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Public Sector Funding and Debt Management: A Case for GDP-Linked *Sukuk*

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Despite the huge amount of wealth in the hand of Muslims, most countries with Muslim majority population fall in the category of developing nations. The development of infrastructure has been proven to be an effective means for economic growth and poverty reduction. Usually governments have recourse to conventional debt financing to undertake infrastructure projects. However, this form of financing is unsuitable in an Islamic framework due to the prohibition of interest. Moreover, the recurrent sovereign debt crises over the last few decades stresses the importance of debt management that helps avoid the high costs of these forms of catastrophe. Debt indexation to some indicators from the real economy (like GDP or Commodity price) has been identified as an effective means for the reduction of sovereign default. Such an idea has the property of strengthening the linkage between the real and the financial sectors of the economy and allows risk sharing between the parties involved in the transaction. In spite of the convergence of such an idea with the spirit of Islamic finance, the Sukūk market has not yet taken advantage of it. The objective of this paper is, therefore, to propose an innovative model of Sukūk for financing non revenue generating public sector projects whose return is linked to the GDP development of the issuing country. The paper examines the potential benefits and obstacles of the GDP-Linked Sukūk (GLS) model, which is based on Forward Ijārah, as well as its risk-return profile. Furthermore, a framework for pricing GLS is put forth. Based on a sample of countries from five regions of the Muslim world, the theoretical properties of the GLS are validated through backtesting method. The model is shown to be a new asset class between the traditional debt and equity instruments and offers interesting diversification opportunities. Besides its theoretical contribution, the model proposed in this paper addresses in an effective way the issue of debt management, in an interest-free context, and the issue of benchmarking sovereign Sukūk against the interest rate.

Key Words: GDP-Linked Sukūk, Forward Ijārah, Backtesting.

1. Introduction

Despite the huge amount of wealth in the hand of Muslims, most countries with Muslim majority population fall in the category of developing nations. The development of infrastructure has been proven to be an effective means for economic progress (Estache and Fay 2007). Thus, it has been shown that the quantity and quality of the infrastructure have a positive impact on economic

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growth and are negatively correlated to income inequality. As an implication, the development of infrastructure is seen to be an effective way to combat poverty (Calderon and Serven 2004). Usually governments have recourse to conventional debt financing to undertake infrastructure projects. However, this mode of financing is unsuitable in an Islamic framework due to the prohibition of interest.

Over the last decade, *Sukūk* (sing. Sakk) have been seen as an alternative to interest-based financing, in the Islamic capital market. *Sukūk* represent proportionate beneficial ownership of an asset or a pool of assets for a defined period when the risk and return associated with the cash flows generated by the underlying assets are passed to the *Sukūk* holders (Iqbal and Mirakhor 2007, p.177). The euphoria which accompanied the phenomenal growth of the *Sukūk* market over the recent years is, however, tarnished by various criticisms raised about the *Sharī'ah* compliance and /or the economic efficiency of many of the current *Sukūk* structures. This led to the famous AAOIFI's statement in 2008.

On the other hand, the recurrent sovereign debt crises during the last few decades stresses the importance of debt management that helps avoids the high costs of these forms of catastrophe. Borensztein and Panizza (2009) document short-lived but significant sovereign default costs which can take various forms. Thus, in addition to its negative effect on GDP growth, sovereign default is shown to cause reputational costs⁴, international trade exclusion costs⁵, costs to the domestic financial system⁶ and political costs to the authorities.

Debt indexation to some indicators from the real economy (like GDP or Commodity price) has been identified as an effective means for the reduction of sovereign default. Despite the potential benefits of indexed-bonds, acknowledged in the literature, little work is done to investigate their adaptability in the context of Islamic finance. The objective of this paper is, therefore, to show the pertinence of this indexation within the framework of Islamic finance and to propose a design of GDP-Linked *Sukūk*. To this end, the next section will be devoted to a review of selected literature pertaining to the potentials of *Sukūk* for the public sector and some relevant issues. The second part of this review investigates the potential benefits and shortcomings of GDP-Linked bonds and examines the possibility of their adoption in the Islamic finance industry. Section 3 is concerned with the design, the pricing and the *Sharī'ah* justification of GDP-Linked *Sukūk*. The theoretical characteristics of this model of *Sukūk* will be tested empirically using backtest method in section 4. The conclusion will end the paper.

⁴ Reputational costs can be in the form of full exclusion from capital market and credit rating downgrade that will result in higher borrowing costs later.

⁵ International trading costs could be in the form of net decrease of bilateral trade and decline of of the trade credit of the defaulted country.

⁶ This can take the form of an increase of the probability of banking crisis. (See Borensztein and Panizza, 2009, for more elaboration).

2. Literature review

The principal message of this section is to point out to the potentials of the *Sukūk* for the public sector and to discuss the issues that could impede their realization. We have argued that to address these issues and take full advantage of the potential benefit we need to be innovative. Wisdom can be taken from anywhere, and conventional finance has some good aspects that can be useful to Islamic finance. In this regard, the idea of GDP-linked bond is explored. This idea presents opportunities for risk sharing and for integrating the financial sector to the real sector of the economy. Both of them fit well to the principles of Islamic finance.

2.1. Sukūk: Potentials for the public sector and issues

2.1.1. Potentials of Sukūk for the Public Sector

As developing countries, Muslim nations have a large demand for infrastructure projects, such as schools, hospitals, roads, water, electricity etc. However, in most cases the governments in the developing countries do not have sufficient revenues to fund these types of projects which are vital for sustainable development. To meet this form of demand, Iqbal and Khan (2004) suggest the utilization of Build-Operate-Transfer (BOT) and its variants along with the *Sukūk* structures as a better alternative to the conventional financing which is based on interest. The reason for that is, at least, twofold: first, given that *Sukūk* and Islamic financing in general are based on real assets, they are expected to enhance the stability of the financial institutions and markets. This feature ensures a stronger connection between the financial sector and the real sector of the economy and renders the system less prone to speculative activities which are the cause of many crises. Second, such a policy consisting of financing government expenditure through Islamic financial instruments is expected to discipline public expenditure as availability of finance without an asset will be very limited. As a result, greater prudence will be introduced in the overall macroeconomic management as well as in the efficiency of microeconomic units operating in an economy.

Indeed, *Sukūk* have already been used as a tool for macroeconomic management in some Muslim countries. Referring to the Sudanese experience, Elteгани (2005) mentions that *Sukūk* can be used by governments as well as the Central banks for monetary policy and for liquidity control. Thus, when *Sukūk* are sold to the public money is withdrawn from the market, and this has its effect on money supply. Money withdrawn will be kept by the Central Bank. On the other hand, when need arises such money or part of it will be poured again into the market by buying *Sukūk*.

In addition to its function as tool for macroeconomic policy, *Sukūk* is, thus, claimed to enhance the efficiency of the financial system, through the linkage of credit supply with real asset (Siddiqi 2006) and improve the equity within the system by allowing many small savers to invest and benefit from the true profits resulting from investments that conform with *Sharī'ah* principles (Usmani 2007). However, many writers have questioned the validity of such claims based on the current practice in the *Sukūk* market. The issues raised against many of the *Sukūk* structures relate to different aspects encompassing *Sharī'ah* compliance, economics, regulatory and legal framework. Here we shall focus on the *Sharī'ah* compliance and the economic aspects

only as the legal and the regulatory aspects may be too variable from a jurisdiction to another and from a period to another.

2.1.2. Sharī'ah issues

Oh et al. (2009) discuss two forms of product efficiency: the technical efficiency and the allocative efficiency. In the price-quality space, a product is technically efficient if it has higher quality for lower price. However, an efficient product may not be selected by consumers, even when it has the highest quality and lowest price. The reason is not the absolute level of quality, but the mix of qualities which does not match the consumer's preference structure. The allocative efficiency refers to the degree of match of quality mix with the preference structure. Adopting these definitions and applying them to financial product, we can say that a *Sukūk* product is technically efficient if it provides higher return compared to other financial instruments with the same level of risk. Furthermore, we consider that tradability in addition to *Sharī'ah* compliance are essential constituents of the 'allocative efficiency' in the *Sukūk* market.

Haneef (2009) identifies three hallmarks in the development of the *Sukūk*. He showed that *Sukūk* evolved from asset-backed model, where the *Sukūkholders* have ownership rights over the underlying asset, as per *Sharī'ah* requirements, to asset-based model. With the latter model, the *Sukūkholders* rank *pari passu* with unsecured creditors. Indeed, for all international bonds there is a negative pledge which restricts the borrowing entity from issuing any bond in future that is not in *pari passu* with existing unsecured bonds. The third stage of the *Sukūk* structures evolution was marked by the emergence of models that were mainly based on partnership contracts but violate some of their basic *Sharī'ah* requirements. Those structures in particular have drawn various criticisms that culminate with Sheikh Taqi Usmani's declaration which considered that 85% of those *Sukūk* were non-*Sharī'ah* compliant. This led the AAOIFI's statement in 2008.

(Al-Amine 2008) points out to the controversy among Muslim scholars over the permissibility for one of the *Mushārahah* partners to give an undertaking to purchase the shares or units of other partners at predetermined price. The rationale for the objection is that the very nature of a *Mushārahah* is the sharing of profit and loss among the partners. The undertaking to purchase the share of a partner at predetermined price defeats that spirit of *Mushārahah* as one partner will have a guaranteed return, whatsoever is the outcome of the venture.

The combination of many *Sharī'ah* endorsed contracts to produce a *Sukūk* structure with a desired cash flow is common in the current Islamic finance industry. Al-Amine (2008) analyses the structure of many of these combined contracts in the light of *Bai' al-Wafā*, *Bai' al-Istighlal* and *Bai al-'Inah*. It is found that all these transactions are controversial and accepted by only a minority of Muslim jurists. Those who reject them consider these forms of transaction as mere *hiyal* (legal tricks) meant to circumvent the prohibition of interest-based lending. Thus, even though the form may adhere to the requirements of *Sharī'ah* in exchange contract, the substance does not (Al-Zuhayli 2003; Al-Amine 2008).

Another issue which has drawn the attention of the scholars is the third party guarantee present in many *Sukūk* structures. Al-Amine (2008) argues that theoretically, a benevolent third party guarantee without fee or consideration can be acceptable in Islamic law. However, in practice guaranteeing the principal in *Sukūk Mushārahah*, or *Sukūk Mudhārahah* or *Sukūk Ijārah*

is problematic. This is due to the fact that if the guarantee is provided by a government it shall be declared non-permissible to use the property of the whole community for the benefit of private entities. Likewise, it is hardly conceivable for a private entity to provide a benevolent guarantee to another entity without a consideration.

2.1.3. Economic issues

The discussion on the economics of *Sukūk* will focus on few issues, such as the efficiency, the tradability and the pricing mechanism of *Sukūk* that have drawn most attention among the players. Another aspect which needs consideration, in this context, is the equity and fairness of the transaction. This equity aspect, as reflected in the pricing mechanism, has been addressed in various ways in the literature. Even though all these issues have *Sharī'ah* dimension, here we will mainly focus on their economic aspects.

Ali (2008) holds that the combined contracts, in the *Sukūk* structures, attempt to replicate conventional financial products while trying to remain within *Sharī'ah* bounds. The end result is complicated products which are hard to understand, costly to construct and implement and which may contradict the objectives of *Sharī'ah*.

It can be argued that the complexity of a structure increases costs stemming from the need of more sophisticated legal documentation and more efforts for advertisement of the new strange product; as a result the *Sukūk* become less profitable either for the investors or for the issuers or for both which means a loss of efficiency in the technical sense.

The tradability of some category of *Sukūk*, in the secondary market, is a subject of concern for many players in the Islamic capital markets as it constrains drastically the liquidity in the *Sukūk* market. The *Sukūk* structures based on sale contracts are not tradable, according to AAOIFI *Sharī'ah* Standard, as this would be tantamount to debt trading which is prohibited by the majority of Muslim jurists except if it is at par. However, this stance is challenged by a minority of scholars, particularly in Malaysia, who allow the sale of debt at discount (Rosly and Sanusi 1999). Their stand is based on the view of some classical jurists who allowed the sale of debt under some conditions. To these Malaysian scholars those conditions are met when there is a transparent regulatory system safeguarding the interests of the market participants. Furthermore, they invoke the concept of *Dha' wa ta'ajjal*⁷ to strengthen their argument⁸. However, both arguments fail to address the main issue in the transaction which is the involvement of *Ribā*, as there is a contractual increase of the amount to be repaid later in a loan contract. Moreover, *Maslahah* is not a valid argument when the transaction in question violates a clear cut text. In this case the text prohibiting *Ribā* is decisive in nature. Similarly, the majority of the Muslim scholars reject the concept of *Dha' wa ta'ajjal* particularly when it is a condition in the contract.

The use of interest rate benchmarks such as LIBOR for pricing purposes, though not desirable, is deemed acceptable from a *Sharī'ah* perspective as long as the pillars and conditions

⁷ The concept is referred to when a creditor forfeits a part of debt when the debtor settles the balance of the debt earlier than scheduled.

⁸ Syariah Advisory Council's Resolution, accessed on 14 March 2011 at <http://www.sc.com.my/main.asp?pageid=450&menuid=554&newsid=&linkid=&type=>.

of the contract in question are present (Usmani 1999a). Thus, the use of these conventional benchmarks can be seen as a transitory step towards the establishment of a mature Islamic finance industry with its own benchmark. El-Gamal (2006) while recognizing the potential benefit of using additional benchmarks related to the underlying assets to reflect the spirit of Islamic commercial law, argues against the replacement of the conventional benchmarks by an Islamic one. He considers such a move unnecessary, impractical and dangerous. This is because there is no reason to be embarrassed about using the conventional benchmarks and, more importantly, there is a lack of depth and liquidity of homogenous Islamic financial assets.

However, the majority of those who have written on the subject consider it aberrant to use a tool that Islamic finance was supposed to remove since its very beginning. Furthermore, it is remarked that by using money market rate as benchmark, the return to the *Sukūkholders* will reflect the prevalent rate of interest instead of the actual performance of the underlying asset of the *Sukūk* (Al-Amine 2008; Jabeen and Khan 2008; Siddiqi 2006). This could defeat what is thought to be one of the features of Islamic finance that is the integration of the real and the financial sectors. In the same vein, Siddiqi (2006) maintains that the disconnection between the two sectors mostly occurs with the over reliance on debt instruments as the case is in conventional finance, while it is admitted that the greater the role of debt the lesser will be the ability of the financial system to absorb real shocks. It also limits the ability of monetary authorities to take corrective actions because of fear of instigating widespread defaults. He further proposes the linking of the returns to *Sukūk* to the actual productivity, as with this arrangement justice and fairness will be ensured. The rationale is fairness requires that uncertainties attending upon productive enterprise be shared. At the same time, justice and fairness require that losses, if and when they occur due to the uncertainties in the business environment, be borne by those who claim the profits when there are profits.

An analysis of all these issues shows that this incongruence observed in the *Sukūk* structures emanates from the desire to reconcile two different paradigms in financing. In the conventional setting, the traditional debt financing allows the issuer to get funds without getting rid of some of its assets. On the other side, the investors get tradable securities whose return is determined ex ante. With the prohibition of interest in the Islamic framework, this form of financing (bonds) is not acceptable. Instead, methods endorsed by *Sharī'ah* entail either a profit and loss sharing scheme or a transfer of asset with all the rights and obligations. The incongruity arises when the *Sharī'ah* contracts are combined to reproduce the substance of financial instrument which is repugnant to their nature and to the Islamic paradigm in finance. The literature that we have examined unveils that the innovation in the *Sukūk* market has been more legal than financial i.e. the forms and the legal documentations of the *Sukūk* may be different from the existing instruments; however, they are very much like the conventional debt instruments in term of cash flow and risk return profile and may contradict some of the principles of Islamic finance.

Thus, as we have seen above, *Sukūk* comport numerous potential benefits. However these potential benefits could be hampered by the increasing controversies over the *Sharī'ah* compliance of many of the *Sukūk* structures in the market. These controversies affect negatively the allocative efficiency of the *Sukūk*, in the long term, as many pious Muslim investors would prefer to put their funds in other investment vehicles. A result of such a move would be less

investor base for *Sukūk* that leads to higher required rate of return for the funds suppliers or higher cost of capital for issuers translating into less efficiency in the technical sense.

Therefore, for a sustainable growth, we argue that financial innovation is necessary as advocated by many Muslim economists who consider financial engineering a vital area for Islamic finance. In the next paragraphs we review the literature pertaining to GDP-Linked bonds, a concept that is of relevance to Islamic finance, as it shares some common features with it.

2.2. GDP-Linked bonds: potential benefits, obstacles and adaptability

In the bond pricing literature there seems to be a growing interest in indexation whereby either coupon or principal payment or both are linked to a given indicator such as inflation, GDP or a commodity price. Though the popularization of indexed bonds is quite recent, distinguished economists like Marshall, Irving Fisher, Keynes, Milton Friedman, have been strong proponents of such an instrument (Price 1997).

A number of reasons have been put forth in favor of indexed bonds. First, GDP-linked bond is shown to improve debt sustainability for sovereigns in times of economic downturn and allows countries to avoid pro-cyclical fiscal policy (Borensztein and Mauro 2004). This is because GDP-linked bond matches the payment obligation to the economic performance. Government revenues, which are mainly constituted of tax income, increase with good economic performance. Thus, with this scheme economic growth risk is shared between borrowing country and its creditors as the latter will receive more cash flow in times of good economic performance, and less when the economy is bad. Notwithstanding the higher risk that the creditors face with this instrument, as compared to straight bond, these indexed bonds provide opportunity to take advantage of the benefits of investing in growing economies. Furthermore, these bonds are of nature to lower the likelihood of defaults and financial crises that could result in costly litigation and sometimes in outright losses⁹ (Borensztein, and Mauro 2002; Miyajima 2006; Griffith-Jones and Sharma 2006).

Another argument in favor of indexed bond is market completeness. With the development of financial markets around the world, there exist many institutional investors with various risk appetite that would be willing to invest in these securities to diversify their portfolios. This is particularly relevant, if we take into consideration the fact that available financial instruments represent a relatively small portion of the real wealth of the nation, making, thus, the supply of instruments indexed to GDP an opportunities for greater diversification (Price 1997; Schroder, Heinemann and Kruse 2004; Kamstra and Shiller 2009).

Quite a few concerns have been raised about some potential risks to investors for the implementation of GDP-linked bond. These can be in the form of GDP data misreporting or moral hazard where the issuing country may lose incentives for promoting growth policies.

⁹ The costs of sovereign default will not be born solely by the defaulted country and its creditors. Indeed, the international community will also bear its share as evidenced by the current European debt crisis whereby the bailout package to Greece, Ireland and Portugal advanced by IMF and EU amounts to € 110 billion, € 85 billion, and € 78 billion respectively.

However, it is unlikely for a government to lower economic growth as the political and social consequences would be undesirable. On the other hand, underreporting economic growth would make new fund raising more costly. Thus, the parties involved in these GDP-linked bonds may seek the involvement of international financial institutions such as International Monetary Fund and World Bank to ensure the accuracy of the data (Miyajima 2006; Griffith-Jones and Sharma 2006).

Although the indexed bonds constitute debt instruments with interest payments we argue that the rationale behind the design of these securities can be acceptable even in an Islamic framework. The reason for this argument can be twofold:

First, the design of these bonds permits the integration of the real sector of the economy with the financial sector, since the return to the bondholders is contingent to the performance of some economic indicators; an element that does not necessarily exist with straight bonds.

Second, the indexed bonds allow cooperation between the parties involved as there is sharing of the upsides and downsides of some real economic activities. Both elements are consonant to the principles of Islamic finance. Indeed, Chapra (2007) argues that risk sharing contributes to the promotion of justice and enhances the stability of the financial system; thus, benefits from the transactions are potentially fairly distributed and the burden of losses is not shifted to only one party. Furthermore, Mirakhor and Zaidi (2007) point out the role of risk sharing in establishing a strong link between the financial sector and the real sector, an aspect that is missing in the interest-based financial system.

Besides the above mentioned benefits, the Islamic finance industry can take advantage of this innovative pricing mechanism, as a second best solution, to address one of major criticism against *Sukūk Ijārah* that is the benchmarking against interest rate.

Wilson (2008) simulated the pricing of *Sukūk Ijārah* based on GDP, for 2 countries, and compared it with the pricing based on interest rate benchmark. Wilson's results are inconclusive as the returns to investors would have been more stable had Saudi Arabia priced the Sovereign *Sukūk* based on non-oil GDP. For the other country, Malaysia, the opposite would be true. However, Wilson's study has several limitations. First, his sample is too small (only 2 countries). His time frame (seven years) does not allow the assessment of the performance of *Sukūk* over a whole economic cycle. Thus, the period he considered does not cover any major economic crisis that would help assess the effectiveness of the model as per its declared rationale.

The above review shows that despite the potential benefits of GDP-Linked Security that are acknowledged within the context of Islamic economics, very little works are undertaken to investigate their adaptability. This study aims at filling that gap by proposing an innovative model of *Sukūk* to raise fund for non revenue generating public sector projects which, at the same time, could help for a better management of sovereign debt.

3. GDP-linked Sukūk: Theoretical analysis

The theoretical analysis of the GDP-Linked *Sukūk* comprises two main phases: The economics of the model and its justification from *Shari'ah* perspective.

3.1. The economics and mathematical formulation

The literature reviewed in the previous section presented some of the potential benefits and obstacles to a successful introduction of GDP-Linked bonds. Thus, in this sub-section other aspects of these instruments pertaining to risk and return are discussed. The discussion will concern particularly, the design and the pricing. The design is done to reflect the desired risk return profile, whereas the discussion on the pricing is meant to provide a framework for their valuation in the secondary market.

The importance of this step lies in the fact that risk and return are key element for both investors and issuers. Investors look for assets that provide good return or offer diversification opportunities when included in their portfolio. On the other hand, the main objective of an issuer is to get stable funding at lower cost (Kamstra and Shiller 2009). Satisfying the needs of these two parties is not necessarily an easy task. Unless the model is attractive, economically speaking, to the parties involved, it does not have any chance to be successful.

3.1.1. The design of the model

Schroder *et al.* (2004) identified various indexations of GDP-Linked bonds. On the one hand, the instrument can be in the form of a forward on the economic performance of the issuing country, whereby the investors will share both upside and downside of the GDP development. The indexation can also be in the form of options whereby a ceiling or a floor is applied to the payment obligations. On the other hand, the coupon and/or the principal can be linked to the development of the GDP over the period of the contract. Schroder *et al.* (2004) found that for short period (e.g. 3 years) the linkage of both coupon and capital could be suitable; however, for longer period the indexation of coupon is preferable for otherwise there could be a big divergence between the face value and the redemption value.

Besides the above forms of GDP indexation, Kamstra and Shiller (2009) suggest another form, very much similar to a company share, which would be long term in maturity or even perpetual. The instruments thus, designed would pay annually a fraction of the 'earnings' (i.e. GDP) of the issuing country to investors as dividend¹⁰.

The indexation method chosen for GDP-Linked *Sukūk* (GLS, thereafter) in this study consists of linking the profit portion to the GDP development of the issuing country. Such an indexation takes into account the findings of Schroder *et al.* (2004) and confines the *Sukūk* model into less risky asset classes that fit the needs of some specific types of investors.

¹⁰ The authors named this new instrument 'Trill' referring to the value of the annual dividend payment which would be one – trillionth of the US GDP.

We assume that the GLS is issued in US dollars. This is consistent with the finding of Ruban *et al.* (2008), suggesting that issuance in local currency is much more expensive than in foreign currency¹¹.

The flow of the transaction can be briefly described as follows:

A country plans to build a non revenue generating project that requires a capital K . The required fund can be raised in a *Sharī'ah* compliant way, through the issuance of GLS. The two counterparts in the contracts (i.e. the government and the *Sukukholders*) agree to link the return to the GDP development of the country, with initial profit rate of $x^0\%$. For the simplicity of the analysis, an annual periodic payment of the profit is assumed. For a given year k , the profit rate $x^k\%$ is variable, and depends on the GDP development (i.e. the country economic performance) and on the GDP growth rate chosen as baseline.

With this background information, the Annual Return in year k (AR^k) on the GLS can be written as follows:

$$AR^k = x^k \% = I^k \times x^0 \% \quad (1)$$

And

$$I^k = \frac{G^k}{G^0} \quad (2)$$

Where:

- $x^0\%$ is the initial rate of profit agreed upon by the parties at the beginning of the contract.
- $x^k\%$ is the rate of return at the k^{th} year, after issuance.
- G^0 is the growth rate of the GDP agreed upon by the contracting parties as baseline in year 0, i.e. at the beginning of the contract.
- G^k is the growth rate of the GDP at year k .
- I^k is an index that measures an increase or a decrease of the growth rate of the GDP in year k , as compared to that of the baseline.

It may happen that the issuing country experiences a negative growth rate; in that case I^k will be negative which would result in a negative payment. To avoid such a scenario, the contracting parties may agree on a minimum rate to be paid if the growth is to be negative. In this study the minimum rate is assumed to be 0. With this additional condition, equation (1) becomes:

$$AR^k = \max[x^k \% ; 0] \quad (3)$$

¹¹ It is worth mentioning that other authors (e.g. Costa, *et al.* (2008)) are of different view as they consider that external liabilities denominated in foreign currency played a central role in many emerging countries crises.

It is clear that the minimum return of 0 is just for the purpose of the simulation to see the extreme cases as it would not be fair to the *Sukūkholders* whose money would have already been put for good use regardless of the economic situation of the issuing country.

Two cash flow structures for the GLS are possible:

- The principal K is divided into n equal shares and paid along with the annual profit over the tenor. In this case, the *Sukūkholders* receive, in year k , an Annual Payment AP^k of:

$$AP^k = \frac{K}{n} + AR^k \times K = K \times \left(\frac{1}{n} + AR^k \right) \quad (4)$$

- The principal K is paid at maturity in year n , and every year only the profit portion is paid:

$$AP^k = K \times AR^k \quad (5)$$

The payment can be annual or semi-annual as agreed upon by the parties. The amount to be paid is calculated based on the GDP figure of the previous year or half a year.

With this design, the profit rate is variable, as the case would be if the returns to the *Sukūk* were linked to another indicator like LIBOR and the principal is protected. Thus, the GLS provides an avenue for addressing the issue of benchmarking the return on some *Shari'ah* compliant financial instruments against interest rate.

3.1.2. Pricing the GLS

The assumption made for this valuation as well as for the simulations is that the investors have long term horizon and their intention is to 'buy-and-hold' the *Sukūk*. They liquidate their position only when some unforeseen circumstances force them to do so. This assumption, which is consistent with the prevalent behavior in the *Sukūk* market, implies that only the future cash flows, in the form of periodic profit and principal payment at maturity, matter for the *Sukūkholders*. It has the advantage of isolating the negative impact that speculators would have on the *Sukūk* price, meaning that only the real performance of the economy imports for the yield. The assumption is theoretically well grounded. The prominent economist Keynes (1936) severely charged the speculative activities which consist of forecasting the psychology of the market that he distinguished from enterprise, defined as the activity of forecasting the prospective yield of assets over their whole life. He further maintained that:

Speculators may do no harm as bubbles on a steady stream of enterprise. But the position is serious when enterprise becomes the bubble on a whirlpool of speculation. When the capital development of a country becomes a by-product of the activities of a casino, the job is likely to be ill-done." (Keynes 1936; pp. 102-106).

With this in mind, the valuation of the GLS, in the secondary markets, at any point of time before maturity follows the same logic as the valuation of bonds (and other financial instruments) which consists of calculating the present value of future cash flows.

To simplify the discussion, we consider the second scenario presented above whereby the periodic payment is constituted of only the profit portion AP^k while the principal K will be paid at maturity. The price of GLS at any point of time before maturity is given by:

$$PV = \sum_{k=1}^n \frac{AP^k}{(1+r)^k} + \frac{K}{(1+r)^n} \quad (6)$$

Where:

PV = the present value of GLS;

n = the number of periods (e.g. years) from the date of valuation to the maturity date;

AP^k = the cash flow at period “ k ” which represents the value of the share of profit at that period. AP^k is obtained based on equation (5).

K = is the principal that the *Sukūholders* disbursed for the development of the project.

r = is the required rate of return to the *Sukūholders*.

There are two unknowns that need to be estimated for the determination of PV, i.e. the fair price of GLS: the periodic cash flow AP^k and the required rate of return r. It is worth remarking that the required rate of return is positively related to the uncertainty or risk associated with AP^k . Therefore, the key point in the pricing exercise resides in the accurate estimation of the risk associated to AP^k which depends on the economic performance of the issuing country in year k.

According to Costa et al. (2008), who studied price behavior of the Argentina-Indexed Warrant, after its successful introduction to the market, the yield at which these new instruments were implicitly discounted can be broken down in three components: (1) the risk free rate which represents an opportunity cost, (2) a default premium, (3) a residual premium, identified as novelty premium. For the GLS, all these components would be relevant beside the economic growth risk premium that would compensate the investors for bearing the country growth risk.

An issue that may arise is the determination of a proxy for the risk free rate knowing that in an Islamic finance framework interest is banned and any gain should be associated with risk as stipulated by the famous legal maxim ‘*al ghum bil ghurm*’. However, for the simplicity of the analysis, we consider the return on *Mudhārabah* deposits as proxy for opportunity cost. *Mudhārabah* deposit carries, in practice, a return similar to conventional fixed deposits, although they are very different in theory (Rosly and Zaini 2008; Diaw and Mbow, 2011). Hence, the **risk free rate** component, which is a proxy for opportunity cost, would be replaced by the return to *Mudhārabah* deposits, assuming that the *Sukūholders* would be able to put their money in a *Mudhārabah* account if they wish.

The *Sukūholders* will be exposed to the **default risk**. However, the risk would be lower compared to the credit risk carried by a plain vanilla bond or a *Sukūk* linked to a variable interest rate benchmark. This stems from the construction of the GLS which matches the payment

obligations to the payment ability. When the GDP growth is low, government revenues proportionally decline but the payment to the *Sukūkholders* declines too. This feature makes the probability of default for GLS lower than the conventional bond and it is translated into a lower default premium (Ruban *et al.* 2008).

Growth risk is another element that needs to be accounted for the determination of the discount rate for the GLS. As indicated by equation (1), $x^k \%$ is a function of $x^0 \%$ and I^k . The latter variable depends on the baseline growth rate and the rate of growth in year k. While G^0 is a matter of agreement between the parties, G^k is rather determined by the economic conditions of the issuing country, and it represents the key variable meant to capture the economic rationale of GLS. This is because the Annual Return will vary in function of the variations of G^k .

Lastly, Costa *et al.* (2008) show that investors require a premium for new financial instrument termed as **novelty premium**. The findings of the authors, nonetheless, suggest that this type of premium is likely to decay fast over time, as the market participants became familiar to the instrument. This is confirmed by the results of the study carried out by Borensztein and Mauro (2004) as well as that of Kamstra and Shiller (2009) who found that the premium would be relatively small.

In sum, the forgoing analysis points out that the components of the discount rate r for the determination of the present value of the GLS at any point of time before maturity are as follows:

$$r = r_d + \text{default premium} + \text{growth risk premium} + \text{novelty premium.}$$

Since the GLS are assumed to be issued in US dollars, the exchange rate risk is relatively negligible for foreign investors.

The discussion thus far carried out shows that the GLS are likely to be priced higher than the conventional debt instruments, particularly in the first stage of their introduction to the market. However, the opportunities that they offer for a better management of a country debt make it worthwhile to pay for the additional costs. The current debt crisis in some countries of the European Union proves that, when they occur, debt crises are costly not only for the country in question, but also for the investors and the international community.

Having thus, discussed the economics and the mathematical formulation of the GLS, the next step is to discuss few issues that may arise from a *Fiqhi* perspective.

3.2. An analysis of the model from Sharī'ah perspective

3.2.1. Sharī'ah justification of GLS

Sharī'ah compliance is a necessary condition for any product to be acceptable in Islamic finance. Two main aspects of *Sharī'ah* compliance can be identified:

- Conformity to the key *Sharī'ah* rulings pertaining to commercial transactions, such as the principle of mutual consent, the prohibition of *Ribā*, *Gharar*, *Maysir* and illicit goods.

- Upholding *Maqāsid al-Sharī'ah* (the objectives of *Sharī'ah*) in transactions which consist of the realization of *Maslahah* in the outcome and the achievement fairness in the terms of the contract¹².

Showing the *Sharī'ah* compliance of the GLS requires, therefore, testing them against the elements in the two aforementioned aspects.

Analyzing the conformity of a product to *Sharī'ah* principles in the light of the first aspect (i.e. key *Sharī'ah* ruling in commercial transactions) can be carried out in two equivalent ways. The analysis can be done indirectly, by showing that the product is in conformity with each of the five elements mentioned under that aspect. The analysis can also be done directly by proving that the underlying transaction fits one or a combination of *Sharī'ah* nominate contracts. We adopt the latter method as it appears more convenient.

Istisnā' would certainly be the most appropriate concept for the development of a non-revenue generating project. However, the non-tradability of *Sukūk Istisnā'* makes them less attractive as a fund raising instrument in the capital market. On the other hand, a simple *Ijārah* would require the delivery of the asset to justify the rental payment. Forward *Ijārah* (*Ijārah al-mawsūfah fī al-dzimah*) overcomes this shortcoming and can be taken as the underlying *Fiqh* concept for GLS. This structure allows the *Sukūkholders*, through their representative, to undertake the construction of the project, lease it to the government and receive the payments (principal + profit), over the tenor of the project.

Forward lease is a sale of future benefits or usufructs for a price which can be paid in advance or deferred. The concept may be used for infrastructure projects whereby the government fully describes the specifications of the infrastructure to be delivered in the future. Thus, a SPV can enter into a contract of forward lease with the government for the usufruct of an asset to be delivered, and then issues *Sukūk* for the needed amount. This method is stronger than a mere promise to rent which is not binding and its non-fulfillment only implies compensation for actual damage (Lahsasna 2010; Abu Ghuddah, (n.d.)). According to Nasar (2009, [2]) Forward lease is endorsed by the majority of the Muslim jurists (*Mālikīs*, *Shāfi'īs* and *Hanbalīs*) who consider it a form of Salam contract. Thus, the legality of Forward *Ijārah* is derived from that of two basic contracts which are Salam and *Ijārah*.

Once the contract is concluded in this stage the delivery of the project as specified is on the liability of the *Sukūkholders* whereas the Government is liable to pay the price K+P (i.e. invested capital plus profit). With the forward lease contract, the *Sukūk* will be tradable in the secondary market, once the project starts.

If the first mode of payment (as in equation (4)) is adopted, then the transfer can be done for free at the end of the contract. But if the second mode is adopted (as in equation (5)), then the *Sukūk* are to be redeemed at their nominal value, for instance. AAOIFI (2004a) and Islamic *Fiqh* Academy, in its Resolution No. 110(4/12), have accepted the transfer of ownership through a separate contract of gift. AAOIFI has also endorsed the redemption of *Sukūk Ijārah* for nominal value, in its 2008 statement.

¹² See Diaw and Boon Ka (2010) for elaboration.

Since *Ijārah* is a sale of usufruct, the price should be known at the beginning, for otherwise there will be *Gharar*. Nevertheless, it is allowed to have different lease contracts for subsequent periods with different rentals agreed upon at the beginning of each contract. For instance, a country X may issue GLS in March 2010, with tenor of 5 years and a rental payable annually in June, every year. This contract can be considered as a succession of 5 lease contracts of one year each. At the beginning of each period, i.e. in March, the contracting parties sign the new contract which lasts for one year. The first annual payment would occur in June 2010, based on the GDP figure of 2009. Such an arrangement would allow taking into account the usual lag for publishing GDP data and the collection of the taxes.

As for the second aspect of *Sharī'ah* compliance i.e. upholding the objectives of *Sharī'ah* in transactions, the GLS clearly constitutes a *Maslahah*. This is because, not only they allow deals that benefit the contracting parties but also they do it in a better way than many traditional investments. Investment is supposed to support productive activities, however, it is not evident that many investments in the stocks market and mutual funds serve the real economy. The GLS, as designed above, do. The proceeds from the *Sukūk* issuance are normally used by the issuer for developing infrastructure projects that ultimately add value to the economy. Hence the GLS constitute a *Maslahah* in that their outcomes are beneficial to the society.

The terms of the contracts in the GLS model are balanced. This is evidenced by its risk sharing characteristics. By accepting to have an exposure to the economic performance of the issuing country, the *Sukūkholders* share with it the upside and downside of its economy. Thus, the interests of the contracting parties move in the same direction, and that constitutes a form of fairness in the terms of the contract.

3.2.2. The Issue of indexation

The issue of indexation has, for a long time, drawn the attention of the contemporary Muslim scholars as evidenced by the numerous seminars held under the auspice of Islamic *Fiqh* Academy, to discuss the issue. One of the reasons for this particular attention is the fact that with the prohibition of *Ribā* in all its forms, the amount of a debt should remain unchanged even though the purchasing power of the currency falls for one reason or another. This could put a creditor in an uncomfortable situation. Thus, based on the experts' research on the matter, the Islamic *Fiqh* Academy Resolution No. 115 (9/12), states that:

“In principle debts that have already been created in terms of a certain currency should be repaid in terms of that same currency and not in terms of an equivalent value, because a debt has always to be settled with its exact similar. It is therefore impermissible to link the already existed debts, whatever their source might be, to price level”

Further in the same Resolution, the Academy emphasizes that it is impermissible from a *Sharī'ah* viewpoint to link, at the time of concluding a debt, the repayable amount to variable, like gold and silver, growth rate of Gross national Product (GNP), interest rate, price of a basket of commodities. The prohibition is due to the presence of a great deal of *Gharar* and uncertainty in that indexation, since neither of the parties knows what will be the commitment at the end.

The indexation in the GLS model is, however, different from that one dealt with in the Resolution. In the Resolution the condition of the variability of the amount to be repaid is contained in the same contract that creates the debt. But in the context of GLS, there is a succession of *Ijārah* contracts and the rental of each is known at the beginning. It is the same procedure that is used to link the return in *Sukūk Ijārah* to LIBOR. It follows from this basic difference that the prohibition in the Resolution does not concern the form of indexation practiced with GLS.

4. GDP-linked Sukūk: Empirical analysis

The GLS are new model which is not yet introduced to the market. Therefore, it is not possible to observe the behavior of their returns. Thus, to test the effectiveness of the model we look into the characteristics of the returns by applying backtesting method.

Thus the simulations permit the study of the behavior of the proposed models under various scenarios to unveil their risk-return profiles. They also make it possible to compare their hypothetical returns to that of some standard benchmark for debt and equity instruments. With the simulations results the diversification opportunities offered by the models are also examined.

4.1. Backtesting GLS: Method and data

Backtesting is a method that permits the comparison of the ex ante forecast from a model to the actual or ex post realization of the variable of interest. (Christoffersen 2008).

Backtesting has been used in the academia as well as in the finance industry to detect possible flaws in a model and check the consistency of its predicted properties. In risk management backtesting has been employed systematically to test the accuracy and efficiency of the Value-at-Risk (VaR) models which are extensively used to manage market risk. The Basel Committee on banking Supervision (BCBS) has endorsed the use of backtesting in conjunction with the internal models approach to determine market risk capital requirements. Thus, the backtest help evaluate and validate the model being used internationally by banks in agreement with the regulatory body (BCBS 1996; Lehikinen 2007, p.24).

The objective of the backtesting is to see what would have happened if the GLS were issued in some selected developing countries few years back. Thus, five countries from different regions of the Muslim world are chosen. These are: Algeria, Bahrain, Malaysia, Senegal and Uzbekistan. It is expected to get useful insight from this diversity, given the relative integration of economies from a same region. Thus, each of the five countries comes from a different region of the Muslim world. Table 1 shows the correlations coefficients between the GDP growth of the selected countries and that of their respective regions from 1990 to 2009.

Table 1: Correlation Coefficients between GDP Growth rate of the Selected Countries and that of their respective regions from 1990 to 2009

	World	North Africa	Middle East	South East Asia	Sub Saharan Africa ¹³	Former Soviet Union ¹⁴
Algeria	0.228	0.607	0.231	-0.324	0.740	0.642
Bahrain	-0.012	-0.241	0.443	0.248	-0.087	-0.028
Malaysia	0.449	-0.304	0.403	0.969	-0.157	-0.339
Senegal	0.585	0.506	0.245	-0.094	0.591	0.496
Uzbekistan	0.204	0.463	0.255	-0.288	0.768	0.909

Except Bahrain, for each of the selected countries the correlation coefficient of the GDP growth rate with that of its corresponding region is greater than 0.5. This strong correlation suggests that the results of the backtest obtained from the sample would be valid for the vast majority of Muslim countries which are the potential issuers of the GLS.

The real GDP of the selected countries from 1969 to 2009, in 2005 dollars, are obtained from Economic Research Service of the United States Department of Agriculture. The choice of real GDP is explained by the fact that it isolates the effect of inflation on GDP figures and, thus, constitutes a more accurate measure of economic performance than the nominal. We retrieved from the internet¹⁵ the 6-Month LIBOR rates for the specified period, and then computed the annual average. The annual returns for the MSCI World are also collected from DataStream. MSCI World is a stock market index of 1500 stocks from 23 developed countries. LIBOR and MSCI World can be considered as global benchmarks for two asset classes (i.e. debt and equity). The correlation coefficients between the countries indices and the annual rates of return for LIBOR and MSCI are computed to examine the diversification opportunities that the introduction of GLS would provide to those portfolios which are highly correlated to these 2 benchmarks.

¹³ Excluding South Africa.

¹⁴ Excluding Russia and Ukraine.

¹⁵ www.wsjprimerate.us, accessed on July 11, 2010.

The construction of the Annual Returns for each country is as follows:

- i. The Index I, as in equation (2) is first constructed using the GDP data:

$$I^k = \frac{G^k}{G^0}$$

Where:

- G^0 is the growth rate of the GDP agreed upon by the contracting parties as baseline in year 0. For this backtest, 1995 is taken as year 0 and G^0 represents the moving average of the growth rate of the country from 1970 to year k^{th} . Where $1 \leq k \leq 11$, i.e. from 1996 to 2006. The moving average is of nature to reduce the volatility of the index as compared to the normal average, since it also captures the most recent development of the GDP.
- G^k is the growth rate of the GDP at year k^{th} .
- I^k is an index that measures an increase or a decrease of the growth rate of the GDP in year k^{th} , as compared to that of the baseline.

Thus, I^5 represents the value of the index in the 5th year, i.e. in 2000, and G^0 the average rate of growth from 1970 to 2000.

- ii. The following step is the computation of the Annual Return, based on equation (3):

$$AR^k = \max[x^k\% ; 0] = \max[I^k \times x^0\% ; 0]$$

- $x^0\%$ is the initial rate of profit agreed upon by the parties at the beginning of the contract. For the sake of comparability $x^0\%$ is set at 5% which is close to that of 6-Month LIBOR rate in January 1996.
- $x^k\%$ is the rate of return at the k^{th} year, after issuance.

4.2. Analysis of the results

Tables 2, provides a summary statistics for the annual values of the indices and the annual rates of returns of the GLS over the 11 years.

Table 2: Summary Statistics for GLS for the period 1996-2006

	Index (I)	Average Return	Annual average 6-Month LIBOR	MS WRLD\$ Index Average Return
Algeria				
Average	0.97	4.87	4.28	8.01
Std Dev.	0.44	2.19	1.90	17.53
Bahrain				
Average	1.51	7.57	4.28	8.01
Std Dev.	0.34	1.69	1.90	17.53
Malaysia				
Average	0.76	3.80	4.28	8.01
Std Dev.	0.40	1.99	1.90	17.53
Senegal				
Average	1.53	7.66	4.28	8.01
Std Dev.	0.59	2.96	1.90	17.53
Uzbekistan				
Average	2.79	13.95	4.28	8.01
Std Dev.	0.83	4.16	1.90	17.53

For 3 countries (Bahrain, Senegal, Uzbekistan), the average value of the Index would have been greater than 1 implying higher costs for the issuing countries (but higher return for the investors). The highest increase was recorded with Uzbekistan whose average payment obligation would have increased by 179%. On the other hand, the lowest average Index is that of Malaysia, with a value of 0.76, implying a decrease of 24% of the average payment obligation as compared to its initial value. Except Uzbekistan, the average returns and the standard deviations of the GLS are less than that of MSCI Index.

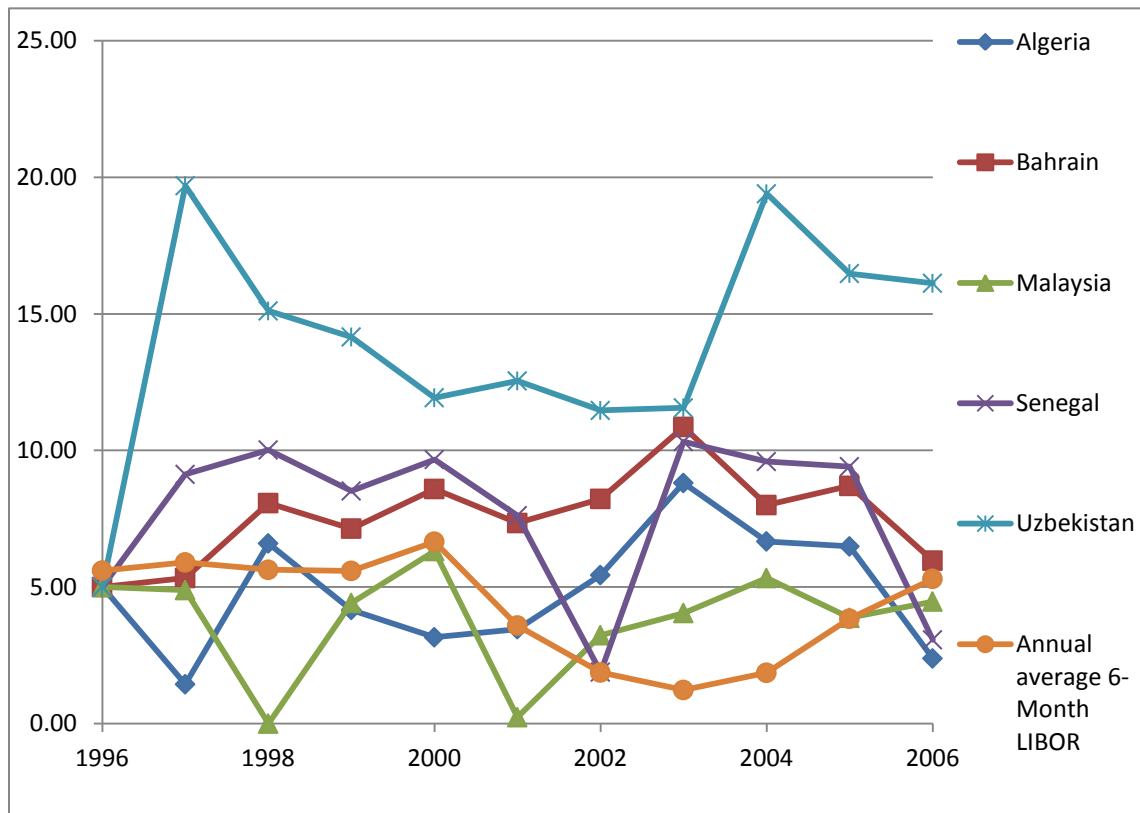
A closer investigation of the reasons for the contrast between the Malaysian scenario and that of Uzbekistan corroborates a point that we made earlier pertaining to the variables that would have greater impact on the value of the Index or the Annual Return. By considering the average growth rate of these two countries in the two sub-periods before the issuance (i.e. 1970 – 1995) and after the issuance (i.e. 1996 – 2006), it appears that the two economies evolved in a contrasted fashion. For the first sub-period, the average growth rate is 7.4% and 1.6% for Malaysia and Uzbekistan respectively, whereas the figures are 4.84% and 4.88% in the second sub-period. It is worth noting that Malaysia was hit by a severe financial crisis in 1997 that badly affected the economic performance of the country in subsequent years. Whereas, Uzbekistan experienced an economic improvement after the dislocation of the Soviet Union to which it belonged. Thus, if the changes in the Index for Malaysia are within acceptable limits - as they are

in line with the economic rationale of the GLS - that is not the case for Uzbekistan which would have been overburden due to a poor design of the instrument. It follows from this remark that some precautions should be taken when designing the GLS. First, a reasonable forecast of the growth prospects of the issuing country is key element for the choice of the baseline growth and hence for the avoidance of sharp fluctuations. Second, the setting up of ceiling and floor for maximum and minimum payments is also important to avoid the bad effects of wrong forecast or inaccurate estimations that may lead to extreme fluctuations.

For the sake of comparison, the 5-years Malaysian sovereign bonds over the same period (i.e. 1996 – 2006) had an average yield of 4.9%, while the average return on the Malaysian Global *Sukūk*, issued in 2002, is 3.93%. both figures are higher than the average return on GLS over the period of the study which is 3.8%. This result substantiates the point that GLS is not necessarily more expensive than the traditional instruments already in the market.

The results of the backtest show that, as they are designed, the GLS would satisfy the main purpose of their introduction. Thus, Algeria and Malaysia which had economic difficulties during the period would have made lower payment and the contrary is true for the other countries.

Graph 1: GLS (hypothetical) Annual Returns for the period 1996-2006



Graph 1 shows the evolution of the GLS annual returns over the period of study. Uzbekistan recorded the highest and most volatile annual return for the whole period, whereas Malaysia is the only country which would have not made payment in one occasion (i.e. in 1998, after the Asian crisis).

Between these 2 extremes the remaining GLS annual returns exhibit different behaviors, with values that vary within the range of 1% to 11%.

From the investor perspective, the choice to include the GLS to his portfolio depends very much on the diversification opportunities that they provide. To analyze this aspect, we follow Schroder *et al.*(2004) by considering a method of portfolio optimization in the Markowitz mean–variance framework. This method indicates that to include a new financial asset A in a portfolio P the following equation should hold:

$$\frac{R_A - r}{\sigma_A} > \frac{R_P - r}{\sigma_P} \cdot \rho_{A,P} \quad (7)$$

Where R_A and R_P are the average returns of A and P; $\rho_{A,P}$, σ_A , and σ_P represent respectively the correlation coefficient and standard deviation of A and P; r is a risk free rate. Within this framework, a financial asset is eligible for inclusion to the portfolio if its Sharpe Ratio (i.e. the left-hand side of (7)) is greater than the Sharpe Ratio of the portfolio time the correlation coefficient of the two (i.e. the right-hand side of (7)). Thus, the value of the correlation coefficient is crucial, as, for instance, if the Sharpe Ratio of the portfolio is 2 times greater than that of the new asset, the latter could be included to the portfolio if the correlation coefficient is less than 0.5.

This intuitive approach shows, without need to any detailed calculations, that the GLS would provide a good avenue for diversification to all the portfolios that are highly correlated to LIBOR and MSCI Index, as suggested by the results in Table 3. Indeed, all the correlation coefficients are less than 0.4, some having even negative values.

Table 3: Correlation Coefficients between the GLS Annual Returns and Selected Benchmarks.

	Algeria	Bahrain	Malaysia	Senegal	Uzbekistan
Cor. Coef. (I, LIBOR)	-0.67	-0.60	0.13	0.06	-0.04
Cor. Coef. (I, MSWRLD\$)	0.34	0.02	0.10	0.38	0.21

4.3. Hypothetical example

A Muslim Country X has an important program for infrastructure development in the next decade. Given the illiquidity in the credit market as a consequence of Global Financial Crisis, Country X wants to diversify its funding sources and tap the excess liquidity in the GCC region by issuing *Sukūk*. On the other hand, the debt crisis in the Euro zone constituted a compelling argument for the government authorities in Country X to fund an important share of these infrastructure projects through state-contingent *Sukūk* (e.g. Commodity-Linked *Sukūk* and GDP-Linked *Sukūk*). An amount $K = \$ 1$ billion is needed to build schools, universities and hospitals in different districts of Country X. Country X decides to raise the capital $K = \$ 1$ billion through the issuance of a 10-year GLS, in March 2011 with initial annual profit rate of 8% (i.e. the amount of the first year rental = \$ 80 million). As the owners of the projects, the *Sukūkholders* will lease the assets (i.e. schools, universities and hospitals) to Country X government which will buy them at maturity for \$ 1 billion. Based on the forecast made by some international financial institutions, Country X GDP growth rate over the next ten years has been estimated and the parties agreed on the baseline GDP growth rate. Further, the parties agreed to set a ceiling and a floor of 50% up and down of the Index (I)¹⁶. This means that with an initial value of $I = 1$, the maximum and the minimum values that I can take are 1.5 and 0.5 respectively. Thus, the various estimated I and the corresponding Cash Flow (CF_k)¹⁷ are as in the following table:

Table 4: Hypothetical Values of I and CF_k for Country X GLS

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
I	1	1.08	0.96	0.79	0.68	0.5	0.73	1.03	1.44	1.5
CF_k (\$ Mil.)	80	86.4	76.8	63.2	54.4	40	58.4	82.4	115.2	120

For this type of *Sukūk* the investors currently require a 7% rate of return. Given that the face value of unit of GLS is \$ 1,000, Country X needs to evaluate the Present Value (PV) of cash flows, to determine the number of units of *Sukūk* to be issued. Thus we have:

$$PV = \sum_{k=1}^{10} \frac{CF_k}{(1.07)^k} + \frac{K}{(1.07)^{10}} = \$ 1,042.92 \text{ Million}$$

To raise the needed fund, the government of Country X has to issue 958847 units of GLS at \$ 1,042.92 per unit.

¹⁶ Based on equation (2).

¹⁷ Based on equations (5).

5. Conclusion

In this paper we made a case for GDP-Linked *Sukūk* as an effective tool for non revenue generating infrastructure projects financing in a *Sharī'ah* compliant way. The GLS allow the synchronization of the payment obligation of the issuing government with its payment ability. With the GLS, the investors' capital is guaranteed but the profit rate is function of the performance of the economy. The theoretical analysis as well as the empirical evidence suggests that the returns on the GLS are higher than that on comparable straight bond as the risk is higher with the former. However, the results of the simulation suggest the presence of interesting diversification opportunities with the GLS. From the issuer perspective, GLS appear more expensive than the traditional debt instruments for fund raising, but GLS offer better opportunities for debt management. To prevent sharp fluctuations of the profit rate, we propose the setting of ceiling and floor for that rate.

In the *Sukūk* literature, many writers have complained of the complexity of certain *Sukūk* structures whose construction involves necessarily additional advisory fees compared to the standards financial instruments. We claim that the GLS model is simple by design as only one *Sharī'ah* concept is involved. Therefore, the contracting parties do not need to disburse exorbitant advisory fees for the construction and the endorsement of the structures. If we add to this characteristic the tradability of GLS and its adherence to *Sharī'ah* principles, we reach the conclusion that the model is efficient in both technical and allocative sense, as defined above.

Kamstra and Shiller (2009) maintained that there is a trade off, in debt management, between low cost but volatile short-term debt and higher cost but more stable long-term debt. A government will certainly be concerned with the risk of a sharp increase of the cost of debt servicing during economic down turn when its budget can least afford it. They, thus, made a case for diversifying government obligations to reduce the budget crisis even though it means higher average cost for fund raising. The current debt crisis in Europe gives credit to this argument. Financial instruments like GLS offer Muslim governments the opportunity to diversify their fund raising and address the issue of benchmarking the *Sukūk* against the interest rate. GLS would also be a suitable instrument to be used by institutions like Islamic Development Bank, International Monetary Fund and World Bank to finance projects in Muslim countries.

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[1] بحوث ندوة (الصكوك الإسلامية: عرض و تقويم) المنعقدة في جدة 10-11 جمادى الآخرة 1431 هـ , الموافق 24 – 25 مايو 2010 م, بالتعاون بين مركز أبحاث الإقتصاد الإسلامي و مجمع الفقه الإسلامي الدولي التابع لمنظمة المؤتمر الإسلامي, والمعهد الإسلامي للبحوث والتدريب عضو مجموعة البنك الإسلامي للتنمية.

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