

# “Dynamic Stochastic General Equilibrium model for the Islamic economy”

## AUTHORS

Khawla Dahani  <https://orcid.org/0000-0002-0112-1811>

Rajae Aboulaich  <https://orcid.org/0000-0001-8003-4080>

## ARTICLE INFO

Khawla Dahani and Rajae Aboulaich (2018). Dynamic Stochastic General Equilibrium model for the Islamic economy. *Investment Management and Financial Innovations*, 15(3), 370-382. doi:[10.21511/imfi.15\(3\).2018.30](https://doi.org/10.21511/imfi.15(3).2018.30)

## DOI

[http://dx.doi.org/10.21511/imfi.15\(3\).2018.30](http://dx.doi.org/10.21511/imfi.15(3).2018.30)

## RELEASED ON

Tuesday, 02 October 2018

## RECEIVED ON

Friday, 27 April 2018

## ACCEPTED ON

Wednesday, 19 September 2018

## LICENSE



This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/)

## JOURNAL

"Investment Management and Financial Innovations"

## ISSN PRINT

1810-4967

## ISSN ONLINE

1812-9358

## PUBLISHER

LLC “Consulting Publishing Company “Business Perspectives”

## FOUNDER

LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

44



NUMBER OF FIGURES

5



NUMBER OF TABLES

0

© The author(s) 2025. This publication is an open access article.



BUSINESS PERSPECTIVES



LLC "CPC "Business Perspectives"  
Hryhorii Skovoroda lane, 10, Sumy,  
40022, Ukraine

[www.businessperspectives.org](http://www.businessperspectives.org)

**Received on:** 27<sup>th</sup> of April, 2018

**Accepted on:** 19<sup>th</sup> of September, 2018

© Khawla Dahani,  
Rajae Aboulaich, 2018

Khawla Dahani, Ph.D. Student,  
Islamic Finance Engineering  
Laboratory, Laboratoire d'Etude et  
de Recherche en Mathématiques  
Appliquées, Mohammadia School  
of Engineering, Mohammed V  
University, Rabat, Morocco.

Rajae Aboulaich, Ph.D., Islamic  
Finance Engineering Laboratory,  
Laboratoire d'Etude et de Recherche  
en Mathématiques Appliquées,  
Mohammadia School of Engineering,  
Mohammed V University, Rabat,  
Morocco.



This is an Open Access article,  
distributed under the terms of the  
[Creative Commons Attribution-Non-  
Commercial 4.0 International license](https://creativecommons.org/licenses/by-nc/4.0/),  
which permits re-use, distribution,  
and reproduction, provided the  
materials aren't used for commercial  
purposes and the original work is  
properly cited.

Khawla Dahani (Morocco), Rajae Aboulaich (Morocco)

# DYNAMIC STOCHASTIC GENERAL EQUILIBRIUM MODEL FOR THE ISLAMIC ECONOMY

## Abstract

This article is concerned with the debate around the economic knowledge evolution and the role of ethics in economy. It reports on the 2008 crisis, the research literature reveals two main problems: the efficiency of the economic modeling and the failure of the ethical system.

The authors explore the use of the new Dynamic Stochastic General Equilibrium "DSGE" model in the case of Islamic economy, it can enable to develop a new approach, taking into account the criticism of the models used before the crisis, and giving more importance to the ethical principles.

The question is to know if the principles of Islamic economy feed into a sustainable economic system.

The characteristic of this model lies in the consideration of Islamic principles, namely the abolition of interest rates and their replacement by the rate of return of the capital. In this perspective, it is supposed that the intervention of the monetary authorities is done by an unconventional approach. The model also distinguishes itself by the integration of Zakat. The model is applied in the case of Morocco.

The results of simulations show that the introduction of these Islamic principles has no negative effects on the macroeconomic and financial conditions of Morocco and that the stability of the economic system is maintained.

## Keywords

Islamic economy, financial crisis, general equilibrium,  
DSGE, monetary policy

## JEL Classification

C68, E52, G01

## INTRODUCTION

Prior to any modeling project, it is worthy to review the economic history. Today, while the shadow of the financial crisis did not fade yet, while debates are still running over its consequences, it is essential or even obligatory to examine the events and reasons, which lead to this crisis. Furthermore, it is necessary to draw possible conclusions and lessons.

The financial crisis of 2008 has revealed the main problems of the economic theory. For the academic and institutional communities, this crisis represents a source for questioning the existing economic knowledge, challenging it from the theoretical and ethical perspective.

This financial crisis has put forward two main deep-seated dysfunctions of the current economic system. On the one hand, we have the collapse of the ethical values system and, on the other hand, the dysfunction of the existing financial institutions and instruments. The crisis turned out to be a crisis of economic knowledge, urging academicians to revisit the theoretical knowledge and to review the existing models (Gertler & Karadi, 2011).

Following Siddiqi (2009), “All the technical flaws and tactical mistakes leading us to the current crisis are rooted in a moral failure” (p. 149), he also argues that “Islamic civilization has the instruments to pre-commit man in society to certain values leading to rules, for example, abolition of interest (riba) and gambling (maysir), that guard the society from falling prey to short sighted predators” (p. 144), equity, transparency, profits and losses sharing ... are all principles that build Islamic ethical value system.

On the other hand, the economic knowledge evolution reporting on criticism, improvements and revolutions that followed the crisis, incited the economists to develop their models, we will focus on DSGE models, as they are used in the main central banks throughout the world (Wabenga Yango et al., 2012).

In addition to studying the crisis from the ethical and theoretical perspective, this paper aims to respond to the problem of the use of an adapted monetary policy to the Islamic economics.

Morocco as many other countries has established mixed system combining aspect of conventional and Islamic banking practices, this would create a difference in the choice of monetary policy between participative and conventional banks. Interest rate, which is prohibited in Islamic economics and then not used by participative banks, is considered as the key instrument for executing monetary policy for conventional ones.

The question we are asking here is to know if the introduction of the conditions imposed by the Islamic economic system will have negative effects on the Moroccan economy? Does the use of the Islamic principles in an economy as Morocco make it possible to maintain macroeconomic achievements and to preserve the balance of the Moroccan economy?

In this paper, we will propose the use of policies called “unconventional”, which will allow us to design a model more in compliance with the Islamic economics system.

The monetary authorities sometimes recourse to these policies during the period of crisis to stimulate the economy without having to use the key interest rate (which is reduced to zero). These measures consist in the financing by the central bank through the purchase of government bonds, which allows to finance more investments plans, to stimulate the credit and to guarantee financing of the economy while reducing risk aversion.

The paper also intends to explore the possibility of integrating the Zakat to the model.

The rest of the paper is organized as follows: section 1 will provide an overview of the study of the 2008 crisis from the ethical and theoretical perspective, section 2 will present a literature review of the use of DSGE model in the Islamic economics framework, section 3 will describe the model proposed and the last two sections will present the empirical results and the conclusion.

## **1. LITERATURE REVIEW: THE STUDY OF THE 2008 CRISIS**

### **1.1. The ethical crisis: choice of a value system**

Lecerf et al. (1991) support that any ethical inconsistency in the different aspects of men's life will

lead to the risk of losing the meaning of one's life and to failure.

Ethics is not only a moral code that guides different aspects of life, it is further fundamental to maintain any system (economic, financial, political and social). With regard to any aspect of life, especially in economy, there must be a value system that has to be respected to ensure balance. Leaders and financial markets, participants should all refer to

a value system, which helps to establish financial discipline and stability of the system (Brack & Saidane, 2010; Hasan & Dridi, 2010).

The 2008 crisis has revealed a major dysfunction and failure of the present financial system. In parallel to the dysfunction of the financial instruments, it also revealed an important ethical failure related to the present economic system. Some scholars have even referred to the collapse of the ethical values system.

It has been reported that this crisis was caused by the lack of appropriate regulations and transparency (Cecchetti, 2009), the potential conflicts of interests between different credit rating agencies and banks, unethical risk management practices and high speculation (Ben Daoud, 2012). In order to raise profits, the financial market participants have used different unethical practices, like the selling of high risk products, the use of complex and opaque financial structures, the massive use of the securitization of complex products, the communication of inaccurate information to the client, the lack of professionalism.

These practices affected the stability of the financial system, leading to a lack of trust that paralyzed the whole system. Thus, transparency and stability of the system have become, now more than ever, vital.

Certain economists have noticed that the financial institutions regulated by an ethical value system were less impacted by the crisis.

Joseph Stiglitz (Nations Unies, 2009) referred to the Islamic finance as an example, Saymeh and Orieqat (2013), in their article "The Global financial Crisis: Is Islamic System a Potential Solution?", made a list of academicians, economists, and policymakers who argue that there is another system, more sustainable and efficient, which is the Islamic one. Islamic banks were largely spared from the crisis, even though they had suffered a slowdown in the overall economic activity (Ben Daoud, 2012).

In fact, Islamic finance promotes an ethical value system built on a balance between personal and

public interests, equity, transparency and sincerity. Therefore, it represents a more stable ethical value system.

Islamic banks have been more resilient to the global financial crisis. They have been able to avoid its consequences due to their ethical policy and to the ethical principles on which they rely:

Islamic finance imposes the respect of several fundamental principles of Islam; we will present here the main principles: profits and losses sharing, asset backing, absence of interest and usury, absence of "gambling" and "ambiguity", absence of investment in "Haram" activities.

## 1.2. The economical knowledge crisis: choice of a theoretical framework

The groundbreaking work of Keynes "The General Theory of Employment, Interest and Money" was published in 1936, a few years after the economic crisis of 1930. This crisis pointed out the weakness of the economic theory at that time, which suffered the lack of adequate tools necessary to understand the present reality.

Keynes' book was the necessary inspiration for the development of quantitative macroeconomic models by Hicks (1937), Tinbergen (1940), Klein (De Vroey & Malgrange, 2012), the Philips curve (Phillips, 1958) achieved in 1958.

These so-called Keynesian models succeeded to be imposed until the late 70's, but they were largely criticized, especially after the failure of the efficient prediction of the economic phenomena witnessed in 1970 (Friedman, 1968; Barro, 1971; Sargent & Wallace, 1975; Lucas, 1975; Kydland & Prescott, 1982).

An alternative approach was developed in the late 70's leading to a new macroeconomic regulation.

The first models of paradigm shift were the so-called "real business cycle" (RBC) proposed by Kydland and Prescott (1982), Long and Plosser (1983), and King, Plosser, and Rebelo (1988). These inter-temporal models of general equilibrium were adjusted to macroeconomic data taking ben-

efit from the microeconomic theory. They are able to reproduce a considerable number of stylized major facts of the economic cycle...but they fail to demonstrate others (Laffargue, 2012).

Economists criticized the fact that these models have neglected monetary policy. Their approach totally ignored the relevance of money in the economic system (Lucas, 1976).

In the early 90's, Keynesian economists proposed a new model, Dynamic Stochastic General Equilibrium (DSGE), which has given back its importance to the stabilizing functions of the monetary and budget policies.

The economic crisis, which started in 2008, revived debate on economic system failure in general and macroeconomic knowledge in particular. It brought about questioning over the DSGE model efficiency and capacity to report and anticipate macroeconomic fluctuations.

For many economists, interaction channels between the financial sphere and real sphere within these models need to be consolidated.

According to Dubois (2010), the crisis we are currently experiencing has revealed the shortage of our knowledge as concerns the relation between the real sphere and financial sphere and how important it is to learn more.

This crisis has invited economists to re-assess the financial sector modeling in the DSGE models. It comes to propose a real modeling of the financial intermediation and its macroeconomic impact. This has led many economists to consider DSGE models known as financial accelerator models (Bernake et al., 1996; Kiyotaki & Moore, 1997), and others.

These "general equilibrium models" focus on amplifications effects, related to financial friction.

The crisis has incited economists to reexamine the coverage of the financial system within their models. This has led, today, to a worldwide use of the DSGE models. We can mention: the European Central Bank uses the model of Smets and Wouters (2003), the Bank of Canada uses the ToTEM (Terms of Trade Economic Model) (Murchison & Rennison, 2006),

the US Federal Reserve uses the EDO (Estimated Dynamic Optimization) model (Kiley et al., 2010), the Sveriges Riksbanks (Sweden's central bank) uses the RAMESES model (Adolfson, 2011), the Reserve Bank of New Zealand uses the KITT (Kiwi Inflation Targeting Technology) model (Lees, 2009).

In the following, we will present an Islamic DSGE model introduced by Khan (1984), Rasoulinzhad (2012), and others.

### 1.3. The new DSGE models in the framework of the Islamic economy

In the following, we will present the concept of "Dynamic Stochastic General Equilibrium" model within the Islamic economy. This model combines the DSGE modeling method with Islamic economy principles and values.

Some researchers initiated this research path in the framework of many DSGE models, others tried to elaborate an important part of the input of which could complete the DSGE model, for example, Khan (1984) developed a macroeconomic consumption function. His paper "Macro consumption in an Islamic framework" examines the consumer behavior and the allocation of resources within the Islamic economy, thus, he creates a macroeconomic model to illustrate his idea.

Taghavi and Safarzadeh (2009) applied a new Keynesian DSGE model in the economy of Iran to calculate money's optimal growth rate. Feizi (2009) builds a new Keynesian DSGE model in an open economy in the framework of the Islamic economy. While studying the Iranian case, he approximated the interest rate by the exchange rate. Zangeneh (1995) formulated an interest free economic system in terms of neoclassical macroeconomic model, when the interest rate is replaced by a rate of return on equity. Rasoulinezhad (2012) realizes a DSGE Islamic structure by using the Interpretative Structural Modeling (ISM) method.

In the next subsection, we propose a DSGE model with financial frictions in a closed economy. Our contribution would be a new thinking on agent's behavior to conform to the chosen value system, which is the Islamic economic system.

## 1.4. Presentation of the proposed I-DSGE model

We will focus on the three basic hypotheses constituting the major contribution of this article, namely:

- the absence of the interest rate: the chosen system is Islamic, interest rate is not used and is replaced by rate of return;
- the second hypothesis concerns the monetary policy: we suppose the use of a monetary policy that does not apply interest rates, the central bank uses an unconventional monetary policy; it has a direct effect on the balance sheet of commercial banks through injection of money;
- the third issue is about the consideration of the Zakat within the model: the decision makers in this model are economic agents; the idea is to include the Islamic variables in every agent's behavior.

While being based on the functions of behaviors in the case of the conventional economy, our objective is to define adequate functions of behaviors, adapted to the case of the Islamic economy.

The model that we will present below is inspired by the work of Gertler and Karadi (2011), five economic agents compose it: households, financial intermediaries, central bank, firms and government, for more details about the functions please refer to Gertler and Karadi (2011).

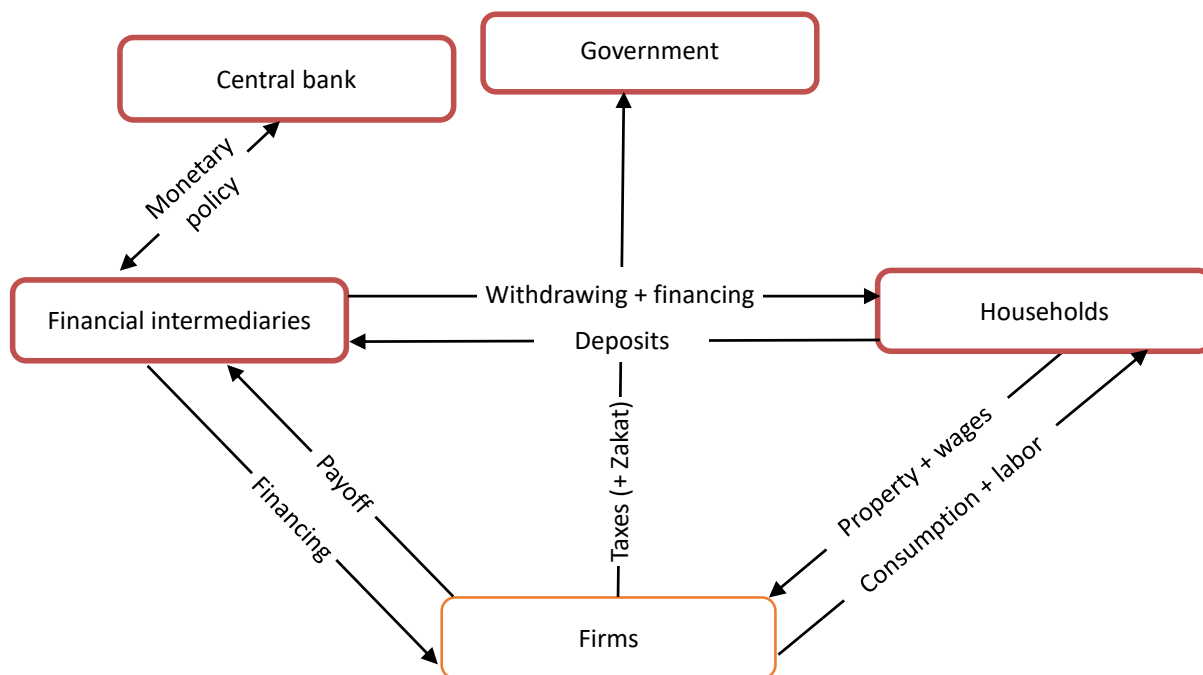
## 1.5. Households

The households are presented through a representative household who consumes, saves, invests in government bonds, supplies labor, pays its taxes, but also pays the Zakat.

The household thus maximizes its following objective function; let us note that is  $C_t$  Consumption,  $L_t$  is Labor supply,  $E_t$  the operator of conditional expectation to information available in  $t$  :

The relation between the various agents is presented in Figure 1.

$$\max E_t \sum_{i=0}^{\infty} \beta^i \left[ \ln(C_{t+i} - hC_{t+i-1}) - \frac{\lambda}{1+\phi} L_{t+i}^{1+\phi} \right], \quad (1)$$



**Figure 1.** Structure of I-DSGE model and relation between the agents



where  $0 < \beta < 1$ ,  $0 < h < 1$  and  $\varphi, \aleph > 0$ , Gertler and Karadi (2011) consider  $\beta$  as a factor of discount, in our case, this factor will be estimated by the rate of return,  $h$  is consumption patterns;  $\aleph$  is a constant that allows to adjust the number of hours worked with the stationary state and  $\varphi$  is the elasticity of the labor demand.

The incomes of households result from their work, rates of return on the deposits in banks and dividends resulting from various financial and non-financial firms.

Let  $W_t$  be the price of labor (or real wage),  $P_t$  – the net payouts to the household from ownership of both financial and non-financial firms,  $R_t$  – the rate of return on the deposits,  $B_t$  – the amount of the deposits and let  $T_t$  be the lump sum taxes.

Then, the household budget constraint is calculated as follows

$$C_t = W_t L_t + P_t - T_t + R_t B_t - B_{t+1}. \quad (2)$$

## 1.6. Financial intermediaries (banks)

We assume that the financial intermediaries do not use interest rates; in fact, Islamic banks use participative financing contracts based on the use of the rate of return.

We consider that the net worth that the bank has at the end of period  $t$  is  $N_t$ , customer deposits (main resource banks) are noted  $B_t$  and the quantity and price of bank assets are  $S_t$  and  $Q_t$ , respectively, then:

$$Q_t S_t = N_t + B_{zt}. \quad (3)$$

We consider in this work that the amount of the Zakat is subtracted from the customer deposits, which represent their saving.

The amount of Zakat is noted  $Za_t$ .

$$B_{zt} = B_t - Za_t, \quad (4)$$

$$Za_t = 0.025 B_t, \quad (5)$$

$$\begin{aligned} N_{t+1} &= R_{t+1}^k Q_t S_t - R_{t+1} B_{zt} = \\ &= (R_{t+1}^k - R_{t+1}) Q_t S_t + R_{t+1} N_t. \end{aligned} \quad (6)$$

The future income generated by the bank is the difference between the returns generated through credit operations and returns paid to depositors. The premium  $(R_{t+1}^k - R_{t+1})$  describes the possibility of the existence of asymmetric information between depositors and non-financial firms and it reflects the opportunity cost due to the use of external financing (Bernanke et al., 1996).

The future income of the bank can be written according to the leverage effect and the risk premium:

$$N_{t+1} = [(R_{t+1}^k - R_{t+1}) \theta_t + R_{t+1}] N_t, \quad (7)$$

$$z_t = \frac{N_{t+1}}{N_t} = (R_{t+1}^k - R_{t+1}) \theta_t + R_{t+1}, \quad (8)$$

$$x_t = \frac{Q_{t+1} S_{t+1}}{Q_t S_t} = \frac{\theta_{t+1} N_{t+1}}{\theta_t N_t} = \frac{\theta_{t+1}}{\theta_t} z_t, \quad (9)$$

where

$$z_t = \frac{N_{t+1}}{N_t}, \quad (10)$$

and where  $\theta_t$  is the leverage ratio of the banks, which represents the relation between the assets and the funds held by the bank.

## 1.7. The central bank

We suppose that the monetary authorities use unconventional measures; they facilitate the granting of the credits by occurring directly on the market of the credits.

Indeed, the central bank finances a part of the assets of banks, not to substitute for them, but to guarantee financing of the economy, to reduce the aversion to the risk and to stimulate the credit.

By using these purchasing strategies of government bonds, the central bank feeds the financial intermediaries of additional liquidity, which should inevitably increase their asset. These bonds can then be bought by the households and produce liquidity to finance investment plan.

Within this framework, let us suppose that the fraction of the active total financed by the central bank is  $(Q_t S_{gt})$ .

For that purpose, the total asset at the disposal of the financial intermediaries will be of the following shape:

$$Q_t S_t = Q_t S_{pt} + Q_t S_{gt}. \quad (11)$$

Then,

$$Q_t S_t = \theta_t N_t + \omega_t Q_t S_t, \quad (12)$$

where  $\omega$  is the parameter of the scale of the credit policy of the central bank.

In the end, the total asset banking is according to three parameters: the income resulting from private activities or the banking equities, the ratio of leverage and the part of assets financed by the government.

### 1.8. Firms

In this part of the model, we consider the production and investment side; the sector of the firms is composed by three types of firms distinguishing the three types of producer on the market: producer of intermediate goods, producer of capital and producer of final goods.

Competitive non-financial firms produce intermediate goods that are eventually sold to retail firms, at the end of the period  $t$ , the intermediate goods producer acquires capital  $K_t$  after production in  $t$ , he has the option of selling the capital on the open market.

The firms are financed with banks, we suppose that all the flows of banks are only used to finance the projects of investments, and that the bank finances all the loans of the firms. The value of the capital of the firms should be equal to the assets of the banks.

$$Q_t K_t = Q_t S_t. \quad (13)$$

At each time  $t$ , the firm produces  $(Y_t)$  on the basis of two factors of production, capital  $K_t$  and labor  $L_t$ :

$$Y_t = A_t (U_t \Lambda_t K_t)^\alpha L_t^{1-\alpha}, \quad (14)$$

where  $A_t$  is total factor productivity,  $U_t$  is rate of use of capital and  $\Lambda_t$ ,  $K_t$  are the effective quantity of the capital.

The prices of the production of intermediate goods  $P_{mt}$  are equal to:

$$P_{mt} (1-\alpha) \frac{Y_t}{L_t} = w_t. \quad (15)$$

Thus, the profitability of the firm is equal to:

$$R_{kt} = \frac{\left[ P_{mt} \alpha \frac{Y_t}{\Lambda_t K} + Q_t - U_t \right] \Lambda_t}{Q_{t-1}}. \quad (16)$$

The activity of the producers of capital is articulated around provisioning the intermediate firms of capital to conclude their exploitation.

It is supposed that the stock of the investments is  $I$ ,  $I_{ss}$  is the potential investment and  $I_n$  is the equity net created, where  $I_{nt} = I_t - U_t \Lambda_t K_t$ , in this case, the objective function of maximizing the capital of the producer is in the following form:

$$\max E \sum_{t=1}^{\infty} \beta \Lambda_t \left\{ (Q_t - 1) I_{nt} - f \left( \frac{I_{nt} + I_{ss}}{I_{nt-1} + I_{ss}} \right) \right\} (I_{nt} + I_{ss}). \quad (17)$$

Concerning the third firm of details  $f$ , it operates on a market of monopolistic competition in order to take account of rigidities on the prices.

The production is defined according to the global production of the various firms

$$Y_{ft} = \left( \frac{P_{ft}}{P_t} \right)^{-\varepsilon} Y_t, \quad (18)$$

and

$$P_t = \left[ \int_0^1 P_{ft}^{1-\varepsilon} df \right]^{\frac{1}{1-\varepsilon}}, \quad (19)$$

where  $\varepsilon$  is the elasticity of substitution.

The firm maximizes the following function:  $(1 + \pi_{t+k-1})^{\gamma_p}$ .

$$\max E_t \sum_{i=0}^{\infty} \gamma^i \beta^i \Lambda_t \left\{ \frac{P_t^*}{P_{t+1}} \prod_{k=1}^i (1 + \pi_{t+k-1})^{\gamma_p} - P_{mt+i} \right\} Y_{ft}, \quad (20)$$

where  $\gamma^\infty$  is the elasticity of rigidities of the prices,  $P_t^*$  is the optimal price,  $P_m$  is the marginal cost and  $\pi$  is the inflation rate.



## 1.9. The government

The aggregate output of the economy is made up of consumption  $C$ , the investment  $I$ , the budget expenditure  $G$  and the intervention of the government in favor of the financial intermediary.

Government spending and their intervention on assets of the banks are financed by the taxes and the spreads over the intermediation of the government through the emissions of the bonds and the Zakat.

$$G + \omega_t Q_t K_t = T + (R_{kt} - R_t) B_{gt} + Za_t, \quad (21)$$

$$Za_t = 0.025 \cdot B_t. \quad (22)$$

## 2. NUMERICAL RESULTS

The parameters was calibrated based on Moroccan data on the basis of previous studies and by using the databases of the HCP relating to the year 2016. The calibration of the parameters is carried out in a standard way (Abouch & Firano, 2014).

The question we are asking here is to know if the introduction of the conditions imposed by the Islamic economic system will have negative effects on the Moroccan economy. Does the use of the Islamic principles in an economy as Morocco make it possible to maintain macroeconomic achievements and to preserve the balance of the Moroccan economy?

To answer these questions, we will begin with several experiments designed to illustrate how the model behaves, first, we will be interested in the reaction of our model to some disturbance and in a second step, we will test the relevance and the stability of the macroeconomic framework by examining the volatility of the main macroeconomic variables and their autocorrelation.

### 2.1. Reaction of the model to shocks

We will simulate various shocks, which are going to allow us to describe through the simulations the effects of the economic changes, and to explain the evolution of the various variables in case of a shock.

A shock provides dynamics to the model, it is represented by the change in the values of the parameters, which disturbs the situation of equilibrium, and then begins a dynamics of transition to a new model, based on the changes made by the agent on their behavior. The impulse supplied by the shocks propagates through the internal mechanisms of the model; we have to obtain after a while a return of the system to the equilibrium.

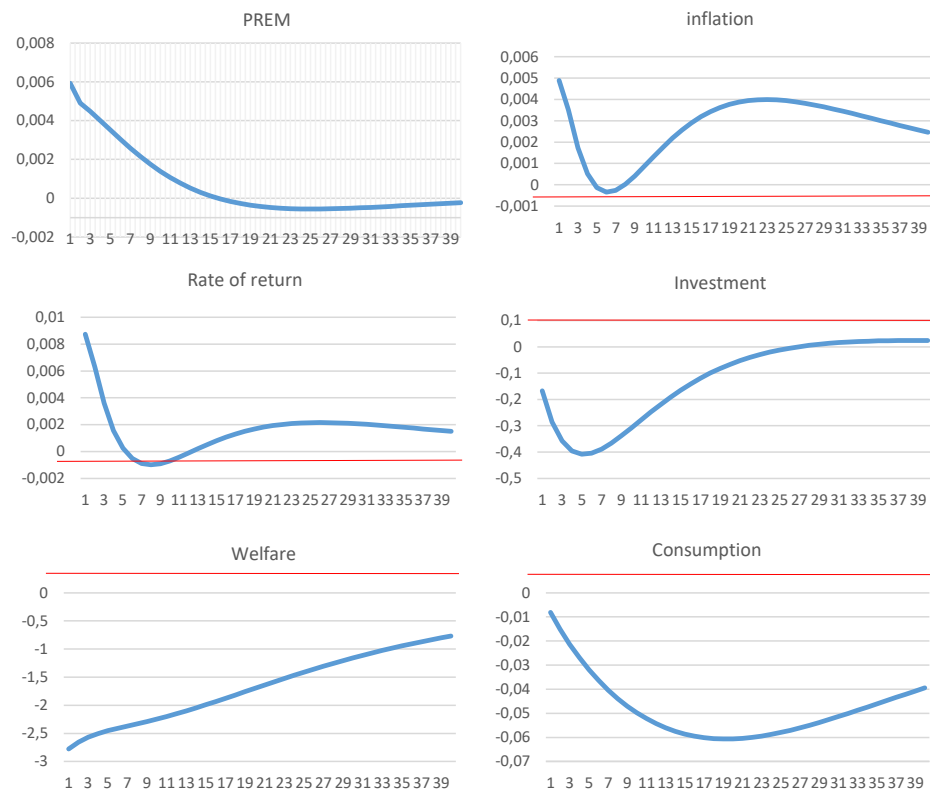
By simulating the shocks, we are trying to capture the dynamic responses of key macroeconomic variables to shocks originating in different sector. We choose to illustrate here the results of simulation of two shocks. Figure 2 and Figure 3 show the response of the model to a technological shock and a fiscal shock, respectively. Each response is expressed as a deviation of a variable from its steady state.

The technological shock will allow us to test the assumption of the increase of the productivity further to the integration of a new technology. The graphs present the functions of answers of several variables of the model to an innovation of 1 point of the technology compared to its level in the stationary state.

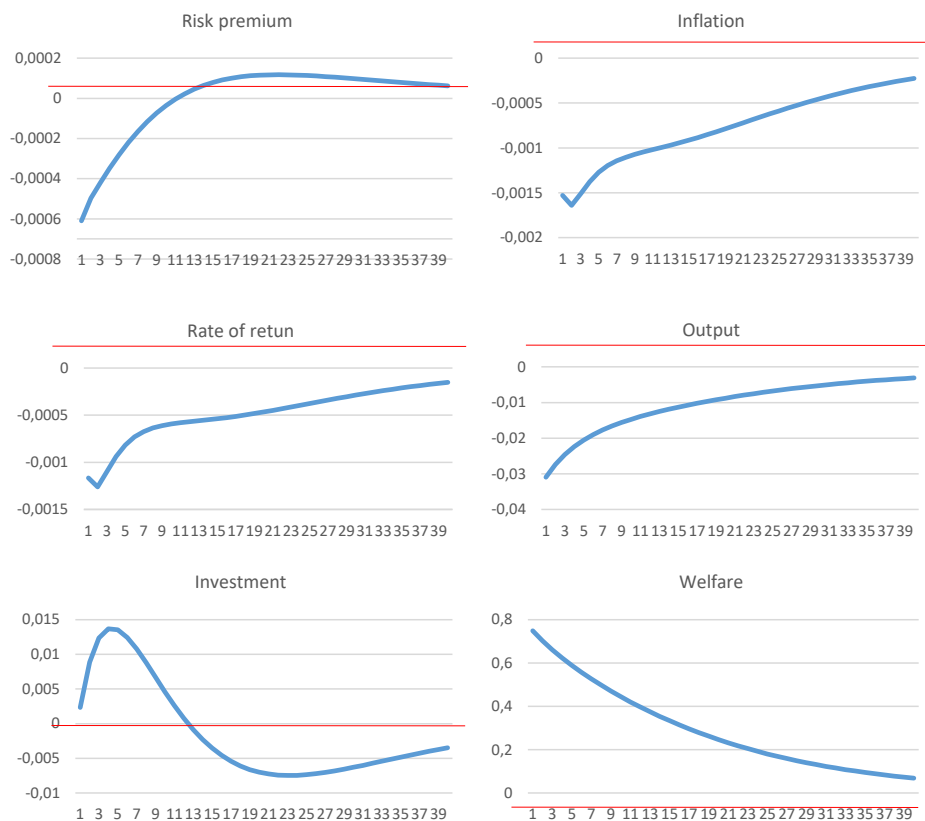
The model reacts actually to the shock: the integration of a new technology increases the level of productivity and thus increases the risk premium, this reaction reflects the apprehension of the agents relative to a new technology, this involves the decline of the inflation, which reduces the wealth.

We tried to get the reactions of the system in the case of a positive fiscal shock by increasing government spending. It is noted that while increasing government spending, the households, anticipating an increase of taxes, are voluntarily going to restrict their spending (through a reduction of the consumption or an increase of the saving), which involve a positive wealth effect of the households and a fall of the inflation and thus a drop in growth.

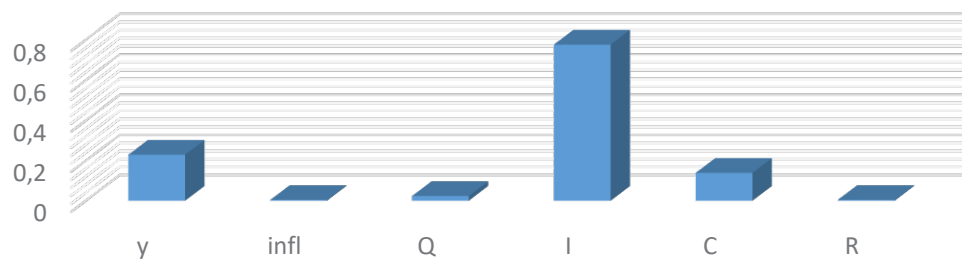
We notice that the effect of the shocks is relatively expected and in conformity with the traditional results in the literature. The various economic variables turn over in their state of equilibrium



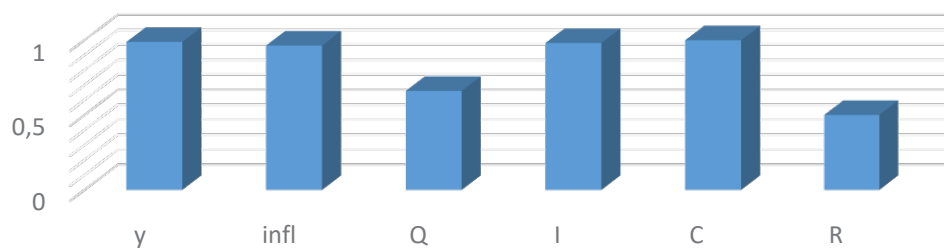
**Figure 2.** Functions of response of the economic activity to a positive technological shock in the Islamic framework



**Figure 3.** Functions of response of the economic activity to a positive tax shock in the Islamic framework



**Figure 4.** Volatility of the main macroeconomic variables of the model



**Figure 5.** Autocorrelation of the main macroeconomic variable of the model

and manage to blur the effect of the shock, which represents a big factor for the stability of the model.

Following the various shocks carried out, we found judicious to analyze the volatility of the main macroeconomic variables and their autocorrelation in order to be able to conclude about the relevance and the stability of the macroeconomic framework.

## 2.2. Test of volatility and autocorrelation

The key macroeconomic variables (y: output, infl: inflation, Q: assets price, I: investment, C: consumption, R: rate of return) are characterized by a low volatility, which does not exceed 1 for the output and very low levels for the other analyzed variables.

The analysis of the volatility allows us to confirm the relevance of integrating the principles of Islamic economy because of the preservation of the stability of the macroeconomic frame. Therefore, the use of Islamic principles in an economy as Morocco allows to maintain the macroeconomic achievements and to protect the balance of the Moroccan economy.

Although volatility allows us to confirm the stability of the macroeconomic framework, the analysis of the autocorrelations is able to confirm the intrinsic behavior of the key economic variables.

The study indicates that the main variables, output, inflation, assets price, investment, consumption, rate of return, preserve their statistical characteristics in terms of short-term memory, which enables us to clearly confirm the relevance of the model with Islamic principles.

## CONCLUSION

Recent disruptions in the economic system and major developments in economic modeling have prompted researchers to pave the way for Islamic economic theory. In this work, we proposed to associate a framework of stochastic dynamic of general equilibrium model with the framework of the Islamic economy used for the Moroccan case. The synthesis of these two approaches enabled us to test the eventuality, in the case of Morocco, of rocking towards an economic system suiting better with the principles of the Islamic economy.

The characteristic of this model lies in its consideration of unconventional monetary policy not using interest rate and of its integration of the payment of Zakat, the use of these characteristics can respond to the problem of the use of adapted monetary policy in the case of mixed system combining aspect of conventional and Islamic banking practices, which is the case of Morocco.

Using the DSGE model, we were able to highlight the effects of the various shocks on the economy, the results were expected and in conformity of the traditional results in the literature, we were able to confirm the relevance to integrate the Islamic way of financing because of the preservation of the stability of the macroeconomic framework.

In spite of the promising results of this work, it remains much to make on the subject, at the same time, not only to confirm the validity of the results obtained, but also to extend the results towards wider or more corresponding frame. A primary goal would be to improve the DSGE model to suit better with Moroccan case through the integration of new variables, constraints and agents (religious constraint on consumption, a conventional bank in addition to the Islamic bank and thus to reinstate interest rate...). A second objective would be to exceed the limits of DSGE modeling and to exploit a new framework of modeling able to translate in a more effective way the behavior of the agents (multi-agent modeling).

## REFERENCES

1. Adolfson, M., Laséen, S., Lindé, J., & Svensson, L. E. O. (2011). Optimal Monetary Policy in an Operational Medium-Sized DSGE Model. *Journal of Money, Credit and Banking*, 43(7), 1287-1331. <https://doi.org/10.1111/j.1538-4616.2011.00426.x>
2. Barro, R. J., & Grossman, H. I. (1971). A General Disequilibrium Model of Income and Employment. *The American Economic Review*, 61(1), 82-93. Retrieved from <http://www.jstor.org/stable/1910543>
3. Belabes, A. (2010). Le lien entre finance et économie Islamiques via le modèle principal 'zr'. *Etudes En Economie Islamique*, 04-1, 15-37. Retrieved from <https://econpapers.repec.org/article/risetecis/0003.htm>
4. Ben Daoud, K. (2012). L'intermédiation financière participative des banques Islamiques. *Etudes En Economie Islamique*, 06-1, 29-56. Retrieved from <https://econpapers.repec.org/article/risetecis/0017.htm>
5. Bernanke, B., Gertler, M., & Gilchrist, S. (1996). The Financial Accelerator and the Flight to Quality. *The Review of Economics and Statistics*, 78(1), 1-15. <https://doi.org/10.2307/2109844>
6. Brack, E., & Saidane, D. (2010). Qu'attend-on de la finance mondiale après la crise ? Les quatre commandements oubliés. *Revue Banque*, 720, 8. Retrieved from [https://mpra.ub.uni-muenchen.de/23472/2/MPra\\_paper\\_23472.pdf](https://mpra.ub.uni-muenchen.de/23472/2/MPra_paper_23472.pdf)
7. Cecchetti, S. G. (2009). Crisis and Responses: The Federal Reserve in the Early Stages of the Financial Crisis. *Journal of Economic Perspectives*, 23(1), 51-75. <https://doi.org/10.1257/jep.23.1.51>
8. De Vroey, M., & Malgrange, P. (2012). Klein et l'émergence de la modélisation macroéconomique. *Economie et Statistique*, 451(1), 21-30. <https://doi.org/10.3406/es-tat.2012.9737>
9. Dubois, É. (2010). La crise de 2008 : des mécanismes souvent inédits, qui appellent de nouvelles avancées de la connaissance économique. *Economie et Statistique*, 438(1), 5-17. <https://doi.org/10.3406/es-tat.2010.9587>
10. Fadhlou, H. (2012). *Les opportunités du développement de la finance Islamique et de la pensée post keynésienne pour penser la réforme du système bancaire: Etude la crise de 2007*. Retrieved from <http://www.iefpédia.com/france/wp-content/uploads/2010/01/Les-opportunit%C3%A9s-du-d%C3%A9veloppement-de-la-finance-islamique-et-de-la-Les-pens%C3%A9e-post-keyn%C3%A9sienne-pour-penser-la-r%C3%A9forme-du-syst%C3%A8me-bancaire-Etude-la-crise-de-2007.pdf>
11. Feizi, M. (2009). A New Keynesian Small Open Economy DSGE Model in Islamic Economic Framework: The Case of Iran! *Journal of Economic Literature*. Retrieved from [https://www.researchgate.net/publication/229028459\\_A\\_New\\_Keynesian\\_Small\\_Open\\_Economy\\_DSGE\\_Model\\_in\\_Islamic\\_Economic\\_Framework\\_The\\_Case\\_of\\_Iran](https://www.researchgate.net/publication/229028459_A_New_Keynesian_Small_Open_Economy_DSGE_Model_in_Islamic_Economic_Framework_The_Case_of_Iran)
12. Friedman, M. (1968). The Role of Monetary Policy. *American Economic Review*, 58(1), 1-17. Retrieved from <http://www.jstor.org/stable/1831652>
13. Gerali, A., Neri, S., Sessa, L., & Signoretti, F. M. (2010). Credit and Banking in a DSGE Model of the Euro Area. *Journal of Money, Credit and Banking*, 42, 107-141. <https://doi.org/10.1111/j.1538-4616.2010.00331.x>
14. Gertler, M., & Karadi, P. (2011). A model of unconventional monetary policy. *Journal of Monetary Economics*, 58(1), 17-34. <https://doi.org/10.1016/j.jmoneco.2010.10.004>

15. Guesnerie, R. (2012). Avant-propos : Les théories et les crises économiques : remarques sur l'amont de la modélisation macro-économétrique. *Economie et Statistique*, 451(1), 5-10. <https://doi.org/10.3406/estat.2012.9734>
16. Hasan, M., & Dridi, J. (2010). *The Effects of the Global Crisis on Islamic and Conventional Banks: A Comparative Study* (IMF Working Paper, wp /10/201). Retrieved from <https://www.imf.org/external/pubs/ft/wp/2010/wp10201.pdf>
17. Hicks, J. R. (1937). Mr. Keynes and the 'Classics'; A Suggested Interpretation. *Econometrica*, 5(2), 147-159. <https://doi.org/10.2307/1907242>
18. Khan, M. F. (1984). Macro Consumption Function in an Islamic Framework. *Journal of Research Islamic Economics*, 71-73. [https://doi.org/10.1007/978-1-349-07728-1\\_11](https://doi.org/10.1007/978-1-349-07728-1_11)
19. Kiley, M. T., Laforte, J.-P., & Chung, H. T. (2010). Documentation of the Estimated, Dynamic, Optimization-Based (EDO) Model of the U.S. Economy: 2010 Version. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1786804>
20. King, R. G., Plosser, C. I., & Rebelo, S. T. (1988). Production, growth and business cycles: I. The basic neoclassical model. *Journal of Monetary Economics*, 21(2), 195-232. [https://doi.org/10.1016/0304-3932\(88\)90030-X](https://doi.org/10.1016/0304-3932(88)90030-X)
21. Kiyotaki, N., & Moore, J. (1997). Credit Cycles. *The Journal of Political Economy*, 105(2), 211-248. Retrieved from <http://www.jstor.org/stable/2138839>
22. Kydland, F. E., & Prescott, E. C. (1982). Time to Build and Aggregate Fluctuations. *Econometrica*, 50(6), 1345-1370. <https://doi.org/10.2307/1913386>
23. Laffargue, J.-P. (2012). Une comparaison des modèles macro-économétriques et DSGE dans l'évaluation des politiques économiques : une comparaison basée sur les modèles Mésange et Egée. *Economie et Statistique*, 451(1), 45-68. <https://doi.org/10.3406/estat.2012.9739>
24. Laffargue, J.-P., Malgrange, P., & Morin, P. (2012). La "nouvelle synthèse néoclassique": une introduction. *Economie et Statistique*, 451(1), 31-44. <https://doi.org/10.3406/estat.2012.9738>
25. Lecerf, O., De Woot, P., & Barraux, J. (1991). *Au risque de gagner : le métier de dirigeant / Olivier Lecerf, entretiens avec Philippe De Woot et Jacques Barraux*. Éd. de Fallois. Paris. Retrieved from <http://documentation.unicaen.fr/Default/doc/FLORA/360294/au-risque-de-gagner-le-metier-de-dirigeant-olivier-lecerf-entretiens-avec-philippe-de-woot-et-jacque>
26. Lees, K. (2009). Introducing KITT: The Reserve Bank of New Zealand new DSGE model for forecasting and policy design. *Reserve Bank of New Zealand, Bulletin*, 72(2), 5-20. Retrieved from <https://www.rbnz.govt.nz/-/media/ReserveBank/Files/Publications/Bulletins/2009/2009jun72-2lees.pdf>
27. Long, J., & Plosser, C. (1983). Real Business Cycles. *Journal of Political Economy*, 91(1), 39-69.
28. Lucas, R. E. (1975). An Equilibrium Model of the Business Cycle. *Journal of Political Economy*, 83(6), 1113-1144. Retrieved from <http://www.jstor.org/stable/1830853>
29. Lucas, R. E. (1976). Econometric policy evaluation: A critique. *Carnegie-Rochester Conference Series on Public Policy*, 1, 19-46. [https://doi.org/10.1016/S0167-2231\(76\)80003-6](https://doi.org/10.1016/S0167-2231(76)80003-6)
30. MOHAMED, A., Zakaria, F., & Amine, A. M. (2014). Why liquidity interventions are they optimal in the case of Morocco for financial stability? *Theoretical and Applied Economics*, 21(3), 75-102. Retrieved from <http://scholar.um5.ac.ma/zakaria.firano/publications/why-liquidity-interventions-are-they-optimal-case-morocco-financial>
31. Murchison, S., & Rennison, A. (2006). ToTEM: The Bank of Canada's New Quarterly Projection Model. *Bank of Canada, Technical Reports*, 97. Retrieved from [https://www.researchgate.net/publication/4984156\\_ToTEM\\_The\\_Bank\\_of\\_Canada's\\_New\\_Quarterly\\_Projection\\_Model](https://www.researchgate.net/publication/4984156_ToTEM_The_Bank_of_Canada's_New_Quarterly_Projection_Model)
32. Nations unies (2009). *Assemblée: le prix Nobel d'économie, Joseph Stiglitz, propose la création d'une nouvelle facilité de crédit et d'un autre système mondial de réserves pour surmonter la crise*. Retrieved from <https://www.un.org/press/fr/2009/AG10815.doc.htm>
33. Phillips, A. W. (1958). The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957. *Economica*, 25(100), 283-299. <https://doi.org/10.2307/2550759>
34. Rasoulnezhad, E. (2012). The Concept of Islamic Dynamic Stochastic General Equilibrium Method in the Financial Theme. *American Journal of Business and Management*, 1(3), 113-118. <https://doi.org/10.11634/216796061706150>
35. Sargent, T. J., & Wallace, N. (1975). 'Rational' Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule. *Journal of Political Economy*, 83(2), 241-254. Retrieved from <http://www.jstor.org/stable/1830921>
36. Saymeh, A. A. F., & Oriqat, H. M. (2013). The Global financial Crisis: Is Islamic System a Potential Solution? *International Journal of Financial Economics*, 1(3), 76-87. Retrieved from [http://rassweb.org/admin/pages/Research-Papers/IJFE-Issue3-Paper%201\\_1496410889.pdf](http://rassweb.org/admin/pages/Research-Papers/IJFE-Issue3-Paper%201_1496410889.pdf)
37. Siddiqi, M. N. (2008). The current financial crisis and Islamic economics. *IIUM Journal of Economics and Management*, 16. Retrieved from [https://www.researchgate.net/publication/290824778\\_The\\_current\\_financial\\_crisis\\_and\\_Islamic\\_economics](https://www.researchgate.net/publication/290824778_The_current_financial_crisis_and_Islamic_economics)
38. Smets, F., & Wouters, R. (2003). An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area. *Journal of the European Economic Association*, 54. Retrieved from [http://statmath.wu.ac.at/~hauser/LVs/SE\\_Macro-Econometrics/DSGE/SmetsWouters2003JEUecoAss\\_DSGE.pdf](http://statmath.wu.ac.at/~hauser/LVs/SE_Macro-Econometrics/DSGE/SmetsWouters2003JEUecoAss_DSGE.pdf)

39. Soleimani Movahed, M., Afshari, Z., & Pedram, M. (2015). Optimal Policy Rules for Iran in a DSGE Framework (Islamic Musharakah Approach). *Journal of Money and Economy*, 9(4). Retrieved from [https://www.researchgate.net/publication/322355841\\_Optimal\\_Policy\\_Rules\\_for\\_Iran\\_in\\_a\\_DSGE\\_Framework\\_Islamic\\_Musharakah\\_Approach](https://www.researchgate.net/publication/322355841_Optimal_Policy_Rules_for_Iran_in_a_DSGE_Framework_Islamic_Musharakah_Approach)
40. Taghavi M, & Safarzadeh E. (2009). Optimum rate of money growth in new Keynesian DSGE framework for Iran economy. *Economic modelling*, 3(39), 77-104. Retrieved from <http://www.sid.ir/En/Journal/ViewPaper.aspx?ID=201764>
41. Tinbergen, J. (1940). Econometric Business Cycle Research. *The Review of Economic Studies*, 7(2), 73-90. <https://doi.org/10.2307/2967472>
42. WabengaYango, J., & Kimbambu TsasaVangu, jean-paul (2012). Lecture panoramique des avancées en macroéconomie DGE 1 Révolution keynésienne et Contre révolution des anticipations rationnelles – PDF Free Download. *Laboratoire d'Analyse – Rechercheen Economie Quantitative*, 4(9). Retrieved from <https://dokodoc.com/lecture-panoramique-des-avancees-en-macroeconomie-dge-1-revo.html>
43. Waqas, M., Uddin, I., Ashfaq, B., & Shakir, R. (2016). Redefining economic systems as an Islamic economic system. *Journal of Business Studies*, 12(1), 14. Retrieved from <http://ibt.edu.pk/qec/jbs/12.1/6.pdf>
44. Zangeneh, H. (1995). A Macroeconomic Model of an Interest-free System. *The Pakistan Development Review*, 34(1), 55-68. Retrieved from [https://econpapers.repec.org/article/pidjournl/v\\_3a34\\_3ay\\_3a1995\\_3ai\\_3a1\\_3ap\\_3a55-68.htm](https://econpapers.repec.org/article/pidjournl/v_3a34_3ay_3a1995_3ai_3a1_3ap_3a55-68.htm)