The possibility of applying the Capital Asset Pricing Model (CAMP) to the Islamic investment Portfolio: Different models

إمكانية تطبيق نموذج تسعير الأصول الرأسمالية (CAMP) على المحفظة الاستثمارية الإسلامية: نماذج مختلفة

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Received: 01/09/2020 *Accepted: 14/01/2021* *Published:24/02/2021*

Abstract:

The main objective of this paper is to demonstrate the Capital Asset Pricing Model application possibilityon Islamic investment portfolio and if its compliant with shariah,which required making some basic adjustments to this modeltoward can be applied.

A number of researchers agreed that the Capital Asset Pricing Model can be applied in Islamic finance, provided an acceptable alternative to the risk-free return, which is considered as the interest rate prohibited by Sharia.There fore, many theoretical frameworks emerged that replaced this return by the zakat rate, the inflation rate or the nominal GDP. This led toseveral versions of the SCAPM-compliant capital asset pricing model are emergence.

Keywords: CAPM model; Islamic investment portfolio; Shariah-compliant CAPM;DGIMI.

JEL Classification Codes :G11, G12, G15

ملخص:

الهدف الأساسي من هذا البحث هو تبيان إمكانية تطبيق نموذج تسعير الأصول الرأسماليةCAPM على المحفظة الاستثمارية الإسلامية ومدى توافقه مع الشريعة الإسلامية، وهو ما استوجب إجراء بعض التعديلات الأساسية على هذاالنموذج حتى يمكن تطبيقه.

اتفق عدد من الباحثين على أنه يمكن تطبيق نموذج تسعير الأصول الرأسمالية في التمويل الإسلامي، شرط إيجاد بديل مقبول للعائد الخالي من المخاطر والذي يعد بمثابة سعر فائدة المحظور شرعا. وظهرت العديد من الأطر النظرية والتي استبدلت هذا العائد بواسطة معدل الزكاة أو معدل التضخم أو الناتج المحلي الإجمالي

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الاسمي؛ وهو ما أدى إلى ظهور عدة نسخ من نموذج تسعير الأصول الرأسمالية المتوافق مع الشريعة الإسلامية SCAPM

كلمات مفتاحية: نموذج تسعير الأصول الرأسمالية،المحفظة الاستثمارية الإسلامية، نموذج تسعير الأصول الرأسمالية المتوافق مع الشريعة، مؤشر داو جونز الإسلامي.

تصنيفات JEL: G11, G12, G15

1. INTRODUCTION

More than half a century has passed since the emergence of modern theory in investment portfolios, and in this period a wave of techniques and tools appeared that helped the investor to rationalize the process of building investment portfolios. The *Markowitz* model "*Mean-Variance*" has gained wide acceptance in the investment world as a technique that helps to differentiate Among different combinations of returns and risks, as later developed by "*William Sharp*", "*John Lintner*" and "*Jan Mossin*" the first theory in the pricing of capital assets, and then came "*Fama*" and "*Samuelson*" the concept of an efficient financial market, as recently emerged model A new asset allocation eliminates the need to define expected returns, standard deviation values, and the correlation matrix in the first place known as the *dynamic model*.

CAPM combines capital market line (CML) and *Markowitz's* efficient frontier to identify a tangency market portfolio that consists of all risky assets in the market. The market portfolio is assumed to be sufficient for explaining returns on any risk asset. Furthermore, market portfolio together with a Risk-free asset, the return on which represents the intercept of CML, constitutes the investment universe for investors. However, CAPM with such an investment universe is not applicable to the explanation of returns on Islamic financial instruments because of the restrictions imposed by Sharīʿah on dealing with interest (ribā) and engaging in *non halal*businesses.

Thus, the problem arises as follows:

Based on the above, most financial theories deal with the application of the capital asset pricing model to the traditional portfolio. The Islamic investment portfolio did not stimulate this interest except in recent years.

The progression of Islamic finance leads to the fundamental question whether or not the practice of modern investment theories and analyses-*Markowitz's*"Mean-Variance" Analysis and Capital Asset Pricing Model (CAPM) are in accord to shariah and could be employed in pricing Islamic

financial assets.The problematic of this Research was formulated inthe Following main question:

What is the possibility of applying the Capital Asset Pricing Model to the Islamic investment portfolio?

The main question has the Following sub-questions:

- Is CAPM relevant for explaining returns on assets in the Islamic investment univers?
- What are the main concerns to identify the criteria that should be considered to construct aShariah-compliant portfolio?
- What changes must be made to the traditional capital asset pricing model in order to be compliantwith*shariah*

To answer the main question and sub-questions, the Following Hypotheses have been adopted:

A- H0:there is a possibility of applying the Capital Asset Pricing Model to the Islamic investment portfolioby the use of a Shariah-compliant zero-beta portfolio in place of the risk-freeasset;

B- H1:there is a possibility of applying the Capital Asset Pricing Model to the Islamic investment portfolio in absence of a zero-beta portfolio by replace risk-free assetwith*cash holding or inflation rate or Zakat rate or Nominal Gross Domestic Product (NGDP) growth rate;*

C- there is a possibility of applying the Capital Asset Pricing Model to the Islamic investment portfolio by replace risk-free asset With*Shariah-compliant indices* like DJIM.

The importance of this study : The progression of Islamic finance leads to the fundamental question whether or not the practice of modern investment theories and analyses-*Markowitz's* Mean-Variance Analysis and Capital Asset Pricing Model (CAPM), are in accord to shariah and could be employed in pricing Islamic financial assets Which differ from theConventionalone in terms of their legal framework and the nature of transactions.

Also, the market portfolio of CAPM that consists of the stocks of both *ḥalāl* and non-*ḥalāl* businesses is not a permissible investment option for Muslim investors.

Objectives of the study: This study aims to achieve the Following points:

- Identify the basics of*Shariah-Compliant Investment;*
- Clarify the possibility to make CAPM applicable in Islamic financial universe;

- Identify the main Features of Shariah-compliant CAPM and differences between it and traditional CAPM.

Research methodology: To study this topic, an analytical descriptive Method that relies on data collection has been adopted for study and Analysis, with a view to studying the topic in all its aspects. In order to achieve this objective, many references that were closely related to the topic Were adopted in the interest of scientific objectivity.

2. Shariah-Compliant Investment

Shariah-compliant investment is a "form of socially responsible investment where investors should comply with the Shariah standards as developed and/or applied byShariah boards". (Pierce & Garas, 2010, pp. p: 386-407). A Shariah board is a group of Islamic jurists and experts that ensures compliance with Shariah standards and regulations and supervises the relevant compliance of a financial or investment product or service.

Dow Jones, *Financial Times*, *Morgan Stanley Capital International* and *HSBC* established indices and defined investment guidelines that are compliant to the Shariah parameters.

2.1 Shariah-compliant portfolio selection process: Better portfolio selection has become more important as global Islamic finance assets have already grown and Shariah-compliant assets can contribute to improving the sustainability of unattractive performance portfolios during financial crises.(González & others, 2019, p. p: 3)

The first step of the portfolio selection process is to determine a sample of the most attractive securities. In conventional portfolio selection, these securities mayBelong to a specific index/market or from around the world. The second step is toobtain data about the past performance of these securities in order to predict theirfuture performance. Finally, we should evaluate each of these securities based onwell-defined criteria and allocate the amount of the investment among the bestsecurities. The portfolio selection problem can be viewed as a multiple criteriadecision problem, where investors maximize the portfolio return, and minimize therisk of their investment.(Al-shammari & others, 2015, pp. p: 1-7)

Most of the above cited objective functions are stochastic because they dependupon random variables associated with each of the n securities. In Islamic finance literature, multiple criteria in portfolio selection are rarely dealt with, neglecting also the stochastic-deterministic distinction. (Chammas & Spronk, 2008, pp. p: 174-176). This distinction is important becauseportfolio section has both deterministic and stochasticd imension and any model ignoring this fact would be rather weak and inadequate.

While the awareness about Islamic portfolio selection process ingeneral and applying multiple criteria in particular is growing, notably there isalso greater complexity due to additional screening parameters : (HSBC Amanah, 2016, pp. pp: 1-2)

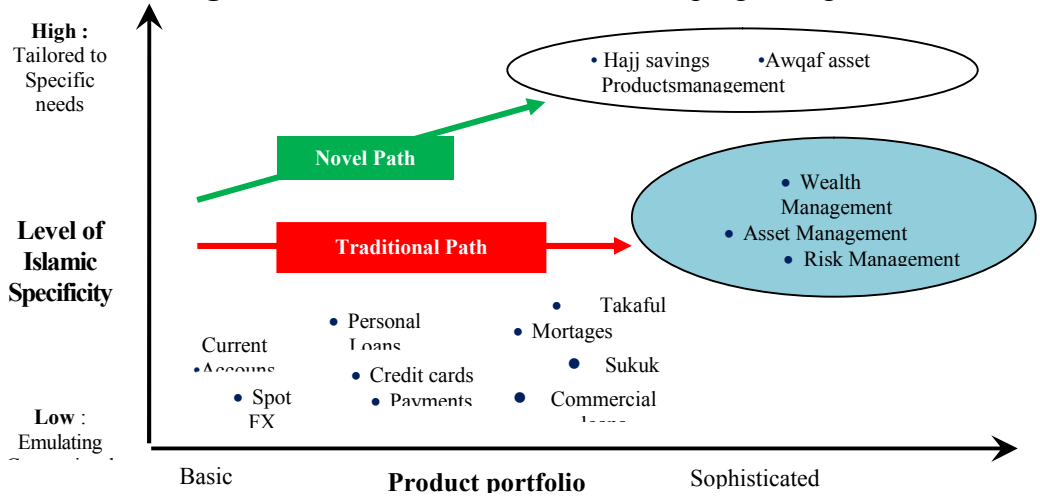
- Ensure the compliance of securities with the Shariah;
- The difference between conventional and Shariah-compliant securities is the application of sector screens and financial screens by which the asset universe is reduced to the Shariah-compliant assets. Dow Jones Islamic Market Index applies Shariah screening methodology;
- The Shariah-compliant portfolio selection process adds limits to the set of Admissible Investments which may lower the performance of the Shariah optimal portfolio compared to the conventional optimal portfolio (Derigs and Marzban2009).

2.2 Islamic Asset Management: The Asset Management Industry is an important provider of liquidity needed to ensure the functioning of the economy through a process of capital allocation that makes individuals financial objectives to match with the capital requirements of sovereign, companies and other individuals. (AZ Fund Management Azimut Group, 2014, pp. pp: 8-9).

Islamic Asset Management enables Believers to achieve their individual financial objectives Matching the capital requirements of any sovereign, companies and other individuals through the use of instruments that ensure the respect of the highest sharia principles of investment.

Product mix is improving beyond basic Banking servicesas shown in the following figure:

Fig.1. Islamic Financial Services Developing Along Needs



Source:(AZ Fund Management Azimut Group, 2014, pp. pp: 8-9)

2.3Using Islamic Investment Screens for Tailor-made Investment Portfolios

Islamic Investments apply two key screens:a Qualitative Screen, and a Set of Quantitative Screens.(Trabelsi & others, 2019, p. pp: 49).

- **Qualitative Screen:** The first screen is known as the qualitative or business screen. All businesses involved in the following are excluded immediately from the investable universe, the first step of the Shariah-compliant portfolio selection process is to ensure thecompliance of securities with the Shariah. Basically, there are threeaspects ofShariah-compliance in developing an Islamic asset/investment portfolio. First, investment in risk free assets is prohibited as there should be no Riba (generally blanketly equated with interest).

Also, investor must avoid investing in assets related to things that are expressly prohibited, such as intoxicants, pork, immoralities,etc. Finally, contracts should be without deficiencies by having them written,while meeting all Shariah requirements to minimize the scope of potential disputes and protect the rights and duties of the parties to the contract ; (Bank Negara Malaysia, 2015, p. p: 27)

- **Quantitative Screen**: The second set of screens is known as the financial or quantitative screen.See the table below.

Table 1.Financial Screening Criteria Based on the Major Four Global Islamic Indices Providers

Financial Screen	Dow Jones Islamic Index	FTSE Islamic Index	MSCI Islamic Index	Bursa Malaysia Shariah Index
Leverage (Debt/Equity)	Debt/ 2 Yr Average Market Cap < 33%	Debt / Total Assets < 33%	Debt / Total Assets < 33.33%	Debt / Total Assets ≤ 33%
Liquidity (Accounts Receivable +Cash)	Acc Rcvbl + Cash / 2 yr Average Market Cap <33%	Acc Rcvbl + Cash / Total Assets < 50%	Acc Rcvbl + Cash / Total Assets < 70%	Cash / Total Assets ≤ 33%
Impermissible Income[5]	Revenue from Prohibited Items + Total Interest / 2 yr Ave Market Cap < 5%	Revenue from Prohibited Items + Total Interest / Total Assets < 5%	Revenue from Prohibited Items + Total Interest / Total Assets < 5%	Revenue from Prohibited Items[6] + Total Interest / Total Assets < 5%
Cash & Interest-Bearing Instruments	Cash + Interest Bearing Instruments / 2 yr Ave Market Cap < 33%	Cash + Interest Bearing Instruments / Total Assets < 33%	Cash + Interest Bearing Instruments / Total Assets < 33.33%	N/A

5- Income for non-compliant activity including interest income

6- Slight differences exist in the categorization of prohibited items between Bursa Malaysia and the other indices. Additional qualitative analysis including the image or public perception of the company, its importance to the community and its social responsibility is also considered.

Source : Bank Negara Malaysia, 2015, p: 27

2.4 level of portfolio compliance with shariah principles

Four strategies are defined:(Hodžić & others, 2017, p. p: 130)

- The best of strategy is the one which chooses one of the basic shariah boards guidelines which produces the best portfolio returns based on some objective function and risk;

- The consensus (*ijma*) strategy is the one where all shariah boards agree that the asset is compliant. That is ijmaprinciple applied here;

- The liberal strategy is the one which considers an asset compliant if at least one shariah board agrees. This enlarges the asset universe, and offers better returns and less risk;

- The majority (*kasra*) strategy considers an asset compliant if the majority of shariah boards agree. This is based on the Islamic juristic principle that "the majority has to be treated as the whole thing".

3. Shariah-compliant capital asset pricing model

Among the most important challenges and issues for any financial system is the alignment between risk and the expected rate of return.The βCoefficient is the core of the capital asset pricing model and is the statistical measure of systemic risk. (Yildirim & Masih, 2019, p. p: 8)

In this context, the capital asset pricing model plays an important role as it is a major component of capital market theory, as this model states that there is a proportional relationship between the expected return on an asset and the risk associated with it. This relationship is given through the stock market line. The capital asset pricing model is defined by the following equation, and this is the stock market line(SML)***S****ecurity* ***M****arket* ***L****ine.*

3.1 One of the most commonly used models to estimate conventional securities rate of return is(CAPM). The CAPM prices securities based on the security's systematic risk represented by the beta (β), the market return (RM) and the return of the risk-free security (R_f):

$$\boldsymbol{E(R_i) = R_f + B_i[E(R_M) - R_f]}$$

$$\boldsymbol{Bi = \frac{Cov\,(Ri, Rm)}{Var\,(RM)}}$$

The risk-free rate R_f is a predetermined return that is considered by Shariah scholars as interest or Riba. Therefore,securities with risk-free component are considered Shariah non-compliant.

Several other studies propose use of different alternatives of risk-free rate, such as nominal GDP (Shaikh, 2009), zakāh rate (El-Ashker, 1987), and inflation (Hanif, 2011). These studies fall short of suggesting a SCAPM

that does not violate the fundamental principles of CAPM theory. (Krichene, 2013, p. p: 20)

3.2 The idea to remove the risk-free rate seems to be a simplistic solution, since there are some theoretical and practical reasons for having that component as ananchor of original CAPM and its variations. Therefore, instead of simply removingthe risk-free component to render the model Shariah-compliant, others havesuggested an alternative to $\mathbf{R_f}$They proposed replacing $\mathbf{R_f}$ by the minimum return that an investor would expect from an investment to cover Zakat.

$$\boldsymbol{z = (Zakat\ rate)/(1 - Zakat\ rate) = 0.0256}$$

The shariah-compliant Capital Asset Pricing Model developed with a few changings of the traditional Capital Asset Pricing Model is integrating zakat, purification of return and exclusion of short sales.

3.3 Shaikh (2010) suggested replacing R_f with Nominal Gross Domestic Product (NGDP) growth rate and the resulting model is as follows:

$$\boldsymbol{r = NGDP + \beta(R_M - NGDP)}$$

We recall that the NGDP is the GDP while taking into account the country inflation. Also, the Rf consists of two parts : the real return and the inflation premium(Hanif, 2011, pp. p: 283-286)While the traditional Shariah view is that it cannot accept the real part of R_f, which is regarded as a rent of money for use, the inflation premium *N* is a debatable issue under Shariah. Notably, excessive inflation is quite common in Muslim-majority countries. Inflation reduces the wealth of the investor and therefore it is argued that compensation equal to inflation premium should begiven.

3-4 Hanif (2011) Introduced the following equation for Shariah-compliant asset pricing model:

$$\boldsymbol{r = N + \beta(R_M - N)}$$

All the above described models may fail to provide a robust pricing model for securities as the main concern was to substitute the risk-free asset with an alternative component that is Shariah-compliant.

Islamic financial instruments differ from the conventional financial instruments in terms of their legal framework and the nature of transactions,it is imperative that asset pricing models originally designed for conventional financial instruments are customized so that they are applicable to Islamic financial instruments (Jobst, 2007, p. p: 6).

4. Modeling the Islamic Capital Asset Pricing Model

The assumptions underlying an Islamic capital asset pricing modelare employed in order to propose the mathematical modeling of pricing Islamic financial assets : (Derbali & others, 2017, p. p: 8).

4.1 The investors' decisions are solely in terms of expected values and standard deviation of asset returns;

4.2 No transaction cost;

4.3*Zakat* and purification are deducted from the expected return;

4.4 The assets are infinitely divisible;

4.5 The assets are marketable;

4.6lending and borrowing at the *sukuk* profit rate or other Islamic benchmarks;

4.7 Homogeneity of expectations;

4.8 An investor cannot influence the price of a stock by his buying and selling actions.

5. Mean-Variance under Islamic framework

The fundamental principle of the mean-variance is to utilize the expected return of a portfolio to represent the investment return and its variance as the investment risk. Basically, portfolio selection is the study of risk and return. This is reliable with the ethical principle of "*no risk, no gain*" in Islamic finance as stipulated in the shariahmaxim *al-ghunm bil ghurm* (there is no return without risk).

Given that all available shariah-compliantassets must be allocated, the N portfolio weight must add up to **1**, so:

$$\sum_{i=1}^{N} x_i = 1 \qquad (1)$$

Therefore, they utilize the same approach in deriving the expected return$\overline{R_p}$, and variance of the portfolio σ_p^2which are given by:

$$\overline{R_p} = \sum_{i=1}^{N} (x_i \overline{R}_i) \qquad (2)$$

$$\sigma_p^2 = \sum_{i=1}^{N} x_i^2 \sigma_i^2 + \sum_{i=1}^{N} \sum_{j=1}^{N} x_i x_j \sigma_i \sigma_j \rho_{ij} \qquad (3)$$

We represent the variance of the expected return of asset $i$by of and the correlation coefficient between the expected returns on assets $i$and $j$by σ_i^2.

Now, we are integrating *zakat* and purification of return in equations (2) and (3). In Islamic finance, *zakat* and purification would naturally be connected and prejudiced by ethical principles and *shariah* constraints forced on investment.

In deriving the mathematical modelling, *zakat* and purification are treated as two independent entities although *zakat* is a subset of purification. Let z denotes the *zakat* rate and$\boldsymbol{\partial_i}$ denotes the individual purification rate of asset $\boldsymbol{i}$. Therefore, the expected return and variance of individual asset *i* are given by:

$$\boldsymbol{E[(1-z)(1-\partial_i)R_i] = (1-z)(1-\partial_i)\overline{R_i}} \qquad (4)$$

$$\boldsymbol{Var[(1-z)(1-\partial_i)R_i] = (1-z)^2(1-\partial_i)^2\sigma_i^2} \qquad (5)$$

After integrating *zakat* and purification of return, we derive the equations for the expected return$\overline{R_p}$, and variance of the portfolioσ_p^2 which are given by:

$$\overline{R_p'} = \sum_{i=1}^{N}[x_i(1-z)(1-\partial_i)\overline{R_i}] \qquad (6)$$

$$\sigma_p'^2 = \sum_{i=1}^{N} x_i^2(1-z)^2(1-\partial_i)^2\sigma_i^2 + \sum_{i=1}^{N}\sum_{i=1}^{N} x_i x_{j(1-z)^2(1-\partial_i)(1-\partial_j)\sigma_i\sigma_j}\rho_{ij} \; 7$$

6. The CAPM of Sharpe cannot be used directly for estimating returns of risky Islamic financial instruments because the inputs of the model do not belong to the investment universe of Muslim investors. Islam strictly prohibits investing in interest-bearing risk-free assets and non-*ḥalāl* businesses.

Therefore, it is necessary to customize CAPM according to the commands of Shariah in order to make it applicable to the Islamic financial instruments. In this direction, we adopt two approaches to propose two versions of Shariahcomplaint CAPM (SCAPM). (Hakim & others, 2016, pp. p: 25-26).

Black (1972) version ofCAPM that relaxes the assumption of risk-freelending and borrowing in order to explain thedeviations of actual returns of low beta and high betafirms, which were consistency higher and lower thanthe returns estimated by CAPM. Black contends thatcombining a zero-beta portfolio with the marketportfolio in CAPM explains the discrepancies inactual returns and CAPM estimated returns. Heillustrates that all efficient portfolios, includingmarket and zero-beta portfolios, can be created fromtwo basic portfolios with different betas.

Black (1972) model is of the form:

$$\boldsymbol{E(r_i) = E(r_z) + \beta_i[E(r_M) - E(r_z)]} \; (1)$$

Where:$\mathbf{r_i}$, $\mathbf{r_z}$, and $\mathbf{r_M}$are returns of asset ***i*,** zero-beta portfolio, and market portfolio respectively, and$\boldsymbol{\beta_i}$is the systematic risk of ***i***. E(.) is the expectation factor.

Second, in case zero-beta portfolio is not available, we suggest removal of risk-free rate from the CAPM. This approach we adopt from Lintner (1965) who, while relaxing the assumption of homogeneity of investors in CAPM, suggests several investment combinations that investors can avail of.

Of those alternatives, we use Case I, which says that investors have the option of holding cash and investing in a risky asset.

An investor can change his overall return and risk as he may desire along the market opportunity line.Using market portfolio as the risky asset, the Lintner (1965) model modifies as:

$$\boldsymbol{E(r_i) = \beta_i[E(r_M)]} \quad \mathbf{(2)}$$

Models (1) and (2) address the prohibition of *ribā*.

Besides, the prohibition of investing in non-*ḥalāl*businesses is overcome by recognizing Islamic financial markets are independent entities, whereinonly Shariah-compliant assets are traded. In suchmarkets, the market portfolio is made up of Shariah-compliantstocks only. Combining (1) and (2) withShariah-compliant market portfolio, they propose thefollowing two versions of Shariah-compliant CAPM(SCAPM).

SCAPM with zero-beta portfolio [SCAPM(Z)]:

$$\boldsymbol{E(r_{i_s}) = E(r_{z_s}) + B_{i_s}[E(r_{M_s}) - E(r_{z_s})]} \quad \mathbf{(3)}$$

2. SCAPM with cash or zero risk-free rate [SCAPM(C)]

$$\boldsymbol{E(r_{i_s}) = B_{i_s}[E(r_{M_s})]} \quad \mathbf{(4)}$$

Where, $\boldsymbol{r_{i_s}}$, $\boldsymbol{B_{i_s}}$and $\boldsymbol{r_{M_s}}$are returns on the Shariah-compliant stock, zero-beta portfolio and market portfolio respectively. $\boldsymbol{B_{i_s}}$is the standardized covariance between return on Shariah-compliant stock *is* and return on Shariah-compliant market portfolio ***Ms***.

Taking off expectations and rearranging transforms (3) and (4) into

$$\boldsymbol{r_{i_s} - r_{z_s} = \alpha_{is} + B_{i_s}[r_{M_s} - r_{z_s}] + \varepsilon_{i_s}} \quad \mathbf{(5)}$$

And

$$\boldsymbol{r_{i_s} = \alpha_{is} + B_{i_s}(r_{M_s}) + \varepsilon_{i_s}} \quad \mathbf{(6)}$$

Where,$\boldsymbol{\alpha_{is}}$ and $\boldsymbol{\varepsilon_{i_s}}$ are the intercept and error termsrespectively. The equations (5) and (6), in fact,represent the modelsSCAPM.

$$\boldsymbol{r_i - r_f = \alpha_i + B_i[r_M - r_f] + \varepsilon_i} \quad \mathbf{(7)}$$

Where, $r_i r_f r_M$ are returns on asset *i*, risk-free asset, and market portfolio respectively.

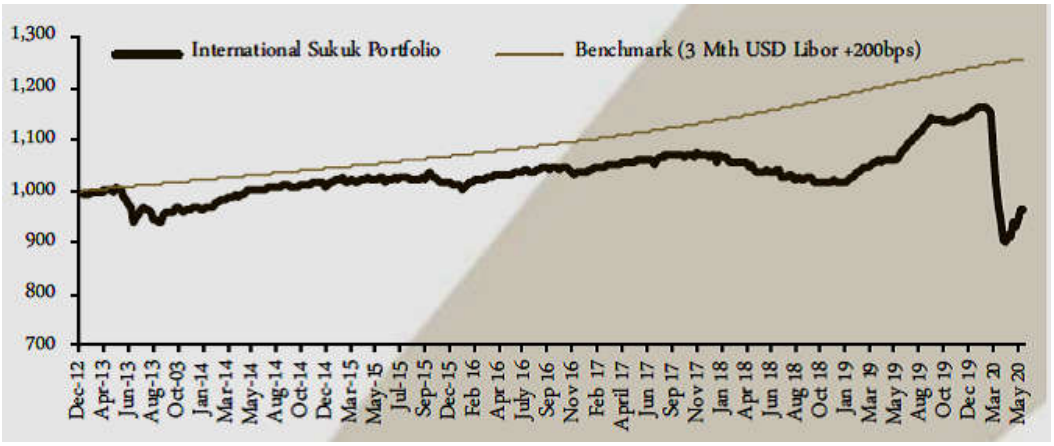
7. Risk-free interest rate in the framework of CAPM : which can be LIBOR or any other conventional interest rate.(Serdehi, 2008, pp. p: 55-58)

7.1 TheLIBOR is applied as a risk-free interest rate in conventional capital markets, and it is also accepted as a benchmark by Islamic scholars.

Consequently, conservative scholars accept interest-based benchmarks onatemporary basis only until shariah-compliant benchmarks aredeveloped.An ideal Islamic capital market is supposed to be based on profit and loss sharing.In conventional capital markets, risk-free assets and interest rates are also provided by short term government bonds, also known as treasury bills.

7.2 For instance, a treasury security from a highly rated country like Germany or the USA with 3-months maturity can be considred as a risk-free asset with a fixed rate of interest. For Example, The International Sukuk Portfolio is designed to provide investors with returns in excess of 3-month USD LIBOR + 200bps by investing predominantly in global Sukuk markets, with a quarterly profit distribution.

Fig.2. Performance Net of the International Sukuk Portfolio



Source:International Sukuk Portfolio, May 2020, p: 1.

Of course, the argumentation for accepting LIBORas permissible benchmark can also be adopted to us treasury bonds and thus the yield on USA treasury bonds can also be taken as a risk-free interest rate in order to determine the asset price in the context of CAPM.

7.3 However, unlike LIBORthere are Islamic equivalents to USA treasury bills. although in Islamic finance short-term sovereign securities are scarce, they already exist. The ***sukuk al-Salam*** is considered to be the equivalent to

treasury bills. needless to say, that the rate of return between these two assets differs, as the us treasury bills are more highly rated than the Bahraini ***sukuk al-Salam***.

7.4 It is a fact that Islamic indices like DJIMI and FTSE-GII exist and are used for benchmarking purposes. But are they also an appropriate market portfolio for asset pricing in the context of CAPM? To provide an answer, the DJIMI will be analyzed.

It is known that the beta of the market portfolio $\boldsymbol{B_M}$ is **1**. logically a security or an index **i** correlated with the market portfolio **M** and with the result of $\boldsymbol{B_i}$equal to **1** would reflect the same volatility as the market portfolio.

In this context a study by Hakim and Rashidian (2004) analytically scrutinized the relation of the most accepted Islamic index, **DJIMI** and probably the largest and most diversified index in the world, the **DOWJones** world index **DJW**.their analytical scrutiny is based on the CAPMin order to examine the efficiency of the Islamic index they use the 30-days LIBOR as the risk free interest rate and the **DJW** as the market portfolio.

The study covered a period of 243 weeks, from January 5 th, 2000 to august 30 th, 2004.

Undoubtedly, the **DJW** can be considered as a market portfolio. The correlation between **DJIMI** and **DJW** implies an *Islamic Beta*. The outcome eventualities of the correlation can be as follows:

- $\boldsymbol{\beta_i < 1}$, the DJIMI is less volatile than the DJW. This indicates that the index is less risky, but in turn they provide lower returns;
- $\boldsymbol{\beta_i = 1}$, the DJIMI has the same characteristics as the market portfolio DJW;
- $\boldsymbol{\beta_i > 1}$, the DJIMI is more volatile than the DJW. This indicates that the index is riskier, but in turn provides higher returns;
- $\boldsymbol{\beta_i < 0}$, the DJIMI moves counter to the market portfolio DJW. In this case the DJIMI can be used as a hedge instrument against stock market downturns.

The covariance of DJIMI and DJW as determined by results in an Islamic Beta of 0.948. this outcome indicates that the DJIMI is less volatile than the **DJW**, which represents the market. Conclusively, the **DJIMI** almost faces the same exposure as the broader world stock market. The **DJIMI** can be considered as an appropriate Islamic index and market portfolio, and Islamic investors are not disadvantaged when they comply with *shariah* rules.

Since the introduction of the Dow Jones Islamic Market (**DJIM**) World Index nearly 20 years ago, there has been a tremendous amount of index innovation as the Islamic investment community has demanded increasingly granular and Sophisticated investment solutions while adhering to the tenets of Islamic law. Today, S&P Dow Jones Indices publishes more than 10,000 *Shariah-compliant indices* each day. (Orzano & Welling, 2018, p. 2)

The table belowprovide an illustrative purpose and reflects hypothetical historical performance.

Table 2.Return Comparison of the S&P 500 Versus the S&P High Yield Dividend Aristocrats and S&P High Yield Dividend Aristocrats Shariah Index

PERIOD	S&P 500	S&P HIGH YIELD DIVIDED ARISTOCRATS	S&P HIGHYIELD DIVIDENDARISTOCRATS SHARIAHINDEX
TOTAL RETURN (%, ANNUALIZED)			
3-Year	**16.1**	**15.9**	**16.5**
5-Year	**14.5**	**13.5**	**14.5**
7-Year	**15.6**	**14.7**	**15.6**
10-Year	**10.9**	**12.1**	**13.8**
STANDARD DEVIATION (%)			
3-Year	**9.4**	**9.1**	**10.2**
5-Year	**9.6**	**9.2**	**10.3**
7-Year	**10.6**	**9.8**	**10.3**
10-Year	**14.7**	**14.1**	**13.5**
RISK-ADJUSTED RETURN			
3-Year	**1.7**	**1.8**	**1.6**
5-Year	**1.5**	**1.5**	**1.4**
7-Year	**1.5**	**1.5**	**1.5**
10-Year	**0.7**	**0.9**	**1.0**

Source: S&P Dow Jones Indices LLC. Data as of Aug. 31, 2018, p: 2.

8.Hypothesis testing:follow the Next scheme:

The application of CAPM, along with its anomalies, still has a prime place in Asset Pricing literature

SCAPM (*Sharia Compliant Asset Pricing Model*)
*Islamic Capital Asset Pricing Model (*ICAPM*)*

Market Portfolio Must include halal business

Reliance of the CAPM on a single risk Factor (beta) is its main limitation

Is Market Portfolio enough ?

Beta have linear relation with return of securities, its means higher beta will lead to maximum return which is according to theory.

The first part of CAPM is Rf means risk free rate which is fixed return on investment means predetermined return. As Interest is prohibited

$$k_e = \beta R_m$$

Modified capital asset pricing model from the Islamic finance perspective

Islamic Beta Shariah-compliant indices

Nominal Gross Domestic product growth rate

Rf should be replaced by

Inflation rate

Zakat which Is equal to 2.56%

9. CONCLUSION

Growth of Islamic finance has led to diversified investments and services by IFIs which demands attention of Sharia experts on regular basis to settle the Sharia compliance status of any business activity performed (or

intended to be performed) by Islamic Financial Institutions.

In this study I discussed the technical asset valuation models used under conventional frame work and their likely application under Islamic frame work. Islamic financing is working within the Sharia frame work following certain restrictions including investing in Halal businesses, prohibition of predetermined fixed charge on capital and sharing outcome of underlying project.

Existing technical equity pricing models are very much applicable under Sharia frame work with a minor modification of risk-free return as under Islamic financial system risk free return does not exist. Traditional CAPM is convertible into SCAPM by eliminating risk free return and including inflation charge. Islamic finance is supposed to work in existing business environment within Sharia restrictions hence only modifications to existing literature are required to bring it in conformity with Sharia instead of re-inventing the wheel, as remained the approach of pioneers in Islamic financial system.

Future research area includes comparative testing of conventional and Sharia compliant asset pricing models.

An efficient portfolio comprises a small component of risk for a given expected returns or the maximum returns at a given risk level.

Therefore, the prohibition of interest does not invalidate the capital asset pricing model in an Islamic context. At first glance the prohibition of interest seems to be the biggest problem, but the existence of a well-diversified market portfolio in Islamic capital markets is also absolutely essential in order to apply this model.

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