Does issuing government debt needed as a Ponzi scheme in Islamic finance

A general equilibrium model

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Abstract

Purpose – The purpose of this paper is to theoretically describe the role of Zakah as a vital tool of fiscal policy in achieving Pareto optimality.

Design/methodology/approach – The paper sets a general equilibrium model that describes the long-run convergence to a Pareto optimal allocation in a theoretical Islamic economy. The model is based on Diamond criteria where the social planner maximizes the utility of all generations subject to the output of the economy.

Findings – While the government in the capitalist economy issues debt like T-bills and government bonds to insure Pareto optimality, the paper shows, theoretically, that constructing a Zakah fund can take the role of issuing debt in financial markets. Furthermore, the paper shows that Islamic economy converges to Pareto optimality by its nature without issuing debt in the financial market.

Research implications – This result is very important in describing the strength of the theoretical Islamic economics in achieving dynamic efficiency with least possible interventions. More importantly, the results would help the government in setting an optimal tax rate that insures Pareto efficiency without issuing debt.

Originality/value – This paper attempts to model the actual effects of Zakah as a fiscal policy tool in wealth redistribution in an Islamic economy. In addition, the paper opens a wide channel for future research in conducting monetary and fiscal policy in a government's debt tools economies.

Keywords Government borrowing, Equilibrium methods, Islam, Finance, Fiscal policy

Paper type Research paper

1. Introduction

Islamic economics and finance (IEF) differs essentially from synthetic laws and systems in defining economic problem. It represents the only wholly independent, alternative economic model in the world today. It is based on principles exposed from Islamic sources as norms for human welfare that offer an obviously alternative set of strictures for economic activity. The conceptual development of IEF gained momentum after the mid-1940s. Thereafter, Islamic scholars made significant contributions to the evolution of the IEF model. The huge influx of petrodollars from the late 1970s provided a strong impetus to the development of several Islamic banks and financial institutions in the Middle East and other parts of the world. IEF has made steady progress over recent decades. In recent years, it has emerged as the fastest-growing segment of global finance due to consistently high oil prices in international markets

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and other favorable socio-political factors. It is flourishing in Africa, Asia, Australia, Europe and North America. There are about 300 Islamic financial institutions across 70 countries, holding capital investments worth more than a trillion dollars with an average annual growth of 15 per cent. It has been estimated that Islamic banking will have a market value of US$4 trillion by 2010. It is expected to capture about 40-50 per cent of the total savings of 1.3 billion Muslims worldwide within the next five years (Bhatti, 2007; Khan and Bhatti, 2008a, b).

The interesting fact in stimulating IEF movement is the Zakah mechanism. It is one of the five pillars of Islamic fundamentals. Zakah is compulsory religious tax levied upon the total net worth of an individual over and above the limits prescribed by Shariah. Shariah prescribed for the poor and destitute a due share of the wealth of the rich. The rate of Zakah is 2.5 per cent per annum on accumulated wealth in any form. It is composed by the state and spends for specific proposes. Zakah is payable on almost all types of wealth and income including saving added during the year as long as the beginning of the year stock is above excused minimum. It is levied on net worth at a fixed percentage which varies according to the type of wealth or income. Zakah covers agriculture products (called Usher; rates vary from 10 to 20 per cent per annum), industry, money and finance and mining.

Besides being the third pillar of religion which provides it with a spiritual backing and supports, the above mentioned characteristics give Zakah a vital role in the Islamic macroeconomic system. It plays a major role in ensuring the equality of income distribution and in enhancing rich people to invest their idle assets (Choudhury, 2006). The presence of Zakah will cause holders of such assets to put them into productive use. Therefore, income will increase through the multiplier effect. This role of Zakah would improve resources allocation (Zubair, 1985, 2002, 2005; Pryor, 1985).

Zakah system as a social security system also differs from the traditional system; because Zakah is not a compulsory contributory savings plan for the future. It is being paid to the needy people and other groups in order to get the reward in the hereafter. Therefore, it is much wider in scope than a traditional social security system. Zakah is indeed a relief to its recipients in the short run, and at the same time it is a long-run mechanism to lessen the impact of poverty and other economic and social problems (Zubair, 2002). Also, it helps in saving part of government expenditures being paid in the form of national aid to the poor and even to low-income people. It is worth to mention here that, in the Islamic state, if the budget runs a deficit, the government has the right to collect Zakah sometimes in advance and even to tax the wealthy people in order to finance the deficit. Thus, Zakah represents a vital tool of the fiscal policy in the Islamic economic system.

Over the last three decades, Muslim economists discussed the effects of introducing Zakah in a contemporary economy from the point of view of allocation, stability, poverty abolition and allocation of resources and wealth. However, no study has tried to model the actual effect Zakah as a fiscal policy tool in redistribution wealth in an Islamic economy. In this paper, we fill the gap in the literature, by developing a general equilibrium model that shows how Zakah, which insures a continuous cash flow from rich to poor, would help the government in setting an optimal tax rate that insures Pareto efficiency without issuing debt. The model is based on Diamond (1965) criteria where the social planner maximizes the utility of all generations subject to the output of the economy; the representative agent tries to maximize his utility function during two periods of life (two overlapping generation (OLG) model); and firms maximizes their profits with respect to the factor of production. The plan for the rest of this paper is as follows. In the subsequent section, we discuss the government behavior as a Ponzi game player in capital economy (O'Connell and Zeldes 1988, for details). In section 3, we propose the new model for the Islamic economy which can improve the standard of living and eliminate poverty among the poor community and encourage the richer by voluntary payment of Zakah. It is envisaged that the Zakah mechanism has the potential to improve the economic conditions of the community (Zaman, 1980). In the final section, we made some concluding remarks.

2. The government as a Ponzi game player in the market economy

Define the government budget constraint as the present value of its spending on goods and services that must be less than or equal to its initial wealth plus the present value of its tax receipt. Mathematically, let $G(t)$, $T(t)$ and $D(0)$ denote the government's real purchases, taxes and initial debt outstanding at time t, respectively. Let $R(t)$ denote $\int_{t=0}^{t} r(t)\mathrm{d}t$, where $r(t)$ is the real interest rate at time t. Therefore, the value of output per unit at time t discounted continuously to time 0 is $e^{-R(t)}$. With this symbolization, one can write the government budget constraint as[1]

$$\int_{t=0}^{\infty} e^{-R(t)} G(t)\mathrm{d}(t) \leq -D(0) + \int_{0}^{\infty} e^{-R(t)} T(t)\mathrm{d}t \tag{1}$$

The government budget constraint does not avoid it from staying permanently from debt, or even from increasing the amount of its debt. We shall note that the households' budget constraint in the Ramsey's (1928) model implies that the limit of the present value of its wealth must be semi-positive. Likewise, the restriction the budget constraint seats on the government is that the present value of its debt cannot be positive in the limit, that is,

$$\lim_{s\to\infty} e^{-R(s)} D(s) \leq 0. \tag{2}$$

Since the interest rate is always positive, a constant positive value of D – so the government debt will never be paid – satisfies the budget constraint. Similarly, a policy with positive growth debt satisfies the budget constraint if the growth rate is less than the real interest paid on government debt. That is,

$$\dot{D}(t) = \{G(t) - T(t)\} + r(t)D(t) \tag{3}$$

where $\{G(t) - T(t)\}$ is the primary deficit. Taking into consideration the primary rather than the total deficit is habitually better way of estimating how fiscal policy at a given point of time is causal to the government's budget constraint. Consequently, one can rewrite the government budget constraint in equation (1) as

$$\int_{t=0}^{\infty} e^{-R(t)} [T(t) - G(t)]\mathrm{dt} \geq D(0).$$

The fact that the government's budget constraint does not involve present values over an infinite horizon sets up other difficulties. For example, there are cases where the government does not have to satisfy the constraints. An individual's budget constraint is not exogenous, but is decided by the transactions other agents are willing and able to make. If the economy consists of a set of agents who have not reached satiation, the fiscal authority does not have to satisfy equation (1). On the other hand, if the present value of the government's spending goes over the present value of its revenues, we can easily infer from equations (1) and (2) that the limit of the present value of its deficit is strictly positive. Consequently, if there are finite numbers of agents, at least one agent must hold a strictly positive fraction of this debt. This implies that the limit of the present value of the agent's wealth must be strictly positive; i.e. the present value of the agent's spending is strictly below the present value of his deposable income. Economically, this cannot be equilibrium behavior, since the agent can gain higher utility by increasing his spending.

However, if there are an infinite number of agents, this claim does not work. Even if the present value of each agent's budget does not have a deficit or surplus since the private sector as whole may still has a present value of spending that exceeds the its after tax income. To interpret this further, consider Diamond (1965) OLG model, where each saves in the first age of life and dissaves in the second stage. Accordingly, at each point of time some agents save and not yet inter the second stage. Therefore, the present value of private sector-spending up to that date must be below its after tax income. If this deficit does not converge to zero, the government can take advantage of this by running a Ponzi game (O'Connell and Zeldes, 1988). Where it can generate debt at any point of time and overturn it forever.

Intuitively, the explicit condition that must be fulfilled for the government to be able to play a Ponzi game in an OLG model is that the real interest rate is less than the growth rate of the natural output, i.e. the equilibrium is Pareto inefficient. To express this further, let the government run a Ponzi scheme by issuing a small quantity of debt at the initial period and overturn it forever. In another word, at each point of time, when the maturity of the old debt comes due, the government issues a new debt to pay the principal and interest on the old issuance. Staying like this, the value of the debt outstanding grows at a rate which is identical to the real interest rate in the economy. Since the economy grows at a rate which exceeds the real interest rate, the ratio of discounted debt outstanding to the natural output is continually falling. Therefore, it would be rational to the fiscal authority in the market economy to invoke in such a game and preventing the budget from approaching zero, (Barro, 1974, for further discussion[2]).

As implied from Diamond's model, the capitalist economy will not be able to achieve Pareto optimality by its nature. Rich refuse to lend poor and young refuse to lend old. The government will try to reallocate the recourse between the two-generations and the two classes by issuing public debt and collecting tax. It can sell bonds at time $(t+1)$ to the young and use the funds to pay for the old generation who are actually buy the government bonds at time (t). Note that each old will get the principal of the bonds that he pays (t) plus the excess of fund, which represents population growth. To make this clear, let us assume that the number of young population at time $(t) = Lt$ and each young will buy one government bond by a 1 dollar value, so the value of governments debt will be Lt Dollars. At time $(t+1)$ a new young generation will buy $Lt+1$ bond by $Lt+1$ dollars and the government will pay those $Lt+1$ dollars to the old, so each old will get $(Lt+1/Lt) = (1+n)$ dollars and so on. In this process, the government will play a Ponzi game and improve the allocation of funds between generations. However, applying the Ponzi game between classes cannot be achieved. The government will sell bonds to young rich at time (t) and subsidize the poor by $\$Lt$, at time $(t+1)$ the government will get $\$Lt+1$ from selling bonds to rich people, but it will face two uses of funds. First, it has to pay for the old rich who pays the government at time (t) and to the poor generation at time ($t+1$), so the government will run in a deficit and the Ponzi game will stop.

3. A simple model of Islamic economy

The model follows the same procedures as that of Diamond (1965) in maximizing the utility behavior in which there is a turnover in the population, new individuals are continually being born, and old individuals are continuously dying.

With turnover, it turns out that it is less complicated to assume that the time is discrete rather than continuous; that is, the variable of the model are defined for $t = 0, 1, 2\ldots$ rather than for all values of $t \geq 0$. To further simplify the analysis, the model assumes that each individual lives for only two periods. It is the general assumption of turnover in the population but not necessary. Blanchard (1985) develops a tractable continuous-time model in which the extent of the departure from the infinite-horizon benchmark is governed by a continuous parameter. Weil (1989) considers a variant of Blanchard's model where new households enter the economy but existing households do not leave. He shows that arrival of new households is sufficient to generate most of the main results of the Diamond and Blanchard models. In the Diamond model, individuals born at different times attain different levels of utility, and so the appropriate way to evaluate social welfare is not clear. If we specify welfare as some weighted sum of the utilities of different generations, there is no reason to expect the decentralized equilibrium to maximize welfare, since the weights we assign to the different generations are arbitrary.

A minimal criterion for efficiency, however, is that the equilibrium be Pareto-efficient. It turns out that the equilibrium of the Diamond model need not satisfy even with this standard. In particular, the capital stock on the balanced growth path of the Diamond model may exceed the golden-rule level. The major differences between our model and that of Diamond involves that old will still work until they die, consumers pay Zakah and will be taxed by a rate endogenously determined from the model. Zakah will improve welfare allocation between classes until Pareto-efficiency is achieved. If Zakah is not sufficient to achieve the efficiency then a forced Zakah, optimal tax, will be deducted. The optimal tax will be deducted endogenously to ensure efficiency.

The model consists of six major parts. After the assumptions in part one, part two solves for social planner problem that tries to maximize all generations' utility subject to the GDP identity and comes up with the first-order condition of Pareto optimality. The third part solves for the rich consumer problem who tries to smooth his consumption during his life. The introducing of this part is very important in order to find the saving function that faces the economy. The fourth part solves for the firms' problem in the perfect competitive equilibrium, the solution insures the clearance of the labor market and provides the wage rate as a function of capital labor ratio. The fifth part introduces government as a controller of Zakah fund and as a collector of tax, which tries to achieve Pareto-optimality by one endogenous tool (the tax rate). The sixth part combines the results of the previous parts in the market clearing condition and comes up with optimal tax rate function, which insures Pareto-efficiency.

3.1 Assumptions of the model

The number of poor equal the number of rich in the economy, Lt individuals are born in period t, population grows at rate n; thus, $Lt = (1+n)\,Lt - 1$. Since individuals live for two periods, at time t there are Lt Individuals in the first period of their lives and $Lt-1=Lt/(1+n)$ individuals in the second period. Each individual supplies one unit of labor at time one and divides the resulting labor income between first-period consumption, saving, paying Zakah and paying tax; in the second period, the individual consumes his future value of the last period saving and his labor income. Consumer tries to smooth their consumption across periods.

Production is described by the same assumptions of that used in the Solow (1956) growth model except that we used hicks-neutral production function instead of labor augmented one. The hicks-neutral production function provides the results in per labor instead of per effective labor, which gives the model better explanation of welfare. There are many firms, each with the production function $Y_t = F(K_t, L_t)$. $F(\bullet)$ Has constant return to scale and satisfies the Inada conditions. Markets are competitive thus labor and capital earn their marginal products, and firms earn zero profits. As in the Ramsey (1928), Cass (1965) and Koopmans (1965) model, there is no depreciation in the real profit sharing rate and the wage per unit of labor are therefore given as $r_t = A_t f'(k_t)$ and $\omega_t = f(k_t) - f'(k_t)k_t$. The savings and the tax rate are endogenously determined within the model.

3.2 The social planner problem

The social planner would try to maximize the utility of all generations subject to GDP identity:

$$f(K_t, L_t) = K_{t-1} - K_t + C_t^t + C_t^{t-1} + G_t$$

where Kt stands for capital stock at time t, C_t^t is the consumption of young generation at time t, C_t^{t-1} is consumption of old generation at t and n is population's growth rate. In per capita term:

$$f(k_t) = (1+n)k_{t+1} - k_t + c_t^t + \frac{c_t^{t-1}}{c_t}$$

For simplicity, we consider the steady state and the stationary allocation that allocate all generations equally, so the social planner problem can be written as:

$$\text{Max}_{c_t^t, c_t^{t-1}} \bigcup \left(c_t^t, c_t^{t-1}\right) \text{ s.t } nk_t + c_t^t + \frac{c_t^{t-1}}{1+n}$$

Forming Hamilton and fined the first-order condition:

$$L_t = U\left(c_t^t, c_t^{t-1}\right) + \lambda\left[nk_t + c_t^t + \frac{c_t^{t-1}}{1+n}\right]$$

$$\frac{\partial L}{\partial c_t^t} = U_1 - \lambda = 0 \tag{4}$$

$$\frac{\partial L}{\partial c_t^t} = U_2 - \frac{\lambda}{1+n} = 0 \quad (5)$$

$$\frac{\partial L}{\partial k_t} = f'(k_t) - n = 0 \quad (6)$$

Divide equation (4) by equation (5), we get:

$$\frac{U_1}{U_2} = 1 + n \quad (7)$$

where equation (3) provides Pareto optimality condition. The social planner will try to equate the marginal productivity of capital with the rate of population growth, assuming output at full employment level, this implies that economic growth equal the real rental rate of capital. Equation (7) sets the first-order condition of the optimization in which the marginal rate of substitution equal the gross growth in output.

3.3 Consumer's problem

The representative consumers from each class (rich and poor) are trying to maximize their utility subject to the lifetime constraints that is derived from his budget set at each period, so he faces the following sets:

$$\left\{c_t^i + s_t + (z + \Gamma_t)\omega_t \leq \omega_t\right\} \quad (8)$$

$$\left\{c_{t+1}^i + (z + \Gamma_t)\omega_{t+1} \leq \omega_{t+1} + (1 + r_t)s_t\right\} \quad (9)$$

where c_t^i represents consumption per rich person at time t, s_t is the saving per rich person at time t, z is the fraction of Zakah that he pays, Γ_t is the tax rate, ω_t is the yearly labor income that the rich person will get and r_t is the profit sharing rate in the economy.

The first constraint implies that the labor income of the consumer at time t will cover his consumption, savings, paying tax and paying Zakah at time t. The second implies that his total income at time $t+1$, labor income and his savings from period t, will cover his consumption, paying tax and paying Zakah at time $t+1$. Substitute equation (8) into equation (9) to get the lifetime budget constraint:

$$\frac{c_{t+1}^i}{1+r_t} + c_t \leq (1 - z + \Gamma_t)\frac{\omega_{t+1}}{1+r_t} + (1 - z + \Gamma_t)\omega_t \quad (10)$$

Assuming constant-relative risk-aversion utility function:

$$\bigcup\left(c_t^i, c_{t+1}^i\right) = \frac{c_t^{1-\theta}}{1-\theta} + \beta\frac{c_t^{1-\theta}}{1-\theta}$$

where $\theta \succ 0$ is the concavity parameter and the consumer tries to smooth his consumption across periods, θ will be close to one and the utility function will be simplified to Ln Ct. the consumer's problem becomes:

$$\text{Max}_{c^i_t, c^i_{t+1}} \bigcup \left(c^i_t, c^i_{t+1}\right) \text{ s.t} \left\{ \left(\frac{c^i_{t+1}}{1+r_t}\right) + c^i_t \le \frac{(1-z-\Gamma_t)\omega_{t+1}}{\omega(1+r_t)} + \omega_t(1-z-\Gamma_t) \right\}$$

Forming Hamilton and fined the first-order condition:

$$L_t = \ln c^i_t + \beta \ln c^i_{t+1} + \lambda \left[\frac{(1-z-\Gamma_t)\omega_{t+1}}{\omega(1+r_t)} + \omega_t(1-z-\Gamma_t) - \left(\frac{c^i_{t+1}}{1+r_t}\right) - c^i_t \right]$$

$$\frac{\partial L}{\partial c^i_t} = \frac{1}{c^i_t} - \lambda = 0 \tag{11}$$

$$\frac{\partial L}{\partial c^i_{t+1}} = \frac{\beta}{c^i_{t+1}} - \lambda = 0 \tag{12}$$

Dividing Equation (11) by Equation (12) to come up with the Autarky condition, then solving for c^i_{t+1} and plug in equations (8) and (9) to solve for s_t, we get:

$$\underset{s_t}{\text{Max}} \ \ln(\omega_t - s_t - (z+\Gamma)\omega_t) + \beta \ln\{(1+r_t)s_t + \omega_{t+1}(1-z-\Gamma_t)\}$$

$$s_t = \left\{ \frac{\omega_t(1-z-\Gamma_t)(1-\beta(1+r_t))}{1+r_t} \right\} \tag{13}$$

3.4 Firms' problem

Firms try to maximize their profits with respect to the factor of production, assuming constant returns to scale allows us to work with production function in the intensive form,

$$(1/L_t)A_t f(K_t, L_t) = A_t f(K_t/L_t) = A_t f(k_t)$$

where, $A_t f(k_t)$ is output per labor.

Mention that in the competitive equilibrium firms achieves zero economic profit, so it is easy to verify that the first order condition will be, $r_t = A_t f'(k_t)$ and $\omega_t = f(k_t) - f'(k_t)k_t$. Assume Cobb-Douglas production function, the first-order condition becomes:

$$r_t = \alpha A_t k_t^{\alpha-1}$$

$$\omega_t = A_t k_t^{\alpha} - \alpha A_t k_t^{\alpha-1} k_t = (1-\alpha) A_t k_t^{\alpha} \tag{14}$$

3.5 The government constraint
The government receives Zt at the beginning of the year and Tt at the end of the year from Lt wealthy people. Zt will be invested at r_t for one period. At the beginning of time $t+1$ the government will pay $Dt+1$ for $Lt-1$ poor people. So the government constraint will be

$$Z_t(1+r_{t)})+T_t=D_{t+1}$$

Transform for per capita form, then solve ξ_t for we get

$$\xi_t=\frac{d_t-\Gamma_t\omega_t(1+n)}{(i=r_t)(1+n)} \tag{15}$$

where ξ_t is Zakah paid by a rich individual, and it is Zakah received by a poor individual.

3.6 Market clearing condition and equilibrium solution
Since the economy in this model consist of three markets (goods, labor and the capital markets) that must clear in order to achieve perfect competitive solution. The solution will be hold if each market is in equilibrium. Since the labor supply is perfectly elastic, the firm optimization behavior (that MPL $=\omega t$) will clear the labor market. According to Walaras' low if we have K markets and $K-1$ markets are cleared then the Kth market must be cleared for all set of prices greater than zero. So Walaras law implies that if the capital market is clear so does the goods market.

In this model, the capital market will be cleared when total saving in the economy at time t, individual savings plus Zakah paid to the fund, equals the capital formation at time $t+1$. So

Divide by Lt we get,

$$k_{t+1}=Z_t+\sum_{t=1}^{.5L_t}s_t$$

$$k_{t+1}=0.5\xi_t+0.5S_t \tag{16}$$

By insert Equations (13) and (15) in Equation (16), we obtain the following expression,

$$k_{t+1}=\left\{0.5\frac{d_t-\Gamma_t\omega_t(1+n)}{(1+r_t)(1+n)}+0.5\frac{\omega_t(1-z-\Gamma_t)(1-\beta(1-r_t))}{1+r}\right\} \tag{17}$$

To solve (17) for the steady state, we invoke ω_t from firms' optimization behavior, recall that $f'(k_t)=n$, so $k_t=(A_t\alpha/n)^{1/\alpha-1}$,

$$\left(\frac{A\alpha}{n}\right)^{1/(\alpha-1)}=\left\{0.5\frac{d_t-\Gamma_t(1+n)(1-\alpha)A(A\alpha/n)^{\alpha/(\alpha-1)}}{(1+r_t)(1+n)}\right.$$
$$\left.+0.5\frac{(1-\alpha)A(A\alpha/n)^{\alpha/(\alpha-1)}(1-z-\Gamma_t)(1-\mathrm{B}(1-r_t))}{(1+r_t)}\right\}$$

Now, the above equation for Γ_t to obtain the optimal tax rate[3]

$$\Gamma_t = \frac{A(A\alpha/n)^{\alpha/(1+\alpha)}(1-z)(1-\alpha) + d/(1+n) - 2A\alpha/n}{\left(A(A\alpha/n)^{\alpha/(1+\alpha)} + A(A\alpha/n)^{\alpha/(1+\alpha)}\right)(1-\alpha)}$$

Where the optimal tax rate is a decreasing function of Zakah paid to the fund, (i.e. the more Zakah paid the higher the likelihood that the government will play the game). This insures the probability of Pareto efficiency in two overlapping generations' economy in the case of no debt issuing economize (Barro, 1974, for further discussion). However, the parameterization of the model implies that the demand for labor must be elastic for the government to play such a game ($\alpha \succ 0$), which is a reasonable assumption. In contrast, the model sets a condition where the trade among generations is possible in the absence of debt issuance. Unlike extents models, the tax policy will be sufficient to derive the Islamic economy to Pareto efficiency in allocation.

4. Concluding remarks

We set an equilibrium model that describes the long run convergence to market efficiency in a theoretical Islamic economy. At steady state the capital labor ratio satisfies the golden-rule of growth requirement. In the market equilibrium when frictions exists, like overlapping-generations, the first theorem of welfare economics will be violated. The government tries to reallocate funds between generations by issuing debt and run a Ponzi scheme, this policy behavior says nothing about income distribution, While Zakah insures the transfer of funds between both classes and generations assumed by the model, the level of Zakah determined endogenously depending on the rich income and poor needs, Islamic government can deduct a tax in a way that insures Pareto efficiency and remove any dynamic inefficiency. The issue of issuing debt is not needed any more to achieve the efficiency. This result is very important in describing the strength of the theoretical Islamic economics in achieving dynamic efficiency with least possible intervention. In addition, the paper opens a wide channel for future research in conducting monetary and fiscal policy in no government debt tools economize.

Notes

1. Note that $D(0)$ represents debt rather than wealth, consequently, it insert negatively into the budget constraint.
2. Note that if the economy is dynamically efficient, the Ponzi game is no longer possible and the government must satisfy the conventional budget constraint.
3. The Analytical solution of the model was done using Mathematica software.

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