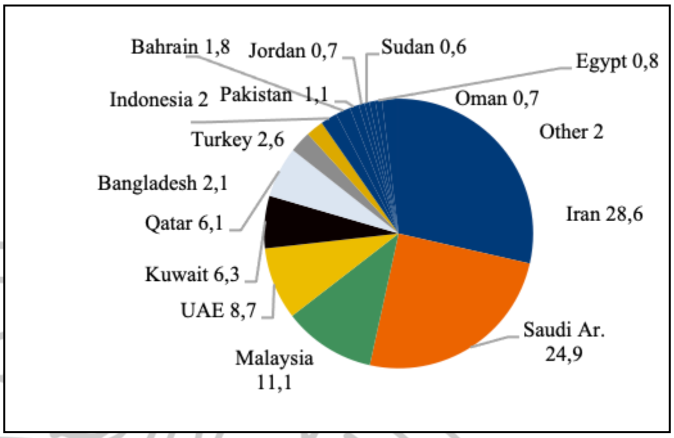

Figure 2. Islamic Finance (breakdown of TA, 2019). Source: our calculations based on IFSB figures.

The share that Islamic finance has compared to traditional finance in the individual countries is very significant. As highlighted by HRH Prince M. Al-Faisal Al-Saud (2000) [5] in providing a wide and in-depth examination of Islamic economic principles, the gradual spread of Islamic finance is part of the process defined in Muslim circles as 'Islamic resurgence', aimed at creating a new, united Islamic society that avoids 'fundamentalism' and extremist positions.

In Iran and Sudan, where the State has Islamised the financial sector, this share is 100%. Among the other countries, there is no perfect correspondence between the size of the sector (in USD Bn) and the share covered by Islamic banks. Saudi Arabia has a significant share of over 60% and high volumes of around USD 450Bn. On the other hand, in Kuwait the share of the total financial system is close to 50%, with a smaller volume (USD 100Bn). Other countries, such as Turkey and Indonesia, with volumes falling within the ranking of the major Islamic countries in the world, have modest shares compared to the conventional system (around 6%).

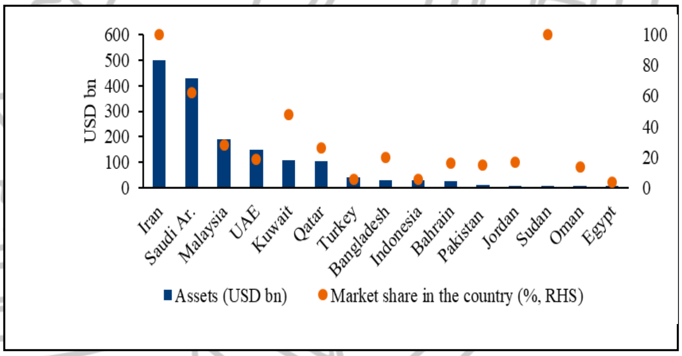

Figure 3. Islamic banks (TA and % share of the total assets of the country's banking system, 2019). Source: our calculations based on IFSB figures.

Egypt is a very important exception. With an almost total Sunni Muslim presence (with the Copts accounting for about 10%) of the population, the weight of Islamic finance in Egypt is still negligible (with a share of total world assets that fails to reach 1%), and the level of financial depth calculated using the main indicators referring to traditional finance also remains modest. A few Sharia-compliant banks were involved in foreign currency speculative transactions in the 1980s, which led to their closing. Subsequently, public banks have assumed a predominant role within the system, and they have held on to

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this role to date. In the country, only 3 Islamic banks are active, controlled by banks based in the Gulf, out of a total of 38 institutions. The structural Loan/GDP ratio also remains very low (just over 20% at the end of 2020) compared to peers, despite the presence of numerous international operators, while the ratio for deposits is higher (over 60% at the end of 2020).

Islamic banks in Bosnia accounted for a share of the country's total assets equal to about 3% at the end of 2019. Among other countries close to Europe, such as Russia, the Muslim presence is not reflected in a corresponding proliferation of Islamic financial instruments, as this presence consists of ethnic minorities whose role in the country's economy remains modest.

III. Deposits in Islamic banks: technical characteristics

There are numerous differences between the principles of European/Western and Islamic finance. These differences pertain to the objectives that can be pursued and therefore their technical characteristics.

Article 14 of the Italian Consolidated Law on Banking (and the European Directive 2006/48, Article 4) provides authorisation to carry out banking activities which, in a "traditional" sense, is focused on the dual function of collecting deposits and loan granting, and Article 11 states "for the purposes of this legislative decree, the acquisition of funds with the obligation to repay...". M. Fahim Khan and M. Porzio (2010) [6], especially in the introduction, explain the way Islamic banks are incorporated into European regulations.

Like conventional banks, Islamic banks receive deposits and finance customers, businesses and households, though with significant specific characteristics. In almost all cases, the collection and financing scheme of Islamic banks does not entail the obligation to repay. The operations of these financial institutions are therefore more complex and this has made it necessary to develop specific international standards to be followed for the preparation of the financial statements of these institutions (P. Biancone, 2014) [7].

The Islamic finance model is based on a different type of financial intermediation activity of banks based on the principle of profit and loss sharing (PLS), i.e. participation in profits and losses deriving from its customers' investments. Income from the interest typical of Western financial systems is replaced by income from assets compatible with Sharia requirements. It is interesting to note in this regard that the bank must adequately distinguish the proceeds obtained from projects financed with its customers' resources, from the profits obtained from its own capital, as explained by Z. Ahmad Khan (2000) [8].

Like all traditional banks, the Islamic Bank transfers financial resources from sectors with financial surplus to sectors with a deficit, but it also participates in business projects and may also promote business initiatives and actively partner with corporate customers.

The assets and liabilities of an Islamic bank differ significantly from those of a traditional bank. In addition to working capital, the bank's assets include also equity investments in companies that entail the sharing of profits and losses, in accordance with Sharia principles (especially mudarabah, musharaka and murabaha contracts).

In liabilities, among funding instruments, G.M. Piccinelli illustrates (in Khan, Porzio, 2010) [9], Islamic banks offer three main categories of accounts, which essentially differ for the repayment method and the allocation of the amounts collected:

- Non-remunerated on-demand deposits in current accounts, in turn concern three types of deposit accounts (current accounts): the amanah or trust deposit, in which the bank acts as trustee and the qard hassan or good loan, where the bank shall return only the principal; the wadiah, or safe deposit, is a custody contract whereby the bank returns the money at the customer's request. In all three cases, the bank obtains authorisation to invest the money deposited in Sharia-compliant assets and does not pay out any form of interest or shares the profits with depositors. It only reserves the right to distribute gifts (hiba) in cash or in kind at its discretion, in order to render these deposits more attractive and competitive. They are mainly used by customers to manage current payments. Due to its nature, this type of account must be backed by reserves of a value equivalent to the deposit (100%), and represent about 10% of liabilities, an average that is, however, only indicative in a highly diverse context;
- Investment accounts concern deposits for which the bank does not ensure reimbursement. Funds collected in these types of accounts are invested in risky activities managed by the bank, which acts as an entrepreneur (rabb-ul-mal) or as investor on the stock market. Depending on the degree of freedom the bank has insofar as the investment activity, the investment accounts may be divided into:
  - restricted investment accounts;
  - unrestricted investment accounts.

  Banks have the highest investment freedom with the first category for which customers are only provided with the general information concerning the investment of their funds, while in the latter category the bank is bound by the depositor to invest only in some types of activities or to observe specific investment methods. In any case, the customers' return is based on the results achieved and therefore they become a sort of shareholder in some projects. They represent about 70% of the bank's total funds.
- Special investment accounts or Profit-sharing investment accounts, i.e. non-guaranteed term deposits. These generally set a minimum initial amount and allow the customer to withdraw only periodically following adequate notice to the bank. They can guarantee an ex-post return through profit and loss sharing, i.e. the equitable sharing of profits and losses of the financial asset. The main profit and loss sharing include the aforementioned mudarabah and musharaka.

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These three types of deposits are recognised in the financial statements under liabilities together with reserves and share capital.

IV. Performance of deposits in Islamic banks

The analysis of data referring to Islamic banks - as highlighted by numerous scholars, as in particular I. Warde (2000) [10] and the central authorities - requires a number of important prerequisites. The relative "youth" of financial institutions and the products they offer, and therefore the uncertainties inherent in the interpretation of their technical and legal characteristics, also give rise to several accounting problems. First of all, operations have been ongoing only over several decades and they are handled differently by the various countries, which renders any analysis and comparison between them difficult. There are quite a few differences in the interpretation concerning the use and accounting of certain transactions.

Moreover, when interpreting the data, the financial and religious aspects are not always perfectly aligned. Regardless of whether or not they evaluate opportunities, Muslims concurrently rely on Islamic banks and conventional banks, and non-Muslims can bank with Islamic banks, to diversify their investments and financial operators that have specific skills and professionalism.

That said, the analysis of the financial statement data of a significant sample of Islamic banks, in countries with an Islamic majority, shows an acceleration in deposits during 2020. However, there is no real surge as was the case in many Western countries. In fact, the fall in GDP in 2020 in all of the Islamic countries considered, with the sole exception of Bangladesh (+5%), was met with an increase in deposits, but not such as to be considered of exceptional magnitude. An acceleration was recorded in Indonesia, Bangladesh and Saudi Arabia, with increases only moderately higher than in the previous year. On the other hand, Oman, Kuwait and Qatar slowed down.

Also, in the three other significant countries contained in the following table, the trend in deposits (over the entire banking system) does not appear to be particularly high, given a decline in GDP. The figures for Egypt are unique, with the resilience of real GDP (3.6%) and a significant increase in deposits, but in line with previous years (in nominal terms).

The comparison with the 2009 crisis is not helpful insofar as the interpretation, also due to the lack of data. As is known, the subprime mortgages storm had limited direct effects on Islamic banks, as they had no exposure to that segment. In 2009, deposits accelerated, especially in Malaysia and Egypt, and held up in Saudi Arabia. This seems to be in line with the data for the last two years, which may help to exclude the assumption of an abnormal trend in deposits in 2020.

The examination of some technical characteristics and functions of the deposits can help explain their growth, despite the decline in GDP.

In Western countries, one of the drivers underlying time deposit dynamics are interest rates. However, this is a factor that did not play a significant role in 2020, since interest rates were very low and decreasing. On the other hand, the precautionary reasons for saving money and the forcedly postponed consumption due to the lockdown measures adopted by governments were decisive in supporting bank deposits in the context of the crisis.

	2008		2009		2019		2020	
	Dep. loc.curr.	Real GDP	Dep. loc.curr.	Real GDP	Dep. loc.curr.	Real GDP	Dep. loc.curr.	Real GDP
Indonesia	5.9	7.4	40.4	4.7	9.45	5	12.66	-2
Bangladesh	ND	6	n.d.	5	9.1	8.2	13.5	5.2
Malaysia	4	4.8	16.8	-1.5	12.2	4.3	6.2	-5.6
S. Arabia	24.7	6.2	22.5	-2.1	8.2	0.3	20.6	-4.1
UAE	27.4	3.2	7.7	-5.2	-2.7	1.7	13.2	-5.5
Oman	ND	8.2	ND	6.1	21.4	-0.8	15.7	-6.2
Kuwait	ND	2.5	ND	-7.1	15.5	0.4	11.7	-5
Qatar	ND	17.7	ND	12	16.1	0.8	10.1	-3
Egypt	6.3*	7.1	13.1*	4.7	17.01*	5.6	16.1**	3.6
Albania	2.6*	7.5	6.8*	3.3	3.8*	2.2	8.1*	-3.3
Bosnia H.	5.5*	3.5	3.8*	-2.3	8.4*	2.91	6.5*	-5.5

Table 1. Deposits in Islamic banks and real GDP in the major Islamic countries (yoy % change). Note: (*) central banks' database referring to the entire banking system; (**) Source: EIU; NA= not available. Source: our calculations on EIU and BankFocus BvD data.

In Islamic countries, the fact that the payment of interest is not permitted, though customers can participate in the bank's results may have prompted deposits by customers, households and businesses, on the basis of the results expected by the bank (according to the participatory model described in the previous paragraph). An empirical analysis regarding Malaysia and Turkey and elaborated by S. Cevik and J. Charap (2011) [11] revealed namely a high degree of correlation between conventional deposit rates and the rate of return Islamic profit-and-loss sharing accounts.

At the same time, very low interest rates from conventional banks also in Islamic countries may have limited the diversion of at least a part of the deposits to these banks by Muslims who do not fully follow Sharia rules, with the aim of a return. As highlighted by B. Akhtar, W. Akhter, M. Shahbaz (2017) [12] with regards to Pakistan, it is observed that any changes in the rate of interest or in the rate of profit of Islamic bank significantly affect the level of deposit in conventional as well as that of Islamic banks. Consequently, customers of Islamic banks appear to be motivated by profit. The conventional bank interest rate has an impact on the customers of both conventional and Islamic systems. A boost in the interest rate of the conventional banks will increase the level of deposits at conventional banks and decrease the deposits of Islamic banks.

The fact that non-Muslim customers can use of the services of an Islamic bank, which in turn can offer its products to non-Muslim customers, is still up for discussion. Far from expressing an assessment of Muslim consistency, it represents a critical issue that is openly pondered by Muslim scholars. That many issues and doubts regarding the admissibility of certain behaviours in the light of Sharia remain open is actually part of the gradual process of understanding their Islamic identity. It is therefore not possible to determine how many customers of Islamic banks are actually Muslim. In E. Smolo, M. Šeho and M. Kabir Hassan (2020), among others, we read: "The term 'Islamic finance' may persuade that it is just for Muslim countries with greater number of Muslim populations.

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Nevertheless, it is been contended that larger part of Islamic fund clients are really non-Muslims." [13]

A further factor that can explain the trend of deposits, which is strengthening, but to a rather modest extent, may be the need to avoid an excessive amassment or accumulation of financial resources, which is explicitly not permitted by Islamic law. In other words, money is only valuable as a useful tool for development and growth, and should circulate rather than being set aside.

Due to the crisis generated by COVID-19, a high level of liquidity has been created in Western countries. On the other hand, the need to implement strategies to mobilise financial resources persists in Islamic countries, especially the less rich ones.

In the current context of strong liquidity, Western banks are able to dispose of funds that are in excess of credit demand. The first consequence, which is rapidly spreading among banks, is the application of negative interest on deposits of a high amount (above 100,000 euro). But cases where the banks diverge their customers towards other forms of investment (to assets under management) also abound, as highlighted in I. Moise (2021) for example [14]. They also do this to reduce the effect of this excessive liquidity on their capital requirements and the charges into the deposit guarantee scheme.

In Islamic countries, these terms do not seem to apply. Especially in the less rich Islamic countries, there exists a problem of mobilising resources and providing a custody function for the financial resources of households and businesses. Both of these functions are of considerable importance in emerging countries, which are still working towards implementing their industrial and production structure. It is worth remembering that in Italy, it was deemed necessary to provide constitutional protection to savings. Article 47 reads "The Republic encourages and protects saving in all its forms. It regulates, coordinates and oversees the operation of credit".

In fact, the incentive to attract savings measured by the level of financial inclusion is a primary objective pursued by the central authorities, since this is an indispensable tool for the development of a country, as analysed by K.B. Jedidia and F. Boubakri (2018) [15] with particular regards to Tunisia. The Gulf countries also need financial resources for the creation of a growing diversification of the local production system, one that is not only based on oil revenues, but also on renewable energy.

Although it is not useful to explain the dynamics of deposits, it should also be remembered that in Islamic countries, particular attention is paid to the origin of the sums deposited, as the activities that gave rise to those amounts must be Sharia-compliant. If the sums held for deposit originate from activities that are not Sharia-compliant, the banks cannot withdraw and use them [16].

V. Liquidity (is not) actively sought

Islamic banks often find themselves holding excessive liquidity due to the numerous restrictions limiting the granting of credit (linked to the technical forms allowed and the risks taken). They route these funds to the interbank market, and often even to conventional banks, generating quite a bit of criticism from the most devout Muslims. In fact, the World Bank and IDBG (2018) [17], among international institutions, point out that funds originating in Islamic countries are mainly sent to banks in OECD countries, with estimates for sovereign funds equal to USD 3Trn. By contrast, Islamic capital markets include an outstanding amount of sukuks and wealth management funds totalling USD 671Bn.

However, liquidity management is structurally complex in Islamic banks, including because they cannot use funds from interest bearing accounts to subscribe for government bonds or hold reserves at central banks. These provisions were particularly binding especially with the application of Basel III provisions on liquidity. Furthermore, the possibility of using sukuks was allowed under certain conditions for refinancing purposes at central banks (eligibility).

VI. Neither interest (riba) nor debt

The main prohibitions concerning the Islamic economy and finance, as mentioned above, include prohibition of the interest (riba). This is an aspect worthy of further analysis.

The term "riba" literally means "increase", "excess" and "growth" in Arabic. The notion of riba has been widely studied and discussed among Islamic schools of jurisprudence and a variety of interpretations and explanations have been attached to it. Moreover, all monotheistic religions have historically condemned usury. The creation of riba responds to the objective of achieving conditions of fairness and economic and social justice by preventing every form of privilege, through the earning of financial returns, without participation in the work effort involved. R. Hamaui, M. Mauri (2009) [18] offer an in-depth analysis on the interpretation of this ban and on certain related problems (in terms of operations, accounting, etc.).

Islamic reflection notes that the main reason for prohibiting interest is to protect the poor. Since money and assets generate interest, the poor cannot obtain interest and accumulate wealth, while the rich can generate wealth from wealth, through interest. However, this position too was not accepted without criticism and reservations. IIBI (1993) [19] raised several – still open - questions. Some aspects are still under discussion today. In particular, the question arises of whether for personal funds only the compound interest must be considered, thereby allowing simple interest, and whether the ban also applies to Muslims living in non-Islamic countries. Islamic banks have actually sought to diversify deposits, providing modest amounts with insurance as well.

In addition, according to Islamic thinking, earning interest discourages donations, as those who obtain interest are less motivated and encouraged to create value and therefore less motivated to build a cohesive society, for the benefit of everyone. It is also believed that interest-based finance leads to many inefficiencies, i.e. high debt and hazardous risks linked to trading on financial markets, which expose economies to instability. On the other hand, sharing risks and results allows the parties involved to minimise the risk and obtain a common benefit. The assumption is that all participate in the risk of

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default and are therefore encouraged to work together toward a common objective. The parties and therefore society as a whole are therefore protected from fraudulent activities and social tensions.

The prohibition of riba prohibits all forms of risk-free "increases" set beforehand, which Western thinking believes to be more "damaging" to investors. In fact, this view is opposite to the typical Western economic thinking, according to which participation in profits entails the assumption of risks that are higher than the interest rate applied, even if it is variable.

Also strictly related to the riba prohibition is the prohibition against using debt. While the level of debt currently plagues many Western countries, companies and states that have undertaken substantial measures to support the economy due to COVID-19, debt is absent from the Islamic system.

As is known, debt is favoured over equity investments in Western countries because it allows issuers to deduct interest paid for tax purposes, as they are costs, but also due to asymmetric information which discourages many investors from assuming capital risks. Leverage obviously mitigates this situation, but if it is too high, it may generate instability risks.

Financial theory has dealt with this issue widely. Here we will examine only some aspects that can explain at least part of the aversion to debt, compared to a partnership relationship with the investor.

First of all, collateral guarantees - which are prohibited by Islamic law - are required by conventional banks, but can lead to a less than optimal allocation of resources in the case of small and medium-sized businesses, even though they do pave the way for interesting projects.

The debt is also unsuitable for financing businesses, especially when the results are highly uncertain, or if the company is in the start-up phase. The debt finally weighs heavily on the economic return and therefore on the project's success.

Similarly, although a model for sharing profits and losses may lead to greater monitoring costs, including on account of the presence of the Bank's representatives in the Board of Directors, it is considered important in Islamic countries for the purpose of the proper functioning of the capital market as it favours social cohesion. When the relationship between entrepreneur and investors is direct and of an ongoing nature, it leads to better risk control and thus to better relations and financial results.

In order to finance themselves, in recent years Islamic banks have increasingly made use of sukuk, which is a form of securitisation of their loans, including on international markets. The peculiarities of this market segment do not fall within the objectives of this sheet.

VII. Financial inclusion in Islamic countries paints a composite picture

An aspect that is fundamental in assessing the role played by Islamic finance and bank deposits - as in Western financial systems - is the level of financial inclusion. In other words, an essential requirement is the examination of the spread of current accounts, which are at the basis of both time deposits and loans, as highlighted by S.B. Naceur, A. Barajas, and A. Massara (2015) [20].

Financial inclusion - measured by the share of people and businesses that use the financial products offered by banks and other intermediaries - is the essential indicator of the proliferation and use of these financial products. Various international institutions - in particular the World Bank, IMF, OECD, IIF - are exploring this issue. The following analysis is based on the Global Financial Inclusion database (Global Findex) published by the World Bank on the basis of surveys conducted in 148 countries over several years (2011, 2014, 2017) [21]. A further update was expected in 2020, but it was postponed due to the COVID-19 crisis. The latest survey in 2017 involved over 150,000 people over 15 years of age. Availability and access to these products are not synonymous, since they may be available but not accessible due to various barriers (such as high costs, complexity of procedures, distance, required documents, etc.).

As shown in Figure Nº. 4 , the World Bank data confirms a gradual growth in the spread of bank current accounts on the three reporting dates, 2011, 2014 and 2017, in the major Islamic countries.

Inclusion is very high in the Gulf countries, involving more than 80% of the adult population in the United Arab Emirates and Kuwait. Also in Malaysia, the spread in percentage terms is very high (85%), but in the other Asian countries the percentages appear to be much more modest, though they are rising (around 50% in Bangladesh and Indonesia, and stable at 21% in Pakistan), mainly on account of the more limited income levels. The countries with the highest shares are High Income countries, as well as Iran among the Upper Middle-Income countries, while the other countries that have lower shares belong to the Lower Middle-Income category.

It should be noted that in all the countries listed in the chart - those where Islamic finance plays a significant role or prevails - the level of inclusion appears to be lower than the international average of the relevant income category, defined considering all financial intermediaries, mainly Western/conventional. Iran is a significant exception, since with a system wholly made up of Islamic banks, it covers about a third of the total assets of the world’s entire Islamic sector while showing a very high level of inclusion.

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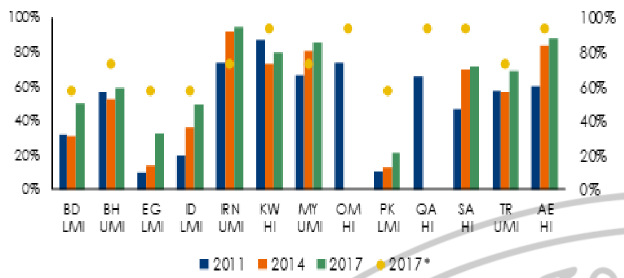

Figure 4. Adults with a bank current account (in some Islamic countries, % of adults, over 15 years of age). Notes: LMI=Lower middle income, UMI=Upper Middle Income, HI=High income. (*) average of the country income category. Source: our calculations based on World Bank and Global Findex database figures.

Various studies - in particular A. Demirguc-Kunt, K. Leora, R. Douglas (2013) [22] - showed that, in general, in Islamic countries the degree of proliferation of savings instruments is lower than that of loans. This can be explained, on the one hand, by the special ability Islamic finance has insofar supporting small and medium-sized businesses. The demand for financial resources, especially in this category of businesses, may be encouraged when risk sharing is concerned, which is typical of operators in Islamic countries, where private equity and venture capital are extremely widespread. This result is significant. According to a study by the World Bank (2014) [23], the higher the number of Islamic banks per 100,000 inhabitants, the lower the share of companies that find it difficult to access credit. In Western countries, where financial systems have always been criticised for credit access by SMEs, the presence of adequate guarantees and the credit history of the borrower is a major consideration.

In terms of deposits, the reduced proliferation may be partly due to the fact that savers may be less incentivised to deposit their money (due to the lack of returns and forms of deposit insurance), but also because of a lower level of disposable income, as mentioned previously. Moreover, even if income is significant, as in the Gulf countries, the income concentration is very high and therefore the level of distribution of financial products (measured by the number of people) may be lower than that recorded in Western countries.

Egypt has additional peculiarities. Despite modest financial inclusion, the deposits/GDP ratio is high (around 60%), but the loans/GDP ratio is just over 20%. The role of public banks is crucial, both during the deposit-taking phase, by offering reinsurance to depositors, and in terms of assets due to the significant weight of subscribed government bonds, with the public system therefore engaged in incisive crowding-out action.

The breakdown by gender shows that it has been reasonable to expect a lower level of financial inclusion of women compared to men. However, it should be noted that also among women, financial inclusion has strengthened significantly in recent years, across all countries, especially in Egypt (from 7% in 2011 to 27% in 2017). The gender gap remained high in Bangladesh and Pakistan (both approximately 30pp in 2017). Surprisingly, these 2017 figures indicate that the gender gap was still equal to about 30pp in Turkey.

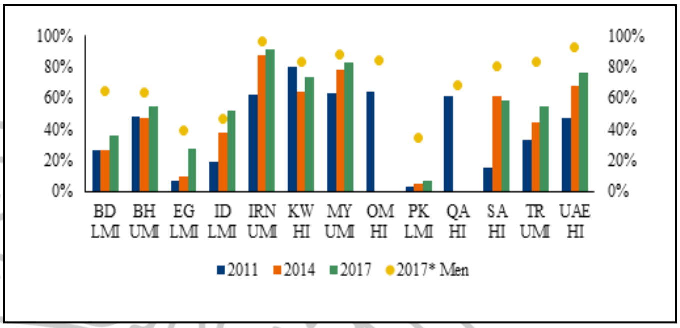

Figure 5. Women with a bank current account (in some Islamic countries, % of adults, over 15 years of age). Notes: LMI=Lower middle income, UMI=Upper Middle Income, HI=High income. (*) average of the country income category. Source: our calculations based on World Bank and Global Findex database figures.

The main reasons why adults do not open a current account include a lack of money or the necessary documents, as well as the (physical) distance from financial institutions.

As highlighted in many studies (as in World Bank, 2020) [24], the proliferation of fintech channels can contribute significantly to financial inclusion. The Islamic population is also very young and includes half of the global population under the age of 34. Young people are not only IT proficient, they are also potential customers.

Among the various channels that can be used, the spread of fintech, especially through mobile phones, is expected in Islamic countries too, especially for payments. The World Bank estimates that two thirds of adults remain unbanked (around 1.7 billion), yet own a mobile phone that can be used to make payments. Most Islamic countries fall within the 50 countries with the highest penetration of mobile phones. Figure N° 6 shows the degree of smartphone penetration in a significant sample of Islamic countries. Indonesia has the highest share, accounting for 66% of the population, followed by Malaysia at 57.5% and Pakistan at 43% in 2018. Egypt has stopped at 28%. These percentages are high, but still far from the 96% average in advanced economies.

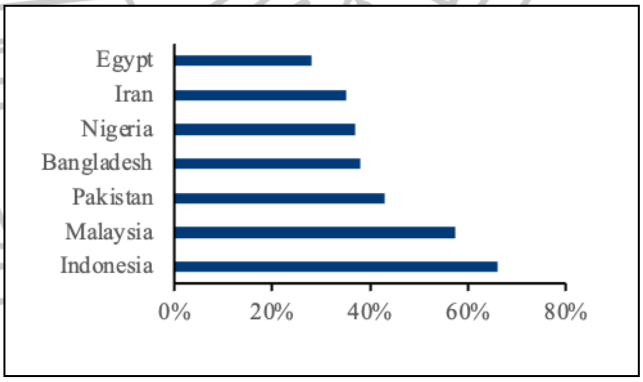

Figure 6. Smartphone penetration in some Islamic countries (2018). Source: Newzoo Global Mobile Market Report, September 2018.

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VIII. CONCLUDING REMARKS

Bank deposits increased sharply in 2020 and in 2021 in Islamic countries but not so strongly as in advanced economies. Nevertheless, some structural factors (such as financial inclusion) may support a furher increase in the next decade.

The numerous constraints that regulate the operations of Islamic banks may affect their capacity to expand. On this topic, the World Bank (2016) [25] offers a broad assessment of the role played by Islamic banks in the economies of their countries.

In 2020, Muslim countries were affected by the pandemic as well, with effects that weighed heavily on their economies, falling GDP, as mentioned above, with even the oil prices dropping. Now, as highlighted by rating agencies and international observers (as Moody's, 2021 [26], and A. Hauser, 2020) [27] prospects are still positive thanks to the confluence of some factors. First of all, demand for Sharia-compliant products is expected to remain strong, throughout the long term.

The fact that Sharia-compliant products will also be able to benefit from the growing focus on ESG products and sustainability, both of which have been historically safeguarded by Islamic principles, is important. K. Long (2020) [28] argues that the affinity between "Sharia-compliant" and "sustainability-compliant" finance is such that it has been proposed in the Islamic sphere to steer Islamic banks in a particularly determined manner towards this way of banking, which is highly appreciated by the community.

The support measures implemented by the central authorities also in these countries in response to COVID-19 will provide further support to "Islamic" activities. Moreover, in recent years numerous mergers have been carried out in the Gulf countries, with Islamic banks acquiring conventional banks, incorporating their business and expanding intermediated volumes represented by them, in many cases. All the mergers carried out in the Gulf in 2020 involved at least one Islamic bank.

As shown in Figure Nº 7 covering total assets, the Islamic financial sector has posted an average increase of 6% over the last 5 years as compared to an average annual reduction of 1% in assets of conventional banks in Saudi Arabia.

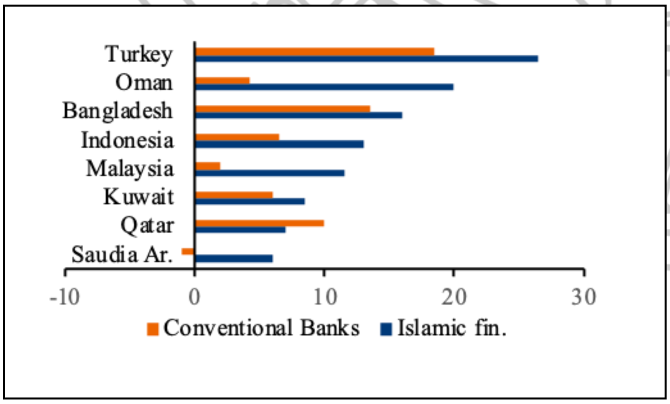

Figure 7. Total Assets (CAGR, %, 2015-9/2020). Note: compound annual growth rate. Source: Moody's.

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