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Article

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Future Business Journal

Provided in Cooperation with:

Faculty of Commerce and Business Administration, Future University

Suggested Citation: Guizani, Moncef (2020) : Testing the pecking order theory of capital structure: The case of Islamic financing modes, Future Business Journal, ISSN 2314-7210, Springer, Heidelberg, Vol. 6, Iss. 1, pp. 1-12,
<https://doi.org/10.1186/s43093-020-00042-9>

This Version is available at:

<https://hdl.handle.net/10419/246647>

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Testing the pecking order theory of capital structure: the case of Islamic financing modes

Moncef Guizani*

Abstract

The purpose of this paper is to examine whether or not the basic premises according to the pecking order theory provide an explanation for the capital structure mix of firms operating under Islamic principles. Pooled OLS and random effect regressions were performed to test the pecking order theory applying data from a sample of 66 Islamic firms listed on Kingdom of Saudi Arabia stock market over the period 2006–2016. The results show that sale-based instruments (*Murabahah*, *Ijara*) track the financial deficit quite closely followed by equity financing and as the last alternative to finance deficit, Islamic firms issue *Sukuk*. In the crisis period, these firms seem more reliant on equity, then on sale-based instrument and on *Sukuk* as last option. The study findings also indicate that the cumulative financing deficit does not wipe out the effects of conventional variables, although it is empirically significant. This provides no support for the pecking order theory attempted by Saudi Islamic firms. This research highlights the capital structure choice of firms operating under Islamic principles. It explores the implication of the relevant Islamic principles on corporate financing preferences. It can serve firm executive managers in their financing decisions to add value to the companies.

Keywords: Pecking order theory, Capital structure, *Murabahah*, *Ijara*, *Sukuk*, Islamic-compliant firms

Introduction

Making financing decisions for firms is one of the most fundamental topics in contemporary finance research since the influential studies of Modigliani and Miller [26] on capital structure irrelevancy. Once we move away from a model of perfect capital markets, most theories have sought to explain how companies choose a particular combination of debt and equity by introducing frictions omitted in the original Modigliani and Miller framework. The pecking order theory (POT) is among the most influential theories of capital structure.

Pioneered by Myers [28] and Myers and Majluf [29], pecking order refers to managers' preferences for funding sources to cover their financing needs. The theory states that managers prefer internal to external financing, and, when outside funds are necessary, they prefer debt to equity because of lower information costs associated

with debt issues. They issue equity as the last alternative. Managers follow this financing hierarchy behavior to avoid both the wealth transfer to outsiders and the negative effect of adverse selection inherent to external funding sources.

In the last two decades, the business community had witnessed a drastic growth of Islamic funds all over the world. Islamic finance has attracted a fair amount of attention from stock market participants. The financial market around the world experienced exceptional growth in Islamic finance [30]. In addition, the recent global financial crisis has added further to the attraction of Islamic finance to practitioners, monetary authorities and academic scholars in their search for a viable and resilient alternative financial system [17]. This increasing market share of Islamic banking begs the question of the importance of Islamic financing instruments in firms' financing choice.

Islamic firms consider Islamic business principles crucial to their business operations. They would not engage in any activity which is forbidden by Islam. For example,

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no firm in an Islamic society would be operating in the production or sale of alcoholic drinks or the production or sale of pigs, or gambling or forbidden speculation, or in lending or borrowing money at fixed interest rates. By reviewing the main restrictions, one can understand how these restrictions might alter Islamic firms' capital structure decisions.

Limited research has been conducted in the areas of financing hierarchy of Islamic financial instruments. Kayed [19] argues that the dominant modes of finance that are being practiced by the majority of Islamic financial institutions are risk-free financing schemes such as *Murabahah* and *Ijara*. In a similar vein, Ismal [18] finds that *Murabahah* financing in the Indonesian Islamic banking industry is the most favored form of Islamic financing. Such a contract dominates 56.24% the total Islamic financing, followed by *Mudarabah* financing (18.54%) and *Musharakah* financing (9.76%). Sakti et al. [33] suggest that the presence of less asymmetric information and lower agency costs between shareholders and managers lead Islamic banks to opt for equity financing. However, lower bankruptcy costs and lower agency costs between shareholders and debt holders lead Islamic banks to favor debt-based financing. Miah and Suzuki [24] show that about 90% of the total financing in GCC countries are concentrated on *Murabahah*, which is the result of existing institutional underpinnings. GCC Islamic banks are involved with PLS-based financing only limitedly.

Thus, in light of the above, it is worth exploring the implications of the relevant Islamic principles on the Islamic firms' capital structure choice. In particular, this study sheds light on whether the basic premises according to the POT provide an explanation for the capital structure mix of KSA Islamic firms.

KSA is an interesting case for studying the financing hierarchy of Islamic financial instruments. Most Saudi listed firms, with their compliance to Sharia rules, are thus differentiated from their conventional counterparts. The legal system of KSA is based on Islamic law (Sharia) derived from the Qur'an and the Sunnah (the traditions of the Islamic prophet Muhammad), which prohibits loan interests whether giving or taking.

This study contributes to existing literature in two ways. First, it highlights the capital structure choice of firms operating under Islamic principles. It explores the implication of the relevant Islamic principles on the financing preferences of KSA firms. Due to the prohibition of interest on debt and promotion of profit and loss sharing, Islamic financing invokes a question on whether the corporate capital structure choice will be influenced by a set of factors similar to conventional finance. Second, the present paper provides further evidence on the

impact of financial crisis on the firms' capital structure choice in a period of considerable slowdown in the world. The credit shortages that characterize the last financial crisis have resulted in changing of firms' demand for credit. This has raised the role of Islamic-based financing as a substitution for the conventional finance system [35]. Therefore, given the high penetration of Islamic finance against conventional finance in KSA, this study provides insights into how the contraction of bank lending during the 2008–2009 crisis affects the corporate capital structure choice in an Islamic finance setting.

Following this introductory section, the rest of the study is organized as follows: "Literature review" section discusses the costs of financial instruments and reviews existing studies in the literature. "Data and methodology" section discusses the data and the theoretical framework. "Results and discussion" section presents the empirical findings, while "Conclusion" section concludes with policy implications.

Literature review

Cost structure of Islamic financial instruments

Islamic financial instruments are based on the principles that they exclude interest (*riba*), not possess major uncertainty (*gharar*) and not have gambling like features (*Maysir*). Under these principles, Islamic modes of financing can be broadly classified into sale-based, profit-loss sharing (PLS) and hybrid instruments. Sale-based instruments are fixed-income instruments that replicate the payoff of a debt instrument by applying the sum paid in advance plus a predefined mark-up. They include: *Murabahah*, *Salam*, *Istisna* and *Ijara*. PLS instruments are Islamic participation contracts based on the principle of profit and loss sharing. They include: *Mudarabah* and *Musharakah*. Hybrid instruments have the characteristics of both, sale-based and PLS instruments. They include *Sukuk*.¹

Islamic financial contracts may generally involve direct and indirect costs. To quantify different costs, we follow Ahmed [1] by ranking them as high, medium, low and negligible. The following table summarizes the cost structure of different financial instruments (Table 1).

Murabahah and *Ijara* are considered as debt-based instruments having low risk relative to equity-based instruments. Accordingly, they have the lower cost of funds. Given that they are negotiated with financial institutions, their contracting costs are relatively low and they imply no floatation costs as in case of

¹ The AAOIFI Sharia Standard (17) defines Sukuk as being: "Certificates of equal value representing undivided shares in the ownership of tangible assets, usufructs and services or (in the ownership of) the assets of particular projects or special investment activities."

Table 1 Costs of various Islamic financial instruments

Instruments	Direct costs		Indirect costs			Total costs
	Funds	Contracting/floatation	Dilution	Distress	Information	
Debt-based						
<i>Murabahah</i>	L(= 1)	L(= 1)	N(= 0)	M(= 2)	N(= 0)	4
<i>Ijara</i>	L(= 1)	L(= 1)	N(= 0)	M(= 2)	N(= 0)	4
Equity-based						
<i>Mudarabah</i>	M(= 2)	M(= 2)	M(= 2)	N(= 0)	H(= 3)	9
<i>Musharakah</i>	H(= 3)	H(= 3)	H(= 3)	N(= 0)	M(= 2)	11
Hybrid						
<i>Sukuk</i>	L(= 1)	M(= 2)	L(= 1)	M(= 2)	H(= 3)	9

H high (with value 3), M medium (with value 2), L low (with value 1) and N negligible (with value 0)

securities [1]. As financing techniques, *Murabahah* and *Ijara* involve no ownership dilution, and thus, their dilution costs are negligible. In addition, since the bank holds the ownership of the asset, these contracts would reduce the problems of asymmetric information associated with financing to more opaque borrowers. Under contracts such as *Murabahah* and *Ijara*, the rate of return is fixed and predetermined and adverse selection and moral hazard problems would not arise. In contrast, as they are debt-based instruments, they have inherent distress costs.

With respect to equity-based instruments, they are based on the principle of profit and loss sharing. Their costs of funds are relatively high. However, given that *Mudarabah* contracts are not affected by dividend policy, their cost of funds will be smaller than the *Musharakah* contracts. Moreover, their floatation costs will be relatively lower than those for *Musharakah* contracts. On the other hand, a firm will choose *Mudarabah* instead of *Musharakah* contract to avoid ownership dilution. *Mudarabah* is a PLS contract where the ownership of the capital or invested assets remain with the fund provider at all times and the entrepreneur provides effort and management expertise. In contrast, the *Musharakah* contract involves a partnership where both partners, that is, entrepreneur and investor jointly provide the capital and manage the venture. In addition, PLS contracts are inherently vulnerable to asymmetric information problems. These problems are relatively higher in the case of *Mudarabah* contract. Asymmetric information on *Mudarabah* contract arises because the entrepreneur who manages the *Mudarabah* fund has full control of the project and has more information regarding the project, which the capital provider does not usually have access to. Consequently, two major problems are issued from the inefficiency in information delegation: adverse selection and moral hazard problems.

As for *Sukuks*, they are considered as hybrid securities, bearing the features of stocks and bonds. Similar to a bond, *Sukuk* has a maturity date and some of these securities are usually of fixed revenue and a final payment at the maturity date [37]. *Sukuk* holders have recourse to the assets in the event of default, or if the issuers have difficulty in repaying. This involves that they have low cost of funds. In addition, given their tradability in secondary market, *Sukuks* are liquid instruments, which involve a medium low floatation costs. On the other hand, although the *Sukuks* are indicative of some sort of partnership and ownership of the holder in respect of the asset, they lack right of voting and interfering in underlying asset. These Islamic instruments involve a high information cost. Due to their specific structuring, *Sukuks* are especially exposed to moral hazard and adverse selection problems [21].

The empirical findings of the POT: conventional versus Islamic-compliant firms

There has been an intense debate over the capital structure choice for conventional firms, particularly in the recent literature. In spite of an enormous volume of research, the hierarchy or pecking order among different sources of funds remains equivocal. One branch of research has provided evidence that is consistent with managers' pecking order preference. Shyam-Sunder and Myers [34] find that the pecking order model is an excellent first-order descriptor of financing behavior in US firms. Booth et al. [6] find result in favor of the POT in developing countries. In the same vein, Lemmon et al. [23] find evidence in tune with the POT. After controlling for debt capacity, the authors show that firms' financing behavior follows the financing hierarchy described by the pecking order model.

However, other empirical studies have found no support of the POT predictions. For instance, Frank and

Goyal [14] find results that are surprising from the perspective of the POT. Using a sample of US firms, the authors show that debt financing does not dominate equity financing in magnitude. The evidence provided by Fama and French [13] strongly rejects the POT hypothesis. They reveal that firms heavily rely on equity financing to fill up deficiency needs. Komera and Lukose [22] argue that the POT fails to explain Indian firms' financing choices. Their estimated annual pecking order coefficients show no support for the financing choices described by the POT. Allini et al. [2] support the predictions of a modified POT in Egypt. They identify that internally generated funds are the preferred option for Egyptian firms followed by equity, where a financial deficit is present, and finally debt finance as a last resort.

In spite of Sharia restrictions on interest, little is known about how these restrictions translate into capital structure decisions in Islamic countries. Using sample of firms in Islamic and non-Islamic countries, Gunn and Shackman [15] provide evidence that Islamic law does not disadvantage firms in terms of the overall levels of debt compared to equity financing. The findings reveal no difference in the level of total debt to total assets when comparing capital structure in firms from Islamic countries to firms in non-Islamic countries. Minhat and Dzolkarnaini [25] addressed the question of which firms use Islamic financing. They provide evidence that Islamic financing attracts less profitable firms due to the presence of adverse selection among Islamic financiers. Yildirim et al. [36] compared the key capital structure determinants between Sharia-compliant (SC) and non-Sharia-Compliant (NSC) firms. Due to the restrictions imposed by Sharia rules, it is expected that SC firms exhibit different capital structure compared to their NSC peers. Their results show that most of the determinants do exhibit different effects among both firm types. The authors document that capital structure decisions for SC and NSC firms are better explained by the pecking order for book leverage and by the trade-off theory for market leverage. In the same token, Alnor and Alqahtani [3] investigate the effect of Sharia-compliance status on firms' capital structure decisions in non-financial firms in the KSA market. They find that SC firms have significantly lower levels of leverage and slower speeds of adjustment than NSC firms. The authors explain these findings by the financing restrictions to which SC firms are subject, creating a finance supply gap for these firms and higher adjustment costs.

Data and methodology

Data sources and sample

The study sample consists of non-financial companies that are publicly traded on the KSA stock exchange.

The analysis is about the period from 2006 to 2016. The financial and market data used in this research were hand-collected from listed firms' annual reports provided by the website <https://www.argaam.com>. We exclude financial firms (banks and insurance) due to their specific regulations. We also exclude firms with missing information over the study period.

This study follows the Sharia Guidelines of Alrajhi bank for Trading and Investment in Stocks. The Sharia Board of Alrajhi Bank has issued its resolution No. (485) regarding the legal rule on the investment and trading in the stocks of the joint stock companies, as follows:

Joint stock companies, in terms of their objectives, activities and controls of dealing in their stocks, are classified into three types:

- (1) Joint stock companies with permissible objectives and activities;
- (2) Joint stock companies with illicit objectives and activities (e.g., tobacco, pork, gambling, interest-bearing banking activities);
- (3) Companies whose objectives and activities are permissible but may have illicit matters in their dealings, such as dealing in usurious interest-bearing loans or deposits.

According to this classification, we define Islamic firms as those of type one. These firms use non-interest based financing modes to finance their assets.

Table 2 describes the sample selection procedure. The final sample consists of 66 firms with a total of 726 firm-year observations.

Theoretical framework and measures of variables

This study employs the methodology of Shyam-Sunder and Myers [34] and Frank and Goyal [14] to test the POT. The test advanced by the authors is based on the implication that, under the POT, a substantial amount of inter-temporal variation in net debt issue (ΔD) should be explained by a single variable, the funds flow deficit (DEF). The DEF variable is given by the following identity:

$$DEF_t = DIV_t + I_t + \Delta W_t - C_t = \Delta D_t + \Delta E_t \quad (1)$$

where DIV_t : cash dividends in year t ; I_t : net investment in year t ; ΔW_t : change in working capital in year t ; C_t : cash flows after interest and taxes in year t ; ΔD_t : net debt issued in year t ; ΔE_t : net equity issued in year t .

According to Shyam-Sunder and Myers [34], the testing strategy of the pecking order hypothesis relies on the following simple model:

Table 2 Summary of the sample selection procedure

	No. of companies	Percentage of sample
<i>Panel A: industrial composition of firms listed on the "Tadawul" available to be sampled as of December 31, 2016</i>		
Materials	42	23.59
Energy	4	2.25
Consumer service	22	12.36
Consumer goods	28	15.73
Capital goods	12	6.74
Real estate development	11	6.18
Telecommunication	4	2.25
Financial	48	26.97
Others (transportation, utilities)	7	3.93
Total firms available to be sampled	178	100
Less: non-Islamic companies (type two and three)	38	
Islamic financial companies	22	
Firms with missing data (newly listed)	52	
Total excluded firms	112	62.92
Final selected sample	66	37.08
Industry classification	No. of observations	Percentage of sample
<i>Panel B: industrial composition of the sample</i>		
Materials	22	33.33
Energy	4	6.06
Consumer service	8	12.12
Consumer goods	14	21.21
Capital goods	6	9.09
Real estate development	3	4.55
Telecommunication	4	6.06
Others (transportation, utilities)	5	7.58
Final selected sample	66	100

$$\Delta D_{i,t} = \alpha_{po} + \beta_{po}DEF_{i,t} + e_{i,t} \quad (2)$$

where α_{po} and β_{po} are the pecking order parameters and $e_{i,t}$ is an error term. In Eq. (2), the strong form test of the pecking order model predicts that $\alpha_{po}=0$ and $\beta_{po}=1$ [34]. However, according to Chirinko and Singha [9], the later form is very restrictive and therefore will not be very useful in evaluating the pecking order model. The authors propose a semi-strong form, which states that firms meet their deficit-in-funds by relying initially and primarily on debt finance.

Given the characteristics of Islamic financial instruments, we propose the following models:

$$NDI_{i,t} = \alpha_{po} + \beta_{po}DEF_{i,t} + e_{i,t} \quad (3)$$

where NDI is net debt issued (*Murabahah, Ijara*).

$$NSKI_{i,t} = \alpha_{po} + \beta_{po}DEF_{i,t} + e_{i,t} \quad (4)$$

where NSKI is net *Sukuk* issued.

Because of the presence of debt capacity constraints, firms must resort to equity issues. Following Chirinko and Singha [9] argument, the present study uses Eq. (5) below to be compared with Eqs. (3) and (4).

$$NQI_{i,t} = \alpha_{po} + \beta_{po}DEF_{i,t} + e_{i,t} \quad (5)$$

where NQI is net equity issued.

Moreover, to test the predictions of the POT in KSA context, the present paper refers to the modified conventional regression of leverage of Frank and Goyal [14]. In the following regression equation, the cumulative financing deficit (CDEF) replaces the financing deficit (DEF) because of using levels of leverage rather than changes in leverage [8].

$$LEV_{i,t} = \alpha + \beta_{TAN}TAN_{i,t} + \beta_{MTB}MTB_{i,t} + \beta_{LS}LS_{i,t} + \beta_{PRF}PRF_{i,t} + \beta_{CDEF}CDEF_{i,t} + \mu_i + v_{i,t} \quad (6)$$

Table 3 Descriptive statistics

Variables	Mean	STD	Min	Max
DEF	0.055	0.205	− 1.734	1.252
NDI	0.014	0.082	− 0.314	0.755
NSKI	0.002	0.028	− 0.095	0.326
NQI	0.009	0.161	− 4.453	0.626
BBD	0.271	0.468	0	0.897
MBD	0.257	0.772	0	0.949
MTB	1.928	1.032	0.731	6.675
LS	9.333	0.715	7.731	11.531
TAN	0.577	0.204	0.021	0.974
PRF	0.091	0.099	− 0.509	1.103

where LEV refers to book leverage (long-term debt/total assets) or market-based debt (long-term debt to market capitalization), TAN is the tangibility of assets (fixed assets/total assets), MTB is the market-to-book ratio (the ratio of the sum of the market value of equity and the book value of debt to the book value of assets), LS is the size of the firm (log of assets), PRF is the profitability (operating income/total assets), and CDEF is the cumulative financing deficit (the ratio of cumulative financing deficit to the book value of assets). (μ_i) is the unobservable individual heterogeneity, and ($v_{i,t}$) is the remainder disturbance or the usual disturbance in the regression model that varies with individual units and time. According to Frank and Goyal [14], the pecking order predicts that $\beta_{TAN} < 0$, $\beta_{MTB} < 0$, $\beta_{LS} > 0$, $\beta_{PRF} < 0$, and $\beta_{CDEF} > 0$.

Equation (6) is simply a modified conventional regression with cumulative financing deficit as an added factor. If the inclusion of the cumulative financial deficit variable should wipe out the effect of the other variables, then the predictions of the POT would be supported. Otherwise, the predictions of the POT would be contradicted [2, 14].

Results and discussion

Descriptive statistics

Table 3 provides the main summary statistics for the variables used in the empirical analysis. Interestingly, to track their financing deficit, KSA firms first issue debt-based instruments (*Murabahah*, *Ijara*), then equity, and finally they issue *Sukuk* as a last resort. On average, the net debt issued is 1.4% of total assets higher than 0.9% of net equity issued and 0.2% of net *Sukuk*. This suggests the preference of KSA firms to issue debt-based instruments rather than equity and *Sukuk*.

The average values of book-based debt and market-based debt are 27.1% and 25.7%, respectively. Looking at these results in comparison with those in other

developing and developed countries, Allini et al. [2] find that the book-based debt and market-based debt means in Egypt are 17%, and 14%, respectively. Chen et al. [8] find them to be 39% and 35% in Taiwan. In European context, Moradi and Paulet [27] find a book-based debt mean of 26% in Austria, 23% in Belgium, 20% in France, 21% in Germany, 20% in Luxembourg and 26% in Netherlands.

With regard to other variables, the results show a mean value of market-to-book ratio of 1.928, with a range from 0.731 to 6.675. The tangible assets as a percentage of total assets average 57.7%. The average firms' size measured by the log of total assets is about 9.333. The KSA firms' profitability averages 9.1% and ranges between − 50.9% and 110.3%.

Tests of pecking order of Islamic financial instruments

Consistent with previous works [9, 34], this study seeks to examine how well Islamic financial instruments track the financing deficit.

The selection of the appropriate model was made following four different tests developed by Baltagi [5], Chow [10], Hausman [16], and Breusch and Pagan [7]. The *F* test [5] determines the best model between pooled OLS and the alternatives of panel data (i.e., fixed and random effects, respectively). A Chow test was performed to distinguish between the pooled OLS model and the fixed effect model. The Breusch and Pagan Lagrangian multiplier (LM test) was performed to examine the existence of random effects. The Hausman test is used to select the best model between the random effects model and the alternative fixed effects model.

The results of the *F* test, Chow test and Breusch and Pagan test (Tables 4 and 5) reveal that the pooled OLS estimators are the most appropriate. The statistics of these tests are not significant.

Table 4 summarizes the basic ordinary least squares (OLS) tests. The dependent variables are net debt (*Murabahah*, *Ijara*) issued, net *Sukuk* issued, total debt issued and net equity issued, all scaled by book assets. The results show that the constant, α , is close to zero in all regressions. The slope parameter, β , ranges from 0.071 to 0.614 depending on the dependent variable. Interestingly, it seems that sale-based instruments (*Murabahah*, *Ijara*) track the financial deficit much closer as they are cheaper than other alternatives and they do not dilute ownership. The estimated coefficient on financial deficit as 0.543 is still far below from observed coefficient for conventional firms in the US market, that ranging between 0.75 and 0.85 [34]. However, it is still far above from observed coefficients in Egyptian market and Taiwan market that are 0.340 and 0.309, respectively [2, 8].

Table 4 The estimators for pecking order model for the full sample

	Net debt issued (1)	Net <i>Sukuk</i> issued (2)	Total debt issued (3)	Net equity issued (4)
α	0.006*** (3.61)	0.001 (1.48)	0.008*** (3.82)	0.009 (1.44)
β	0.543*** (35.95)	0.071*** (8.87)	0.614*** (35.37)	0.359*** (9.88)
N	726	726	726	726
R^2	0.627	0.092	0.619	0.157
F	1292.36***	78.59***	1250.97***	97.29***
F test ($u_i = 0$)	1.29	1.03	1.20	0.98
Chow test	1.06	1.34	1.18	1.45
$B-P$ LM test	0.74	0.89	0.79	0.97

This table displays results for OLS estimations of the equations in specifications (3), (4) and (5). t -statistics are shown in parentheses

*** $p < 0.01$

Table 5 The estimators for pecking order model according to crisis period classification

Variables	Pre-crisis			Crisis			Post-crisis		
	Net debt	Net <i>Sukuk</i>	Net equity	Net debt	Net <i>Sukuk</i>	Net equity	Net debt	Net <i>Sukuk</i>	Net equity
α	0.001 (0.05)	0.001 (0.06)	− 0.007 (− 0.22)	0.017*** (3.47)	0.002 (0.71)	0.013** (2.16)	0.005*** (3.05)	0.001 (1.06)	0.010*** (5.21)
β	0.529*** (17.69)	0.083*** (6.96)	0.376*** (4.72)	0.396*** (13.55)	0.059*** (3.30)	0.424*** (7.77)	0.551*** (27.82)	0.023*** (5.25)	0.225*** (9.95)
N	132	132	132	132	132	132	462	462	462
R^2	0.692	0.254	0.084	0.568	0.066	0.299	0.612	0.046	0.167
F	312.8***	48.46***	7.42***	183.5***	10.86***	60.42***	773.8***	9.08***	98.99***
F test	1.01	0.62	1.01	1.48	0.91	0.84	1.57	1.09	1.28
Chow test	1.17	1.42	1.33	1.27	1.36	1.09	1.22	1.54	1.13
$B-P$ test	0.72	0.93	0.86	0.81	0.89	0.66	0.79	0.98	0.69

This table displays results for OLS estimations of the equations in specifications (3), (4) and (5) according to crisis period classifications. t -statistics are shown in parentheses

*** $p < 0.01$, ** $p < 0.05$

If the firm needs more funds but cannot use debt-based instruments due to the debt-ratio constraint,² then it moves to equity financing. Regarding net equity issued, the results show a positive and significant coefficient (0.359) associated with financial deficit. Looking at these results in comparison with those in other developing countries, Allini et al. [2] find a coefficient of 0.519 in Egypt, and Chen et al. [8] find it to be 0.675 in Taiwan.

As a last alternative to finance deficit, Islamic firms issue *Sukuk*. The results reveal a positive low coefficient (0.071) of financial deficit on net *Sukuk* issued. This can be explained by the under-development of *Sukuk* market in KSA. According to Alshamrani [4], the *Sukuk* market

in KSA is new and immature; the first issuance of *Sukuk* was in 2004. The author emphasizes that the issuance of *Sukuk* in Saudi Arabia is suffering from heavy regulation and supervision drawbacks, which need to be identified in order to resolve the problems of regulation and insufficiency of supervision. This argument aligns with Alnorria and Alqahtani [3], who state that because of its complexity, firms are discouraged from issuing a *Sukuk* or at least making it their first option.

In sum, capital choice decision of Islamic-compliant firms seems to follow a modified POT, in which firms rely on retained profit, followed by sale-based instrument (*Murabahah*, *Ijara*), then equity, with *Sukuk* as the last option.

We also ran tests using deficits, debt issues, *Sukuk* issues and equity issues according to crisis periods. The results presented in Table 5 support the same modified

² The debt-ratio constraint maintains that it cannot exceed the ratio of tangible assets to total assets [1].

Table 6 Correlation matrix and VIF values

	TAN	MTB	LS	PRF	CDEF	VIF
TANG	1					1.13
MTB	− 0.005	1				1.19
LS	0.249	− 0.205	1			1.17
PRF	− 0.180	0.307	0.068	1		1.21
CDEF	0.095	− 0.022	0.084	− 0.113	1	1.03

Table 7 Results of the unit root tests

Variables	ADF		PP		Stationarity status
	Level <i>I</i> (0)	First difference <i>I</i> (1)	Level <i>I</i> (0)	First difference <i>I</i> (1)	
BBD	102.058***	169.252***	85.763***	237.423***	<i>I</i> (0)
MBD	100.865***	208.513***	100.168***	269.756***	<i>I</i> (0)
TAN	89.743***	149.254***	73.016**	193.654***	<i>I</i> (0)
MTB	91.907***	168.772***	97.483***	192.896***	<i>I</i> (0)
LS	93.421***	232.425***	83.147**	289.452***	<i>I</i> (0)
PRF	111.546***	187.472***	86.471***	234.912***	<i>I</i> (0)
CDEF	124.253***	272.857***	125.704***	396.453***	<i>I</i> (0)

This table displays the results of ADF test and PP test

*** $p < 0.01$, ** $p < 0.05$

POT in the pre and post-crisis only. Financial deficit is financed by sale-based instrument (*Murabahah*, *Ijara*), then equity, and lastly by *Sukuk*. However, the POT is highly violated in the crisis period. The results displayed in Table 5 show less reliance of firms on debt issuance in the crisis period. KSA firms seem more reliant on equity, then on sale-based instrument and on *Sukuk* as last alternative. Hence, KSA firms that are willing to expand often find it difficult to obtain financing from financial institutions in the crisis period and are thus credit constrained. This constitutes the “financing-gap” encountered by firms and this gap is more prevalent in crisis period. The financial crisis arguably provides a shock to the supply of external financing resulting in lending contraction for banking system. Consequently, firms will experience a fall in corporate borrowing and capital expenditures. This reflects in less leverage ratios in the crisis period. This argument aligns with Dewally and Shao [11] who suggest that the liquidity shocks to the short-term funding markets impose liquidity constraints to banks, resulting in lending cut and changes in the capital structure of corporations.

Tests of conventional leverage regressions

The next test of the theory is to see how the financing deficit works when added to a conventional leverage regression. If the pecking order hypothesis is true, the inclusion

of the financing deficit variable would increase the R^2 considerably (relative to running the regression without this variable) because the financing deficit should be the most important variable in the equation. In addition, we would expect that adding the financing deficit variable should render the effects of the other conventional explanatory variables insignificant.

First, we carry out two tests to check the existence of multicollinearity among the explanatory variables: the pairwise correlation matrix among the explanatory variables and the variance inflation factor (VIF). According to Kennedy [20], a multicollinearity problem arises if the correlation among the independent variables is greater than or equal to 0.80. As shown in Table 6, the Pearson correlation coefficients appear to be relatively low and there is no correlation between the variables that reach 0.8. The low magnitude of correlations among the explanatory variables indicates that multicollinearity is not a problem for the sample.

Furthermore, a VIF test was performed to examine the existence of multicollinearity. As highlighted in Table 6, all VIF values of explanatory variables are less than 4, supporting the previous conclusion of the absence of multicollinearity problem in the data. According to O'Brien [31], a VIF value exceeding 4 warrants further investigations, while a VIF value exceeding 10 is a sign of serious multicollinearity requiring correction.

Table 8 Leverage regressions with conventional variables and cumulative financial deficit for the full sample

Variables	Book-based debt		Market-based debt	
	(1)	(2)	(3)	(4)
Constant	−2.858*** (−7.43)	−2.815*** (−7.71)	−1.342** (−2.41)	−1.290** (−2.44)
TAN	0.553*** (5.88)	0.552*** (6.00)	0.361** (1.97)	0.333* (1.88)
MTB	−0.036** (−2.29)	−0.036*** (−2.32)	−0.123*** (−3.61)	−0.124*** (−3.74)
LS	0.313*** (7.57)	0.308*** (7.84)	0.177*** (2.96)	0.171*** (3.02)
PRF	−0.492*** (−3.27)	−0.484*** (−3.26)	−0.254 (−0.76)	−0.192 (−0.59)
CDEF		0.370*** (4.55)		0.932*** (4.45)
R ²	0.398	0.417	0.326	0.369
N	726	726	726	726
F test ($u_i = 0$)	14.30***	14.09***	2.99***	2.87***
Chow test	17.86***	21.07***	24.93***	31.05***
B–P LM test	1089.42***	1044.40***	74.60***	66.16***
Hausman test	6.06	7.35	8.32	11.08
Wald χ^2	158.51***	188.46***	37.84***	61.76***

This table reports the results of Eq. (6). *t*-statistics are shown in parentheses.

****p* < 0.01, ***p* < 0.05 and **p* < 0.1

Second, this study carried out two root tests on all the variables in order to confirm that all variables are stationary. In particular, we employed the augmented Dickey and Fuller [12] test (ADF) and the Phillips and Perron [32] test (PP). The results reported in Table 7 indicate that all variables are stationary at the first difference. Therefore, our models using the first difference operator are appropriate for avoiding spurious estimates.

Third, the selection of the appropriate model was made following four different tests developed by Baltagi [5], Chow [10], Hausman [16], and Breusch and Pagan [7]. The results reported in Tables 8 and 9 reveal that the individual effect models (fixed effects and the random effects) are the most appropriate. The statistics of *F* test, Chow test and Breusch and Pagan test are significant in all regressions. Thus, the Hausman [16] specification test was conducted to decide between the fixed effect model and the random effect model. The results show that all values of Hausman test are insignificant implying that the random effects model is preferred to the fixed effects model.

Table 8 provides the results for the full sample using Book-based debt and Market-based debt as independent variables. The conventional regressions before the deficit variable addition are provided in columns (1) and (3). The

Table 9 Leverage regressions according to crisis period classification

Variables	Pre-crisis		Crisis		Post-crisis	
Constant	3.095*** (−4.84)	1.816*** (−3.69)	−2.677*** (−4.80)	−2.628*** (−4.66)	−2.692*** (−5.27)	−2.642*** (−5.17)
TAN	0.285* (1.71)	0.199 (1.50)	0.531*** (3.08)	0.546*** (3.12)	0.768*** (5.84)	0.828*** (6.41)
MTB	−0.064* (−1.73)	−0.045* (−1.64)	−0.045 (−1.37)	−0.047 (−1.41)	−0.029 (−1.56)	−0.027 (−1.49)
LS	0.369*** (5.26)	0.219*** (4.02)	0.298*** (4.95)	0.291*** (4.77)	0.278*** (5.12)	0.269*** (4.95)
PRF	−1.265*** (−2.85)	−0.695** (−1.98)	−0.283 (−1.02)	−0.257 (−0.91)	−0.257* (−1.71)	−0.284* (−1.95)
CDEF		1.141*** (7.67)		0.045 (0.61)		0.583*** (5.07)
R ²	0.303	0.565	0.371	0.372	0.322	0.312
N	132	132	132	132	462	462
F test ($u_i = 0$)	6.87***	4.71***	22.97***	22.60***	19.42***	20.74***
Chow test	22.83***	19.24***	17.07***	14.87***	21.98***	25.02***
B–P LM test	26.96***	13.86***	56.29***	56.19***	718.90***	745.19***
Hausman test	4.78	3.43	1.12	0.49	2.48	2.83
Wald χ^2	49.72***	131.56***	50.89***	51.05***	86.45***	115.06***

This table reports the results of Eq. (6) for the following subsamples: pre-crisis, crisis and post-crisis periods. *t*-statistics are shown in parentheses. ****p* < 0.01, ***p* < 0.05 and **p* < 0.1

estimated coefficients on tangibility, the market-to-book ratio, firm size and profitability have the usual signs. The results show that the tangibility is found to be significant and positively related to both leverage measures which is inconsistent with the POT prediction. As debt has to be asset-backed in firms operating under Islamic principles, leverage will increase with the increase in tangible assets.

The coefficient signs are negative on the market-to-book ratio for both leverage measures. Like conventional firms, debt instruments in Islamic-compliant firms have high distress costs (see Table 1). Consequently, a negative relationship between firms' future opportunities and their leverage choice will be established because growth firms are predicted to lose more of their value when they become financially distressed [14].

The coefficients associated with the size variable are positive and significant on both leverage measures consistent with the findings of Frank and Goyal [14]. In term of information asymmetries, large firms are expected to convey more information than small firms. This facilitates their access to the credit market which enhances their debt capacity. The results reveal that profitability is negatively related to both leverage measures, which is consistent with the POT and in line with most empirical research (e.g., [3, 14]).

In columns (2) and (4), both leverage regressions are estimated with financing deficit as an additional explanatory variable. The results show that the cumulative financing deficit added about 2% and 4% to the explanatory power of the Book-based debt and Market-based debt regressions, respectively. Further, the results indicate that the addition of the deficit variable to the regression does not result in an effect on the magnitudes and significance of the coefficients on the conventional variables. However, the financing deficit is empirically relevant. Thus, the cumulative financing deficit works well in both leverage regressions, although the POT is rejected. This reflects that the current capital structure of Islamic-compliant firms in KSA is strongly related to cumulative financing deficit.

This result aligns with previous studies including Chen et al. [8] who find that the introduction of the cumulative financial deficit in leverage specifications did not have much influence on the significance of other conventional variables' coefficients although the financing deficit is empirically significant. Similarly, Allini et al. [2] show that the inclusion of the cumulative financial deficit in leverage regressions did not affect the significance of the other conventional variables. Moreover, there is no gain in terms of the explanatory power of the regressions.

The same tests are done considering crisis period classification. Table 9 provides empirical results. To save space, we only report the results using the Book-based debt regression. Except market-to book ratio, most variables show the similar sign and significance to the all-firms' sample. The coefficient associated with MTB variable is not significant in crisis and post-crisis periods.

Further, the results indicate that the inclusion of the cumulative financing deficit did not influence the signs, magnitudes and significance of the coefficients of conventional factors. As seen in Table 9, the coefficient of the cumulative financing deficit is significant in all regression except in crisis period. This aligns with the original results about the reject of the POT in KSA Islamic firms. In addition, the findings reflect the financial behavior disturbance of KSA firms during the crisis period.

Conclusion

The objective of this study was to investigate whether the POT is an accurate means to describe the incremental financing practices by firms operating under Islamic principles.

Employing panel data analysis, this study first examines how well Islamic financial instruments track the financing deficit. The results show that sale-based instruments (*Murabahah*, *Ijara*) track the financial deficit much closer as they are cheaper than other alternatives and they do not dilute ownership. If the firm needs more funds but cannot use debt-based instruments due to the debt-ratio constraint, then it moves to equity financing. As a last alternative to finance deficit, Islamic-compliant firms issue *Sukuk*. This can be explained by the under-development of *Sukuk* market in KSA. Further, the results reveal high violation of the POT in the crisis period. Islamic-compliant firms seem more reliant on equity, then on sale-based instrument and on *Sukuk* as last alternative. Due to credit constraints in the crisis period, debt financing is less preferred and more equity capital financing is used.

Next, the study findings indicate that the inclusion of the cumulative financing deficit does not wipe out the effects of conventional variables, although it is empirically significant. This provides no support for the POT attempts by KSA Islamic-compliant firms.

Overall, it seems that the issuance activity of Islamic-compliant firms is more closely to the need of funds instead of adhering to a hierarchy of financing sources.

There are several important areas where this study makes original contributions to the related literature. First, this research extends literature on capital structure. It highlights the capital structure choice of firms operating

under Islamic principles. Second, this research focuses on the capital structure of Islamic-compliant firms in KSA, which has not been previously tackled by any research effort. Third, the present paper sheds light on the impact of the global financial crisis on Islamic banking, and therefore, on the Islamic firms' capital structure choice. Finally, the findings will contribute significantly to the body of knowledge as well as to practitioners and to firms that would like to operate under Islamic principles.

Several implications can be derived from the study results. First, due to the lack of legislative and regulatory framework of *Sukuk* issuance, it is recommended to update the present regulations for the offering and issuance of securities in KSA in order to cover *Sukuk*. In this regard, policymakers, bankers and standard-setting organizations should undertake more collective work to simplify the process of issuing Islamic financial instruments, including *Sukuk*. Second, the Saudi government has to encourage the private sector to be more innovative in developing products and services that are in line with Sharia principles. Finally, to attract investors, the Saudi Capital Market Authority (CMA) has to encourage transaction, efficiency and liquidity of Islamic financial instruments.

The paper identifies some areas where further research on topics related to capital structure of Islamic-compliant firms is needed. The failure of the POT to explain KSA firms' financing choices strongly pushed researchers to test the market timing theory for the Saudi stock market. Further, scholars could re-examine the trade-off theory in the absence of interest tax shield as in an Islamic economy.

Abbreviations

AAOIFI: Accounting and Auditing Organization for Islamic Financial Institutions; CMA: Capital Market Authority; GCC: Gulf Cooperation Council; KSA: Kingdom of Saudi Arabia; NSC: Non-Sharia-Compliant; OLS: Ordinary least squares; PLS: Profit and loss sharing; POT: Pecking order theory; SAMA: Saudi Monetary Authority; SC: Sharia-compliant; VIF: Variance inflation factor.

Acknowledgements

Not applicable.

Authors' contributions

MG reviewed the literature, analyzed, interpreted and discussed the results. He is the only contributor in writing the manuscript. The author read and approved the final manuscript.

Funding

There is no source of funding.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available in the Argaam web site repository, www.argaam.com.

Competing interests

The authors declare that they have no competing interests.

Received: 28 November 2019 Accepted: 2 November 2020

Published online: 26 November 2020

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