Inflation: Islamic and Conventional Economic Systems - Evidence from the United States

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ABSTRACT

In an Islamic framework, when there is no imported inflation and/or a sudden shock to demand or supply, inflation rate should be zero. Similar to a conventional economic system, there is a higher inflation rate in an Islamic economic system if there is deterioration in the domestic currency. It has been shown that debt financing and economic waste plus other known factors can cause inflation in a conventional economic system, but since debt financing is replaced by equity financing and wasteful consumption is extremely discouraged in an Islamic system, everything else being the same, the inflation rate should be lower in this system. Islamic laws guarantee the flow of labour and capital. Therefore, the possibility of cost-push inflation is nil or very low. A zero predetermined interest rate in an Islamic system, contrary to a positive interest rate in a conventional system, helps to keep inflation rate lower over the long run. A price model for a large country which operates under a conventional economy was developed and tested on US data. It was found that the Islamic prediction that “God will deprive usury of all blessing” for a large country like the United States is satisfied.

JEL Classification: E31; E41; E62; E69.

Key Words: Inflation; Islamic and Conventional Systems; Debt; Foreign-Financed Debt; Interest Rate.

1. INTRODUCTION

Inflation is defined as a sustained rise in the level of prices. It results in the reduction of the real value of savings and wealth. It also causes the distribution of income from lenders to borrowers and from salary/wage makers to employers if wages and salaries are not adjusted for inflation. An expected inflation creates uncertainty about current and future consumption and investment. In general, as Kia (2006a) described, inflation can be influenced by both internal and external factors. Internal factors include, among others, government deficits, debt financing, monetary policy, institutional economics (shirking, opportunism, economic freedom, risk, etc.) and structural regime changes (revolution, political regime changes, policy constraints, etc.). External factors include terms of trade and foreign interest rate as well as the attitude of the rest of the world (sanctions, risk generating activities, wars, etc.) toward the country.

The channels through which government deficit and debt financing influence inflation include the formation of capital (crowding out effect), the monetization of debt and the wealth effect of debt. By reducing information costs, institutional economics can also reduce the inflation rate in a country. Furthermore, the change in terms of trade and foreign interest rates can influence the inflation rate in a country for which the economy is heavily dependent on imports and foreign financing of its debt. This is particularly important for developing/emerging countries.

The purpose of this paper is to describe, compare and contrast the inflation from a conventional and an Islamic economic system. I will develop a monetary model for inflation and estimate it for a large country which operates under a conventional economic system, the United States (US). To the best knowledge of the author, no such study has ever been done in the literature.

It was found in this paper that a predetermined interest rate has a positive relationship with the price level over the long run and inflation over the short run in both small and large countries which operate under a conventional economic system. Interest-financed debt in the US leads to a higher speculative demand for money and causes unproductive investment. This is in contrast to interest-financed government debt in Turkey which causes higher...
price level, see Kia (2010). However, profit-risk-sharing financed government debt in Iran has a negative relationship with the price level over the long run, see Kia (2006a)\(^1\).

The next section is devoted to the causes of inflation which is followed with a section on inflation in a conventional large country and the model. Section 4 is devoted to empirical evidence. Section 5 describes how to control inflation. Section 6 investigates the impact of unanticipated shocks on the price level in a large conventional economy, the United States. The final section provides concluding remarks.

2. Causes of inflation

In both the conventional and the Islamic economic systems, the role of both demand and supply is emphasized in the determination of prices. In fact, Islamic scholars realized many centuries ago the importance of demand and supply in causing inflation.\(^2\)

Both fiscal and monetary policies affect aggregate demand and supply. Consequently, they can cause a sustained rise in prices. A higher government expenditure results in an upward shift in the aggregate demand causing the price level to go up. When the government expenditure is financed by issuing debt, a further shift in aggregated demand is possible if the outstanding debt is considered by the debt holders a net wealth. The monetization of the debt will further cause a rise in the price level as it creates another shift in the aggregate demand. Furthermore, the expected monetization of government debt leads to an expected rise in future price, i.e., a higher expected inflation. A higher expected inflation causes an increase in interest rate which, by itself, leads to an increase in cost schedule for each firm in the economy. As it is known a higher cost schedule leads to a left shift in the supply and a higher price level.

In a conventional economy, the government deficits will be added to the outstanding debt if it is not monetized or tax-financed. Consequently, a government deficit results in a higher price and, therefore, a higher inflation. In general, the negative impact of interest-financed debt in a conventional economy is a higher price and inflation. According to The Holy Qur-an, a predetermined interest (usury) is strictly prohibited as usury is not like trade. Furthermore, usury is unjust and giving it up results in prosperity. Consequently, we would expect predetermined interest rates to negatively impact the economy. In fact, Kia (2013b) finds interest rate, outstanding government debt and deficits result in a reduction of the stock price in the United States. We will also show that the existence of a predetermined interest rate results in a higher price level over the long run and higher inflation rate over the short run in the United States. Namely, a tight monetary policy has the same results. In other words, a predetermined interest rate creates injustice in the economy due to resulting higher price and inflation.

According to monetarists led by Milton Friedman, inflation is only a monetary phenomenon. When money supply increases, people have more money than they desire. They, consequently, spend the extra money. Since goods and services are constant the prices will go up. It is also possible for the consumers to be responsible for monetary expansion and inflation. This may happen if foreign remittances increase demand for goods and services without a corresponding increase in their supply.

In an Islamic framework, when there is no imported inflation, inflation should be zero. However, it should be mentioned that a very low inflation rate was experienced in early Islamic history. The main reason for such a rise in price levels was the influx of gold and silver. Furthermore, there were brief periods of rising prices due to an interruption in the supply in the third and fourth decades of the Islamic history. Another inflationary period was due to

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\(^1\) Iran operates under an Islamic system.

\(^2\) Al-Jahiz (776 AD in Basra, Iraq-868 AD in Basra), Taymiyyah (1263 AD in Haran, now in Eastern Turkey, near the border of northern Iraq-1328 AD in a Damascus jail) and Ibn Khaldun (1332 AD in Tunis-1406 AD in Cairo, Egypt) explained in one way or another how the movements of demand and supply cause the price level to go up and down, see Chapra (2008) for a more detailed explanation.

\(^3\) This rule is based on verses 275, 276, 278 and 279 of Chapter 2 and verse 130 of Chapter 3. Specifically, God says in 2:275: “Those who devour usury will not stand except as stand one whom the evil one by his touch hath driven to madness. That is because they say: "Trade is like usury," but God hath permitted trade and forbidden usury. Those who after receiving direction from their Lord, desist, shall be pardoned for the past; their case is for God (to judge); but those who repeat (the offence) are companions of the fire: They will abide therein (forever).” Furthermore, God says in 2:276 of The Holy Qur-an: “God will deprive usury of all blessing, but will give increase for deeds of charity: For He loveth not creatures ungrateful and wicked.” And God says in 2:278: “O ye who believe! Fear God, and give up what remains of your demand for usury, if ye are indeed believers”. And God says in 2:279: “If ye do it not, take notice of war from God and His Messenger. But if ye turn back, ye shall have your capital sums: Deal not unjustly, and ye shall not be dealt with unjustly.” Finally, God says in 3:130: “O ye who believe! Devour not usury, doubled and multiplied; but fear God that ye may (really) prosper.”
an excessive issue of currency (copper coins) known as fulus. For more on these historical periods see Siddiqi (1996) and references within.

It should be mentioned that even in an Islamic economic system a sudden rise in the aggregate demand, say, as a result of a rise in population or urbanization, can cause inflation. Prices can also go up as a result of deterioration in the value of the domestic currency. Inflation can also be imported as the value of imported goods or imported factors of production goes up.

According to Siddiqi (1996), there are four ‘built in stabilizers’ in an Islamic economic system which guarantee zero inflation or at least minimize its incidence. They include:

- Debt financing which is replaced by equity and share based financing.
- The existence of Zakat and the inheritance laws which affect the distribution of income in favour of a less fortunate population. Consequently, they influence the composition of the aggregate demand in such a way that it reduces the fluctuations in aggregate demand.
- The reduction in wasteful consumption and encouragement of moderate consumption. This will result in a decrease in the aggregate demand.
- Public money considered as trust by Islamic governments. Consequently, they must keep public expenditure within the bounds set by the available means. Public financing of government debt is very rare as predetermined interest rates do not exist and in case of financing debt/deficits the rate should be attached to the growth of the economy. The monetization of debt/deficits in an Islamic economic system is almost non-existent.

As mentioned above, one cause of inflation is the reduction in the aggregate supply in the economy. Given the technology, such a reduction can occur because of the reduction in the labour supply, the unavailability of productive land and the reduction in the supply of capital. Under Islamic laws, it is possible to have a sustained labour and capital supply as well as productive land. These laws can be divided into two groups: laws that are encouraged through the teaching of Islamic principles and laws which are enforced by the government.

Islam strongly encourages people to work4 which includes the following: (i) If a landlord leaves his lot unusable and lets the land deteriorate in its quality an Islamic government can take the land away from him. The reason behind this law is that land is an important and limited factor of production. (ii) A person cannot own an unutilized land without developing it. (iii) Those who discover natural resources (e.g., mines) are not allowed to leave these resources unused. (iv) The government cannot give more resources for utilization to a person than what that person can handle. (v) It is prohibited in Islam for a person to lease a property and then in turn that person rents or leases the same property at a higher price. In this way the middle man who is causing inflation is virtually eliminated. (vi) Since a predetermined interest rate is prohibited, funds should be used in productive activities under profit-loss agreements. It has been shown by Kia and Darrat (2007) that demand for profit-sharing money is more stable than any other demand for money. Furthermore, a predetermined interest rate will push cost schedule up and so it has a negative supply effect. However, under a profit-loss agreement, this supply effect does not exist because profit or loss is the residual of total income and cost. Consequently, it cannot affect output decision. (vii) Gambling, speculative and witchcraft activities which are considered a waste of resources as they do not add to any production.5 We can see Islamic laws clearly guarantee the flow of labour, productive land and capital. Therefore, the possibility of cost-push inflation is nil or very low.

We discussed above that one of the main causes of inflation is the predetermined interest rate. Furthermore, the government debt/deficit financing through interest payment is also another source of inflation. If, alternatively, a government finances its debt the Islamic way, i.e., the payment on the debt is based on the return of the fund in a productive activity or the growth rate of the economy, then such a debt results in a reduction in inflation rate, see Kia (2006a) whose estimation results for Iran proves this fact. In the next section, I will develop a price model for a large country which operates under a conventional economic system and estimate the model on US data.

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4 Working is equivalent to worshipping God. It is quoted that the Prophet of Islam kissed a hand of a tired worker and said it is compulsory for any Muslim, man or woman, to work and earn halal (lawful) income. For such people the doors of Paradise are open and God looks at them with mercy and never punish them. When the Prophet used to hear about someone who decided not to work and to stay at home the value of that person would fall in his eyes and he used to say a believer who does not have any profession sells his religion to live. For more sayings on the importance of working, see, e.g., Sader (1349).

5 The Holy Qur-an, Chapter 2, verse 188, “And eat not up your property among yourselves in vanity …”, explicitly discourages any wasteful use of resources. For more explanation on both groups of laws, see Sader (1349 and 1350).
3. Inflation in a conventional large country (United States) - The model

In this section I will develop a long-run monetary approach model of price level for a large country like the United States. Let us consider an economy with a single consumer, representing a large number of identical consumers. The consumer maximizes the following utility function:

$$E\left[ \sum_{t=0}^{\infty} \beta^t U(c_t, c^*_t, k_t, m_t) \right] = (1 - \alpha)^6 \left( c_t^{\alpha_1} c^*_t^{\alpha_2} \right)^{1-\alpha} + \xi (1 - \eta)^{-1} \left( m_t / k_t \right)^{\eta_1} \cdot \eta, \quad (1)$$

where $c_t$ and $c^*_t$ are single, non-storable, real domestic and foreign consumption goods, respectively. $m_t$ is the holdings of domestic real ($M/p$) cash balances, where $M$ is the nominal money and $p$ is the domestic price. $E$ is the expectation operator, and the discount factor satisfies $0 < \beta < 1$. Furthermore, $\alpha_1$, $\alpha_2$, $\alpha$, $\eta_1$, $\eta$ and $\xi$ are positive parameters. Following Kia (2013a) we assume the magnitude of $\alpha_1$, $\alpha_2$, and $\eta_1$ are all equal to one and $0.5 < \alpha < 1$ and $0.5 < \eta_1 < 1$.

Let us choose the units in such a way that the services of domestic money ($S$) is equal to $m$. Variable $k$ summarizes the risk associated with holding domestic currency. Let us assume over the long run:

$$\log(k_t) = k_0 \text{defgdp} + k_1 \text{debtgdp} + k_2 \text{fdgdp} + k_3 \text{ggdps}. \quad (2)$$

I assume for a large economy the short-run dynamics of the risk variable $[\log(k)]$ includes a set of interventional dummies which account for economic crises, policy regime changes and other exogenous shocks. Variables defgdp, debtgdp, fdgdp and ggdps are the government deficit, the government debt outstanding, the government foreign-financed debt and the government expenditure on goods and services all as a percentage of GDP, respectively. Following Kia (2013a) we assume government debt pays the same interest rate as deposits at the bank (i.e., $R$) and in a risky environment agents substitute real or interest-bearing assets for money. It is further assumed as the government deficit per GDP increases agents perceive higher future taxes, money supply (inflation) or outstanding debt per GDP. At the same time, the higher is the outstanding government debt relative to the size of the economy, the riskier the environment will be. Individuals may hold government bonds to bridge the gap between the future labor income and expenditures, including tax expenditures. It is also possible that a higher outstanding government bond or the size of the government results in a higher speculative demand for money. The reason is that in a conventional economy when, contrary to the Islamic system, the excessive speculative activities are allowed, a higher outstanding government bond leads to a lower price of bond (a higher interest rate) which by itself causes a higher demand for interest bearing money (saving accounts). Furthermore, as the demand for money goes up, the demand for goods and services falls which leads to a lower price level or inflation rate.

Consequently, we hypothesize constant coefficients $k_0 > 0$, $k_1 > 0$. Furthermore, let us follow Kia (2013a, p. 166) and assume “an increase in the amount of government debt held by foreign investors may be considered a cause for future devaluation of the domestic currency. Specifically, when a large amount of government-issued bonds is held by foreign investors there is always the risk that these investors decide to dump those bonds. This action would result in an increase in the supply of the country’s currency and so a devaluation of the currency. Consequently, the demand for domestic money may fall if a large portion of the government debt is financed externally, implying $k_3 > 0$."

Finally, as the government expenditure relative to the size of the economy increases (a higher ggdps), the government demand for money may increase. But at the same time there will be a higher expected future tax and/or deficit as well as outstanding debt. Therefore, there will be a riskier environment which may cause a lower demand for money and a higher demand for real assets or bonds. Consequently, the sign of $k_3$ is ambiguous and so is an empirical issue, i.e., $k_3 = ?$.

Given ggdps, defgdp, debtgdp and fdgdp, the consumer maximizes Equation (1) subject to the following budget constraint:

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6 It is assumed labor is supplied inelastically.

7 However, it should be mentioned that this utility is completely different from what was introduced by Kia (2013a). This utility is for a large country and contrary to Kia’s utility it has neither foreign currency nor real government expenditure as its components.
\[ \tau + y_t + (1 + \pi_t)^{-1} \text{ms}_t + (1 + \pi_t)^{-1} (1 + R_{t-1}) \text{dc}_t = c_t + p_t^i c_t^j/e_t \text{p}_t + m_t + d_t \quad (3) \]

where \( \tau \) is the real value of any lump-sum transfers/taxes received/paid by consumers, \( e_t \) is the nominal exchange rate, \( p_t^i \) and \( p_t \) are the foreign and domestic price levels of foreign and domestic goods, respectively, \( y_t \) is the current real endowment (income) received by the individual and \( d_t \) is the one-period real domestically financed government debt which pays \( R \) rate of return. Assume further that \( d_t \) is the only storable financial asset. We approximate \( p_t^i c_t^j/e_t \) as the real trade weighted US dollar index \( q_t \) real effective exchange rate hereafter which is defined as a trade weighted average of the foreign exchange value of the US dollar against the currencies of a broad group of major US trading partners.

Maximizing the preferences with respect to \( m_t, c_t, c_t^* \) and \( d_t \) and subject to budget constraint (3) for the given output and fiscal variables, will yield:

\[
\log(m_t) = m_t^0 + m_t i_t + m_2 \log(y_t) + m_3 \log(k_t) + m_4 \log(q_t), \quad (4)
\]

where, for simplicity, we assume the domestic real consumption \( (c_t) \) is some constant proportion \( (\omega) \) of the domestic real income \( (\gamma_t) \) and \( \omega = 1 \). In this equation,

\[
i_t = \log(R_t/1+ R_t), \text{ using } 0.5 < \alpha < 1 \text{ and } 0.5 < \eta < 1 \text{ we will have:}
\[
m_0 = -1/(1-2\gamma) \log(\pi_t^0) > 0, \quad m_1 = \eta(1-2\eta)^{-1} < 0, \quad m_2 = (1 - 2\eta)^{-1} (1 - 2\alpha) > 0, \quad m_3 = (1 - 2\eta)^{-1} \{(\eta-1) - \eta(1-\alpha)\} < 0.
\]

Note that the coefficient of \( k \) is negative implying that the risk associated with holding money reduces demand for it. However, the impact of the components of \( k \) depends on the net impact of the demand for money and fixed income securities (bonds). A higher real effective exchange rate \( (k_t) \) results in a higher demand for goods and services and so, a higher price level. A higher interest-financed outstanding government debt leads to a higher speculative demand for money, rather than money to be used in a productive investment, resulting in a lower demand for goods and services and price. A higher government expenditure percentage of GDP is an empirical issue. Namely, it depends on the net impact of the demand for money and fixed income securities (bonds). A higher real effective exchange rate results in a lower demand for foreign products (imports) which in turn results in a higher demand for domestic goods and services. The latter demand leads to a higher domestic price level. In other words, since variable \( q \) is a weighted average of the foreign exchange value of the US dollar against the currencies of a broad group of major US trading partners, a higher \( q \) leads to a lower foreign competitiveness through higher relative import prices.

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8 The full derivation of Equation (4) is available upon request.
9 See The Holy Qur-an, 2:276, “God will deprive usury of all blessing”.
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It should be emphasized that the long-run Equation (6) is also subject to a short-run dynamics of the system which includes stationary variables representing crisis as well as policy regime changes and other exogenous factors that affect the system.

4. Empirical evidence

4.1. Long-run relationships

The model is estimated by using quarterly US data for the sample period 1973Q1-2011Q4. The choice of the period is based on the availability of the data. Some variables (e.g., the real trade weighted U.S. Dollar Index) are not available before 1973. All data are taken from the St. Louis Federal Reserve Database (FRED). Price ($p$) is the consumer price index, $M_s$ is M1 and $i (= \log(R_t/1 + R_t))$, where $R$ is the three-month Treasury Bill rate. Variable $y$ is the real GDP. Variables $\text{defgdp}$, $\text{debtgdp}$, $\text{fdgdp}$ and $\text{ggdp}$ are US federal government deficit, outstanding debt, foreign-financed federal debt and the government expenditure as a percentage of GDP, respectively.

The real effective exchange rate is the real trade weighted US dollar index (broad) which is the average of daily figures. The series is price adjusted. Broad currency index includes the Euro Area, Canada, Japan, Mexico, China, United Kingdom, Taiwan, Korea, Singapore, Hong Kong, Malaysia, Brazil, Switzerland, Thailand, Philippines, Australia, Indonesia, India, Israel, Saudi Arabia, Russia, Sweden, Argentina, Venezuela, Chile and Colombia. Note that as $q$ goes up the level of foreign competitiveness will increase.

To investigate the stationarity property of the variables, I used the Augmented Dickey-Fuller and non-parametric Phillips-Perron tests. Furthermore, to allow for the possibility of a break in intercept and slope, I also used tests developed by Lee and Strazicich (2003) (which was adjusted for four structural breaks), Perron (1997) and Zivot and Andrews (1992). According to the test results, all variables are integrated of degree one (non-stationary). It should, however, be noted that the inflation rate, according to the Phillips-Perron’s, Lee and Strazicich’s and Zivot and Andrews’ test results, is stationary while based on ADF test result it has a unit root. Furthermore, changes of variable debt as a percentage of GDP are stationary at only 90% level of significance according to Zivot and Andrews’ (1992) test result. For the sake of brevity, these results are not reported, but are available upon request. All data, when appropriate or when they are available only in a non-seasonal form are seasonally adjusted. All variables, when appropriate, are in billions of dollars.

The long-run estimation results are given in Table 1. Johansen-Juselius maximum likelihood estimation results are reported in the first and second panels. During the sample period the exogenous shock which could influence the short-run dynamics of the system is the financial crisis of 2007–2008, also known as the global financial crisis and 2008 financial crisis. Kia (2006b) shows constant models can have time-varying coefficients if a deeper set of constant parameters characterizes the data generation process. Furthermore, he showed that the estimated long-run relationship can be biased when the appropriate policy regime changes and/or other exogenous shocks are not incorporated in the short-run dynamics of the system.

I, consequently, included dummy variable uscrisis (equal to one for the period of 2007Q4 and 2009Q3 and zero, otherwise) in the short-run dynamics of the system. Consequently, I had to simulate the critical values of the Trace rank test. The critical values of the test statistics are calculated based on the length of the random walk of 400 with 2500 replications and using the Bartlett correction factor, the Trace test has been corrected for the small sample error; see Johansen (2000 and 2002). Based on the Trace test results, there are six cointegration relationships in space. According to the diagnostic test, there is no autocorrelation with the lag length of 5. However, the error is not normally distributed, but as Johansen (1995a) states, a departure from normality is not very serious in cointegration tests.
Since there are more than one cointegration relationship we need to identify each one. Namely, in order for the estimated coefficients of cointegrating equations to be, in fact, economically meaningful, identifying restrictions must be imposed to ensure the uniqueness of both short- and long-run parameters in the cointegrating relationships. Following, e.g., Johansen and Juselius (1994 and 1991) and Johansen (1995b), we can test for the

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25
existence of possible economic hypotheses among the cointegrating vectors in the system. Many different identification restrictions were imposed. The final identified equations are reported in the second panel of Table 1. Although according to Chi squared result the restrictions are rejected but generic identification (which is related to the linear statistical model and requires the rank condition) is satisfied. Furthermore, both empirical and economic identifications are satisfied.

Figure 1: Recursive Likelihood Ratio Tests*

Test for Constancy of the Log-Likelihood

Figure 2: Test for Constancy of the Parameters of the Model*

Test of Beta Constancy

*X(t) = the actual disequilibrium as a function of all short-run dynamics and the dummy variable.
R1(t) = the “clean” disequilibrium that corrects for short-run effects.

* See footnote of Figure 1.
Figure 3: Test for the Hypothesis that Betas of Each Sub-Period Equal to Betas of the Entire Sample of Model *

Test of Beta(t) = 'Known Beta'

* See footnote of Figure 1.

Figure 4: Constancy Tests for the Betas of Identified Equations

Beta 1 (R1-model)

Beta 2 (R1-model)
As figures 1 to 4 show all tests and coefficients are stable. Note that all recursive tests are normalized by the 5% critical value implying that calculated statistics that exceed unity reject of the null hypothesis and suggest unstable cointegrating vectors. The curve \( X(t) \) plots the actual disequilibrium as a function of all short-run dynamics including the dummy variable, while the \( R1(t) \) curve plots the “clean” disequilibrium that corrects for short-run effects. The first 23 years were held up for the initial estimation. As these figures show, all coefficients appear stable over the long run and the LR tests are also stable when the models are corrected for short-run effects.

Having established that both tests and coefficients are stable we will interpret the identified equations. The first equation resembles the long-run price function which is a restricted form of Equation (6). All coefficients are statistically significant and except the coefficients of income and the government foreign-financed debt, have the correct sign. Consequently, as interest rate goes up we have a higher price over the long run\(^{11}\). This result confirms Kia’s (2010) finding for Turkey which operates under a conventional economy. A higher income in US results in a higher price level over the long run which also confirms Kia’s finding for Turkey. In contrast Kia (2006a) finds a higher income in a small country (i.e., Iran) which operates under an Islamic system results in a lower price over the long run.

A higher interest-financed debt, as the estimated coefficient of \( \text{debtgdp} \) indicates, results in a higher speculative demand for money. Namely, instead of being used in a productive investment, money is kept for speculation purposes. Everything else being constant, demand for money goes up (demand for goods and services falls) in order to be used for buying bonds when their prices will fall, i.e., a wasteful speculative activity.\(^{12}\) The impact will be a lower price. This result contradicts Kia’s (2010) finding for a small country like Turkey. The negative estimated coefficient of the foreign-financed debt implies that an increase in this variable in US, similar to Kia’s findings for Turkey and Iran, results in a lower price level. According to the estimated coefficient of \( \text{lq} \), a higher effective real exchange rate in US (a lower foreign competitiveness) results in a higher price level over the long run. This result confirms Kia’s (2006a) finding for Iran, but contradicts Kia’s (2010) finding for Turkey.\(^{13}\)

In sum, the impact of income on the price level in both large and small countries which operate under a conventional economic system is positive, but it is negative in a country which operates under an Islamic economic system. The foreign-financed debt results in a higher price in a country which operates under an Islamic economic system, but it does the opposite in countries which operate under a conventional economic system.\(^{14}\)

There are three identified equations for the real effective exchange rate among these equations. All three equations are generically and empirically identified. However, only one of them is economically identified. In

\(^{11}\) This supports the Islamic view that usury will be deprived of all blessing (The Holy Qur-an, 2:276).

\(^{12}\) In general, in Islam any hoarding for speculative activity is prohibited.

\(^{13}\) Note that the nominal exchange rate was used for Iran and the real exchange rate was used for Turkey.

\(^{14}\) Note that since different variables are used for measuring foreign competitiveness in these countries we cannot accurately compare its impact on the price level in countries under conventional and Islamic economic systems. The impact of government expenditure, foreign interest rate and deficit cannot be compared between two economic systems. This is because these variables either are not included in all three price equations or are restricted in the estimation of the price level in the US.
the first equation (the second equation in Panel 2 of Table 1), except for the coefficient of deffgdp and intercept, all other coefficients are statistically insignificant. The estimated coefficient of deficit as a percentage of GDP is positive, but has a wrong sign. The reason is that as deficit per GDP increases we would expect that the demand for money falls, which would result in a higher price level. A higher price level should be associated with a lower and not a higher real effective exchange rate. Consequently, this equation is not economically identified.

All coefficients in the second identified equation for lq are statistically significant. See the fourth identified equation in the second panel. The estimated coefficient of money supply is negative indicating that a higher money supply will increase the domestic price and, therefore, will reduce the real effective exchange rate. The estimated coefficient of debt per GDP is negative. This result confirms the negative speculative effect of this variable on the price level, which results in an increase in the real effective exchange rate. This is also true for the estimated coefficient of foreign-financed debt, see the first equation in the panel for these coefficients. Consequently, this equation is generically, empirically and economically identified. Finally, the last identified lq equation (sixth equation in the panel) is not economically identified. That is, the estimated coefficient of interest rate, which is positive and statistically significant, has a wrong sign. The reason is that as i goes up demand for the $US will go up leading to a higher nominal exchange rate. Furthermore, such an increase leads to a higher price, see the price equation. Both of these effects should cause lq to fall and not to increase. However, this equation is generically and empirically identified.

The third equation in the panel resembles the long run aggregate supply. The positive and statistically significant estimated coefficient of lq justifies the price equation (the first equation in the panel) or Equation (6). Finally, noting that Ms = M, the fifth equation in this panel resembles demand for money. However, the estimated coefficient of interest rate is weakly statistically significant. All other estimated coefficients are statistically significant. This equation is an estimated restricted equation (p=0) of Equation (5) where all estimated coefficients justify this equation. The third panel in Table 1 reports Fully Modified Least Squares results. All estimated coefficients, except the coefficient of deffgdp, confirm the estimated price equation in Panel 2. In fact, according to the Chi-Squared result, Column 2 in Panel 3, we cannot reject the null hypothesis that the coefficient of money supply is one. This result further justifies Equation (5).

The slight differences between two long-run estimated results for the price equation (reported in panels two and three) are that the Maximum Likelihood estimation result is a system of structural identified equations rather than a single equation. Furthermore, we needed to impose some restrictions to make the price equation identified in the Johansen-Juselius Maximum Likelihood estimation technique.

4.2. Short-run dynamic model

Table 2 reports the parsimonious estimation of the final error correction model (ECM) that is implied by the cointegrating vector on the basis of Hendry’s General-to-Specific approach. I allowed a lag profile of eight quarters at the original ECM. To calculate the error correction term, I used the cointegrating vector estimated by Fully Modified Least Squares, reported in Panel 3 of Table 1. This result fully reflects the price model [Equation(6)]. Following Granger (1986), we should note that if small equilibrium errors can be ignored, while reacting substantially to large ones, the error correcting equation is non linear. I, therefore, incorporated all possible kinds of non linear specifications, i.e., squared, cubed and fourth powered of the equilibrium errors (with statistically significant coefficients) as well as the products of those significant equilibrium errors.

Assuming government spending and foreign-financed debt as a percentage of GDP as well as money supply variables are exogenous over the short run, we will have five endogenous variables in the system. But for the sake of brevity, I only report the ECM of the price level. However, the full estimation results of all these ECMs will be used to analyze the unanticipated shocks in endogenous variables using impulse response functions. In Table 2, Δ denotes a first difference operator and ECS, $R^2$, σ and DW, respectively, denote the squared of error correction term from the long-run equation for the price level (which was the only statistically significant EC term), the adjusted squared multiple correlation coefficient, the residual standard deviation and the Durbin-Watson statistics, respectively. White is White’s (1980) general test for heteroskedasticity, ARCH is the five-order Engle’s (1982) test, Godfrey is the five-order Godfrey’s (1978) test, REST is Ramsey’s (1969) misspecification test, Normality is Jarque-Bera’s (1987) normality statistics, Lc is Hansen’s (1992) stability test for the null hypothesis that the estimated i\textsuperscript{th} coefficient or variance of the error term is constant and Lc is Hansen’s stability test for the null hypothesis that the estimated coefficients as well as the error variance are jointly constant.
Table 2*: Error Correction Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>p-value for Hansen’s (1992) stability L_i test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.15</td>
<td>0.06</td>
<td>0.43</td>
</tr>
<tr>
<td>Δlp_t-1</td>
<td>0.50</td>
<td>0.06</td>
<td>0.38</td>
</tr>
<tr>
<td>Δlp_t-2</td>
<td>0.38</td>
<td>0.06</td>
<td>0.76</td>
</tr>
<tr>
<td>ΔIM_{t-1}</td>
<td>5.30</td>
<td>2.29</td>
<td>0.47</td>
</tr>
<tr>
<td>Δi_t-2</td>
<td>0.20</td>
<td>0.04</td>
<td>0.10</td>
</tr>
<tr>
<td>Δfdgdp_{t-7}</td>
<td>0.15</td>
<td>0.06</td>
<td>0.51</td>
</tr>
<tr>
<td>Δlq_{t-2}</td>
<td>-3.81</td>
<td>1.02</td>
<td>0.09</td>
</tr>
<tr>
<td>ECS_t-1</td>
<td>-41.87</td>
<td>11.61</td>
<td>0.41</td>
</tr>
<tr>
<td>D8602</td>
<td>-1.50</td>
<td>0.09</td>
<td>0.20</td>
</tr>
<tr>
<td>D0804</td>
<td>-3.72</td>
<td>0.04</td>
<td>0.92</td>
</tr>
<tr>
<td>D0604</td>
<td>-1.38</td>
<td>0.01</td>
<td>To avoid nonsingular matrix the dependent variable was adjusted for this dummy variable.</td>
</tr>
</tbody>
</table>

Hansen’s (1992) stability L_i test on the variance = 1.10

Joint (coefficients and the error variance) Hansen’s (1992) stability L_c test = 3.62

Normality, Jarque-Bera = 3.01

*p-value = 0.00  
*p-value = 0.00  
*p-value = 0.22

* The sample period is 1973Q1-2011Q4. Mean of dependent variable=1.10. Δ means the first difference, Δi is the change in log[R/(1+R)], Δlp is the change in the log of CPI and Δlq is the change in the log of effective real exchange rate, Δfdgdp is the change in the log of foreign financed debt per GDP and ΔIMs is the change in the log of money supply (M1). ECS is the squared of error correction term generated from the long-run price determination of the fully modified model. (See Table 1.) Dummy variables D8602, D0604 and D0804 are equal to one for 1986:02, 2006:04 and 2008:04 respectively, and zero otherwise. These dummy variables are included in order to eliminate the outliers in the residuals. The estimation method is Newey and West’s (1987) Robusterror Ordinary Least Squared. R² = 0.81, σ = 0.37, DW = 1.86, Godfrey(5) = 0.57 (significance level = 0.75), White = 53.64 (significance level = 0.98), ARCH(5) = 11.92 (significance level = 0.04), RESET = 0.30 (significance level = 0.82) and Normality, χ² = 3.01 (significance level = 0.22). Note that R², σ and DW, respectively, denote the adjusted squared multiple correlation coefficient, the residual standard deviation, and the Durbin-Watson statistic. White is White’s (1980) general test for heteroskedasticity, ARCH is five-order Engle’s (1982) test, Godfrey is five-order Godfrey’s (1978) test, RESET is Ramsey’s (1969) misspecification test, Normality is Jarque and Bera’s (1987) normality statistics, L_i is Hansen’s (1992) stability test for the null hypothesis that the estimated coefficient or variance of the error term is constant and L_c is Hansen’s (1992) stability test for the null hypothesis that the estimated coefficients as well as the error variance are jointly constant.

Dummy variables D8602, D0604 and D0804 are equal to one for 1986:02, 2006:04 and 2008:04 respectively, and zero otherwise. These dummy variables are included in order to eliminate the outliers in the residuals. According to the Engle’s (1982) ARCH test result, the error is heteroskedastic. Consequently, the estimation method is Newey and West’s (1987) Robusterror Ordinary Least Squared. Otherwise, none of these diagnostic checks is significant. Based on Hansen’s stability test results, all of the coefficients individually are stable. However, because the error is heteroskedastic, the variance of the estimate is not stable and the stability test result for the joint test is significant.

I also included the dummy variable uscrisis as well as a linear time trend in the EC model. But none of these variables was statistically significant and so they were dropped in the parsimonious estimation result reported in Table 2. According to these results, the estimated coefficient of the error-correction term is negative and statistically significant. Interestingly, the impact of the equilibrium error is non-linear implying that agents may ignore the small deviation from the equilibrium in goods and services markets, but react drastically to a large
equilibrium error. According to the error-correction estimation result reported in Table 3 of Kia (2010), this result confirms his finding for Turkey. However, according to the error-correction estimation result reported in Table (2) of Kia (2006a), the error-correction term is linear, implying that under an Islamic economic system market participants react to any deviation from equilibrium.

Apparently, except for foreign-financed debt management variable fdgdp, none of the fiscal variables has any impact, over the short run, on the inflation rate in the United States. The estimated coefficient of this variable is positive and influences inflation after seven quarters. This result confirms Kia’s (2006a) finding, but in the Islamic economic system of Iran the positive impact of the change in foreign-financed debt per GDP on inflation is within two quarters and it is drastic during the continuous sanction period, see Table 2 of this paper. Interestingly, the change in deficit per GDP while it does not have any statistically significant impact on the inflation over the short run in US and Turkey has a negative impact on inflation in Iran.

The estimated coefficients of the lagged inflation rate in the US are positive and statistically significant for two quarters, implying that the inflation rate is persistent over the short run, see Table 2. As it is expected the change in the interest rate increases the inflation rate after two quarters over the short run which contradicts the result for the small economy of Turkey. The estimated coefficient of the growth of money supply is positive implying that an increase in money supply leads to a higher inflation rate even over the short run. The estimated coefficient of the growth of the real effective exchange rate is negative and it is significant only after two quarters. This result is the opposite of what the model predicts over the long run. It seems as the growth rate of the foreign price goes up or the growth rate of the value of the US dollar falls, the inflation rate in the United States will fall. In other words, as the growth of \( q \) goes up (foreign competitiveness falls) domestic inflation will fall.15 A potential explanation for this result is that, everything else being constant, in such cases it is worth to produce more internally than import foreign products and so the change in supply over the short run will be more than the change in the demand. Consequently, the price would fall as the real effective exchange rate goes up. This result also means the foreign competition has played an important role in accounting for the behavior of inflation rate in the US.

In sum, market participants in a small country which operates under an Islamic economic system react to any deviation from equilibrium, but it is not true for a large country like US. Furthermore, the impact of the change in the foreign-financed debt per GDP on inflation rate is the same in a large or a small country irrespective of their economic system, conventional or Islamic.

5. Controlling inflation

As mentioned by Zaman (1993), the Islamic economic system completely disapproves of sharp fluctuations in prices. As he indicates (pp. 27-28), “Some scholars interpret such Qur’\( \text{'nic \)verses as: ‘But observe the measure strictly; and do not fall short thereof,’ (55:9) and ‘… weigh with true balance’ (26:182) to mean that government should strive to stabilize consumer prices since inflation as such is undesirable in Islam.” According to the Islamic law (Shariah) and as the Prophet of Islam has said, people should neither suffer nor cause any harm and damage. Consequently, it is the responsibility of the government to control inflation.

Fiscal policy can be effectively used to control inflation. A reduction in the government expenditure leads to a left and downward shift in the aggregate demand. For a given aggregate supply this results in a reduction in price level. Therefore, a government downsizing reduces the inflation rate. Another way to reduce the inflation rate is to increase taxes. Fiscal policy can also affect the aggregate supply. For example, a reduction in or the elimination of distorted taxes will result in an increase in the aggregate supply and a reduction in the price level. Furthermore, allocating the government expenditure to mostly infrastructural investment leads to a rightward shift in the aggregate supply and a reduction in the price level.

Monetary policy can also effectively be used to reduce inflation in a conventional economic system. In this system the central bank lends interest-bearing funds to the banking system. The banking system in turn provides interest-bearing loans to the agents in the economy. In this way, the banking system increases the money supply. Note that only a small

fraction of these loans is directed towards the production of goods and services. The rest is used mostly for consumer credits, speculative activities, etc. which only contribute to inflation [Shakespeare (2006)].

In an Islamic economic system, money supply is purely endogenous and is generated by some interest-free loans of the central bank to the banking system. The banking system loans the fund to economic agents based on profit-risk sharing agreements. Consequently, the loans are directed towards the production of goods and services in such a way to ensure the investment can pay for itself. The loans eventually are paid back to the central bank. In this way it is ensured that productive assets always back a society’s currency. There are two important characteristics for these loans. First, they can grow without any limitation, and second Islamic loans issued by the central bank are not only non-inflationary over time, but are counter-inflationary [Shakespeare (2006)].

Income policy is another way to control inflation. This policy entails the intervention of government to control wage rates and prices as well as profits. This policy must be accompanied by sufficiently restrictive demand policies. Otherwise, it fails. Even a restrictive expenditure policy must be accompanied by an income policy in order to work. An income policy reduces the transition period of high expected inflation to low expected inflation.

What remedy in an Islamic system is possible if inflation cannot be avoided, e.g., if it is imported or if it is the result of continuous currency deterioration? One possible solution is the indexation of financial assets. However, not all Islamic scholars support the idea. Scholars who favour the indexation refer to the Qur-anic verses “And give full measure and weigh with justice” (17:35) and “diminishing the goods of others” (7:85) to prove their point. Money loses its real value as a result of inflation and if loans are indexed to ex-post inflation rate the lenders get full measure and weigh with justice. Consequently, indexation conforms to the spirit of the Islamic law. Furthermore, the advocates of indexation refer to the Qur-anic verse “O ye who believe! Fulfil your undertaking” (5:1). Since inflation results in a reduction of purchasing power of money the borrowers violate the letter and spirit of the contract by not paying the same quantum of purchasing power which they have borrowed. Indexation, however, safeguards both the letter and the spirit of the contract. With indexation the interests of both lenders and borrowers are protected and so the spirit of the Qur-anic law “Wrong not and be not wronged” (2:281) will be satisfied [Zaman (1993)].

Zaman also provides a full and comprehensive summary of the arguments against indexation. I will briefly cover these arguments. The scholars who are against indexation, argue, e.g., that the indexation may harm the public. For example, when government bonds are indexed there should be an increase in taxes in order to finance the cost of indexation. This will hurt the general public. One may not agree with this argument as the government loans may also have returns, which, in an Islamic system, are based on the profit from productive activities or simply the growth of the economy. Government should resort to taxes to pay for these loans. An Islamic government does not borrow money to use it in wasteful activities. It borrows for the infrastructural investment or other welfare-increasing expenditures. Therefore, such a taxation to pay for the loans or their returns including indexation is justified.

Those scholars also argue that indexation can be complete if it also incorporates deflation, i.e., when the prices fall the lenders accept a lower amount at maturity since now the purchasing power of money is more than what it was at the time of the contract. They argue that the Consumer Price Index (CPI) is not a perfect index and may cause a misleading indexation. Furthermore, they claim the CPI or other price indices are based on periodical averages and can never be precisely factual and fair. The reason is that the activities of savings, lending, depositing and redemption are part of everyday life. The CPI, which is based on the prices of goods and services that a typical individual consumes during a year, may not reflect items that were saved for. Therefore, the indexation based on the CPI is unfair. Note that, during an inflationary period, prices of most goods and services go up, though not in the same proportion. The CPI or other price indices are approximations for the changes in prices. In fact, the CPI is a relatively good approximation for the overall price. There are also other weak arguments against the indexation which I do not cover, but the interested readers can refer to Zaman (1993, pp. 46–48).

In a conventional economic system, one way to fight inflation is to increase unemployment, i.e., there is a trade-off between unemployment and inflation rates (the so-called Phillips curve). However, even the existence of such a trade-off is questionable as it is possible when we fight inflation we may cause the curve to move outward, i.e., a period of stagflation. In an Islamic system, both unemployment and inflation are undesirable. In such a system, the policy makers should fight both inflation and unemployment.
6. Unanticipated shocks

In a pure Islamic system, no endogenous unanticipated shock can occur if the Islamic economic law is followed precisely. The reason is that since the government and the majority of people are supposed to follow the exact law no uncertainty exists. As we saw so far in this paper all predictions of Islam are feasible in a conventional, both small and large economies. In this section I analyze the impact of unanticipated shocks on the price level in the United States.

The estimated coefficients of all ECMs were used to analyze the impact of unanticipated shocks (impulse responses) in domestic factors on the inflation rate. The Choleski factor is used to normalize the system so that the transformed innovation covariance matrix is diagonal. This allows us to consider experiments in which any variable is independently shocked. The conclusions are potentially sensitive to the ordering (or normalization) of the variables. As one would expect, part of a shock in the government expenditures is contemporaneously correlated to a shock in deficits, debt financing and the outstanding debt which by themselves are correlated to a shock in the money supply, the interest rate, the real exchange rate, GDP and the price level. Consequently, let us propose the ordering of ggdp, defgdp, debtgdp, fdgdp, IMs, i, ly, lq and lp. By ordering the price level last, the identifying restriction is that the other variables do not respond contemporaneously to a shock to the price level. Note that this ordering is not critical in the analysis as no particular theory or empirical evidence conflicts with the logic of the proposed ordering.

We will run the VAR, with five lags (the lag length of the cointegration equations, see Table 1), in the error-correction form. The impulse response functions reflect the implied response of the levels. The deterministic variable, uscrisis, which accounts for exogenous shock is included as an exogenous variable. Let us follow Lütkepohl and Reimers (1992) and assume a one-time impulse on a variable is transitory if the variable returns to its previous equilibrium value after some periods. If it settles at a different equilibrium value, the effect is called permanent. Since neither the coefficients of VAR are known with certainty nor their responses to shocks, in computing confidence bands, the Monte Carlo simulation is used. The number of Monte Carlo draws is 1000.

In Figure 5, plots A to I depict the impulse responses of the price level to a shock in the government expenditure, deficits, debt and foreign-financed debt, all as a percentage of GDP, as well as money supply, interest rate, real GPP, real effective exchange rate and the price level, respectively. As we can see all responses are within the confidence band.

![Figure 5: Impulse Responses of Domestic Price to a Shock to Other Variables Plot A](image-url)
Plot B
Responses to Deficits as a Percentage of GDP

Plot C
Responses to Debt as a Percentage of GDP

Plot D
Responses to Foreign-Financed Debt as a Percentage of GDP
Note that all plots in Figure 5 show the normalized responses of a shock. The normalization has been done by dividing the response by its innovation variance. This allows all the responses to a shock to be plotted on a single scale. According to plots A to D, the fiscal policy shock can be both deflationary and inflationary. As plots A and C demonstrate, a one standard deviation shock to government expenditure and debt, both as a percentage of GDP, result in a permanent fall in the price level. But a one standard deviation rise in deficits and foreign-financed debt is inflationary and permanent (plots B and D).

Shocks to monetary policy are inflationary and permanent (Plot E) and temporary (Plot F). An unanticipated shock to real GDP is also inflationary and permanent, (Plot G). As Plot H demonstrates an unanticipated shock to real effective exchange rate is deflationary and permanent. Finally, a one unit standard deviation shock about 0.003 units to price level leads to its increase permanently by 0.02 units at the 24th quarter (Plot I).

We analyze variance decompositions for various time horizons in order to investigate whether fiscal, monetary and other shocks have played much of a role in accounting for movements in the price level. Table 3 reports variance decompositions for various time horizons. Each row shows the fraction of the t-step ahead of forecast error variance for the price level that is attributed to shocks to the column variables. According to these results, except money supply shock and price level itself, none of the other variable shocks account for a significant percentage of the price forecast error variance at all horizons.
Table 3*: Decomposition of Variance for the Log of Price

<table>
<thead>
<tr>
<th>Period (Quarters)</th>
<th>Shock to:</th>
<th>ggdp</th>
<th>defgdp</th>
<th>debtgdp</th>
<th>fdgdp</th>
<th>IMs</th>
<th>i</th>
<th>ly</th>
<th>lq</th>
<th>lp</th>
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<tr>
<td>1</td>
<td></td>
<td>0.57</td>
<td>0.00</td>
<td>1.00</td>
<td>0.07</td>
<td>0.03</td>
<td>1.34</td>
<td>0.07</td>
<td>1.81</td>
<td>95.11</td>
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<tr>
<td>4</td>
<td></td>
<td>8.17</td>
<td>0.35</td>
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<td>0.50</td>
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<td>5.08</td>
<td>0.01</td>
<td>0.58</td>
<td>76.86</td>
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<tr>
<td>12</td>
<td></td>
<td>14.53</td>
<td>0.06</td>
<td>5.08</td>
<td>2.21</td>
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<tr>
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<td>2.45</td>
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<td>3.27</td>
<td>4.45</td>
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<td>0.31</td>
<td>4.14</td>
<td>4.29</td>
<td>50.25</td>
</tr>
</tbody>
</table>

* See footnote of Table 1 for the definition of mnemonics.

For instance, after three years, money supply shock accounts for 15.53% of the price forecast error variance. This rises to 24.39% after six years. Interestingly, almost half of the price forecast error variance is due to innovations in itself up to three years, but the price forecast error variance will continue to fall to about 50% after six years.

7. Conclusions

This paper reviews inflation from both a conventional and an Islamic economic system point of view. Furthermore, it develops a price model for a large country which operates under a conventional economic system. The model is estimated on US data for the period 1973Q1-2011Q4. The Islamic economic system, similar to the conventional economic system, completely disapproves of sharp fluctuations in prices. In fact, in the absence of imported or other exogenous inflation, the change in the price level should be zero. The system of zero predetermined interest rate where the debt is financed according to an equity-based system with many other Islamic laws guarantees an economy with a zero inflation rate.

It was found that a pre-determined interest rate has a positive impact on price level and inflation both over the long and short run periods in a large country which operates under a conventional economic system. Interest-financed debt in the US leads to a higher speculative demand for money and causes unproductive investment. Following Islamic laws, there should be a flow of labour supply and productive capital. Consequently, in the absence of a natural disaster, in an Islamic system, there is no reason the aggregate supply be affected negatively by the shortages of the factors of production, and so there will be a possibility of inflation.

In the case of uncontrollable inflation and the absence of predetermined interest rate, the indexation of debt could be a just solution for both lenders and borrowers. However, we discussed the arguments in favour of and against the indexation of financial assets. Finally, it should be mentioned that under an Islamic economic system both inflation and unemployment are undesirable. So, in contrast with the conventional economic system, the idea of creating an environment of high unemployment in order to fight against inflation goes completely against the spirit of Islam.

References


