DYNAMICS OF INFLATION DETERMINANTS UNDER DUAL MONETARY SYSTEMS: EMPIRICAL EVIDENCES FROM INDONESIA AND MALAYSIA

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ABSTRACT

Achieving monetary stability is a primary goal promoted by monetary authority, including through reaching low and stable the rate of inflation. Indonesia and Malaysia are the two countries which have been implementing dual monetary system where conventional and Islamic system running side by side. Due to inflation is always a monetary phenomena, it is interesting to look at some determinants which generate the rate of inflation. The paper attempts to investigate which variables, either individually or accumulately, form the inflation in the both countries. Subsequently, which system is more stable in terms of generating inflation rate in both countries?. The paper employs several monetary variables which proxy of conventional and Islamic group spanning from January 2012 till April 2015. By using vector autoregressive (VAR) approach, the results reveal that inflation generating under conventional system is unstable compared to Islamic system due to an inherent instability of interest rate and fractional reserve banking in both countries. Moreover, the Islamic monetary system can reduce the generated inflation in both countries around 25-50% if was practically implemented. Therefore, continous effort in terms of establishing institutional and instrumental arrangements should be gradually developed to further accomodate and enhance the effectiveness of monetary policy particularly in curbing inflation rate under dual monetary systems.

ABSTRAK

Mencapai stabilitas moneter adalah tujuan utama otoritas moneter dalam suatu negara, termasuk dengan mencapai tingkat inflasi yang rendah dan stabil. Indonesia dan Malaysia adalah dua negara yang telah menerapkan sistem moneter ganda di mana sistem konvensional dan sistem syariah berjalan berdampingan. Inflasi merupakan fenomena moneter, maka hal tersebut menarik untuk melihat beberapa faktor penentu yang menentukan tingkat inflasi. Paper ini mencoba untuk menyelidiki variabel, baik secara individu atau akumulatif yang akan menentukan tingkat inflasi di kedua negara tersebut . Selanjutnya, manakah sistem yang lebih stabil dalam hal menentukan tingkat inflasi di kedua negara tersebut ?. Makalah ini menggunakan beberapa variabel moneter yang mempengaruhi kelompok konvensional dan syariah mulai dari Januari 2012 sampai April 2015. Dengan menggunakan pendekatan vektor autoregressive (VAR), hasil menunjukkan bahwa inflasi di sistem moneter konvensional tidak stabil dibandingkan dengan sistem moneter Islam dikarenakan fluktuasi tingkat suku bunga dan fractional reserve banking di kedua negara tersebut. Selain itu,apabila kedua negara tersebut menerapkan sistem moneter Islam ,maka dapat mengurangi tingkat inflasi sekitar 25-50% . Oleh karena itu, diperlukan upaya yang berkelanjutan dalam hal pengembangan pengaturan kelembagaan dan instrumental secara bertahap sehingga meningkatkan efektivitas kebijakan moneter, terutama dalam mengendalikan laju inflasi di bawah dual sistem moneter.

Kata Kunci:
Inflasi, Sistem Moneter Ganda, Indonesia, dan Malaysia

INTRODUCTION

Ensuring low and stable price environment has been one of the major macroeconomic objectives in most economy throughout the globe. Indeed, a stable price environment is an indication of a healthy economy as it provides an optimum environment for creation of real economic activity. In a stable price environment, economic agents are able to plan ahead in major economic decisions, let it be in investment, consumption, or production activities. Thus, understanding factors determining inflation is highly relevant and is the hallmark for effective macroeconomic stabilization policies.

Following the global financial crisis in 1997/1998, the Malaysian government had instituted various macroeconomic stabilization policies. Apart from introducing two rescue packages of fiscal stimuli totaling RM67 billion (US$18.1 billion), the government had also strived to retain the inflation under control. However, in view of the increasing energy prices, inflationary pressure has been increasing since 2008. Despite the rising inflation rate, Bank Negara Malaysia (BNM) had tried to maintain the interest rate unchanged at 3.5% until late-2008 to support the economic activities. At all times, BNM had been vigilant towards inflationary threats as the impact of inflation could be damaging to the real economy. The table below shows that inflation rate in Malaysia had been relatively stable in general. It peaked to roughly 8 percent during the global crisis and calmed down, even disinflation afterward. However, in the early 2011, inflation rate kept increasing.

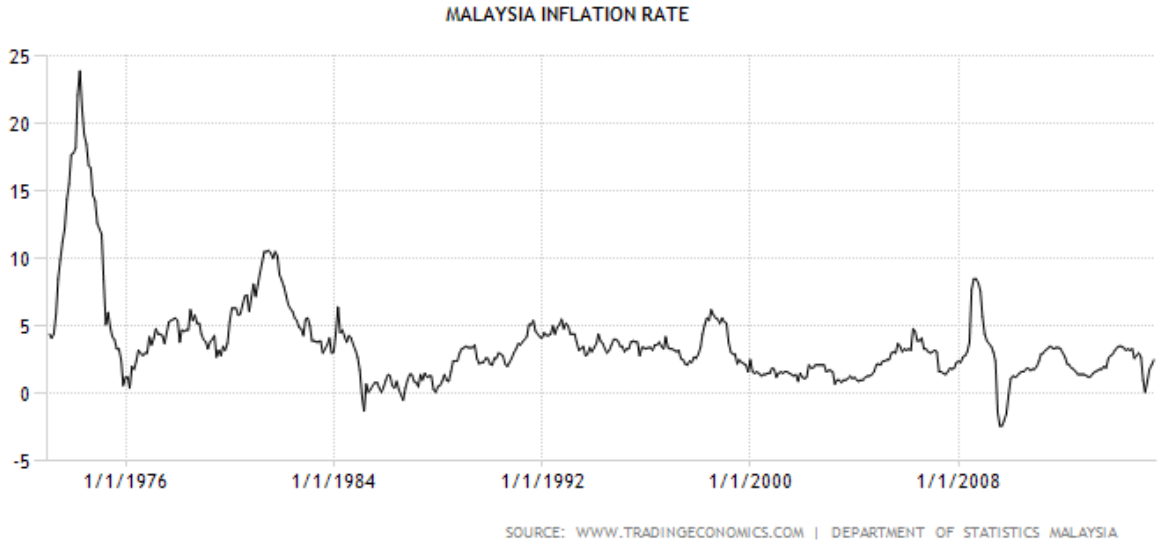

Figure 1. Malaysia Inflation Rate

Source: www.global-rate.com

Figure 1 shows an overview of historical inflation rate in Malaysia since 1973 until 2015. The inflation rate in Malaysia was recorded at 2.50% in June of 2015. Inflation rate in Malaysia averaged 3.68% from 1973 until 2015, reaching an all time high of 23.90% in March of 1974 and a record low of -2.40% in July of 2009.

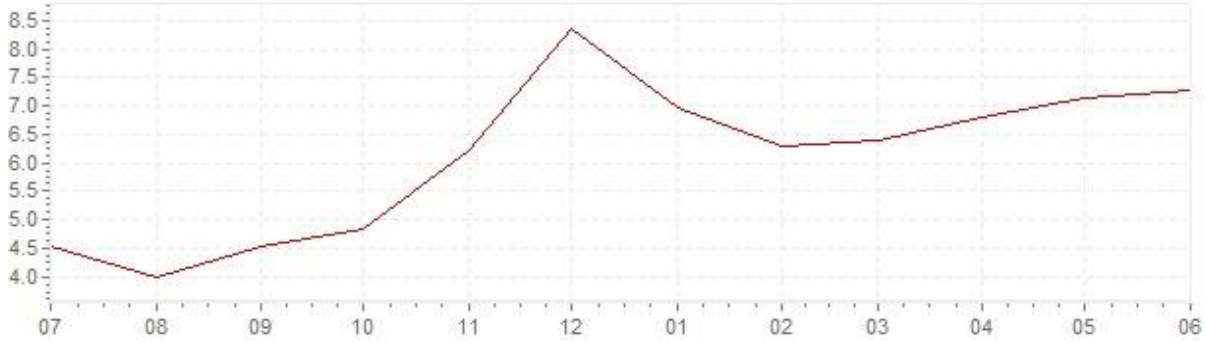

Figure 2. Current Inflation Indonesia (CPI) – Last 12 Months

Source: www.global-rate.com

Figure 2 features the overview of current Indonesian inflation over the last 12 months in monthly basis. The trend is increasing since July 2014, recorded 0.93% and reached its peak on December 2014, 2.46% mtm. Although it seems to decrease afterward, it showed an increased position till June 2015, roughly 0.54%.

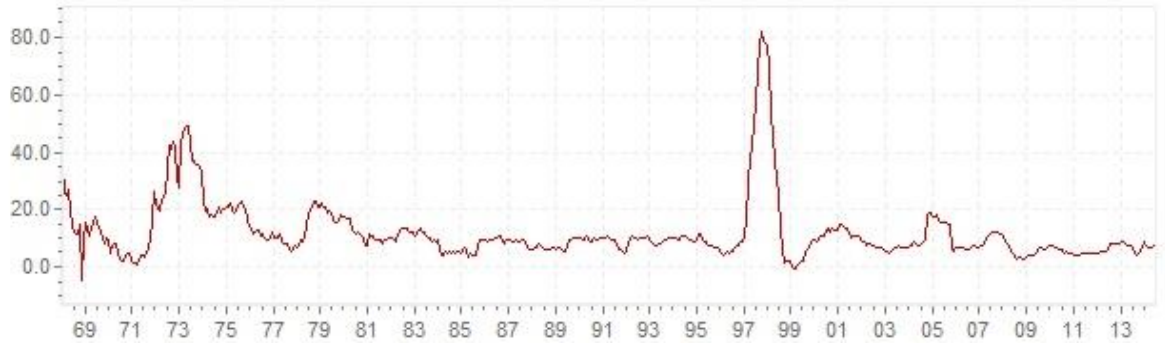

Figure 3.Historic CPI inflation Indonesia (yearly basis) – full term

Nevertheless, figure 3 shows the historic CPI inflation in Indonesia (yoy) since 1969 till 2013. The inflation rate in Indonesia was recorded at 7.26% in June of 2015. It averaged 11.22% from 1997 until 2015, reaching an all time high of 82.40% in September of 1998 and a record low of -1.17% in March of 2000. In general, the inflation rate in 2013 is no longer as high as during Asian Financial Crisis in 1997-1998. However, the monetary authority should be taking a close eye policy and strategy to overcome the potential shocks upon the rising inflation rates.

Monetary economists had maintained that “inflation is a monetary phenomenon”, suggesting that the fiat monetary system is always inflation-generating. Likewise, most economists tend to agree that the problem of inflation is the greatest problem faced by the market economy. Inflation may trigger crisis and recession if it was not cured precisely. To overcome the recent inflation tension, many countries are seriously implementing various types of anchoring policy such as monetary targeting, inflation targeting, interest targeting, and exchange rate targeting.

Theoretically, inflation can be assessed from two distinct paradigms, conventional and Islamic. From the conventional perspective, the causes of inflation can be cost push, demand pull, or rational expectation. Meanwhile, the Islamic paradigm stresses that inflation is a result of natural as well as artificial human error. The Islamic system proposes that inflation is not a system failure or planned deteriorating economic agenda, but more or less real turbulence or outside factors per se. In contrast, conventional system has the tendency to introduce instability by accumulating a fiat system, which is entrenched by fiat money, fractional reserve banking, and interest rate (Meera, 2006).

Malaysia and Indonesiaare countries which have been implementing a dual monetary system, in which conventional and Islamic systems are evolving side by side in the economic system. On that regard, Malaysia is exceptionally successful not only in maintaining a low inflation, but also in controlling inflation rate so that price stability, economic stability, justice and distributive property are indeed enjoyed fairly by the whole community. Meanwhile, Indonesia has been facing the flow of inflation turbulance due to external and structural factors. Therefore, the present study empirically analyzes the causes of inflation under the dual monetary system in Malaysia. By comparing the main determinants of inflation in conventional and Islamic economic systems, the study aims to identify the sources of inflation.

LITERATURE REVIEW

Theoretical Perspective of Inflation

Inflation is defined as a general increase in the level of prices of goods and services in an economy over a period of time. According to aggregate supply relation, inflation is a function of expected inflation and unemployment rate. Higher inflation expectations lead to higher nominal wages, which in turn, lead to higher price pressure. Hence, higher expected inflation leads to higher actual inflation. In addition, given expected inflation, the higher the markup chosen by firms or the higher the factors that affect wage determination, the higher the inflation. For a given expected inflation, there is an inverse relationship between unemployment and inflation, a relationship summarized by the Philip's curve. Such theory contends to argue that low inflation is a necessary pre-condition to achieve high employment, *vice versa*. However, some recent research document that the Philip's curve has failed to explain the relationship between unemployment and inflation, thus started questioning the existence of such a trade-off. In this regard, Friedman (in Blanchard, 1997) takes the stance that there is always a temporary trade-off between inflation and unemployment, but there is no permanent trade-off between the two. The temporary trade-off comes not from inflation per se, but from a rising rate of inflation.

In contrast, monetarists propose that the source of inflation is excessive money supply in the system. The Okun Law explains this by taking the relationship among money growth, inflation, and output growth, that given inflation, lower money growth implies a decrease in output growth. The decrease in output growth leads to an increase in unemployment rate. Accordingly, the relation between inflation and output growth can be explained in general by analyzing the dynamic movement in unemployment rate in the medium and long run. In the medium run, Okun (in Blanchard, 1997) assumes central bank can maintain a constant growth rate of nominal money, so that unemployment can also be constant. With constant money

growth, inflation is also constant and under control. Thus, it will be convenient to state inflation equals adjusted nominal money growth.

In other words, the output growth in the medium run can be set by manipulating the level of nominal money growth. However, such argument is opposed by Fisher (in Blanchard, 1997) which uses the quantity theory of money. By exercising such theory, the velocity of money is inclined to be constant in the long run since the broader definition of money itself has transformed into numerous shapes. Money in the current era is not limited only to monetary base or high powered money, but derivative money through bank accounts and financial markets. Thus, in the long run, money is neutral and anticipated, which implies that there is no effect on either output and unemployment, but merely reflecting one for one changes in the price level. Furthermore, due to constant velocity, the real sectors which are mainly relied upon financing will definetely fail to sustain. The process in which transmission mechanism of monetary policy will also remain unpowerful to affect the real economy, resulting in a deceleration in output. Such condition finally may create a direct relation between growth of nominal money supply and price level.

A major reflection of these theories suggests that the conventional sytem relies heavily on money supply and interest rate as main contributors for achieving economic stability. In this case, controlling manipulation and moral hazard inside the system are being a part of process in efforts to keep the economy on track. On contrary, the Islamic economic system emphasizes on the element of ethic into the system. Such element is further elaborated and conformed with the *shariah* law and religious tradition of Islam. Islamic monetary system defines inflation as a consistent and appreciable increase in prices due to natural causes (technical change, natural disaster) as well as due to artificial causes (hoarding, fraud, deception, price manipulation, and other related criminal activities) (Rab, 2002). From this perspective, inflation is not ascribed from the weakness of the system itself, but more on human error and natural events. In short, inflation is mainly triggered by imported or external factors. Natural disaster for instance, may create a condition in which foodstuffs and other crops have failed to be harvested. Assumed that the effective demand is unchanged, the low availability of output put an upward pressure on the price level. Beside natural factors, human error, namely corruption and bad administration, excessive taxes, and increase in circulation of *fulus* (a small domination currency made from copper or bronze) currency, are the main cause of inflation.

According to Chapra (1985), inflation implies that money is unable to serve as a just and honest unit of account. It impairs the efficiency of the monetary system and impose a welfare cost on society. Some losses emerges in the rise of inflation, including climate of uncertainty, discourages capital formation, and a misallocation of resources. Hence, inflation is thus a sympthom of disequilibrium and is not compatible

with the islamic tenets on balance and equilibrium. Therefore, the only way to a lasting recovery of economic health is to put an end to inflation by attacting its root cause.

In terms of root cause of inflation, Ascarya (2013a) spells out some facts, particularly relating to financial crisis but yet relevant for determining inflation's factors. By using Vector Error Correction Model (VECM), he finds that the root causes of financial crisis are structural in unstable monetary system (interest system and fiat money system), poor governance (administered price), and unsustainable fiscal system (volatile food), as well as misbehavior of economic actors (expectation). Interest rate (Monetary) is the number one root cause of financial crisis with 43.66per cent share in inducing inflation and 24.85per cent share in curbing economic growth, followed by administered price (Governance) with 14.41per cent share in inducing inflation and 5.33per cent share in curbing economic growth, fiat money (Monetary) with 5.54per cent share in inducing inflation and 13.49per cent share in curbing economic growth, and volatile food (Fiscal) with 5.79per cent share in inducing inflation and 9.11per cent share in curbing economic growth.

Meanwhile, Ascarya (2013b) using Structural Equation Modelling (SEM) finds that the main root causes of financial crisis are structural in unsustainable fiscal system (0.60, especially, excessive spending and unsustainable fiscal deficits), poor governance (0.53, especially, poor administration and minimal control), unstable monetary/financial system (0.51, especially, fractional reserve banking system and fiat money system), and external factors (0.45, especially, business cycle and natural disaster). Misbehaviors of economic actors (especially, speculation and individualism) are also responsible for the crisis through its influence in fiscal system (0.39), governance (0.35) and monetary/financial system (0.32).

Some empirical studies have proven that financial crisis could be prevented using Islamic economic perspective, so that financial stability could be maintained. Ascarya (2013a) suggests that the best cure of financial crisis is single global currency (External) with 8.03 per cent share in curbing inflation and 3.50 per cent share in inducing economic growth, followed by profit-and-loss sharing (Monetary) with 0.02 per cent share in curbing inflation and 0.09 per cent share in inducing economic growth. Ascarya (2013b) proposed that proper solutions to these structural problems would be gradual and systemic structural reforms as proposed in all five areas. Meanwhile, Ascarya (2014a) suggests that the first controlled main real cause of financial crisis is Speculation or maysir (next to uncontrolled Social Instability), so that the prohibition of speculation in all markets, especially in financial markets should become the first priority. At the end, all of these real causes should be removed gradually in order to systematically and gradually improve the stability of financial system so that financial crisis will not reappear again in the future.

Comparison of Inflation under Dual Monetary System

In comparing inflation under the Islamic and conventional systems, we can underscore on its similarity and differences. The similarity can be traced out by looking at the sources of the inflation itself. From the Islamic perspective, inflation starts to emerge when the Islamic money (dinar, dirham) as currency started to operate. Inflation occurs when there is an excess in money supply in circulation. In essence, this is similar to the monetarists, expecially Austrian school, where they assert that inflation is a result of excessive fiat money or a huge number of credit creation. In addition, output gap, which is a common phenomenon in economy, can be described equally by both perspectives. The Keynesian school asserts that the ouput gap is due to cost push and demand pull factors, while Al-Maqrizi (2004) and Ascarya (2009) emphasizes the natural disasters and human error factors. Both of these arguments are stemmed from the same root, namely demand pull or cost push inflation. Table 1 below indicates major determinants of inflation under a dual system.

Table 1

Determinants of Inflation under Conventional and Islamic Perspectives

General Cause	Specific Mechanisms	Conventional Monetary System	Islamic Monetary System
Human error/artificial inflation	DEMAND		
	Corruption		V
	Misbehavior		V
	Excess money supply from money creation	O	V
	Excess money supply from credit creation	O	V
	Ouput Gap	O	V
	Poor Administration		V
	Expectation		
	Adaptive	O	
	Forward	O	
	Cost		
	Foreign Inflation	O	V
	Exchange Rate		
	Volatile Food		
	Administered Price		
	Wages		
Natural Inflation	Supply shock	O	V
	Natural Disaster	O	V

Source : Ascarya (2009).

Notes: O denotes inflation determinants recognized in conventional monetary system and V denotes inflation determinants recognized in Islamic monetary system.

Meanwhile, the difference between the Islamic and conventional monetary systems lie in the determinants of inflation. The Islamic system, which is considered a new approach in the modern economy, does not specify human errors and natural disasters as variable indicators. It is due to the fact that Islamic variables are invented recently by contemporary conventional economists and empirically have the potential to be corrected and replaced the former system as an alternative. Corruption, poor management, and excessive taxes can be vividly corrected by rule and regulation under the Islamic law, while conventional pillars should and must be gradually replaced by *shari'ah* law, namely fiat money can be replaced by gold standard system, fractional reserve banking system replaced by 100 percent reserve banking or free interest banking system, credit card replaced by debit card, and derivatives can be replaced by asset based or backed securities. As every country has their own system and target, inflation target is transmitted through various instruments or channels. Table 2 below outlines several monetary determinants which are used in selected countries.

Table 2
Determinants of Inflation in Various Countries

Country	**Output Gap**	**Excess Money**	**Exchange Rate**	**Foreign Inflation**	**Energy price**	**Food Price**	**Expected Inflation**
Country	**Demand**			**Supply**			**Expectation**
MENA							
Saudi Arabia		Money Supply Shock		Trading partner inflation			
Developing Countries							
Malaysia		M2	Nominal ER to US$		Crude Oil Price	Price of Rice	CPI(-1)
Indonesia		M1-M2	Nominal ER to US$		Retail Gas Price	Price of Rice	CPI(-1)

Source : Ascarya (2009)

Previous Study

Dlamini, et.al (2001) studied the determinants of inflation in Subsaharan Africa by using error correction modelling (ECM). The results suggest that real income, money supply, interest rates, exchange rate, and level of salary would induce the level of inflation.

Roberto, et.al (2006) focused on the dynamic inflation in Malaysia during last 2006. By using ECM approach, the findings show money growth, nominal effective exchange rate, unit labor costs growth, deviations from mark-up pricing, and excess money supply have significant effect for stimulating inflation. Moreover, by using New

Keynesian Phillips Curve , the inflation is inertia and expected outcome. Therefore, inflation obviously is triggerred by past and future condition of an economy.

Nguyem, et.al. (2010) explored the determinants of imflation in Vietnam over 2001-2009. By using time series estimation techniques, they find that inflation is persistent and that the money supply, oil prices and rice prices present the strongest influences on CPI inflation. in the case of Vietnam, the cost push inflation is the primary factor elevating the rate of inflation.

Kennedy and Bernard (2010) analyzed some determinants of Inflation in Ghana by utulizing regression techniques. The findings suggest It is clear that the growth rate of real GDP and the growth of money supply are the main determinants of inflation in Ghana- both in the short-run and the long-run, with money supply being the key determinant. The coefficient for money supply from the estimated long-run inflation function confirms the Monetarists theory of inflation in the long-run . And the independence of the central bank is very important if policy makers want to reduce the effects of money supply on inflation.

Aurangzeb and Haq (2012) conducted an analysis on determinants of Inflation in Pakistan by using multiple regression. They find Gross domestic production is having negative relationship with inflation, while exchange rate, interest rate, fiscal deficit and unemployment have positive relationship inflation. It is recommended that the policy makers should critically evaluate and analyze the exchange rate, remittances, gross domestic production and foreign direct investment on continuous basis to reduce the trade deficit.

Kuijs and Katz (1998) focused their study on Determinants of Inflation, exchange rate and output in Nigeria case. By using co-integration analysis, the study suggest The price level is, in long run, determined by monetary policy, as an excess of money supply over money demand leads to a rise in the rate of inflation, while the long run effect of import prices is insignificant. The long run equilibrium real exchange rate, the only relative price in the model, is determined by the real demand for, and supply of foreign exchange.

Another study conducted in Nigeria by Abidemi and Malik (2010) by using cointegrating model reveal that only Inflation rate (INF), Growth Rate of GDP, Growth Rate of Money supply (GRM) and real share of Fiscal deficit (FDGDP) are found to reject the null hypotesis of no stationary at level and this implies that the time series variables are relatively stable and integrated of orger zero. While other time series variables, real share of import (MGDP), Exchange rate and Interest rate accept the null hypothesis of no stationary at level and are differenced once to make them stationary. This implies that MGDP, EXR and INT data are not stable at levels but stable at first difference.Reveals that the residual tern generated from the model is stationary at

level which implies that there exist long-run relationship between inflation and it's considered determinants-fiscal, monetary and key macroeconomic indicator factors.Reveals that growth rate of GDP, growth rate of money supply, real share of import, first lagged of inflation rate and interest rate exert positive influence on inflation rate have significant effect on current inflation rate in Nigeria during the review period.

Mohanty and Klau attempted to explore on" What determines inflation in emerging market economies? ". The findings show Excess money supply, another demand side indicator, was related to inflation in only some countries. This finding supports the argument that money supply may have lost relevance for predicting inflation under the impact of financial liberalisation and innovation.

Inflation persistence is rather high in many countries. To the extent that high inflation persistence reflects backward-looking wage and price expectations, it makes it more costly for countries to reduce inflation. But once inflation has been stabilised at a low level, a high degree of persistence could be helpful to central banks to firmly anchor inflation expectations in the economy.

Supply side factors seem to play more than a passing role in the inflation process. The exchange rate or import prices turned out to be a significant and important determinant of inflation and this result appears to be robust across alternative specifications.

The influence of oil prices seems to differ across countries. This could be related to different responses to oil price shocks, particularly with regard to the degree of monetary accommodation or to rigidities in the adjustment of domestic oil prices.

RESEARCH METHOD

Conceptual Framework

The framework of this study shows the inter-relation among determinants that triggered inflation from conventional and Islamic point of views.Summarizing the earlier discussion on the determinants of inflation, the main determinants of inflation in the conventional system are: 1) demand pull, represented by fiat money and fractional resrve banking, 2) cost push inflation, denoted by interest, exchange rate, volatile food, and administered price, 3) adaptive inflation. Therefore, the model of conventional determinants of CPI inflation can be written as follows:

$$INF = f(FM, FRB, INT, EXC) \quad (1)$$

Meanwhile, since the Islamic system does not recognize some of the conventional variables, selected variables are replaced by variables which are considered Islamic compliant, namely Islamic money, profit-loss sharing return, and gold price. The other three variables are left unchanged, since these variables are categorized from the supply side. Therefore, the model for inflation determinants for the Islamic system can be expressed :

$$INF = f(IM, RS, GOLD) \quad (2)$$

Variables and Operational Definition

The variables used in this study and their operational definitions are summarized as follows:

Table 3
Definition and Sources of Variables

No	Variable	Definition	Explanation
1.	Inflation Rate (IR)	A proxy for inflation	Index of monthly CPI inflation
2.	Fiat money (FM)	Excess money supply from money creation	M3, which is included M2 + all other CDs (large time deposits, institusional money market mutual fund balances), deposits of foreign currency and repurchase agreements
3.	Fractional reserve banking (FRB)	Excess money supply from credit creation	Difference between broad money and Base Money
4.	Interest rate (INT)	Saving Deposit Rate	Monthly 1-month deposit rate of conventional banks
5.	Exchange rate bilateral system (EXR)	Price of domestic exchange rate against foreign exchange rate	Domestic nominal exchange rate against the US Dollar
6.	Just money supply or money in Islamic perspective (IM)	Base Money	Calculated as money based on demand, namely cash currency in circulation + deposit money
7.	PLS Return (RS)	Returns of investment from Islamic bank	Used as a proxy for interest free banking by using 1 month mudharabah deposit
8.	Single global currency of GOLD price (GOLD)	International gold price index	Used as a proxy for international payment system

Several variables are excluded from the conventional model, including output gap, foreign inflation, supply shock, excess money from credit card, and excess money supply from derivative. The exclusion is to limit the measurement of inflation determination due to the different classes of money and credit in the economy. Accordingly, this would be a drawback of this study and may have affected in the

process of monetary policy under dual system. Nevertheless, future research should include these variables so as to arrive at a more conclusive findings on this topic.

Sources of Data

The data used in this study is secondary data of monthly time series obtained from Central Bank of Indonesia, and Bank Negara Malaysia (BNM). The sample period of thestudy spans from January 2012 to April 2015 due to the modest inflation rates in both countries.

Method of Estimation

The analysis used in this present study is the Vector Autoregressive (VAR) model where some variables are not only explanatory variables for a given dependent variable, but they are also explained by the variables that they are used to determine. According to Sims (1980), if there is simultaneity among a number of variables, then all these variables should be treated in the same way. In other words, there should be no distinction between endogenous and exogenous. Therefore, in VAR, all variables are treated as endogenous. Such condition has treated the time series, for instance y_t is affected by current and past values of x_t, and simultaneously, the time series x_t to be a series that is affected by current and past values of the y_t series. In this case, the model will separately describe, namely under Islamic and conventional system.

In addition, if the variables have unit roots, then we can expect that there may exist co-movement in their behavior and possibilities that they will trend together toward a long run equilibrium state. Then, using the greater representation theorem, we may posit the following testing relationships that constitute a VEC model for dual monetary systems, as follows:

$$\Delta Z_t = \tau_1 \Delta Z_{t-1} + \tau_2 \Delta Z_{t-2} + \_\_\_\_ + \tau_{l-1} \Delta Z_{t-l-1} + \pi Z_{t-l} + \mu + \sigma_t$$

Where $\boldsymbol{\Delta} Z_t$ contains the growth rate of the variable. The τ's are estimable parameters. $\boldsymbol{\Delta}$ is a difference operator, $\boldsymbol{\sigma}$ is a vector of impulses which represent the unanticipated movements in Z_t and π is the long run parameter matrix.

Time Series Properties

Unit Root Tests

There are important differences between stationary and non-stationary time series (Enders, 1995). Shocks to a stationary time series are necessarily temporary; overtime, the effects of the shocks will dissipate and the series will revert to its long-run mean level. As such, long term forecasts of a stationary series will converge to the unconditional mean of the series. To identify the presence of unit root, the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) are the two most widely adopted tests. The

distribution theory supporting the Dickey-Fuller tests is based on the assumption that the error terms are statistically independent and have a constant variance. So, the ADF assumes that the error terms are uncorrelated; however PP (1988) developed a generalization of the ADF test procedure that allows for fairly mild assumptions concerning the distribution of errors. The test regression for the PP test is the AR (1) process: $\Delta y_{t-1}=\alpha_0 +\gamma y_{t-1} + \varepsilon_t$

While the ADF test corrects for higher order serial correlation by adding lagged differenced terms on the right-had side, the PP test makes a correction to the t-statistic of the coefficient γ from the AR (1) regression to account for the serial correlation in e_t.

Co-integration Test

Co-integration then becomes an over-riding requirement for any economic model using non-stationary time series data. If the variables do not co-integrate then we have the problems of spurious regression and econometric work become almost meaningless. The concept of co-integration later was developed by Engle and Granger (1987) which were working in the context of a bivariate system with at most one co-integrating vector and they give the formal definition of co-integration, as follows: "Time series Yt and Xt are said to be co-integrated of order d,b where d>b>0, written as Yt, Xt ~ CI (d,b), if (a) both series are integrated of order d, (b) there exists a linear combination of these variables". Therefore, for empirical econometrics, the most interesting case is where transformed with the use of the co-integrating vector become stationary, that when d=b, and the co-integrating coefficients can be identified as parameters in the long-run relationship between the variables.

Variance Decomposition

In econometrics and other applications of multivariate time series analysis, a variance decomposition or forecast error variance decomposition (FEVD) is used to aid in the interpretation of a vector autoegression (VAR) model once it has been fitted. Theoretically, the FEVD indicates the amount of information each variable contributes to other variables in the autoregression. It determines how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables.

RESULTS AND DISCUSSION

Unit Root Test Results

Before we proceed, it is imperative to perform a-priori analysis of the variables temporal properties. The summary unit root test are used simultaously to test the existence of root test or the stationary of the data. We subject each time series to the

standard Augmented Dickey- Fuller (ADF) unit root test. With 1% and 5% statistical critical value, meaning that if the value of t-ADF less than 1% and 5%statistical critical value, then the data can be identified as stationary or has no unit root. The results, under conventional and Islamic monetary system, indicate that almost all data series under consideration are integrated of order 1, or I(1). In addition, the study implements the Philips-Perron (PP) test for all variables under consideration and the PP test confirms the stationarity in I(1) process. The importance of stationary time series is in terms of shocks coming into the system. The shocks towards a stationary time series are considered temporary. Therefore, the stationary time series enable the shocks will dissipate and revert it to its long-run mean level.

Table 4

Unit Root Tests Results under Dual Monetary System in Indonesia

	Conventional	Islamic	Cross-sections	Obs
Method	Statistic	Statistic	Conv/Islamic	Conv/Islamic
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.38598***	-1.64917**	5/4	186/149
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.4985***	-9.82176***	5/4	186/149
ADF - Fisher Chi-square	103.910***	88.5823***	5/4	186/149
PP - Fisher Chi-square	133.468***	67.9735***	5/4	190/152
** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.				

*** Significant at 1%, ** Significant at 5%

Table 5

Unit Root Tests Results under Dual Monetary System in Malaysia

	Islamic	Conventional	Cross-sections	Obs
			Islamic/ Conv	Islamic/Conv
Method	Statistic	Statistic		
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.44110***	-11.550***	4/5	150/188
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-12.1914***	-14.631***	4/5	150/188
ADF - Fisher Chi-square	109.916***	145.243***	4/5	150/188
PP - Fisher Chi-square	112.815***	146.958***	4/5	152/190
** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.				

*** Significant at 1%, ** Significant at 5%

Cointegration Result

Subsequently, we proceed with a co-integration test as suggested by Johansen (1992) and Johansen and Juselius (1990). Essentially, the test of a VAR- based test, treating all variables as essentially endogenous. In implementing the test, we place emphasis on the pre-condition that the error terms need to be serially uncorrelated. Co-integration test based on trace statistics will be applied to determine the number of equation systems that can explain long term relationship. As it can be observed from the table, we find evidences for the presence of a long run relationship among the variables in all systems we estimate. Trace test of conventional model shows 1cointegrating equations at the 5%, while trace test of Islamic model indicates 1cointegrating equations at the 5% and 1cointegrating equations at 1% levels.

Variance Decomposition Analysis

Table 6 below clearly shows the innovation accounting of several selected variables against inflation under dual monetary system in Malaysia. Interestingly, the contribution of inflation under conventional system increasingly rises over 30 periods compared with under islamic system. In the 2nd period of conventional system, inflation is mainly contributed by fractional reserve banking (FRB) around 5.11% out of 7.87%. However, the more periods go along, fiat money (FM) leads to have dominant shares in accumulating inflation under conventional system for 9,36% followed by exchange rate, 8.40% out of 23.85% in 30th period. Meanwhile, under Islamic system, profit loss sharing return (RS) in the beginning holds non-negligible share towards inflation determinants. However, time goes by, international gold price (GOLD) becomes the dominant in the 30th period for 6.25% and all together records roughly 17.68%. in comparison between two systems, empirically ilustrate Islamic system would give lower share towards inflation determination in Malaysia. If the ongoing conventional system was replaced by islamic system, the inflation rate could be reduced due to its determinants would contribute less in generating inflation around 6%.

Table 6
Analysis for Variance Decomposition Results of LnINF under Conventional and Islamic Model in Malaysia

PERIOD	CONVENTIONAL					ISLAMIC			
	FRB	FM	EXR	INT	TOTAL	GOLD	IM	RS	TOTAL
2	5.11	2.10	0.66	0.00	7,87	1.00	2.84	3.33	7,17
4	3.81	4.51	3.20	0.53	12,05	2.30	2.98	3.38	8,66
8	4.12	5.83	3.73	0.70	14,38	2.79	3.52	4.01	10,32
12	4.01	6.98	4.37	0.98	16,34	3.32	3.80	4.13	11,25

16	3.97	7.74	5.36	1.23	18,3	4.03	4.27	4.44	12,74
20	4.04	8.23	6.32	1.44	20,03	4.71	4.77	4.78	14,26
24	4.11	8.63	7.18	1.63	21,55	5.34	5.24	5.10	15,68
28	4.16	9.10	7.99	1.82	23,07	5.95	5.68	5.39	17,02
30	4.17	9.36	8.40	1.92	23,85	6.25	5.90	5.53	17,68

Table 7 shows the innovation accounting of inflation under dual monetary systems in Indonesia. In conventional system, Fractional reserve banking (LNM2) initially contributes the biggest determinant for around 1.45% at 2nd period. Subsequently, at 30th period, interest rate (IR) becomes a dominant share towards inflation roughly 23.87% at 30th period. Accumulately, under conventional system, all selected variables contribute 43.4%. Meanwhile, international gold price (LNIGPI) becomes the dominant variable for generated inflation since the 2nd period till 30th period. Accumulately, they form towards inflation for 20.8%. Therefore, under Islamic system, the inflation generated can be reduced significantly around 50%.

Table 7
Analysis for Variance Decomposition of LNINF under Conventional and Islamic Model in Indonesia

PERIOD	**CONVENTIONAL**					**ISLAMIC**			
	INT	EXR	FM	FRB	TOTAL	IM	RS	GOLD	TOTAL
2	0.02	0.58	1.45	1.32	3,37	0.03	0.25	2.82	3,1
4	3.34	4.89	2.56	10.55	21,34	0.57	1.09	10.50	12,16
8	10.69	8.05	2.26	9.01	30,01	3.47	1.91	13.54	18,92
12	15.58	8.96	2.06	8.54	35,14	4.82	1.90	13.43	20,15
16	18.67	9.37	1.96	8.28	38,28	5.61	1.82	13.16	20,59
20	20.75	9.61	1.89	8.08	40,33	6.08	1.75	12.93	20,76
24	22.26	9.79	1.84	7.93	41,82	6.35	1.69	12.76	20,8
28	23.40	9.92	1.80	7.81	42,93	6.52	1.65	12.64	20,81
30	23.87	9.97	1.79	7.77	43,4	6.57	1.63	12.60	20,8

CONCLUSION

Inflation is a monetary phenomena. Indonesia and Malaysia are two countries which have been implementing dual monetary systems. By using vector auto regressive (VAR) approach, the results reveal that generated inflation can be reduced by using Islamic system. The main contributor of inflation either in Malaysia or Indonesia during january 2012 to May 2015 is fiat money (FM) and interest rate (INT). The innovation of inflation can be reduced almost 50% and 25% if the two countries replaced theirs systems with islamic system, including using real money (IM), profit loss sharing (RS), and gold price (GOLD). The monetary policy under dual monetary

system in the future need to have special arrangements in terms of institutional, and instruments to accomodate and effectively promote monetary framework under dual systems.

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